DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT

For

ROUGH STONE, WEATHERED ROCK & GRAVEL QUARRY OVER AN EXTENT OF 4.38.0 Ha.

Lease in Consent Patta Land

Schedule & Project Category	: 1(a) Mining of Minerals 'B1' (Cluster)
TOR No. & Date	: SEIAA-TN/F.No.9520/SEAC/ToR-1342/2022, 09.02.2023
Baseline period	: March 2023 to May 2023

At

SF. No. 467/2,3,477/3,4,5 & 468/1, A.P.Nadanur Village,

Alangulam Taluk, Tenkasi District,

Tamil Nadu.

Proponent/Leasee

Thiru. M.Mohamed Ismail

S/o. Mohamed Mahaboob,

No. 8/143, Main Road, Pottalpudur,

Tenkasi District

Environmental Consultant

M/s. EHS360 Labs Pvt. Ltd.,

Ashok Nagar, Chennai

NABET- Certificate No. NABET/EIA/2225/IA 0098 validity 24th June-2025

July- 2023

PREFACE

Thiru. M.Mohamed Ismail
S/o. Mohamed Mahaboob,
No. 8/143, Main Road, Pottalpudur,
Tenkasi District.

DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT

For

"Rough Stone, Weathered Rock & Gravel Quarry Over an Extent of 4.38.0 Ha".

Lease in Consent Patta Land

Lease Period: 5 years

SF. No. 467/2,3,477/3,4,5 & 468/1, A.P.Nadanur Village,

Alangulam Taluk, Tenkasi District,

Tamil Nadu.

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

Approved by: Santhoshkumar. A

Signature: A. S EHS360 LABS PRIVATE LIMITED Chennai-600 083

Designation: CEO

Date:

The report has been prepared in line with the prescribed ToR vide Lr. No. **SEIAA-TN/F.No.9520/SEAC/ToR-1342/2022, 09.02.2023** isued by SEIAA-TamilNadu. This report has been updated with required data and report modified by M/s. EHS360 Labs Pvt. Ltd., with all reasonable skill, care, and diligence within the terms of the contract with the project proponent.

Document Control			
Name of the Document	Environmental Impact Assessment report for "Thiru. M.Mohamed Ismail's Rough stone, Weathered Rock & Gravel Quarry over an extent of 4.38.0 Ha. located at Located at SF. No. 467/2,3,477/3,4,5 & 468/1 A.P.Nadanur Village, Alangulam Taluk, Tenkasi District, TamilNadu		
Document No.	**EHSL/EIA-PH/1(a)/01**	**Revision:**	**01**
		Date:	**28.06.2023**

DISCLAIMER:

This report has been prepared by M/s. EHS360 Labs Pvt. Ltd. for obtaining Environmental Clearance based 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.

DECLARATION OF EXPERTS CONTRIBUTING TO THE EIA:

Declaration by Experts Contributing to Environmental Impact Assessment for the ***"Thiru. M.Mohamed Ismail's Rough Stone, Weathered Rock & Gravel Quarry over an extent of 4.38.0 Ha located at Located at SF. No. SF. No. 467/2,3,477/3,4,5 & 468/1, A.P.Nadanur Village, Alangulam Taluk, Tenkasi District, TamilNadu".***

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: Tatiparthi Rajani

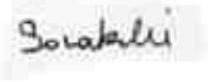
Date: 11.05.2023

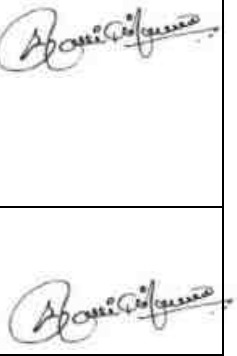
Period of Involvement **:** November 2022 to till date.

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	Ms. Sonakshi Garg	**Period:** Nov 2022 to Till date **Task:** Selection of monitoring 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 EIA documentation	
		Mr. Santhosh kumar A (TM)	**Period:** Nov 2022 to Till date **Task:** Site visit and Kick of meeting with client. Assisting with FAE during Selection of monitoring locations, Identification of most suitable control device for reducing process emission	

			at source and contribution to EIA documentation	
2.	AQ	Ms. Tushali Jagwani	**Period:** Nov 2022 to Till date **Task:** Developing meteorological data with collected secondary data, identification of impacts, finalization of mitigation measures and contribution to EIA documentation	
3.	WP	Ms. Sonakshi Garg	**Period:** Nov 2022 to Till date **Task:** supervision & checking of sampling locations for surface water & Ground water samples & their analysis results. Auditing water use, water balance water budgeting, water Conservation and developing schemes for reuse of water Identification of Impacts pollution evaluation of water control management, finalization of mitigation measures and contribution to EIA documentation	
		Mrs.Tatiparthi Rajani (TM)	**Period:** Nov 2022 to Till date **Task:** Assistance to FAE during auditing water use, water balance water budgeting, water Conservation and developing schemes for reuse of water Identification of Impacts pollution evaluation of water control management finalization of mitigation measures and contribution to EIA documentation.	
		Ms. Soosan Steffy S (TM)		
4.	SHW (SW& HW)	Mrs. Tatiparthi Rajani	**Period:** Nov 2022 to Till date **Task:** Identification of waste generation, studying adequacy of Mitigation measure for management of hazardous waste and contribution to EIA documentation	
		Mr. Santhosh Kumar. A (TM)	**Period:** Nov 2022 to Till date **Task:** Assistance to FAE during Studying adequacy of Mitigation measure for management of hazardous waste and contribution to EIA documentation	

5.	SE	Mrs. Anitha Reddy	**Period:** Nov 2022 to Till date **Task:** Collection of secondary and primary from the surrounding area/villages of the proposed project for mpact identification and mitigation measures for incorporating to EIA documentation	
6.	EB	Mr.G. Raja Reddy	**Period:** Nov 2022 to Till date **Task:** Site visit and conduct of ecological survey, assessment of the impacts of proposed project activities on the biological environment and contribution to EIA documentation	
		Mrs.Tatiparthi Rajani (TM)	**Period:** Nov 2022 to Till date **Task:** Assisting FAE during Site visit, conduct of ecological survey, and contribution to ELA documentation	
7.	HG	Mr. Mallikarjuna Rao	**Period:** Nov 2022 to Till date **Task:** Understanding and representing groundwater conditions, Supervision of groundwater sampling locations, finalization of survey findings, identification of impacts, suggestion of mitigation measures and contribution to the EA documentation.	
8.	GEO	Mr. Mallikarjuna Rao	**Period:** Nov 2022 to Till date **Task:** Not Involved functional area rationalized as per OCI Scheme for Accreditation Version 3.	
9.	NV	Mr. Varadharajan Natarajan (Noise Only)	**Period:** Nov 2022 to Till date **Task:** site visit and Checking of noise sampling results, analysis of data identification of impacts and mitigation measures, and contribution to EIA documentation	
10.	LU	Mr. Varadharajan Natarajan	**Period:** Nov 2022 to Till date **Task:** Generation and analysis of data related 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. Ganesh Gopal Watve	**Period:** Nov 2022 to Till date **Task:** Identification of hazards and hazardous substance, preparation of	

			impacts diagrams & mitigation measures, dentifing risk and consequenod analysis usung latest software and contribution to EIA documentation	
		Dr. Vivakandan (TM)	**Period:** Nov 2022 to Till date **Task:** Assesting FAE during Identification of hazards and hazardous substance, preparation of impacts diagrams & mitigation measures, dentifing risk and consequenod analysis usung latest software and contribution to EIA documentation	
12.	SC	Dr. Aparna Chittajallu	**Period:** Nov 2022 to Till date **Task:** Understanding and representing soil conditions, supervision of soil sampling locations, finalization of survey findings, identification of impacts, suggestion of mitigation measures and contribution to the EIA documentation	
		Ms. Soosan Steffy S (TM)	**Period:** Nov 2022 to Till date **Task:** Assistance to FAE during soil study. identification of impacts, suggestion of mitigation measures 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

Acknowledgment

The following personnel are sincerely acknowledged for their fullest support in colletion, compilation of data regarding the project and cooperating in the report on Environmnetal Impact Assessment Report (EIA) of "Thiru. M.Mohamed Ismail's Rough Stone, Weathered Rock & Gravel Quarry over an extent of 4.38.0 Ha located at Located at SF. No. 467/2,3,477/3,4,5 & 468/1, A.P.Nadanur Village, Alangulam Taluk, Tenkasi District, TamilNadu".

M/s. EHS360 Labs Private Limited

1. Mr. Santhosh Kumar. A (CEO)
2. Mrs. Tatiparthi Rajani
3. Mr. N. Varadharajan
4. Mr. Mohan Raj. V
5. Ms. Soosan Steffy. S
6. Mr. G. Krishnan
7. Ms. S. Kalaiyarasi
8. Ms. B. Monishadevi

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

I, Mr. Santhoshkumar.A hereby, confirm that the Above-mentioned experts prepared the EIA/EMP report for "Thiru. M.Mohamed Ismail's Rough Stone, Weathered Rock & Gravel Quarry over an extent of 4.38.0 Ha located at Located at SF. No. 467/2,3,477/3,4,5 & 468/1, A.P.Nadanur Village, Alangulam Taluk, Tenkasi District, TamilNadu".

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 : A-S EHS360 LABS PRIVATE LIMITED Chennai-600 083

Date :

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/2225/IA 0098 valid up to- June 24th,2025

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ANNEXURES

S. No.	Description
1	Tor Copy
2	Lease document
3	Toposheet
4	Mining plan
5	Executive summary

LIST OF ABBREVIATIONS

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

1 INTRODUCTION

1.1 Project background

Project proponent Thiru. M.Mohamed Ismail, a resident of Pottalpudur Village, in Tenkasi District of TamilNadu. He had proposed to extract Rough Stone, Weathered Rock & Gravel in an extent of 4.38.0 Hectares of Patta land, located in SF. No 467/2,3,477/3,4,5 & 468/1 A.P.Nadanur Village Alangulam Taluk, Tenkasi District Tamil Nadu.

The Proposed land has Patta in the name of Thiru. Mohamed Mahaboob vide Patta No-2666 & 2090, where the proponent had obtained consent from the Pattadhar and lease agreement had been registered in the year 2021. The Proponant had obtained lease for a period of 15 years(2021-2036) .

The Proponent has proposed to do quarry Rough stone, Weathered Rock & Gravel over an extent of 4.38.0 Ha of Patta land located in the SF. No. 467/2,3,477/3,4,5 & 468/1, A.P.Nadanur Village, Alangulam Taluk, Tenkasi District, TamilNadu State under Rule 19(1) of TamilNadu Minor Mineral Concession Rules, 1959. The Assistant Director, Department of Geology and Mining, Tenkasi District has issued a Precise area communication letter vide Rc. No. M1/6695/2021, Dated: 09.04.2022 to submit the Approved Mining Plan and Environmnetal Clerance from State Level Impact Assessment Authority (SEIAA) under the Rule 42 of Tamil Nadu Minor Mineral Concession Rules,1959.

The Mining Plan has been prepared by Recognised Qualified Person and the same was submitted to Department of Geology and Mining, Tenkasi for the approval. The Mining plan was approved by the Assistant Director, Department of G&M, Tenkasi vide Letter Rc.No.M1/6695/2021 dated 26.04.2022.

Now, the Proponent has applied for Environmental Clearance (EC) from State level Environment Impact Assessment Authority (SEIAA), TamilNadu. In line with the provisions of Environment Impact Assessment (EIA) Notification 2006 (incl. its amendments from time to time), the SEIAA, Tamil Nadu had issued the Standard Terms of Reference (ToR) vide **Letter No. SEIAA-TN/F.No.9520/SEAC/ToR-1342/2022, Dated: 09.02.2023** along with additional Terms of Reference, for carrying-out EIA

Studies and preparation of an EIA/EMP Report. Copy of the ToR issued by SEIAA, TamilNadu, is enclosed as **Annexure 1**.

This EIA report contains information as per TOR and has been prepared as per generic structure given in Appendix III of EIA notification 2006 by MOEF & CC, Govt. of India.

1.2 Identification of Project & Project Proponent

1.2.1 Project

The proposed proposal is for excavating rough stone, weathered rock and gravel by Opencast semi-mechanised method with drilling and blasting. The proposed production quantity (saleable quantity) is 10,24,965 m^3 of rough stone,1,85,470 m^3 of Weathered rock and 76,944 m^3 of gravel for a period of 5 years. The excavated minerals will be transported through tippers to the required customers. There are no notified sensitive areas located within 10 km radius from the project site.

1.2.2 Project Proponent

Thiru. M.Mohamed Ismail is an individual proponent who is residing at Pottalpudur Village in Tenkasi District. The contact details of the project proponent are as under:

Name	: Thiru. M.Mohamed Ismail, Project Propoenet.
Address	: Thiru. M.Mohamed Ismail S/o. Mohamed Mahaboob, No. 8/143, Main Road, Pottalpudur, Tenkasi District.
Contact No.	: 9443932490
Email ID	: mohamadismailtenkasi@gmail.com

Thiru. M.Mohamed Ismail had engaged Mr.V.Radhakrishnan of trichy, as their RQP, for preparation of the mining/quarry plan for mining of Rough Stone, Weathered Rock & Gravel quarry over an extent of 4.38.0 Ha.

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

The applicant has obtained Precise area communication from District Collector's Office, Geology & Mining, Tenkasi vide Rc. No. M1/6695/2021, Dated: 09.04.2022.

After submitting the mining plan by the proponent, The Mining Plan got approved by the Assistant Director, Department of Geology and Mining, Tenkasi vide Letter Rc.No.M1/6695/2021, dated: 26.04.2022.

1.4 Land Acquisition Status

The entire quary land over an extent of 4.38.0 Ha is a Patta land in the name of Thiru. Mohamed Mahaboob vide Patta No. 2666 & 2090. The applicant had obtained lease from the Pattadhar for a period of 15 years (2021-2036).

1.5 Purpose and Status of the Report

The proposal is quarry operation of rough stone, weathered rock and gravel over an extent of 4.38.0 Ha. by Opencast semi-mechanised method with drilling and blasting. As per the EIA notification 2006 and its subsequent amendments, the proposed project falls under Schedule 1 (a) Mining of Minerals, Category 'B1' (Cluster category). The application for Environmental Clearance has been submitted to State Environment Impact Assessment Authority (SEIAA), TamilNadu vide Proposal No. SIA/TN/MIN/402060/2022 and the same was acknowledged by SEIAA-TN vide Letter No. SEIAA-TN/F. No. 9520/2022, dated: 26.10.2022. Later the file has been placed in the 345th SEAC Meeting held on 10.01.2023 and the Terms of Reference (ToR) has been issued by SEIAA-TN for carrying out the Environmental Impact Assessment (EIA) Studies and preparation of EIA/EMP Report for the proposed project. The draft EIA prepared will be submitted for Public Consultation. Upon incorporating the minutes of the public consultation along with proponent action plan the final EIA will be submitted to SEIAA-TN 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 Proponent Thiru. M.Mohamed Ismail had proposed to quarry Rough stone, Weathered Rock & Gravel over an extent of 4.38.0 Ha of Patta land located in the SF. No. 467/2,3,477/3,4,5 & 468/1, A.P.Nadanur Village, Alangulam Taluk, Tenkasi District, TamilNadu. The proponent has obtained a lease from the Pattadhar Thiru. Mohamed Mahaboob, in the year 2021 for a period of 15 years which is valid up 2036. The Assistant Director, Department of Geology and Mining, Tenkasi District has issued a Precise area

communication letter vide Rc. No. M1/6695/2021, Dated: 09.04.2022 to submit the Approved Mining Plan and Environmnetal Clerance from State Level Impact Assessment Authority (SEIAA) under the Rule 42 of TamilNadu Minor Mineral Concession Rules,1959. The Mining Plan has been prepared by Recognised Qualified Person and the same was submitted to Department of Geology and Mining, Tenkasi for the approval. The Mining plan was approved by the Assistant Director, Department of G&M, Tenkasi vide Letter Rc.No.M1/6695/2021 dated 26.04.2022.

The proposed quarry is located between the Latitude 08°48'08.86" N to 08°48'17.74" N and Longitude 77°26'03.91" E to 77°26'12.39" E. There are three proposed quarries and one Existing quarry located within 500m radius from the project site. Considering the active/working quarries, the total extent of the area is 9.89.0 Ha. As per the Office memorandum (F. No. L-11011/175/2018-IA-II(M)) dated: 12.12.2018, if a cluster or individual lease area exceeds 5 Ha. the EIA/EMP report with Public consultation is mandatory.

Therefore, the application for Environmental Clearance has been submitted to State Environment Impact Assessment Authority (SEIAA), TamilNadu vide Proposal No. SIA/TN/MIN/402060/2022 and the same was acknowledged by SEIAA-TN vide Letter No. SEIAA-TN/F. No. 9520/2022, dated: 26.10.2022. Later the file has been placed in the 345th SEAC Meeting held on 10.01.2023 and the Terms of Reference (ToR) has been issued by SEIAA-TN for carrying out the Environmental Impact Assessment (EIA) Studies and preparation of EIA/EMP Report for the proposed project.

The baseline data was collected From March 2023 to May 2023. The Public Hearing minutes with the action plan will be incorporated while submitting the documents for appraisal.

1.6.2 Size of the Project

The proposed location is a Non-Forest Private Land, bearing SF. No. 467/2,3,477/3,4,5 & 468/1, A.P.Nadanur Village, Alangulam Taluk, Tenkasi District, TamilNadu. It is proposed to mine the Rough stone, Weathered rock and gravel using Open Cast Semi-Mechanized Method (with drilling and blasting), by developing the benches of 5m Height with 5m Width.

The total Geological Resources of the minerals to be mined out upto a depth of 52 m below ground level is worked out to be 19,70,685 m^3 of Rough Stone , 2,18,965 m^3 of weathered rock

and 87,586 m^3 of Gravel. Considering the safety distance and the bench loss the total mineable reserves calculated as 76,944 m^3 of Gravel, 1,85,470 m^3 of Weathered rock and 10,24,965 m^3 of Rough stone upto a depth of 52 m for a period of 5 years.

Table 1-1 Estimated Geological and Mineable Reserves

Description	Geological Reserves (m^3)	Mineable Reserves (m^3)
Gravel	87,586	76,944
Weathered Rock	2,18,965	1,85,470
Rough Stone	19,70,685	10,24,965

1.6.3 Location of the project

The proposed quarry is located between the Latitude 08°48'08.86" N to 08°48'17.74" N and Longitude 77°26'03.91" E to 77°26'12.39" E. The quarrying is Non-Forest Patta Land, bearing SF. No. 467/2,3,477/3,4,5 & 468/1, A.P.Nadanur Village, Alangulam Taluk, Tenkasi District, TamilNadu. The boundary co-ordinates of the mine lease area are tabulated in **Table 1-2**

Table 1-2 Boundary Coordinates of the project

Label	Latitude	Longitude
1.	08°48'12.72" N	77°26'03.53" E
2.	08°48'13.98" N	77°26'03.91" E
3.	08°48'14.34" N	77°26'03.98" E
4.	08°48'15.57" N	77°26'04.42" E
5.	08°48'14.84" N	77°26'06.34" E
6.	08°48'17.74" N	77°26'07.55" E
7.	08°48'17.47" N	77°26'07.99" E
8.	08°48'15.97" N	77°26'10.20" E
9.	08°48'15.43" N	77°26'10.90" E
10.	08°48'14.32" N	77°26'11.19" E
11.	08°48'14.83" N	77°26'12.39" E
12.	08°48'09.98" N	77°26'11.49" E
13.	08°48'09.33" N	77°26'11.15" E
14.	08°48'10.63" N	77°26'08.09" E
15.	08°48'09.82" N	77°26'07.73" E
16.	08°48'09.24" N	77°26'07.37" E
17.	08°48'08.86" N	77°26'07.04" E
18.	08°48'09.61" N	77°26'05.59" E
19.	08°48'09.98" N	77°26'04.72" E
20.	08°48'12.09" N	77°26'05.22" E
21.	08°48'12.54" N	77°26'03.93" E
WGS 84 – DATUM		

1.6.4 Need for the project and its importance to the country and or region.

The Rough stone, Weathered rock and Gravel quarrying project falls in Thenkasi District, Tamilnadu where scanty agricultural activities are been carried out. Rough stone, Weathered rock and Gravel are important commercial products, with several applications. The proposed project will fulfill its end uses in building and construction of roads, paving and many other exterior projects. This project will give employment opportunities to 20 members. Mineral Industries of the state of Tamilnadu provides employment opportunities for the people of the state as well as in the specific project area. This also helps in countries economic development.

1.6.4.1 Demand –Supply Gap

There is a huge demand of rough stone, Weathered rock and Gravel in Thenkasi District. The excavated rough stone, weathered rock and Gravel is used for construction industries for Government & Public sector projects besides catering domestic housing and infrastructure projects in and around the district. There is a large requirement of rough stone which meets the demand supply chain.

1.6.4.2 Imports Vs Indigenous

There is no import of rough stone, weathered rock and Gravel at present in India. India especially the peninsular India (southern India) has good resource of rough stone, Weathered rock and Gravel.

1.6.4.3 Export possibility

Not envisaged at this stage, as there is enough demand in the local market.

1.6.4.4 Domestic/export markets

The excavated rough stone, weathered rock and Gravel is used for construction industries for Government & Public sector projects besides catering domestic housing and infrastructure projects in and around the district.

1.7 EIA Study

As a part of compliance to the regulatory requirement i.e., to obtain Environmental Clearance from SEIAA, TN, 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 studies and preparation of EIA/EMP report under 'B1' category as per the obtained Terms of Reference from SEIAA-TN was assigned to M/s.

EHS360 Labs Private Limited, Chennai (accredited by NABET for Schedule 1(a) Mining of Minerals Category B vide Certificate No. NABET/EIA/2225/IA/0098, valid up to 24.06.2025) and the baseline studies were carried out during March 2023 to May 2023. The Draft EIA prepared is submitted for Public Consultation. Upon receiving the minutes of Public Hearing, the action plan for the respective questions will be detailed in the final EIA/EMP report and will be submitted for appraisal.

1.8 EIA Cost

Validation of EIA and Apraisal of the project was undertaken by EHS360 Labs Pvt. Ltd. for an amount of Rs. 3,00,000 Lakhs.

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 14th September 2006 and subsequent amendments.

The basic structure of the report will be as under:

Chapter No	Description of Content
Chapter 1	**Introduction** The Chapter gives brief outline of the project details, need of the EIA report, details of the 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, noise, water, soil, socioeconomic, land use and meteorology of the study area within 10.0 km 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 Analysis** Highlights environmental value enhancement and benefits thereof if recommended in scoping stage only if recommended during scoping stage.
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 10 km 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 & delineation of EMP.
- ✓ Risk assessment and safety & disaster management plan.
- ✓ Review & finalization of EIA Report based on the ToR requirements.
- ✓ Submission of EIA report for implementation of mitigation measures & EMP as well as necessary clearances from relevant Authority.

1.9.4 Legal Complicability

The establishment and functioning of the mining industry will be governed by the following environmental acts/regulations besides the local zoning and land use laws of the States.

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

1.9.5 Terms of Reference Compliance

The Terms of Reference (ToR) issued by SEIAA-TN vide Lr no. SEIAA- Letter No. SEIAA-TN/F.No.9520/SEAC/ToR-1342/2022, Dated: 09.02.2023 and the compliance is given as follows:

S. No	Terms of Reference	Compliance
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 copies of lease document is attached as Annexure-II
3	All documents including approved mine plan, EIA and public hearing should be compatible with one another in terms of the mine lease area, production levels, waste generation and its management and mining technology and should be in the name of the lessee.	All the documents are compatible with one another,with reference to lease area, production levels, waste generation etc. and all documents are in the name of the lessee only.
4	All corner coordinates of the mine lease area, superimposed on a High-Resolution Imagery/topography 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).	We have enclosed the Topo-sheet extract (10 km radius), Landuse/Land Cover Map, Satellite imagery etc. showing the core zone and buffer zone of 10km radial distance around the proposed lease. Refer Annexure-IIIfor Toposheet.
5	Information should be provided on 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.	1:50000 scaled SOI Toposheet showing the project area and 10 km buffer zone around it, Topo Map is enclosed as Annexure-3. Geomorphology details of the study area is discussed in Section 3.5.6.
6	Details about the land proposed for mining activities should be given with information as to whether mining conforms to the landuse policy of the state, land diversion for	The proposed quarry area is part of Non-Forest Government land and the proponent

	mining should have approval from landuse board or the concerned authorities.	has obtained the lease. The Proposed land is having Patta in the name of Thiru. Mohamed Mahaboob vide Patta No-2666 & 2090, where the proponent had obtained consent from the Pattadhar and lease agreement has been registered in the year of 2021. The Proponent had obtained lease for a period of 15 years(2021-2036)
7	It should be clearly stated whether the proponant company have a well laid down Anne 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 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.	Noted.
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.	Being an open cast mine, it is proposed to follow a bench slope of 45^{o} by way of benches of 5 m height and 5m width, to maintain the mine safety.
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.	Study is carried out for 10 Km area around mine lease for carrying out EIA. As per the Approved Mining Plan, 100% of the mined mineral is saleable and there is no waste generation.
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 use features should be indicated. Land use plan of the mine lease area should be prepared to encompass preoperational, operational and post operational phases	Refer Chapter 3,Table 3.1

	and submitted. Impact, if any, of change of land use should be given.	
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 and R issues, if any, should be given.	No Over Burden Dumps are proposed outside the lease area. Also, the proposed lease area, being non-forest government land, without any habitation, no R & R issues are involved.
12	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.	The proposed land being non-forest government revenue land, this condition is not applicable.
13	Status of forestry clearance for the broken-up area and virgin forest land 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.	The proposed land being non-forest government revenue land, this condition is not applicable.
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.	The proposed land being non-forest government revenue land, this condition is not applicable. Also, there are no dwellers in the proposed quarry area.
15	The vegetation in the RF / PF areas in the study area, with necessary details, should be given.	The details of vegetation in the Study Area are given in chapter -3,Table 3.1.
16	A study shall be got done to ascertain the impact of the Mining Project on wildlife of the study area and details furnished. Impact of the project on the wildlife in the surrounding and any other protected area and accordingly detailed mitigative measures required, should be worked out with cost implications and submitted.	No wild life in the surrounding and other protected area is involved.
17	Location of National Parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, 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 State Wildlife Department/Chief Wildlife Warden under the Wildlife	No National Parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, Tiger/ Elephant Reserves are existing as well as proposed within 10 Km of mine lease area. No clearance is required.

	(Protection) Act, 1972 and copy furnished.	
18	A detailed biological study of the study area [core zone and buffer zone (10 km radius of the periphery of the mine lease)] shall be carried out. Details of flora and fauna, 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 schedule-I fauna found in the study area, the necessary plan 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. The Conservation Plan for Schedule-I species shall be approved by the Chief Wildlife Warden of the State Government.	Detailed Biological Study of the Study Area [core zone and buffer zone (10 km radius of the periphery of the mine lease)] was carried out by experts and list of Flora & Fauna is detailed in Ch-3, Sec 3.11.
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 Dept. Should be secured and furnished to the effect that the proposed mining activities could be considered.	Proposed lease does not fall under Critically Polluted area or under "Aravali range".
20	Similarly, for coastal Projects, A CRZ map duly authenticated by one of the authorized agencies demarcating LTL. HTL, CRZ area, location of the mine lease w.r.t CRZ, coastal features such as mangroves, if any, should be furnished. (Note: The Mining Projects falling under CRZ would also need to obtain approval of the concerned Coastal Zone Management Authority).	Not applicable since proposed lease doesnot fall under CRZ area.
21	R&R Plan/compensation details for the Project Affected People (PAP) should be furnished. While preparing the R and R Plan, the relevant State/National Rehabilitation and 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 located in the mine lease area will be shifted or not. The issues relating to shifting of Village including their R&R and socio-economic aspects should be discussed in the report.	Not applicable since land is already notified in favour of the Project Proponent.R & R not applicable.
22	One season (non-monsoon) [i.e., March-May (Summer Season); October-December (post monsoon season); December-February (winter season)] primary baseline data on	One season i.e., Post Monsoon Season primary baseline data on ambient air quality as per

	ambient air quality as per CPCB Notification of 2009, water quality, noise level, soil, 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 500m of the mine lease in the pre-dominant downwind direction. The Mineralogical composition of PM10, particularly for free silica, should be given.	CPCB Notification of 2009, water quality, noise level, soil and flora and fauna had been collected. Site- specific meteorological data collected. The location of the monitoring stations such as to represent whole of the study area and justified keeping in view the pre-dominant downwind direction and location of sensitive receptors baseline data collected and detail is furnished in Chapter-3
23	Air quality modeling 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 modeling 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.	The proposal involves controlled sequential blasting, with delayed electric detonators. It will be carried-out in open area, during a specific time of the day.
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.	Water required for the project is 2.5 KLD for different purposes like Domestic, Dust suppression, plantation. Drinking water will be Sourced from Private tankers.
25	Necessary clearance from the competent authority for drawl of requisite quantity of water for the Project should be provided.	Water will be sourced by private tankers from the nearby stone crusher unit. Hence no permission is needed by the project proponent
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.	Rainwater Harvesting for the proposed project is given in Ch-4, Sec 4.4.4
27	Impact of the project on the water quality, both surface and ground water should be assessed and necessary safeguard measures, if any required, should be provided.	Detail impact on water is given in Chapter-4, Section 4.4
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 depth (52 m) of the proposed quarry will not intersect with the ground

	the working will intersect groundwater table, a detailed Hydro Geological Study should be undertaken, and Report furnished. 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.	water.Since the water level is found at the depth of 58 m (rainy season) to 65(summer season) m BGL.
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.	There is no stream (seasonal or perennial) crossing the proposed Quarry Lease Area.
30	Information on site elevation, working depth, groundwater table etc. Should be provided both in AMSL and BGL. A schematic diagram may also be provided for the same.	Provided in the EIA report.
31	A time bound progressive greenbelt development plan shall be prepared in a tabular form (indicating linear and quantitative coverage, plant species and time frame) and submitted keeping in mind, the same will have to be executed upfront on commencement of the project. Phase-wise plan of plantation and compensatory afforestation should be charted clearly indicating the area to be covered under plantation and the species to be planted. The details of plantation already done should be given. The plant species selected for greenbelt should have greater ecological value and should be of good utility value to the local population with emphasis on local and native species and the species which are tolerant to pollution.	Green belt development program is discussed in Chapter-10.
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. Arrangement for improving the infrastructure, if contemplated (including action to be taken by other agencies such as State Government) should be covered. Project proponent shall conduct Transportation Study as per Indian Road Congress	There will not be any significant impact on the traffic.
33	Details of the onsite shelter and facilitiesto be provided to the mine workers should be included in the EIA report.	The facilities to be provided in the mines are detailed in Mines Rules 1955 (Draft amendments in 2019). Accordingly rest shelters, drinking water, sanitary facilities, canteen etc. will be provided.
34	Conceptual post mining land use and Reclamation and Restoration of mined out areas	Detail given in Mining Plan attached as

	(with plans and with adequatenumber of sections) should be given in the EIA report.	Annexure-4.
35	Occupational Health impacts of the Projectshould be anticipated, and the proposed preventive measures spelt out in detail.Details of pre-placement medical examination and periodical medicalexamination schedules should be incorporated in the EMP. The project specific occupational health mitigationmeasures with required facilities proposed in the mining area may be detailed.	Occupational Health Impact is furnished in Ch-4. Medical Examination of the employee carried out as per DGMS Guideline.
36	Public health implications of the Project and related activities for the population inthe impact zone should be systematically evaluated and the proposed remedial measures should be detailed along with budgetary allocations.	There will not be any public health implications due to the project. However, we are proposing an annual health camp as part of CSR for employees as well as general public.
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.	CSR and CER activities are discussed in Chapter -10.
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 other impacts specific to the proposed Project.	Detailed Environmental Management Plan is Discussed in Chapter-10
39	Public hearing points raised and commitment of the project proponent on the same along with time bound action plan to implement the same should be provided and also incorporated in the final EIA/EMP Report of the Project.	This document is prepared for public hearing only. Based on the feedback of PH, the budget for EMP, CSR etc. will be updated/ revised.
40	Details of litigation pending against the project, if any, with direction / order passed by any Court of Law against the project should be given.	No litigation or Court Case is pending agains Project, in any Court of Law
41	The cost of the project (capital cost and recurring cost) as well as the cost towards implementation of EMP should clearly be spelt out.	Environment management plan is discuused in chapter - 10
42	A Disaster Management Plan shall be prepared and included in the EIA/ EMP Report	Noted.
43	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.	Discussed in chaper-8.
44	Besides the above, the below mentioned general points are also to be followed	

a.	Executive Summary of the EIA/EMP Report	Prepared and enclosed Annexure - 5
b.	All documents to be properly referenced with index and continuous page numbering	Noted and taken due care in indexing and page numbering of all the documents.
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 taken care.
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 analysis/testing reports should be available during appraisal of the Project.	All analysis reports are available for appraisal.
e.	Where the documents provided are in a language other than English, an English translation should be provided.	All documents are in English language. Executive summary in Tamil Language is also prepared
f.	The Questionnaire for environmental appraisal of mining projects as devised earlier by the Ministry shall also be filled and submitted.	Noted.
h.	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.	Noted and followed.
i.	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.	As such there are no changes in the project parameters.
j.	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.	This is a new proposal. Hence Certified Compliance Report from Regional Office of MoEFCC, is not applicable.
k.	The EIA report should also include (i) surface plan of the area indicating contours of main topographic features, drainage and mining area, (ii) geological maps and sections and (iii) sections of the mine pit and external dumps, if any, clearly showing the land features of the adjoining area.	Attached in the Mining plan. (Annexure -4)

2 PROJECT DESCRIPTION

2.1 Type of Project including interlinked and interdependent projects

The proposed proposal is for excavating rough stone, weathered rock and gravel by Opencast semi-mechanised method with drilling and blasting. The proposed production quantity 10,24,965 m^3 of rough stone,1,85,470 m^3 of Weathered rock and 76,944 m^3 of gravel for a period of 5 years over an extent of 4.38.0 Ha. The proposed location is a Non-Forest Private Land, bearing SF. No. 467/2,3,477/3,4,5 & 468/1, A.P.Nadanur Village, Alangulam Taluk, Tenkasi District, TamilNadu. The proponent has obtained a lease from the Pattadhar Thiru. Mohamed Mahaboob in the year 2021 for a period of 15 years which is valid up 2036. The Assistant Director, Department of Geology and Mining, Tenkasi District has issued a Precise area communication letter vide Rc. No. M1/6695/2021, Dated: 09.04.2022 to submit the Approved Mining Plan and Environmnetal Clearance from State Level Impact Assessment Authority (SEIAA) under the Rule 42 of Tamil Nadu Minor Mineral Concession Rules,1959. The Mining Plan has been prepared by Recognised Qualified Person and the same was submitted to Department of Geology and Mining, Tenkasi for the approval. The Mining plan was approved by the Assistant Director, Department of G&M, Tenkasi vide Letter Letter Rc.No.M1/6695/2021 dated 26.04.2022.

2.2 Need of the Project

The Rough stone, Weathered rock and Gravel quarrying project falls in Thenkasi District, Tamilnadu where scanty agricultural activities are been carried out. Rough stone, Weathered rock and Gravel are important commercial products with several applications. The proposed project will fulfill its end uses in building and construction of roads, paving and many other exterior projects. This project will give employment opportunities to 20 members. Mineral Industries of the state of Tamilnadu provides employment opportunities for the people of the state as well as in the specific project area. This also helps in countries economic development. Considering the growing demand of the mineral, it necessitates the operation of this mining project. This project will provide direct employment for about 20 persons.

2.3 Location of the Quarry

The proposed quarry is located between the Latitude 08°48'08.86" N to 08°48'17.74" N and Longitude 77°26'03.91" E to 77°26'12.39" E. The quarrying is Non-Forest Patta Land, bearing SF. No. 467/2,3,477/3,4,5 & 468/1, A.P.Nadanur Village, Alangulam Taluk, Tenkasi District, TamilNadu. The proposed Quarry Lease area falls on the Survey of India Topo Sheet No. 58 H/5.

The nearest National Highway NH-44 Srinagar to Kanyakumari is located at ~ 31.93 km (E). There is also a State Highway SH-40 Tiruchendur – Tenkasi – Shenkottai located at ~ 4.21 km (WSW) from the project site. The GPS coordinates are shown in the **Table 1-2**. The index map, showing the location of the proposed Rough stone, Weathered rock and gravel quarry, is shown below.

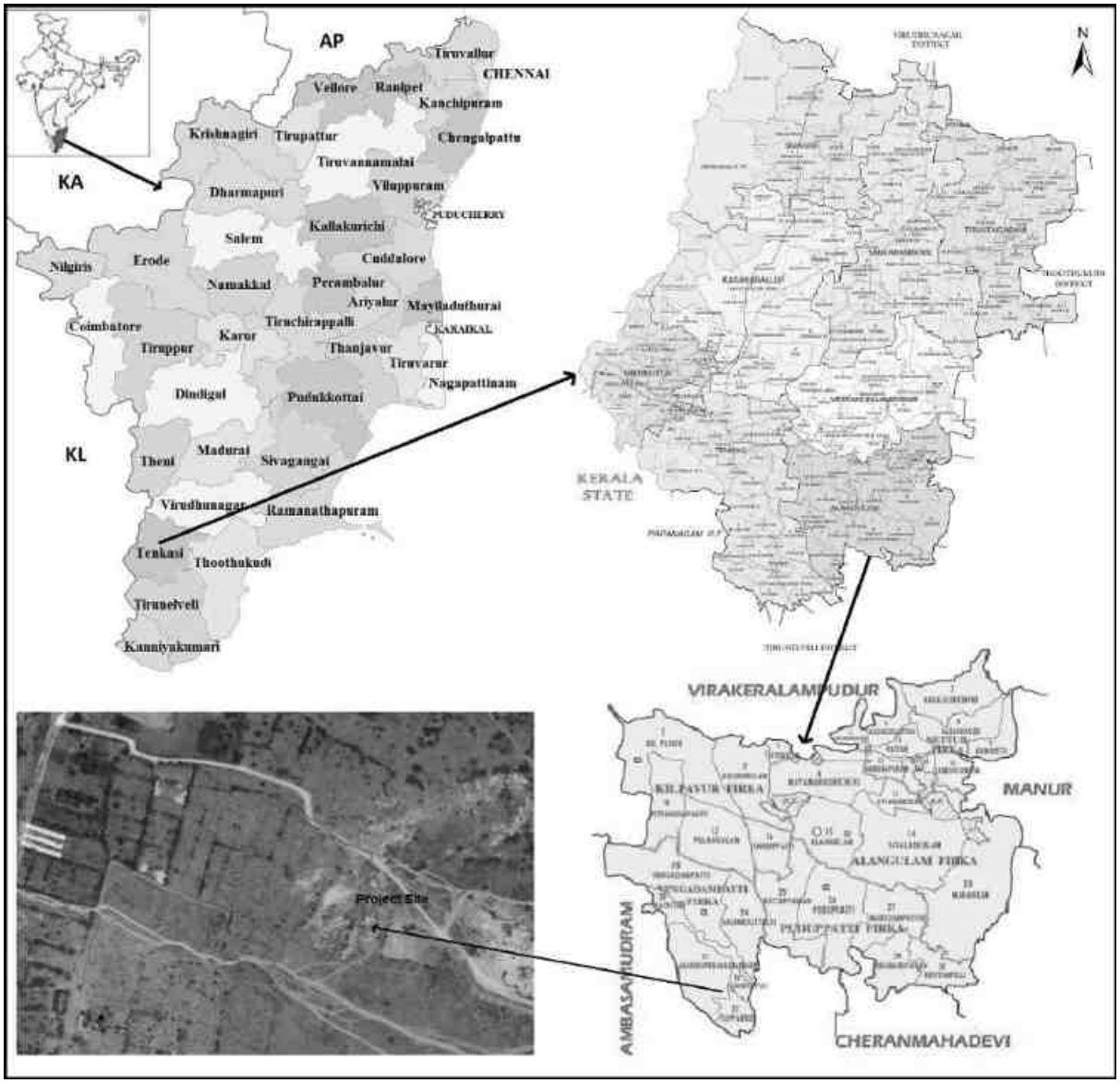


Figure 2-1 Index map

Figure 2-2 Google image of the lease area

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

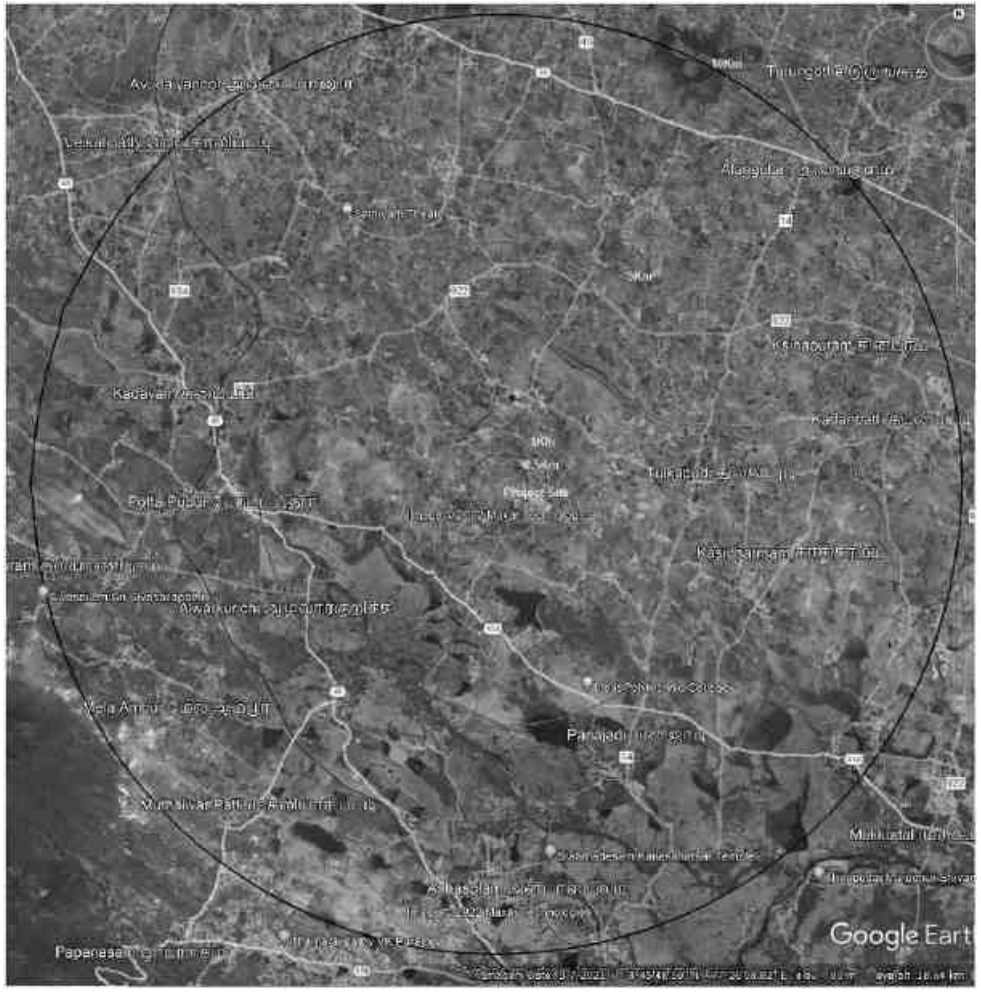


Figure 2-4 Google Imagery of 1, 5 & 10 km radius of the lease area

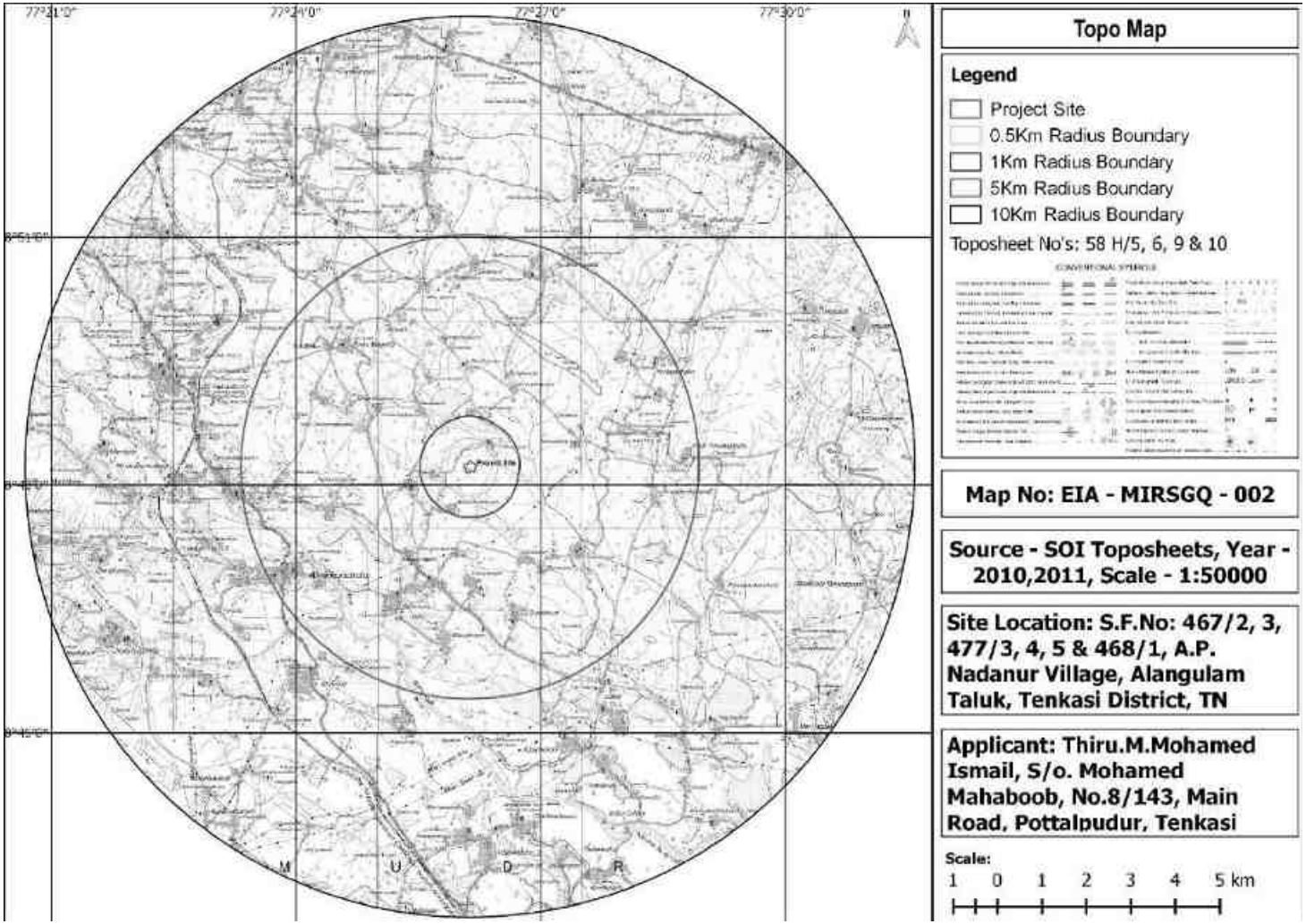


Figure 2-5 Topo map of the study area

Table 2-1 Salient Features within 15km radius of the lease area

<table>
<tr><th>S. No</th><th>Particulars</th><th>Details</th></tr>
<tr><td>1.</td><td>Latitude & Longitude</td><td>08°48’08.86” N to 08°48’17.74” N
77°26’03.91” E to 77°26’12.39” E</td></tr>
<tr><td>2.</td><td>Site Elevation above MSL (m)</td><td>95 m MSL</td></tr>
<tr><td>3.</td><td>Topography</td><td>Flat terrain</td></tr>
<tr><td>4.</td><td>Lease area Topo Sheet details</td><td>58 H/5</td></tr>
<tr><td>5.</td><td>Land classification</td><td>Patta Land</td></tr>
<tr><td>6.</td><td>Nearest Village</td><td>Pottalpudur Village ~ 4.63 km (W)</td></tr>
<tr><td>7.</td><td>Nearest Highway</td><td>➢ SH-40: Tiruchendur – Tenkasi-Shenkottai Road ~ 4.21km (WSW)
➢ SH-41A: Tirunelveli – Pottalpudur Road ~ 2.24km (SSW)
➢ MDR-922: Kadayam – Mukkudal Road ~ 3.68km (NNW)
➢ NH-44: Srinagar – Kanyakumari ~ 31.93km (E)</td></tr>
<tr><td>8.</td><td>Nearest City/Town</td><td>Nearest Town: Kadaiyam ~ 6.54 km (WNW)
Nearest City : Tirunelveli ~ 26.19 km (ESE)</td></tr>
<tr><td>9.</td><td>Nearest Railway station</td><td>Kizhakadaiyam Railway Station ~ 6.11 km (WNW)</td></tr>
<tr><td>10.</td><td>Nearest Airport</td><td>Tuticorin Airport ~ 64.63 km (E)</td></tr>
<tr><td>11.</td><td>Areas which are important or sensitive for ecological reasons – Wetlands, Watercourses or other water bodies, coastal zone, biospheres, mountains, forests</td><td><u>Water Bodies:</u>
<table>
<tr><th>S. No</th><th>Name</th><th>Distance ~ (km)</th><th>Direction</th></tr>
<tr><td>1</td><td>Kadana Dam</td><td>13.52</td><td>W</td></tr>
<tr><td>2</td><td>Ramanathi Reservoir</td><td>13.31</td><td>WNW</td></tr>
<tr><td>3</td><td>Pond Near AP Nadanur</td><td>0.54</td><td>WSW</td></tr>
<tr><td>4</td><td>Lake near Sivanadanur</td><td>1.04</td><td>NW</td></tr>
<tr><td>5</td><td>Lake near Terku Madattur</td><td>4.38</td><td>WNW</td></tr>
<tr><td>6</td><td>Lake near Nagalkulam</td><td>9.50</td><td>NNW</td></tr>
<tr><td>7</td><td>Lake near Chalaipudur</td><td>9.77</td><td>N</td></tr>
<tr><td>8</td><td>Lake near Pottapudur</td><td>5.82</td><td>W</td></tr>
<tr><td>9</td><td>Pond near Iyyantankattalai</td><td>3.57</td><td>NNE</td></tr>
<tr><td>10</td><td>Alangulam Lake</td><td>9.46</td><td>NE</td></tr>
<tr><td>11</td><td>Pond near Anaintanadatpatti</td><td>3.94</td><td>ESE</td></tr>
<tr><td>12</td><td>Pond near Sadaiyandiyur</td><td>2.07</td><td>S</td></tr>
<tr><td>13</td><td>Lake near Adaichchani</td><td>4.53</td><td>S</td></tr>
<tr><td>14</td><td>Kapaliparai Lake</td><td>7.29</td><td>SE</td></tr>
<tr><td>15</td><td>Kasidharmam Lake</td><td>6.67</td><td>ESE</td></tr>
<tr><td>16</td><td>Lake near Nandantattai</td><td>8.97</td><td>SE</td></tr>
<tr><td>17</td><td>Lake near Vellikulam</td><td>2.51</td><td>SW</td></tr>
<tr><td>18</td><td>Ayyampiallai Kulam</td><td>6.17</td><td>WNW</td></tr>
<tr><td>19</td><td>Chittar R</td><td>13.40</td><td>NNE</td></tr>
<tr><td>20</td><td>Marandai Channel</td><td>11.885</td><td>NNE</td></tr>
<tr><td>21</td><td>Manur Channel</td><td>12.35</td><td>NNE</td></tr>
<tr><td>22</td><td>Nettur Channel</td><td>14.10</td><td>NNE</td></tr>
</table></td></tr>
</table>

23	Rama Nadi	3.87	SW
24	Gatana Nadi/Karunai Ar	4.45	SW
25	Jambu Nadi	7.13	W
26	Iluppai Ar	12.39	W
27	Kal Ar	14.34	W
28	Pamb Ar	14.59	W
29	Karunai Ar	14.44	W
30	thamirabarani R	10.42	SE
31	Kodagam Channel	13.31	SE
32	Vel Odai	9.57	ESE
33	Kannadiyan Channel	11.85	SSE
34	Kangeyan Channel	6.09	S
35	Canal	7.84	S
36	Agasthiyar Falls	13.52	SW
37	Papanasam Lower Dam	14.52	SW

Reserve Forest:

S. No	Name	Distance ~ (km)	Direction
1	RF	2.88	NNE
2	Onnanindran Pottal RF	9.19	NNE
3	Kottaimalai PF	14.65	NE
4	Papanasam RF/KM Tiger Reserve *(Note: As per DFO letter)*	10.5	SW

12.	Areas used by protected, important or sensitive species of flora or fauna for breeding, nesting, foraging, resting, over wintering, migration	Nil
13.	Environmental Sensitive areas: National parks / Wildlife Sanctuaries/etc/ Areas protected under international conventions, national or local legislation for their ecological, landscape, cultural or other related value	Nil
14.	Seismic Zone	Zone-II
15.	Inland, Coastal, Marine waters	Nil
16.	Interstate Boundary	Nil
17.	HACA Regions	Nil

Table 2-2 Project summary

S. No	Particulars	Details
1.	Land classification	Patta Land
2.	Extent of lease area (Ha.)	4.38.0
3.	Quarry Lease	The Proposed land has Patta in the name of Thiru. Mohamed Mahaboob vide Patta No-2666 & 2090, where the proponent had obtained consent from the Pattadhar and lease agreement had been registered in the year 2021. The Proponant had obtained lease for a period of 15 years(2021-2036)
4.	Lease Period	15 years
5.	Estimated Geological Reserves	Rough Stone: 19,70,685 m^3 Weathered rock: 2,18,965 m^3 Gravel: 87,586 m^3
6.	Estimated Mineable Reserves	Rough Stone: 10,24,965 m^3 Weathered rock: 1,85,470 m^3 Gravel: 76,944 m^3
7.	Total Mineable reserves	Rough Stone: 10,24,965 m^3 Weathered rock: 1,85,470 m^3 Gravel: 76,944 m^3
8.	Depth of Mining	52m Below Ground Level ((2m Gravel + 5m Weathered Rock+ 45m Rough Stone)
9.	Method of Mining	Open cast semi mechanized method
10.	Water Requirement (KLD)	2.5
11.	Source of Water	Private tankers
12.	Fuel requirements for Machineries & vehicles	8,32,788 Litres for entire project life
13.	Manpower (Nos)	20
14.	Municipal Solid Waste Generation (kg/day)	9
15.	Project Cost Rs. (Lakhs)	101.2508
16.	EMP Cost Rs. (Lakhs)	18.08

2.4 Topography

The proposed land is a Patta land which is classified as Non-Government land. The slope is gentle towards Southern side. The altitude of the area is above 95.0m above MSL. The proposed are lies in the topo sheet No's. 58 H/5. The Topo sheet shown in **Figure 2-5** in detail. The area is coverd by 2m thickness of Gravel, 5m of weathered rock and followed by Massive Charnockite which is clearly inferred from the nearby existing quarry pit.

Peninsular genesis forms the oldest rock formations, in which the massice formation of Chrnockite lies over with rich accumulation of recent quanternary formation.

2.5 General Geology

Southern Granulite Terrain (SGT) of Tamil Nadu lying south of Palaghat-Cauvery shear zone has been divided into two major tectonic blocks by the Madurai block and Nagercoil-Trivandrum Block in the south. It is separated by WNW-ESE trending Achankovil-Tambaraparani Lineament. Tenkasi, Tirunelveli and Toothukudi are significantly the only districts in the state to witness the geology and structure of both the blocks. Tenkasi district represents a well-developed lithopackage of meta-sedimentary sequence inter banded with charnockite Group of rocks. The rock types exposed are of quartzite, calc-granulite, garnet-biotite-sillimanite gneiss, garnet quartzo-feldspathic gneiss and garnetbiotite-cordierite gneiss belonging to Khondalite Group of rock. Charnockite and pyroxene granulite are the Charnockite Group. Hornblende-biotite gneiss belongs to Migmatitic Complex. Besides, basic intrusive (pyroxenite) and acid intrusive (granite) are noticed. The younger intrusive are represented by pegmatite and quartz veins. Evidence of development of incipient / patchy charnockite along the shear plane is noticed in the district along the Western Ghat high hills.

2.6 Size or Magnitude of operation

The proposed production quantity (saleable quantity) is 10,24,965 m^3 of rough stone,1,85,470 m^3 of Weathered rock and 76,944 m^3 of gravel for a period of 5 years upto a depth of 52m (2m Gravel, 5m Weathered Rock and 45m Rough Stone) below the ground level.

There is no waste generation from the quarry. The machinery required to achieve the proposed production level are Jack hammer, Compressor, Tippers and Excavators. The Land Use break up summarized as Table 2-3**Table 2-3.**

Table 2-3 Land use breakup of the quarry area

S. No	Description	Present area (Ha.)	Area at the end of this quarrying period (Ha.)
1	Area under quarrying	Nil	3.75.0
2	Infrastructure	Nil	0.02.0
3	Roads	Nil	0.02.0
4	Greenbelt	Nil	0.50.0

5	Unutilized Area	4.38.0	0.09.0
Grand Total		**4.38.0**	**4.38.0**

2.6.1 Total Geological Resources

The Geological Re sources of rough stone, weathered and gravel is calculated up to a maximum depth of 52m (2m Gravel, 5m Weatherd rock and 45m Rough stone) below the ground level for a period of 5 years. The calculation of the geological resources is given below:

Total Area of Extent = 4.38.0 Ha.

The Geological Resources of Gravel formation = 87,586 m^3

The Geological Resources of Weathered Rock = 2,18,965 m^3

The Geological Resources of Rough Stone = 19,70,685 m^3

Proposed Production Plan during Plan Period is shown in **Table 2-5**. Proposed Production Plan during Conceptual Period is shown in **Error! Reference source not found.**.

2.6.2 Total Mineable Reserves

The mineable Reserves are calculated by leaving the safety distance and bench loss. The **Table 2-4** shows the total mineable reserves of the minerals.

Table 2-4 Mineable Reserves

Section	Bench	Length (m)	Width (m)	Depth (m)	Volume (m^3)	Gravel (m^3)	Weathered Rock (m^3)	Mineable Reserves of Rough Stone (m^3)
XY - AB	95-93	76	160	2	24320	24320		
	93-88	74	156	5	57720		57720	
	88-83	69	146	5	50370			50370
	83-78	64	136	5	43520			43520
	78-73	59	126	5	37170			37170
	73-68	54	116	5	31320			31320
	68-63	49	106	5	25970			25970
	63-58	44	96	5	21120			21120
	58-53	39	86	5	16770			16770
	53-48	34	76	5	12920			12920
	48-43	29	66	5	9570			9570
	Total					**24320**	**57720**	**248730**
XY-CD	95-93	91	237	2	43134	43134		
	93-88	91	233	5	106015		106015	

	88-83	91	223	5	101465			101465
	83-78	91	213	5	96915			96915
	78-73	91	203	5	92365			92365
	73-68	91	193	5	87815			87815
	68-63	91	183	5	83265			83265
	63-58	91	173	5	78715			78715
	58-53	86	163	5	70090			70090
	53-48	81	153	5	61965			61965
	48-43	76	143	5	54340			54340
	Total					**43134**	**106015**	**726935**
XY-EF	95-93	65	73	2	9490	9490		
	93-88	63	69	5	21735		21735	
	88-83	58	59	5	17110			17110
	83-78	53	49	5	12985			12985
	78-73	48	39	5	9360			9360
	73-68	43	29	5	6235			6235
	68-63	38	19	5	3610			32610
	Total					**9490**	**21735**	**49300**
	Grand Total					**76944**	**185470**	**1024965**

Total Mineable Reserves of Gravel = 76,944 m^3

Total Mineable Reserves of Weathered Rock = 1,85,470 m^3

Total Mineable Reserves of Rough Stone@ 100% = 10,24,965 m^3

The mineable reserves have been computed as 76,944 m^3 of Gravel, 1,85,470 m^3 of Weathered rock and 10,24,965 m^3 of Rough stone upto a depth of 52m (2m Gravel + 5m Weathered Rock+ 45m Rough Stone) below the ground level for a period of five years)

2.6.3 Magnitude of Operations

- Open Cast Mechanised method of mining will be carried out.
- The quarry operation involves shallow jack hammer drilling and controlled blasting (slury explosives), excavation, loading and transporatation of minerals.
- Mineable Production: 76,944 m^3 of Gravel, 1,85,470 m^3 of Weathered rock and 10,24,965 m^3 of Rough stone
- Total Mineral Rejects/ Waste: NIL during the lease period.

Table 2-5 Proposed Production Plan during Plan Period

Year	Section	Bench	Length (m)	Width (m)	Depth (m)	Volume (m^3)	Weathered Rock (m^3)	Gravel (m^3)	Mineable Reserves of Rough Stone (m^3)
I	XY - AB	95-93	76	160	2	24320	24320		
		93-88	74	156	5	57720		57720	
		88-83	69	146	5	50370			50370
	XY-CD	83-78	64	136	5	43520			43520
		95-93	30	237	2	14220			
		93-88	30	233	5	34950	34950		
		88-83	30	223	5	33450			33450
		83-78	30	213	5	31950			31950
		Total					**38540**	**92670**	**159290**
II	XY-CD	95-93	61	237	2	28914	28914		
		93-88	61	233	5	71065		71065	
		88-83	61	223	5	68015			68015
		83-78	61	213	5	64965			64965
	XY-EF	95-93	65	73	2	9490	9490		
		93-88	63	69	5	21735		21735	
		88-83	58	59	5	17110			17110
		83-78	40	49	5	9800			9800
		Total					**38404**	**92800**	**159890**
III	XY-EF	83-78	13	49	5	3185			3185
		78-73	48	39	5	9360			9360
	XY-CD	78-73	91	203	5	92365			92365
		73-68	82	193	5	79130			79130
	XY-AB	78-73	59	126	5	37170			37170
		73-68	54	116	5	31320			31320
	Total								**252530**
IV	XY-CD	73-68	9	193	5	8685			8685
		68-63	91	183	5	83265			83265
		63-58	91	173	5	78715			78715
		58-53	32	163	5	26080			26080
	XY-EF	73-68	43	29	5	6235			6235
		68-63	38	19	5	3610			3610
	XY-AB	73-68	49	106	5	25970			25970
		68-63	44	96	5	21120			21120
	Total								**199575**
V		58-53	54	163	5	44010			44010

	XY-CD	53-48	81	153	5	61965			61965
		48-43	76	143	5	54340			54340
	XY-AB	58-53	39	86	5	16770			16770
		53-48	34	76	5	12920			12920
		48-43	29	66	5	9570			9570
Total									**199575**
Grand Total							**76944**	**185470**	**1024965**

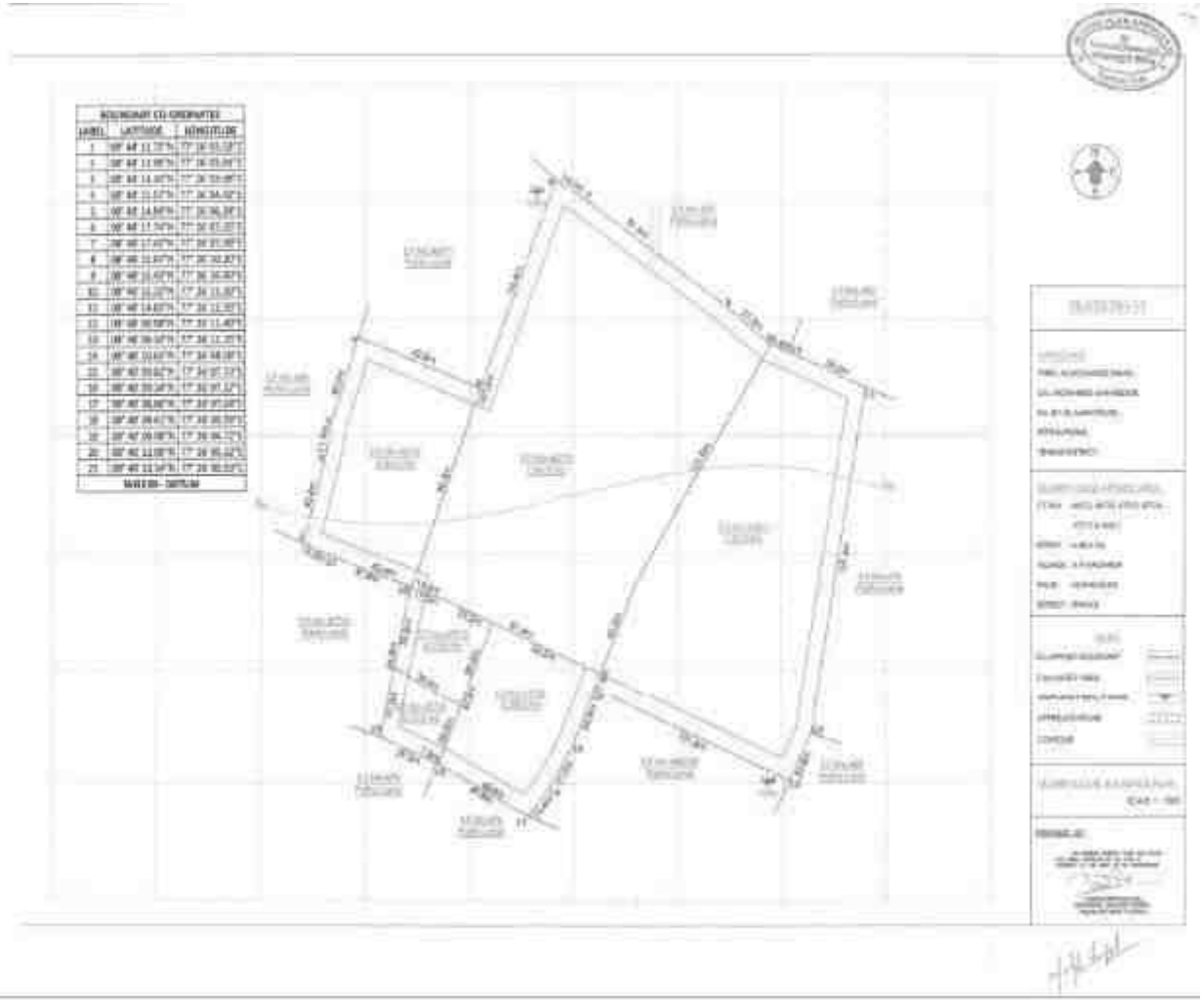


Figure 2-6 Surface Geological Plan of the Quarry

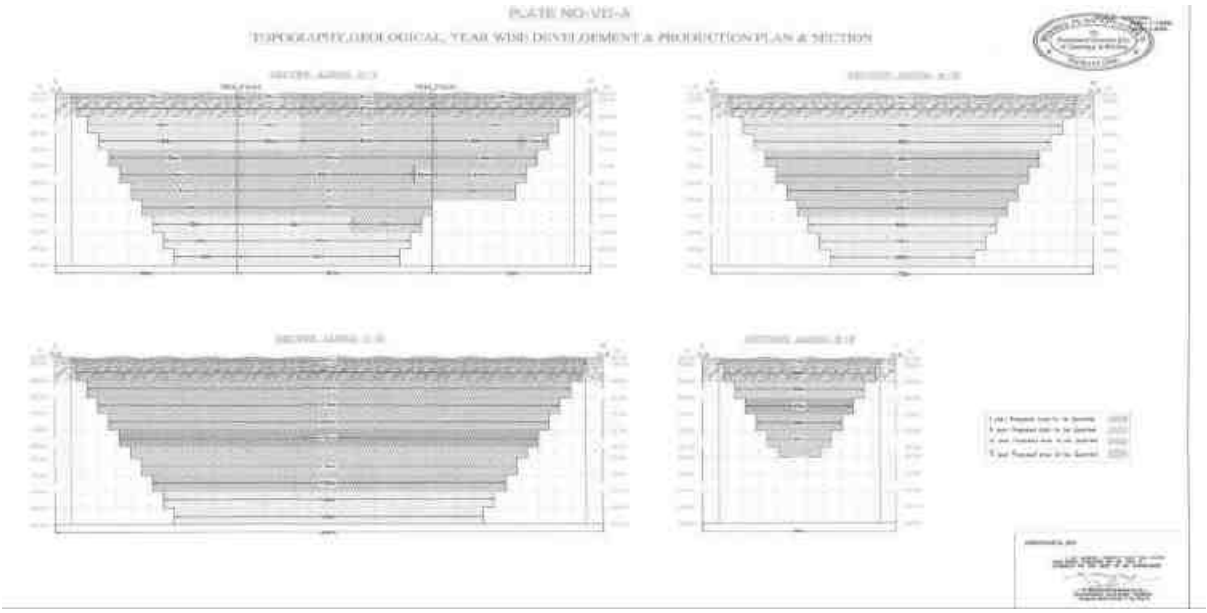


Figure 2-7 Surface Geological Plan of the Quarry

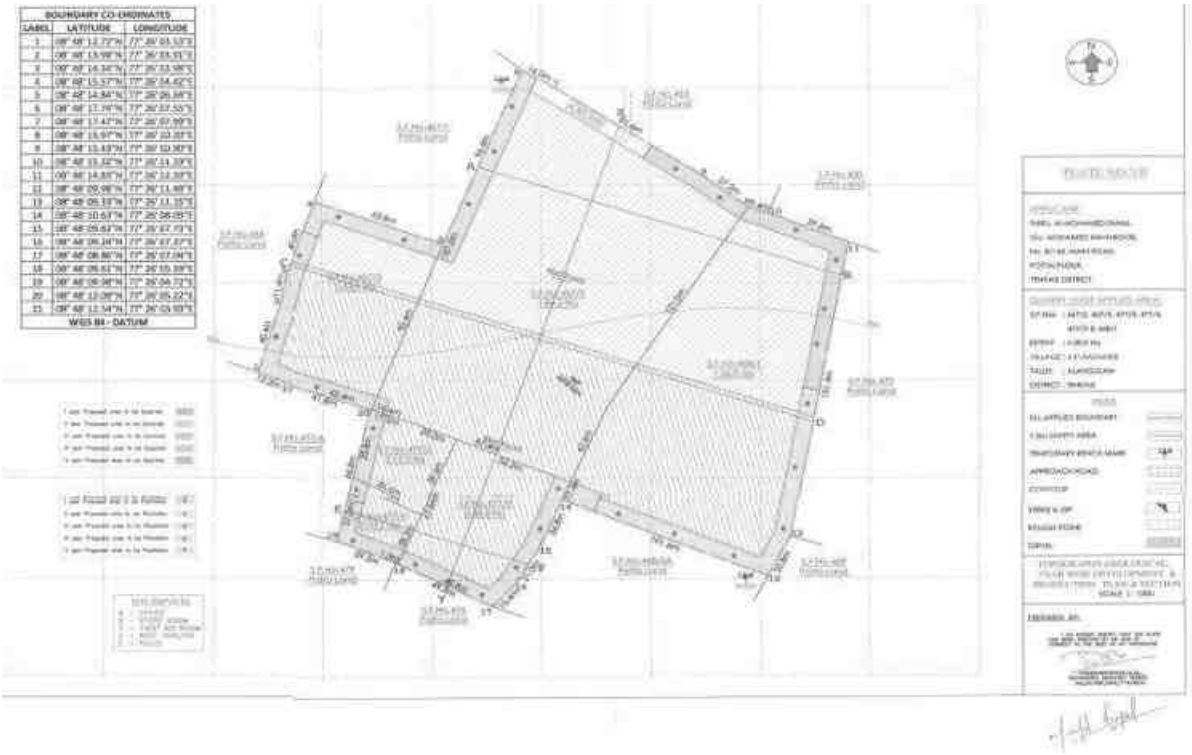


Figure 2-8 Yearwise Development & Production Plan and Sections

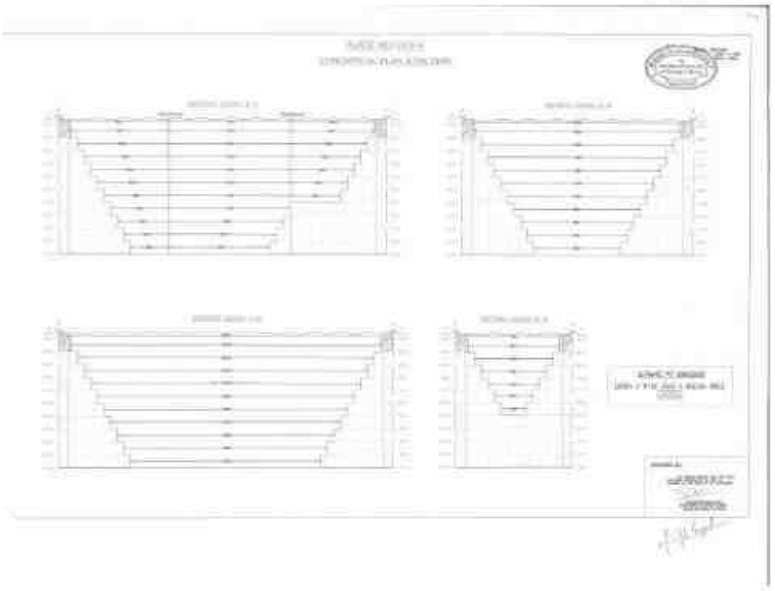


Figure 2-9 Conceptual Plan & Sections

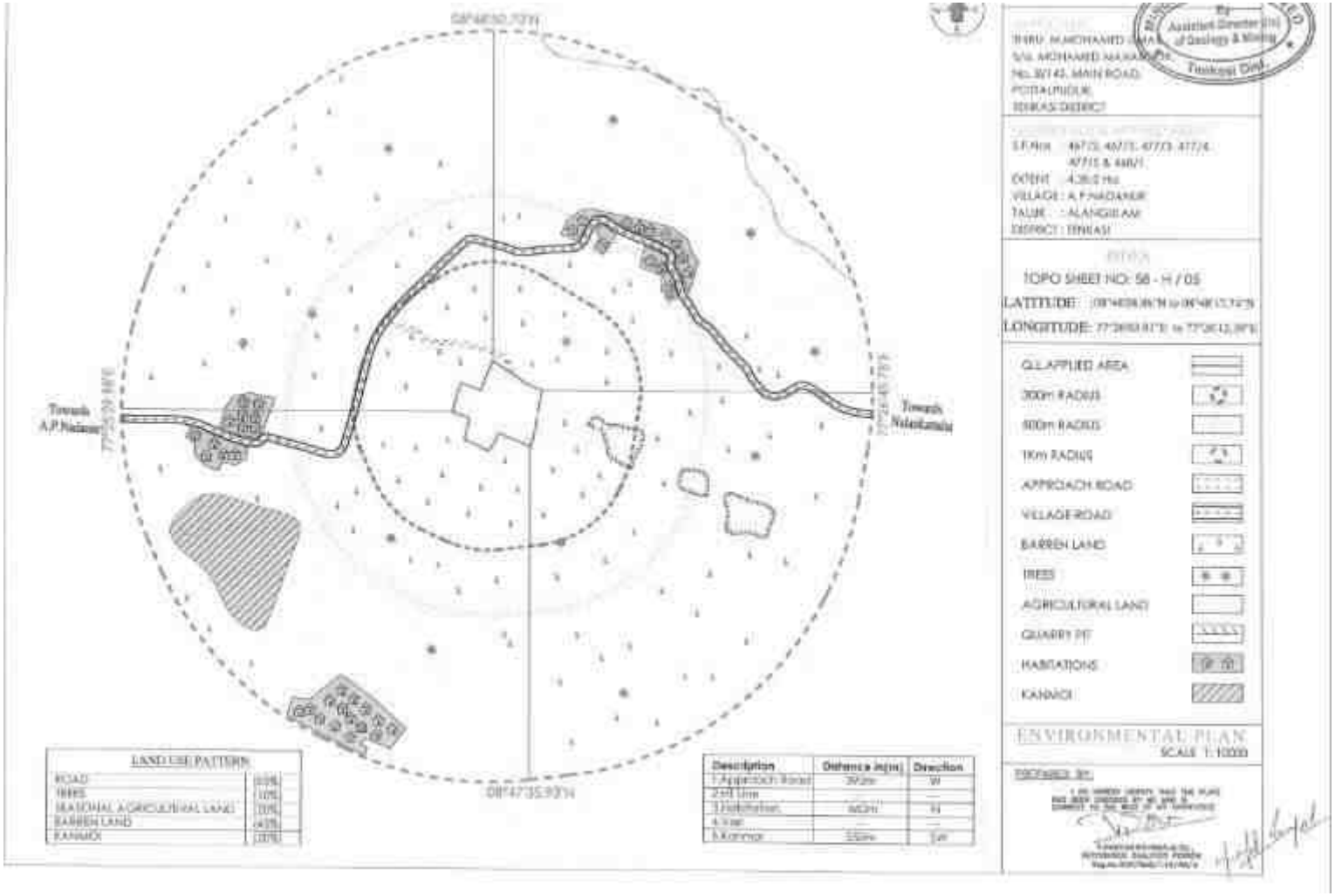


Figure 2-10 Environment Plan of the Quarry

2.7 Project Cost

The project cost estimated as Rs. 1,01,25,080/-

Table 2-6 Proposed Project Cost

S. No	Description	Amount (INR in Lakhs)
A.	Fixed asset cost	41,54,000
B.	Machinery Cost	40,00,000
	Total Project Cost	**81,54,000/-**
EMP Cost (for 5 years)		**18,08,000/-**
CER Cost		**1,63,080/-**
	Total Project Cost	**1,01,25,080/-**

2.8 Technology & Process Description

2.8.1 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.

2.8.2 Method of mininig –Open Cast Mechanised Working

The Rough stone, weathered rock and gravel quarry in the lease area is extended upto an area of 4.38.0 Ha. It is proposed to quarry the minerals by open cast, mechanized method by developing the bench of 5m height and the bench width not less than the height. The development of benches in the sheet rock will be maintained at 60° safety slopes. Initially thorny shrubs present in the proposed area of excavation will be removed.

Based on the Recovery Factory (100%), it is proposed to adopt opencast mechanized method of mining with shallow drilling and blasting.

There is no blockage of minerals due to presence of / maintenance of benches, barriers, internal roads, electrical lines etc. The internal roads are temporary in nature and suitable benches will be formed. No Electrical Lines are passing over the subject area.

Excavation and loading shall be carried out with simple excavators. These shall be utilized for developmental work, excavation and loading into the trucks. Tippers of 10/20T capacity shall be utilized for all transportation purposes. In addition, certain service equipment like water tanker (for dust suppression) will be used.

2.9 Process Description

2.9.1 Mining

The mining operations are carried out by the opencast mechanized method of mining. The operations will involve shallow jack hammer drilling, slurry explosives in blasting, excavation and directly loads into the tippers/tractors.

Drilling & Blasting:

The quarrying operation is proposed to carry out by Opencast mechanized method which involves drilling, blasting and excavation. The drilling & blasting patterns are given below:

Depth of each hole	: 1 to 1.5m
Dia of hole	: 30-32mm
Spacing between the holes	: 1.2m
Burden for hole	: 1.0m
Blasting Design	: Staggered “V” Pattern
Inclination of holes	: 80°from horizontal
Use of delay detonatord	: 25millisecond relays
Detinating fuse	: “Detonating” cord

In the proposed quarry, gravel/ earth exists at top layers, which can be removed easily using an excavator and it doesn’t require any kind of blasting. After the earth/ gravel layer, there is weathered/ semi-weathered rock (called pumice), which can be removed either by excavators or rock breakers (at times). Once we reach the bottom layers, the sheet rock exists, from which the building stone boulders can be extracted.

The roughstone at the bottom layer will be extracted by drilling and blasting. Blasting design is in the V pattern.

Spacing = 1.2m

Burden = 1.0m

Depth of hole = 1.5m

Small dia of 45mm slurry explosives are proposed to be used for shattering and heaving effect for removal and winning of rough stone. No deep drilling or primary blasting is proposed.

Considering the facts that the Building Stone requires blasting for its extraction and class II explosives are to be used, the powder factor is estimated as 6 to 7 tonnes per kg of explosives.

Precautionary Measures to be adopted at the time of Blasting Period:

1. The employer shall permit only authorized and qualified persons to handle and use explosives.
2. All persons within the premises of danger zone (500meters) shall be cleared before blasting.
3. Siren shall be horned before the blasting. An effective communication system shall be established between all entries and the blasting personnel.
4. All entries to the mine shall be guarded by security to prevent inadvertent entry of persons into the restricted area of blasting.
5. Smoking, firearms, matches, open flame lamps, and other fires, flame or heat producing devices and sparks shall be prohibited in or near explosive magazines or while explosives are being handled, transported, or used.
6. No person shall be allowed to handle or use explosives while under the influence of intoxicating liquors, narcotics, or other dangerous drugs.
7. All explosives shall be always accounted for Explosives not being used shall be returned to the magazine, unavailable to persons not authorized to handle them. The employer shall maintain an inventory and use record of all explosives. Appropriate authorities shall be notified of any loss, theft, or unauthorized entry into a magazine.
8. No explosives or blasting agents shall be abandoned.
9. No fire shall be fought where the fire is in imminent danger of contact with explosives. All employees shall be moved to a safe area and the fire area guarded against intruders.
10. Original containers, or Class II magazines, shall be used for taking detonators and other explosives from storage magazines to the blasting area.
11. When blasting is done in congested areas or in proximity to a structure, railway, or highway, or any other installation that may be damaged, the blaster shall take special precautions in the loading, delaying, initiation, and confinement of each blast with mats

or other methods to control the throw of fragments, and thus prevent bodily injury to employees.

12. Employees authorized to prepare explosive charges or conduct blasting operations shall use every reasonable precaution including, but not limited to, visual and audible warning signals, flags, or barricades, to ensure employee safety.
13. In so far as possible, blasting operations above ground shall be conducted between sunrise and sunset.
14. Due precautions shall be taken to prevent accidental discharge of electric blasting caps from current induced by radar, radio transmitters, lightning, adjacent power lines, dust storms, or other sources of extraneous electricity. These precautions shall include:
15. Detonators shall be short-circuited in holes which have been primed and shunted until wired into the blasting circuit.
16. The suspension of all blasting operations and removal of persons from the blasting area during the approach and progress of an electric storm.
17. The prominent display of adequate signs, warning against the use of mobile radio transmitters, on all roads within 1,000 feet of blasting operations. Whenever adherence to the 1,000-foot distance would create an operational handicap, a competent person shall be consulted to evaluate the situation, and alternative provisions may be made which are adequately designed to prevent any premature firing of electric blasting caps. A description of any such alternatives shall be reduced to writing and shall be certified as meeting the purposes of this subdivision by the competent person consulted. The description shall be maintained at the construction site during the duration of the work and shall be available for inspection by representatives of the Secretary of Labor.

Storage of Explosive:

Explosives will not be stored in the mine since the entire handling of explosives and charging operations will be carried out by a licensed contractor who sells, possesses and uses explosives having a magazine with license from the competent authority. Blasting operations will be carried out from a blasting shelter provided in the lease. Wherever, it is permitted in the quarry lease by the person having a competent certificate. Otherwise, the extraction is by heating and cracking process wherever required.

2.9.2 Loading & Trasnportation

The mode of transport of the excavated materials by road based through trucks to nearby crushers as needed. Each truck carries about 10/20T per trip and there were 4 No's of trucks used for the transportation of materials.

2.9.3 Storage of Explosives

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

2.9.4 Disposal of Waste

Proposed project is an extraction of rough stone, weathered rock & gravel quarry for a depth of 52m for a period of 5 years. The anticipated recovery (saleable production) is 100% of the mined quantity, Hence, there is no waste generation in proposed quarry. 9 kg/day Municipal Waste will be generated it will dispose of through local municipal disposal bins.

2.9.5 Topsoil Management

There will be no topsoil generated during the proposed plan period. All the minerals quarried will be utilized (100%).

2.10 Requirements

2.10.1 Land Requirement and Land Use Planning

Quarry Land details are shown in **Table 2-7** and Land use pattern is provided in **Table** 2-8**.**

Table 2-7 Quarry Land details

District and State	Taluk	Village	SF. No	Area (Ha)	Land Classification
Tenkasi TamilNadu	Alangulam	A.P.Nadanur	467/2,3,4 77/3,4,5 & 468/1	4.38.0	Patta Land

Table 2-8 Land Use Pattern of the lease area

Description	Present area (Ha.)	Area at the end of this quarrying period (Ha.)
Area under quarrying	Nil	3.75.0
Infrastructure	Nil	0.02.0
Roads	Nil	0.02.0
Greenbelt	Nil	0.50.0
Unutilized Area	4.38.0	0.09.0
Total	**4.38.0**	**4.38.0**

2.10.2 Water Requirement

The total water requirement is 2.5 KLD. The total water requirement will be met through private tankers. The 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 (0.4 KLD) will be disposed of in a septic tank followed by a soak pit. The septic tank will be cleaned periodically. The water requirement details are given below **Table 2-9.**

Table 2-9 Water requirement breakup

S. No	Description	Quantity (KLD)
1	Drinking & Domestic Purpose	0.5
2	Dust Suppression	1.0
3	Greenbelt	1.0
	Total	2.5

2.10.3 Power & Fuel Requirement

The Fuel requirement details are given in **Table 2-10.**

Table 2-10 Power Requirements

S. No	Description	Quantity
1	Fuel requirements – HSD (Lts for 5 years)	8,19,968

2.10.4 List of Equipments

The list of Equipments is given in **Table 2-11.**

Table 2-11 Lists of Machineries

S. No	Type/ Description	Capacity	Quantity (No's)
1	Excavator with Bucket rock beakers	0.9 m^3	2
2	Tippers	10/20 Tonnes	4
3	Jack Hammers	1.2m to 6.0m	2
4	Compressors	400psi	1

2.10.5 Manpower Requirement

Manpower details are given in **Table 2-12.**

Table 2-12 Manpower Details

Sl. No.	Description	No's
	Management & supervisor	
1	Second Class Mines Manager (with valid statutory qualification)	1
2	Mines Foreman (with valid statutory qualification)	1
3	Mines Mate (with valid statutory qualification)	1
4	Blaster	1
	Laborers, Skilled, Semi-skilled & Un-skilled	
1	Skilled (Operators – Excavators & Jackhammer)	3
2	Semi-skilled (Driver)	3
3	Unskilled (Musdoor/Labours, Cleaners & Watchman)	10
	Total	**20**
Allowing 10% absenteeism, the no. of men of roll will be around 18 No's		

2.10.5.1 Solid Waste Management

The municipal solid waste generation and management details are given in **Table 2-13**.

Table 2-13 Municipal Solid Waste generation & Management

S. No	Type	Quantity Kg/day	Disposal method
1	Biodegradable waste (organic)	9	Municipal bin including food waste
	Total	**9**	

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

2.10.6 Hazardous waste Management

The type of hazardous waste and the quantity generated are detailed in**Table 2-14.**

Table 2-14 Hazardous Waste Management

Waste Category No	Description	Quantity (T/Year)	Mode of Disposal
5.1	Waste Oil	0.5	Will be Collected in leak proof containers and disposed to TNPCB Authorized Agencies for Reprocessing/Recycling

2.11 Infrastructure facilities

Sanitation facility will be provided.

2.12 Resource optimization/recycling and reuse envisaged in the project.

No optimization/recycling and reuse envisaged in the proposed quarry project.

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

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

2.14 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 2-11**.

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

Figure 2-11 Feasibility & Environmental Assessment Process

2.15 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.

2.15.1 Land Environment

The proponent obtained a Mining lease for 15 years and the extraction of mineral is proposed for 5 years. Hence there will be no change in land use pattern. The applied area Quarrying will alter the shape of the land with a large, sliced pit.

I. Discharges on Land-Impact

Domestic:

Domestic wastewater will be disposed into septic tank followed by soak pit. Soak pit will be cleaned periodically.

Mitigation Measures

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

II. Impacts- Soil Contamination

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

Soil – Mitigation Measures

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

2.15.2 Air Environment

Mining operations contribute towards air pollution in two ways: addition of gaseous pollutants to the atmosphere and the dust particles. The gaseous pollutants include NO_x, SO_2 and Hydrocarbons. The sources of pollutants from the mining activity include:

- ✓ Operation of Mining machaniries which mostly run-on diesel
- ✓ Drilling and Blasting operations.
- ✓ Loading /unloading operations
- ✓ Transportation of mineral

2.15.3 Sources of Air Pollution-Single Sources

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

2.15.3.1 Drilling

Drilling is an important activity of the mining process. Air pollution in the form of SPM is envisaged from this activity.

2.15.3.2 Loading

In the proposed project, the loading of transportation is proposed by Hydraulic excavators. This activity is likely to contribute to air pollution in the form of SPM (dust) during discharge of material from bucket and gaseous pollutants like SO_2, NO_x and Hydrocarbons due to combustion of fuel (diesel) in the loading machinery.

2.15.3.3 Unloading

The quarred material 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, NO_x and Hydrocarbons due to consumption of fuel (diesel) by dumper while unloading the material.

2.15.3.4 LineSources

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

2.15.3.5 Transportation

The mined-out quantity will be transported by haul road. Transportation also includes movement of service vehicles in the quarry 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.

2.15.3.6 Area Sources/Multiple Sources

These constitute pollution from various sources and activities situated in the lease area. The total quarry area with all its mining activities constitutes the area source. These include all the mining activities, operations of equipment/machinery, wind erosion from active quarry pit, and haul road which contribute to the atmospheric pollution from the various units/activities.

2.15.3.7 Instantaneous Sources

The instantaneous sources consist of air pollution due to sudden/instantaneous activities like blasting in the quarry 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.

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.
- ✓ 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.
- ✓ Provision of green belt by vegetation for trapping dust.
- ✓ Greenbelt development along the haul roads, dumps and along the boundaries of the lease area.
- ✓ The utmost care will be taken to prevent spillage of sand and stone from the trucks.
- ✓ Covered tarpaulin for transport of materials.

2.15.4 Noise & Vibration Environment

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

- ✓ Drilling and Blasting
- ✓ Excavation
- ✓ Loading & unloading of minerals.

- ✓ Transportation vehicles.

2.15.4.1 Noise Levels

Stationary sources due to operation of heavyduty machinery at the project site like Compressors, Jack hummer, Quarry vehicles and drilling machinery etc.

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

The Noise produced due to machinery operations and transport vehicles not much but for the extraction activity. The noise Levels of machinery can be categorized as noise due to static machinery like excavators, another category is noise generated due to moving machinery Noise due to tippers.

The noise Levels for various activities are,

1. Tipper Empty- 88 to 91 dB (A)
2. Tipper Loaded - 95 to103 dB (A)
3. Proclain - 90 to 96 dB (A)

2.15.4.2 Vibration

The Road Metal Quarry machinery produces very little vibration, the vibration generated will be within 5-8 Hz.

Impacts:

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.

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

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

Mitigation Measures

- The major noise generating equipments like Compressors, Exacavator, & Tippersetc, 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 equipments/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.
- Vehicle speed will be restricted to a maximum of 25KMPH.
- Low vibration generating machines/equipment will be selected to meet international standards and foundations will be so designed to minimize vibrations and secured properly.
- Vibration generating sources and their platforms should be maintained properly to minimize vibrations and related impacts.

2.15.5 Water Environment

Impact on Existing Water Resources

The total water requirement for a quarry is 2.5 KLD. The total water requirement is met from private tankers; Domestic sewage is being disposed into Septic tank & no toxic/other effluent generation. Hence the impact due to the project is very minimal.

2.15.5.1 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, apparent tothatthere will is negligible impact of mining on the surface water regime.

2.15.5.2 Impact on Ground Water

There will not be any ground water withdrawal, as the total water requirement is being met by private water tankers.

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 the project site will be adhered to.

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

2.15.6 Biological Environment

Impact on migratory paths for wildlife and forest blocks

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

Mitigation Measures

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

2.15.7 Dump Management

The applicant will arrange a temporary dump area in the lease applied area. The dumping material is Dog Stool Spar, unwanted Boulders, Overburden Etc., will be transported to the project works. Daily maintenance of the soil cover and boulders etc. for systematic and progressive reclaimation.

2.15.8 Solid Waste Management

2.15.8.1 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.

2.15.8.2 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 2-12.**

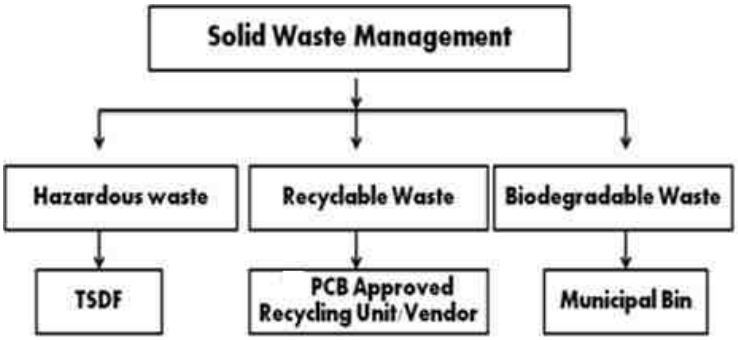


Figure 2-12 Waste Management Concepts

2.15.9 Afforestation

There is no forest area falling around the quarry lease area. Besides common trees, natural vegetation grows during monsoon & fades away with the onset of summer. However, to absorb the dust due to vehicle movement on the haulage road, it is proposed to take-up plantation work during the 5 years of operation of the quarry. 300 saplings (total) on either side of the approach road and in the vacant area surrounding the quarry site will be planted in phased manner as given in table below **Table 2-15**.

Table 2-15 Afforestation Plan details

Year	No of Trees proposed to be planted	Survival rate	Name of the species	No of trees expected to be grown
I	60	80 %	Neem and pungam,	48
II	60	80 %		48
III	60	80 %		48
IV	60	80 %		48
V	60	80 %		48

2.15.10 Occupation Heath and safety

In Open Cast Mining possibilities of small injuries are anticipated. The applicant is proposed First Aid facilities at Quarry site and temporary Office room. This also consists of issuing PPE (Personal Protective Equipments) to all the persons working, and those that are needed for the site-specific operations. The following PPE is proposed to be distributed.

- ✓ Helmets once in Five years as needed under Mines Act
- ✓ Safety shoe to all the employees twice a year as per the same statute.
- ✓ Nose masks once two months (Actually these are the cotton thin towels)
- ✓ Another step to improve safety conditions is to inculcate the safety culture among the persons working.

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

The project is a fresh quarry. The technology used for mining as per the approved mining plan prepared by RQP 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 Proponent will be processed to take care of any technological failures.

3 DESCRIPTION OF ENVIRONMENT

3.1 Preamble

This chapter depicts the establishment of baseline for valued environmental components, as identified in and around the proposed project rough stone, weathered rock, and gravel quarry over extent of 4.38.0 Hectares of Patta Land, located at SF. No. 467/2,3,477/3,4,5 & 468/1, A.P.Nadanur Village, Alangulam Taluk, Tenkasi District, TamilNadu. The primary baseline data monitoring covering one season (three (3) months) i.e., from March 2023 to May 2023 has been carried out as per the ToR issued and the Draft EIA is prepared and submitted for Public Consultation.The details of the baseline conducted and the results we described in this chapter.

S. No	Description	Section	Parameters
1	Meteorology	Section 3.6.2	Temperature, Relative Humidity, Rainfall, Wind Speed & Direction
2	Ambient Air Quality	Section 3.6.4	As per NAAQS, 2009
3	Ambient Noise Levels	Section 3.7	Day equivalent noise levels, Night equivalent noise levels (As per CPCB Standards)
4	Water Quality	Surface water – Section 3.8.2 Ground water – Section 3.8.3	Ground Water – IS 10500:2012 Surface Water – IS 2296 (Class – A)
5	Soil Quality	Section 3.9	ICAR (Indian Council of Agricultural research)
6	Ecology	Section 3.10	Flora and Fauna
7	Social Economic Status	Section 3.11	Socio Economic Profile of Study area (Population Profile, Employment and Livelihood, Education and Literacy, etc.,)

3.2 Study Area

A 10km 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 of 1km radius from the site boundary. Further the Project Impact/Influence Area (PIA) is 10km from the boundary of the project. Topo Map of the study area is given in **Figure 3-1.**

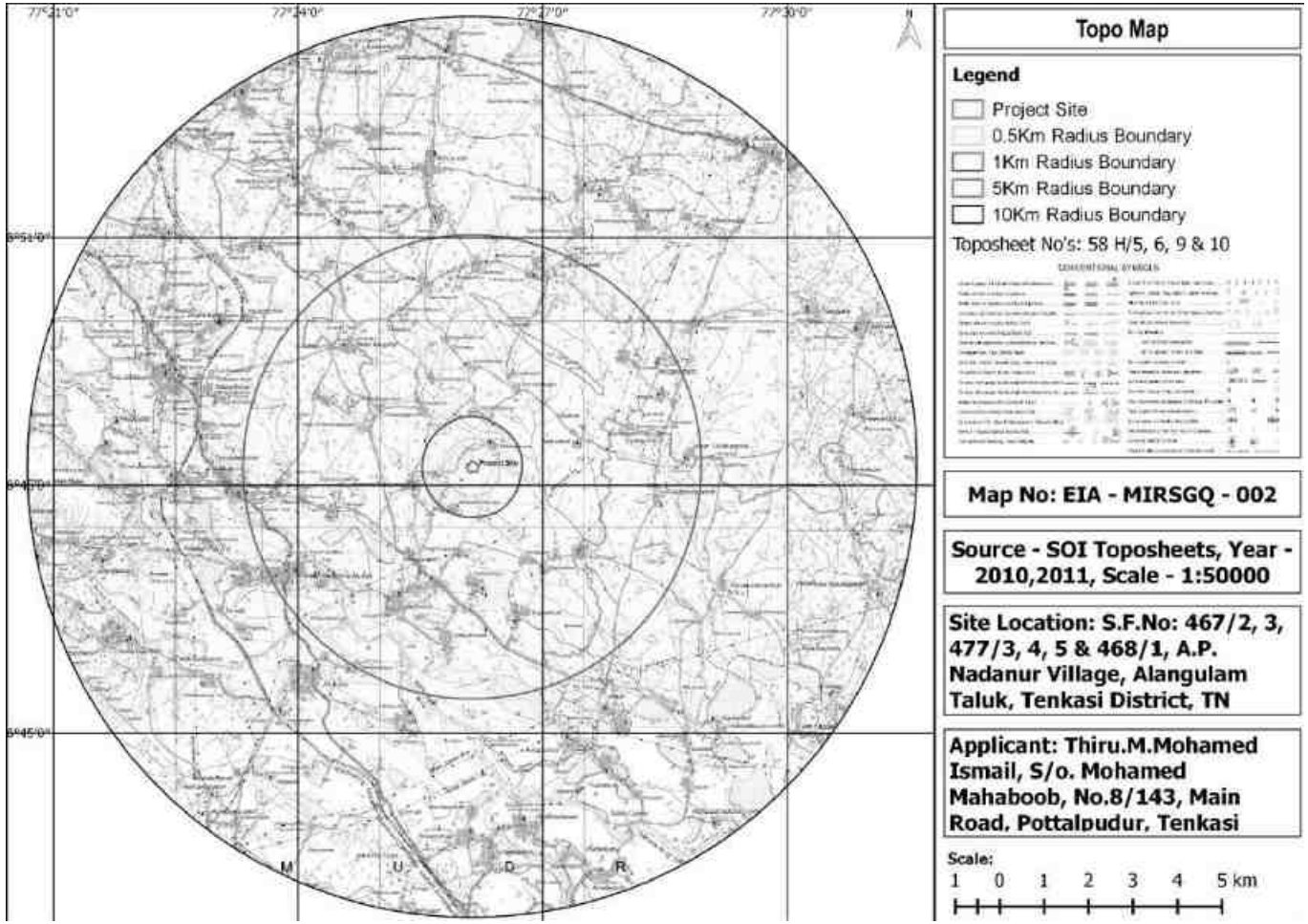


Figure 3-1 Topo Map of Study area

3.3 Description of the Study Area

An overall idea of the study area with reference to the physical conditions are presented for better understanding in the following sections before proceeding into the section on the prevailing environmental conditions of the study area.

3.4 Environmentally/Ecologically Sensitive areas

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

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

<table>
<tr><th>S. No</th><th>Areas</th><th>Aerial distance (within 15 km.)
Proposed project location boundary</th></tr>
<tr><td>1</td><td>List of Monuments and Heritages</td><td>Valisvara temple, Tiruvalisvaram, ~ 6.95Km, S
Thiruppudaimaruthur Bird Sanctuary, ~ 10.78, SE</td></tr>
<tr><td>2</td><td>List of Water Bodies and reserve Forest</td><td><u>Water Bodies:</u>
<table>
<tr><th>S. No</th><th>Name</th><th>Distance ~ (km)</th><th>Dir.</th></tr>
<tr><td>1</td><td>Kadana Dam</td><td>13.52</td><td>W</td></tr>
<tr><td>2</td><td>Ramanathi Reservoir</td><td>3.31</td><td>WNW</td></tr>
<tr><td>3</td><td>Pond Near AP Nadanur</td><td>0.54</td><td>WSW</td></tr>
<tr><td>4</td><td>Lake near Sivanadanur</td><td>1.04</td><td>NW</td></tr>
<tr><td>5</td><td>Lake near TerkuMadattur</td><td>4.38</td><td>WNW</td></tr>
<tr><td>6</td><td>Lake near Nagalkulam</td><td>9.50</td><td>NNW</td></tr>
<tr><td>7</td><td>Lake near Chalaipudur</td><td>9.77</td><td>N</td></tr>
<tr><td>8</td><td>Lake near Pottapudur</td><td>5.82</td><td>W</td></tr>
<tr><td>9</td><td>Pond near Iyyantankattalai</td><td>3.57</td><td>NNE</td></tr>
<tr><td>10</td><td>Alangulam Lake</td><td>9.46</td><td>NE</td></tr>
<tr><td>11</td><td>Pond near Anaintanadatpatti</td><td>3.94</td><td>ESE</td></tr>
<tr><td>12</td><td>Pond near Sadaiyandiyur</td><td>2.07</td><td>S</td></tr>
<tr><td>13</td><td>Lake near Adaichchani</td><td>4.53</td><td>S</td></tr>
<tr><td>14</td><td>Kapaliparai Lake</td><td>7.29</td><td>SE</td></tr>
<tr><td>15</td><td>Kasidharmam Lake</td><td>6.67</td><td>ESE</td></tr>
<tr><td>16</td><td>Lake near Nandantattai</td><td>8.97</td><td>SE</td></tr>
<tr><td>17</td><td>Lake near Vellikulam</td><td>2.51</td><td>SW</td></tr>
<tr><td>18</td><td>Ayyampiallai Kulam</td><td>6.17</td><td>WNW</td></tr>
</table>
<u>Reserve Forest:</u>
<table>
<tr><th>S. No</th><th>Name</th><th>Distance ~ (km)</th><th>Direction</th></tr>
<tr><td>1</td><td>RF</td><td>2.88</td><td>NNE</td></tr>
<tr><td>2</td><td>Onnanindran Pottal RF</td><td>9.19</td><td>NNE</td></tr>
<tr><td>3</td><td>Kottaimalai PF</td><td>14.65</td><td>NE</td></tr>
<tr><td>4</td><td>Papanasam RF/KM Tiger Reserve</td><td>10.5</td><td>SW</td></tr>
</table></td></tr>
</table>

3	Nearby Town, City and Head Quarters	Town: Kadiyam, ~6.54Km, WNW City: Tirunelveli - ~26.19Km, ESE District HQ - Thenkasi - ~20.40Km, NW
4	Nearest Airport, Port and Railway Stations	Railway Station: Kizhakadaiyam - ~6.11Km, WNW Airport: Tuticorin Airport, ~64.63Km, E
5	Nearest Highways	SH 40 Tiruchendur - Tenkasi - Shencottai Road, ~4.21Km, WSW SH 41 A Tirunelveli - Pottalpudur Road, ~2.24Km, SSW MDR 922 Kadayam - Mukkudal Road, ~3.68Km, NNW NH 44 Srinagar to Kanyakumari, ~31.93Km, E
6	Densely Populated	Pottapudur, ~4.63Km, W Kadiyam, ~6.54Km, WNW Ambasamudram, ~9.66Km, SSE Alangulam, ~8.47Km, NE

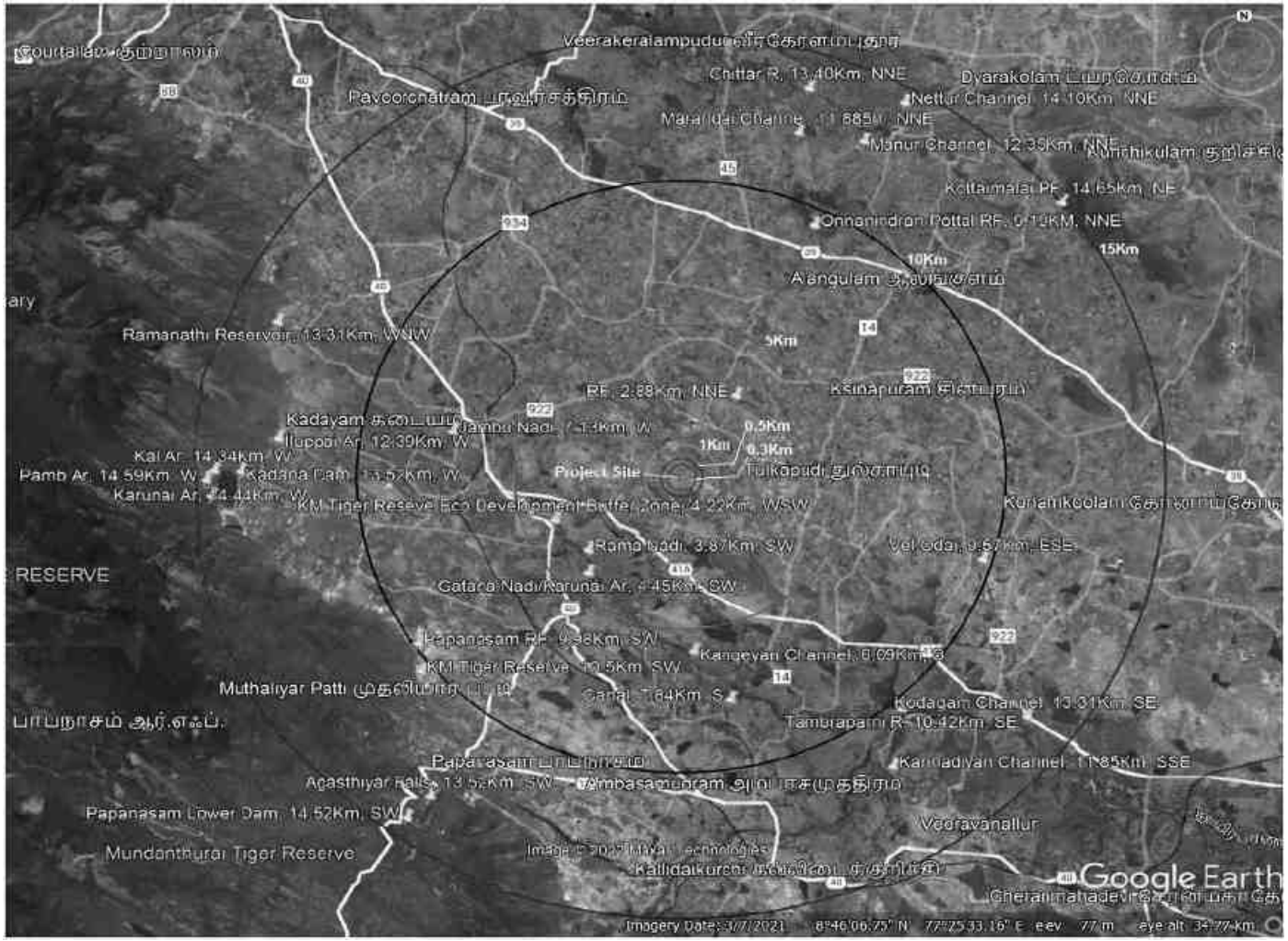


Figure 3-2 Environmental sensitive areas within 15 km from project boundary

3.5 Physical Conditions

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

1. District profile
2. Drainage, land use, geology, Physiography
3. Natural resources
4. Climatic conditions, seismic zone characteristics and natural hazard

3.5.1 PIA District Profile

Tenkasi district was formed on 12.11.2019 vide. G.O.(ms) No.427, dated 12.11.2019 of Revenue and Disaster Management Department, Revenue Adminstration wing [RAI (1)] section, after bifurcating from Tirunelveli District. District headquarters is Tenkasi, which is the largest Municipality in Tenkasi District. Tenkasi is named after Kasi Viswanathar Temple, built by the Pandian ruler Parakkirrama Pandian during the 13th Century. The district is located in the South Western part of Tamil Nadu, surrounded by Virudhunagar district in the north, Western Ghats and Kerala in the west, the South East is covered by Tirunelveli district and North East by Thoothukudi district. Chitharu, Gundaru, Karuppanathi, Gadana, Ramanathi and Hanuman nathi are main source of irrigation for Agriculture and Allied activities.

Source : ***https://cdn.s3waas.gov.in/s37cbbc409ec990f19c78c75bd1e06f215/uploads/2022/12/2022122344.pdf***

3.5.2 Climatic Conditions

The prevailing climate of this town is mostly pleasant. The temperature is about 30°C most of the months except during May and September. The temperature is little above 30°C during May and September. Tenkasi is receiving rainfall during summer, Northwest monsoon and Northeast monsoon seasons. The annual average rainfall of Tenkasi is 2.86 mm. The wind velocity is mild in most of the months except July and August. The wind velocity is high during June to August. Tenkasi is a town getting bright sunlight during all the months of a year except on the days of rainfall**.**

Source : ***https://www.tnurbantree.tn.gov.in/tenkasi/about-city-2-2/***

3.5.3 Natural Resources of PIA District

3.5.3.1 Irrigation of PIA district

The district is blessed with Western Ghats from which all the rivers viz, Chitharu, Hanuman Nathi, Ramanathi and Karuppanathi flows from west to east. Gundaru, Adavinainar, Karuppanathi, Gadana, Ramanathi are the main source of irrigation dams and also for drinking purpose. The other sources of irrigation are wells, tanks and canals which cover the gross and net cultivated area of 73858 and 62659 hectares when compared with the previous year their

gross and net area irrigated were decreased.

***Source** : https://cdn.s3waas.gov.in/s37cbbc409ec990f19c78c75bd1e06f215/uploads/2022/12/2022122344.pdf*

3.5.3.2 Agricultural Resources & Irrigation

Agriculture is playing a very crucial role in the district economy. The gross cropped area for the year 2021-22 was 137332 hectares which covers about 47.64% of the total geographical area. Out of which 84910 hectares were irrigated and 52421 were unirrigated. Around 62% of the total cropped was irrigated and 38% of the total cropped area was unirrigated. The net area shown, to total cropped area was 119843 hectares which is about 87% of gross cropped area and 17488 hectares were shown as more than once.

Source :

https://cdn.s3waas.gov.in/s37cbbc409ec990f19c78c75bd1e06f215/uploads/2022/12/2022122344.pdf

3.5.4 Land Use & Land Cover

3.5.4.1 Land Use and Land Cover of the Study Area

The total Project Study area is 329.26 Sq.km. The Land Use Pattern is given in **Table 3-2.** The Land Use Pattern and Land Use Map of the Study area are given in **Figure 3-3** and **Figure 3-4** respectively.

Table 3-2 Land Use Pattern of the Study Area

S. No	Description	Area (Sq. Km)	Area (Acres)	Area (Hectares)	Percentage (%)
1	Barren rocky	3.98	983.48	398	1.21
2	Crop land	183.19	45267.16	18319	55.64
3	Deciduous	1.08	266.87	108	0.33
4	Fallow	84.16	20796.36	8416	25.56
5	Mining	2.43	600.47	243	0.74

6	Plantation	4.61	1139.15	461	1.40
7	River / Stream / Canals	1.22	301.47	122	0.37
8	Rural	24.82	6133.15	2482	7.54
9	Scrub land	4.66	1151.51	466	1.42
10	Urban	0.9	222.39	90	0.27
11	Waterbodies/ ponds , lakes	18.21	4499.78	1821	5.53
	Total	**329.26**	**81361.79**	**32926**	**100.00**

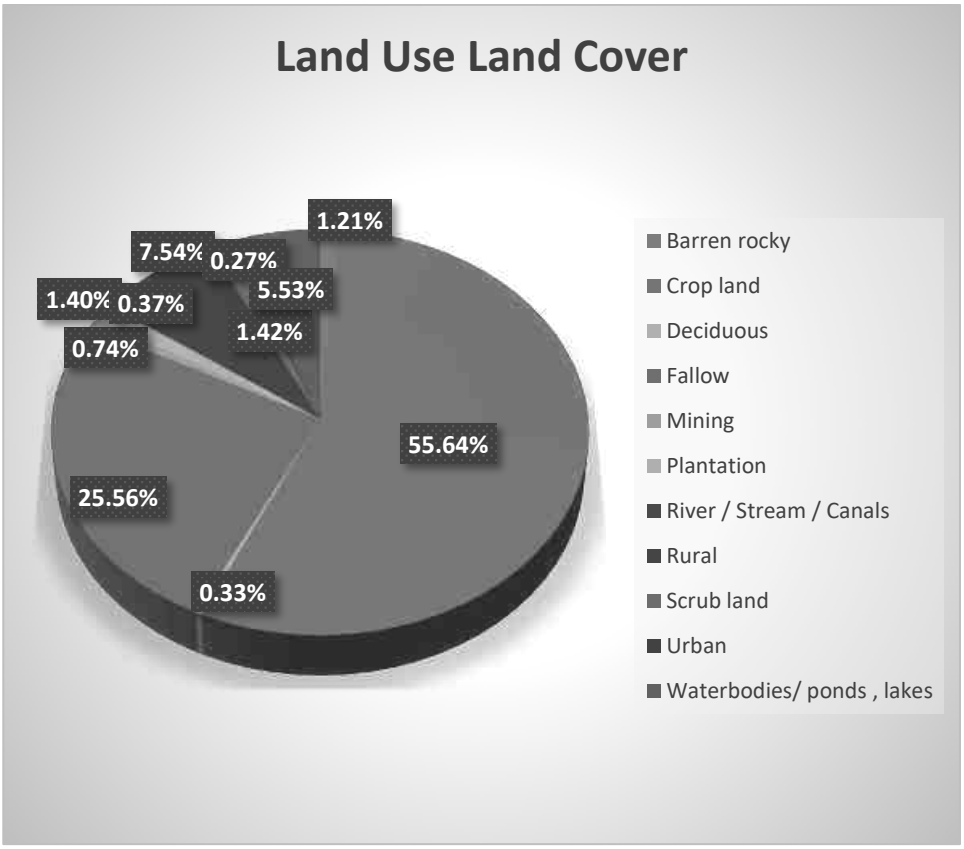


Figure 3-3 Land use Landcover Pattern of the Study Area

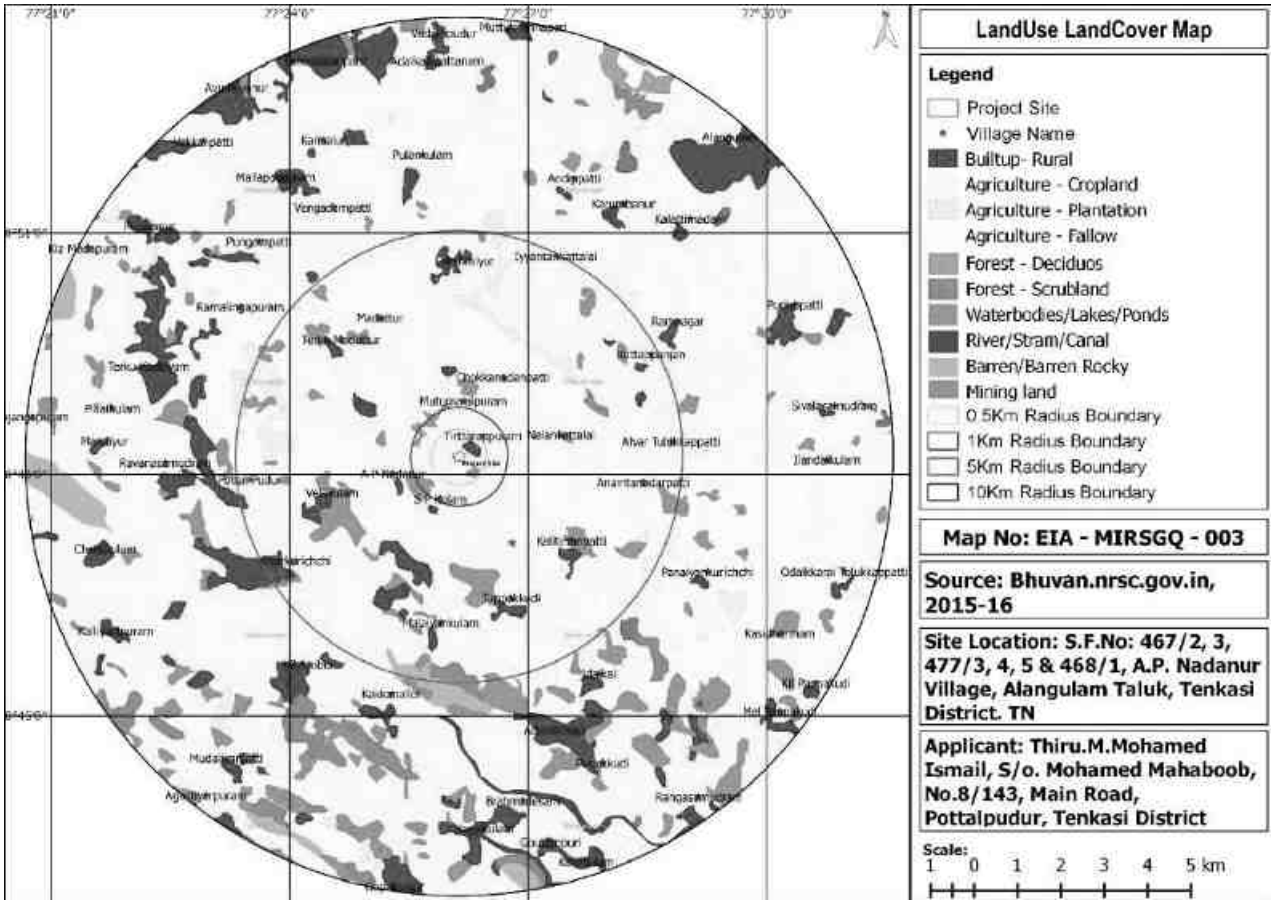


Figure 3-4 Land Use Land Cover map of the study area

3.5.5 Topography of PIA district

The district is located in the South Western part of Tamil Nadu, surrounded by Virudhunagar district in the north, Western Ghats and Kerala in the west, the South East is covered by Tirunelveli district and North East by Thoothukudi district. Chitharu, Gundaru, Karuppanathi, Gadana, Ramanathi and Hanuman nathi are main source of irrigation for Agriculture and Allied activities.

Source : ***https://cdn.s3waas.gov.in/s37cbbc409ec990f19c78c75bd1e06f215/uploads/2022/12/2022122344.pdf***

3.5.6 Geomorphology of the study area

The total Geographical area of the study area is 329.26 Sq.Km. The Geomorphology of the study area is given in **Table 3-3** and Geomorphology pattern and Geomorphology Map of the study area is given in **Figure 3-5** and **Figure 3-6** respectively.

Table 3-3 Geomorphology of the Study Area

S. No	Geomorphology	Area in Sq. Km	Total Area %
1	Structural Origin - Low Dissected Hills and Valleys	3.14	0.95
2	Denudational Origin-Low Dissected Hills and Valleys	1.48	0.45
3	Denudational Origin - Pediment – Pedi Plain Complex	302.08	91.75
4	Fluvial Origin-Active Flood Plain	2.24	0.68
5	Anthropogenic Origin-Anthropogenic Terrain	0.89	0.27
6	Waterbodies, Lakes, Ponds,River	19.43	5.90
	Total	**329.26**	**100.00**

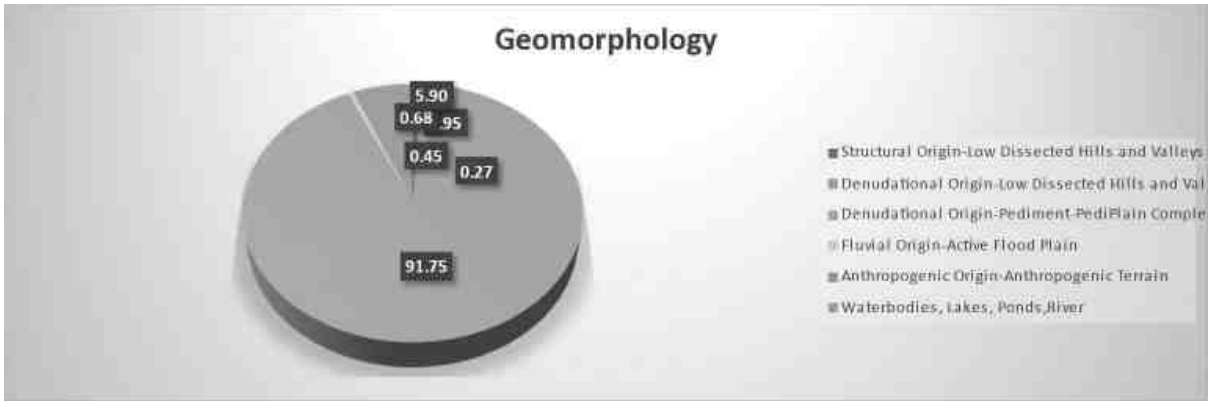


Figure 3-5 Geomorphology pattern of the study area

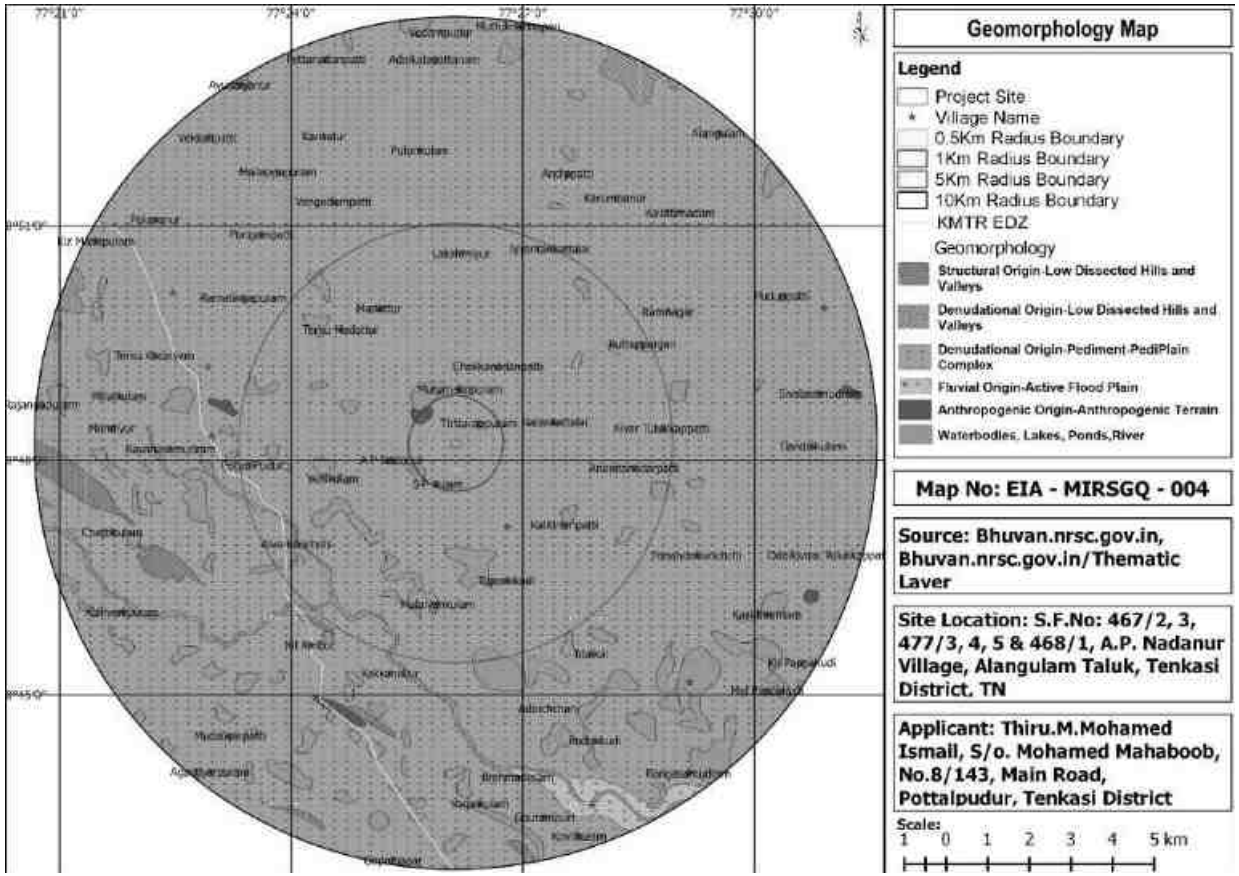


Figure 3-6 Geomorphology map of the study area

3.5.7 Geology of PIA District

Hard rock, Charnockite, Gneiss, Granite, Granite, Pegmatite are available geological formation in the district

Source : ***https://www.twadboard.tn.gov.in/content/tenkasi***

3.5.8 Drainage Pattern in PIA District

Tenkasi district falls in Tamiraparani river basin, Chittar river is the main river of the district. The river has a large network of tributaries which includes the Karaiyar, Pampar, Jambunathi, Gadananathi, Kallar, Karunaiyar, Chittar, Gundar, Aintharuviar, Hanumanathi, Karuppanathi and Aluthakanniar draining the district. The river Chittar originates from the hills in the west and confluences in Tamiraparani. The other one river draining in the district is Uppodai river. The small part of the district in the northern part falls in river Vaippar basin.

Source : ***https://www.twadboard.tn.gov.in/content/tenkasi***

3.5.9 Drainage Pattern of Study area

Drainage Map for the study area has been developed in the GIS Environment by using Digital Elevation Model. Methodology involved for producing Drainage maps has been discussed below. Strahler method of ordering is used for developing drainage map for the study area. Based on the elevation profiles of the study area drains will beformed as First order, Second Order, Third Order and so on. Accuracy of the maps has been verified by using Ground Truthing Technique. Drainage Map of the Study Area is given **Figure 3-7.**

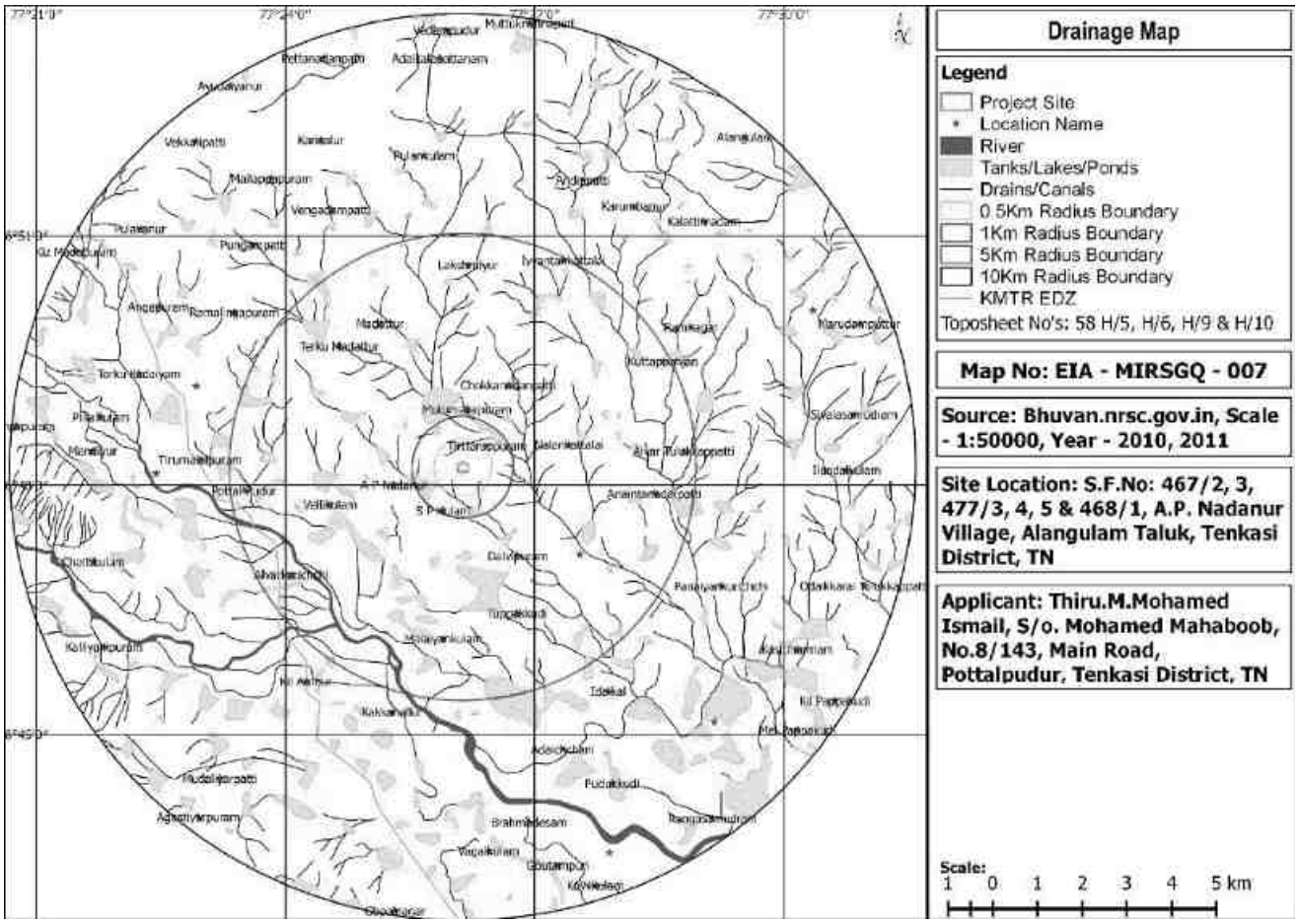


Figure 3-7 Drainage Map of the Study Area

3.5.10 Soils in PIA District

Tenkasi town has predominantly red soil. The soil of the wet lands located in this town is mostly sandy loam. The rocky and hard soils are also found in certain places of this town.

Source : ***https://www.tnurbantree.tn.gov.in/tenkasi/about-city-2-2/***

3.5.11 Seismicity

As per Seismicity Map of India, the project location/study area falls in Zone II, which is categorized as a Least Active Zone. The Seismicity Map of India is shown in Error! Reference source not found.**8**.

Figure 3-8 Seismicity map of India

3.6 Air Environment

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

Air pollution means the presence in the outdoor atmosphere of one or more contaminants or combinations thereof in such quantities and of such duration as are or may tend to be injurious to human, plant or animal life or property. Air pollutants include smoke, vapours, soot, fumes, gases, mist, odours, particulate matter, radioactive material, or noxious chemicals. With upcoming activity, a range of different pollutants are released into the atmosphere that are dispersed and have a significant impact on neighborhood air environment. Thus, collection of base line data of air environment occupies a predominant role in the impact assessment statement. The ambient air quality status across the study zone forms basis for prediction of the impacts due to the project.

3.6.1 Meteorological Conditions

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

3.6.2 Meteorological Data Collection

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

3.7 Ambient Air Quality

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

1. Topography/Terrain
2. Meteorological conditions
3. Residential and sensitive areas within the study area
4. Representatives of regional background air quality/pollution levels and
5. Representation of likely impacted areas

3.7.1 Ambient Air Quality Monitoring Stations

To evaluate the baseline air quality of the study area, eight (08) monitoring locations have been identified as per Annual wind predominance. The annual wind predominance is from North west to Southeast. Map showing the Ambient Air Quality (AAQ) monitoring locations is given

in

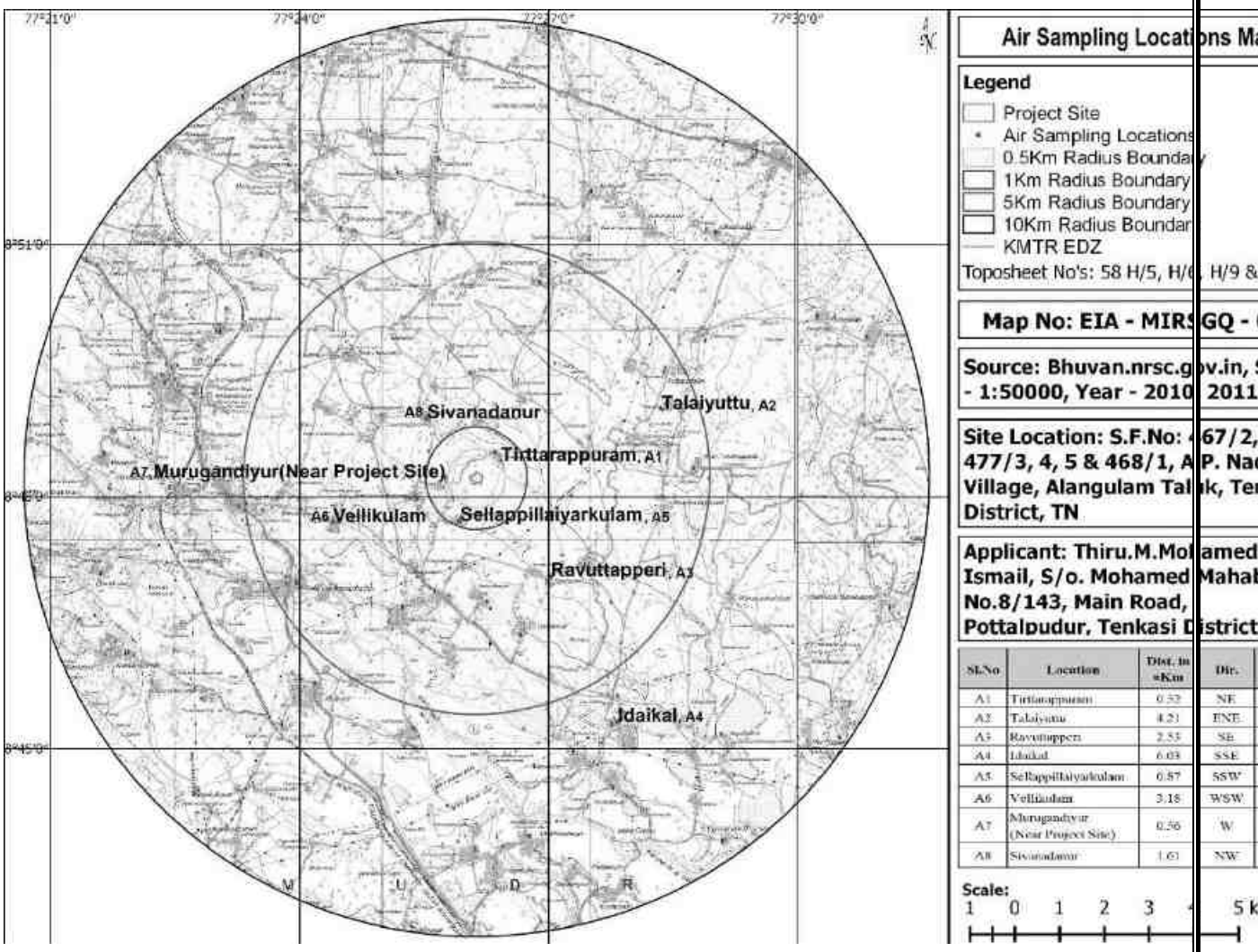
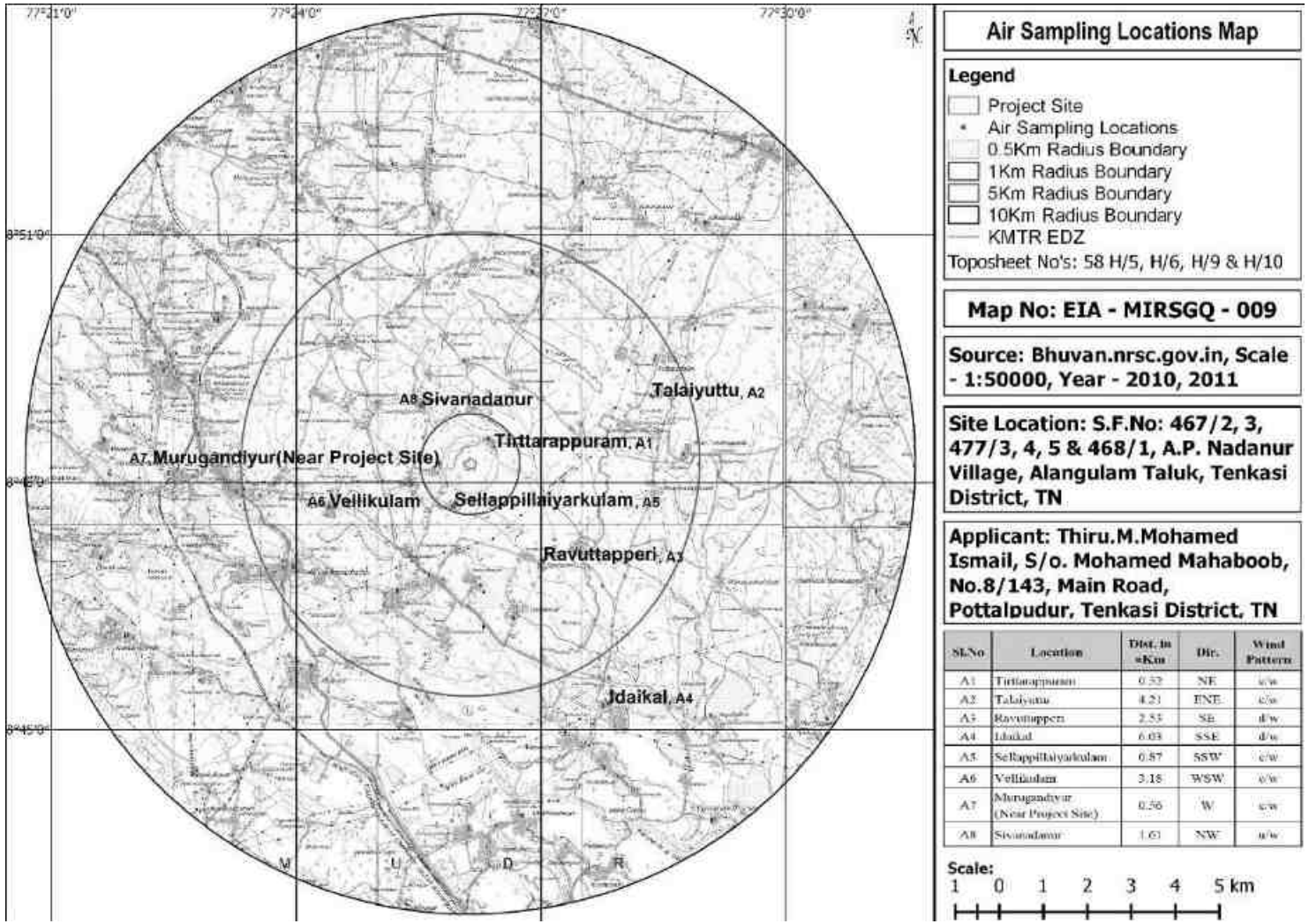


Figure 3-9 and the details of the locations are given in **Table 3-4**. Summary of the average baseline concentrations of pollutants are given **Table 3-13**.

Table 3-4 Details of Ambient Air Quality Monitoring Locations

S. No	Village	Wind Pattern	Distance in km~	Direction
1	Tirttarappuram	c/w	0.52	NE
2	Talaiyuttu	c/w	4.21	ENE
3	Ravuttapperi	d/w	2.53	SE
4	Idaikal	d/w	6.03	SSE
5	Sellappillaiyarkulam	c/w	0.87	SSW
6	Vellikulam	c/w	3.18	WSW
7	Murugandiyur (Near Project Site)	c/w	0.56	W
8	Sivanadanur	u/w	1.61	NW



Sl.No	Location	Dist. in ±Km	Dir.	Wind Pattern
A1	Tirttarappuram	0.52	NE	u/w
A2	Talaiyuttu	4.21	ENE	u/w
A3	Ravuttupperi	2.53	SE	d/w
A4	Idaikal	6.03	SSE	d/w
A5	Sellappillaiyarkulam	0.87	SSW	c/w
A6	Vellikulam	3.18	WSW	u/w
A7	Murugandiyur (Near Project Site)	0.56	W	u/w
A8	Sivaradanur	1.61	NW	u/w

Figure 3-9 Map showing the Ambient Air Quality monitoring locations.

3.7.2 Ambient Air Quality Monitoring Techniques and Frequency

Ambient air quality was monitored twice in a week for One (01) season (shall cover 12 weeks), i.e., 3 months (March 2023- May 2023) PM_{10}, $PM_{2.5}$, SO_2, NO_x, Pb, NH_3, C_6H_6, $C_{20}H_{12}$, As and Ni were monitored and the Summary of the average baseline concentrations of pollutants is given in Error! Reference source not found..

Table 3-5 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/m3	IS 5182(Part 22) : 2004 RA
7	O3, µg/m3	IS 5182(Part 9) : 1974 RA
8	NH3, µg/m3	SOP – EA -009 - In house validated method / Issue No/Date: 03/04.08.2014 (Based on CPCB Method)
9	Benzene, µg/m3	IS 5182(Part 11) : 2006 (RA 2012)
10	Benzo (a) pyrene, ng/m3	IS 5182(Part 12) :2004 RA
11	Arsenic, ng/ m3	SOP – EA -010 - In house validated method / Issue No/Date :03/04.08.2014 (Based on CPCB Method)
12	Nickel ng/ m3	SOP – EA -011 - In house validated method / Issue No/Date :03/04.08.2014 (Based on CPCB Guideline)

3.7.2.1 Results and Discussions

The variations of the pollutants PM_{10}, $PM_{2.5}$, SO_2, NO_x, Pb, NH_3, C_6H_6, $C_{20}H_{12}$, As and Ni are compared with National Ambient Air Quality Standards (NAAQS), MoEF&CC Notification, November 2009. Ambient Air Quality Monitoring Data (March 2023 to May 2023) for the study area. Summary of the average baseline concentrations of pollutants is summarized **Table 3-6**.

Table 3-6 Summary of the average baseline concentrations of pollutants

Parameters	Conc.	NAAQ Standards	Locations							
			Tirttarappuram	Talaiyuttu	Ravuttapperi	Idaikal	Sellappillaiyarkulam	Vellikulam	Murugandiyur (Near Project Site)	Sivanadanur
			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)	46.5	42.3	43.9	41.7	43.3	45.3	43.5	44.8
	Max		66.3	60.3	62.6	59.4	61.6	64.6	62.0	63.9
	Avg.		**55.8**	**50.8**	**52.7**	**50.0**	**51.9**	**54.4**	**52.2**	**53.8**
	98th 'tile		65.9	60.0	62.2	59.0	61.3	64.2	61.6	63.5
$PM_{2.5}$ Conc. ($\mu g/m^3$)	Min	60 (24 Hours)	20.8	18.9	17.2	22.0	20.6	19.9	21.8	20.4
	Max		29.7	26.9	24.4	31.3	29.4	28.4	31.0	29.0
	Avg.		**25.0**	**22.7**	**20.6**	**26.3**	**24.7**	**23.9**	**26.1**	**24.4**
	98th 'tile		29.5	26.8	24.3	31.1	29.2	28.3	30.9	28.9
SO_2 Conc. ($\mu g/m^3$)	Min	80 (24 Hours)	9.4	6.6	7.6	7.0	9.2	7.7	8.0	8.9
	Max		13.4	9.4	10.8	10.0	13.2	11.0	11.4	12.8
	Avg.		**11.3**	**7.9**	**9.1**	**8.4**	**11.1**	**9.2**	**9.6**	**10.7**
	98th 'tile		13.4	9.4	10.8	9.9	13.1	10.9	11.3	12.7
NO_2 Conc.($\mu g/m^3$)	Min	80 (24 Hours)	20.5	17.4	14.4	15.8	20.3	18.0	19.9	18.8
	Max		29.3	24.8	20.6	22.5	28.9	25.7	28.3	26.8
	Avg.		**24.6**	**20.9**	**17.3**	**18.9**	**24.3**	**21.6**	**23.9**	**22.5**
	98th 'tile		29.1	24.7	20.4	22.3	28.7	25.5	28.2	26.6

Parameters	Conc.	NAAQ Standards	Locations							
			Tirttarappuram	Talaiyuttu	Ravuttapperi	Idaikal	Sellappillaiyarkulam	Vellikulam	Murugandiyur (Near Project Site)	Sivanadanur
			AAQ 1	AAQ 2	AAQ 3	AAQ 4	AAQ 5	AAQ 6	AAQ 7	AAQ 8
CO (mg/m3)	Avg.	4 (1hour)	0.37	0.26	0.28	0.33	0.42	0.19	0.4	0.29
Pb (µg/m3)	Avg	1 (24 hour)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
O3 (µg/m3)	Avg.	180 (1 hour)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
NH3 (µg/m3)	Avg.	400 (24 hours)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzene (µg/m3)	Avg.	5 (Annual)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzo (a) pyrene, (ng/m3)	Avg.	1 (Annual)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Arsenic (ng/ m3)	Avg.	6 (Annual)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Nickel (ng/m3)	Avg.	20 (Annual)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Note: *BDL (Below detectable limit)*

3.7.2.2 Observations

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} (41.7– 66.3 µg/m³), $PM_{2.5}$ (17.2– 31.3 µg/m³), SO_2 (6.6 – 13.4µg/m³), NO_2 (14.4 – 29.3 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.

3.8 Noise Environment

Noise is an unwanted sound without musical quality. Artificial noise impact on environment, growing apace is with advancing human civilization. Noise pollution is equally hazardous to the environment as air, water, and other forms of pollution. Various noise measurement units have been introduced to describe, in a single number, the response of an average human to a complex sound made up of various frequencies at different loudness levels. The most common scale is, weighted decibel dB (A), and measured as the relative intensity level of one sound with respect to another sound (reference sound).

The impact of noise depends on its characteristics (instantaneous, intermittent, or continuous in nature), time of day and location of noise source. The environmental impact of noise can have several effects varying from noise induced hearing loss to annoying depending on noise levels. As there is no operation at the project site, noise level was monitored at nearby places where impact of project is likely to happen due to transportation. A map showing the noise monitoring locations is given in Error! Reference source not found.**0.**

3.8.1 Results and Discussions

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

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

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

The comparison of day equivalent noise levels (Ld) and night equivalent noise levels (Ln) with the respective CPCB stipulated noise standards for various land use categories are shown in the **Table 3-7**.

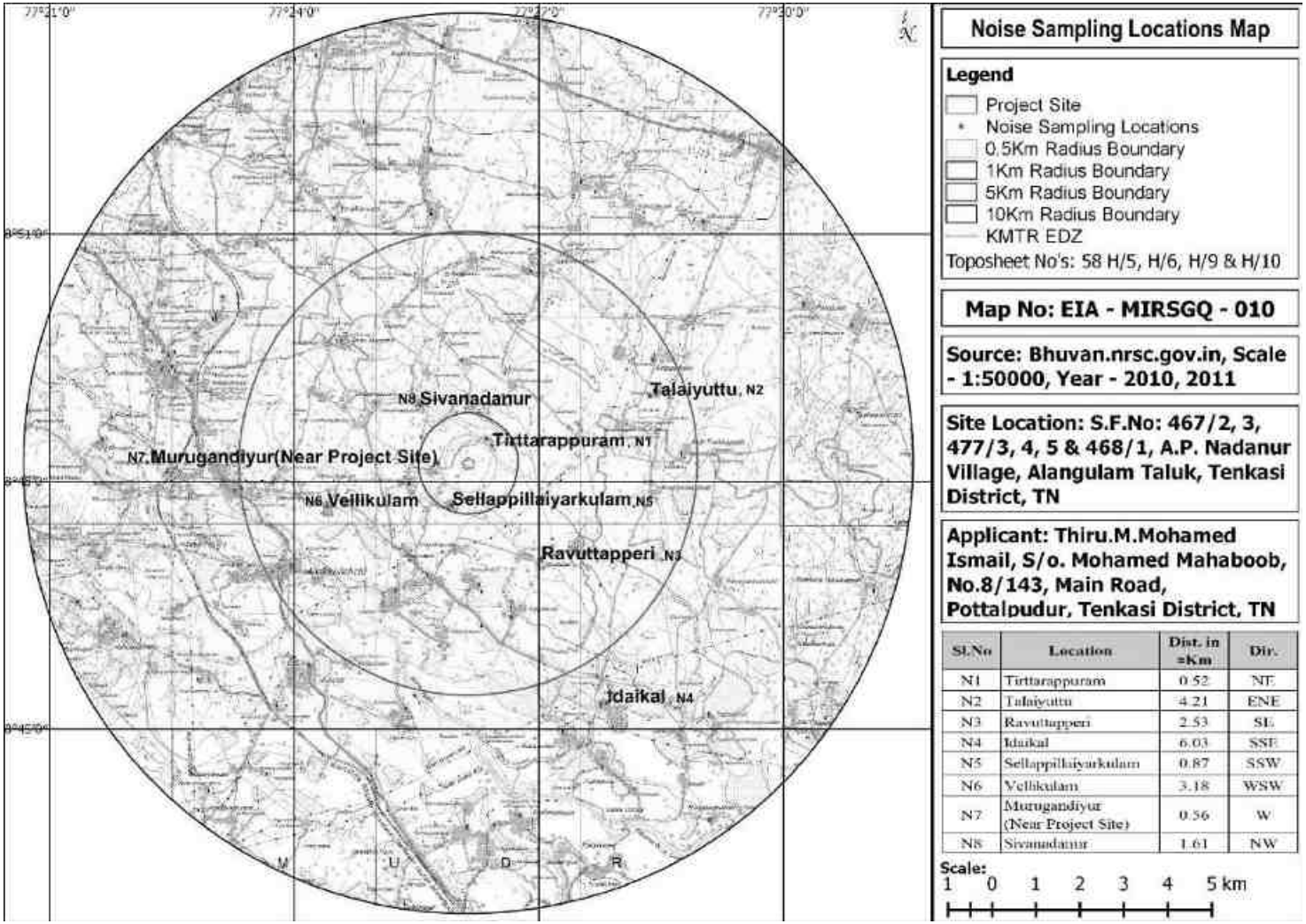
Table 3-7 Day and Night Equivalent Noise Levels

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	Tirttarappuram	N1	0.52	NE	53.7	43.2	75	70	Industrial
2	Talaiyuttu	N2	4.21	ENE	51.8	40.8	55	45	Residential
3	Ravuttapperi	N3	2.53	SE	52.1	41.3	55	45	Residential
4	Idaikal	N4	6.03	SSE	50.9	41.9	55	45	Residential
5	Sellappillaiyarkulam	N5	0.87	SSW	51.2	42.2	55	45	Residential
6	Vellikulam	N6	3.18	WSW	49.2	39.9	55	45	Residential
7	Murugandiyur (Near Project Site)	N7	0.56	W	50.5	42.7	55	45	Residential
8	Sivanadanur	N8	1.61	NW	51.6	40.3	55	45	Residential

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

- In Industrial areas daytime noise levels were about 53.7 dB(A) and 43.2 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 49.2 dB(A) to 52.1 dB(A) and nighttime noise levels varied from 39.9 dB(A) to 42.7 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 since the project site is surrounded by many Quarries.



Sl.No	Location	Dist. in =Km	Dir.
N1	Tirttarappuram	0.52	NE
N2	Talaiyuttu	4.21	ENE
N3	Ravuttapperi	2.53	SE
N4	Idaikal	6.03	SSE
N5	Sellappillaiyarkulam	0.87	SSW
N6	Vellikulam	3.18	WSW
N7	Murugandiyur (Near Project Site)	0.56	W
N8	Sivanadanur	1.61	NW

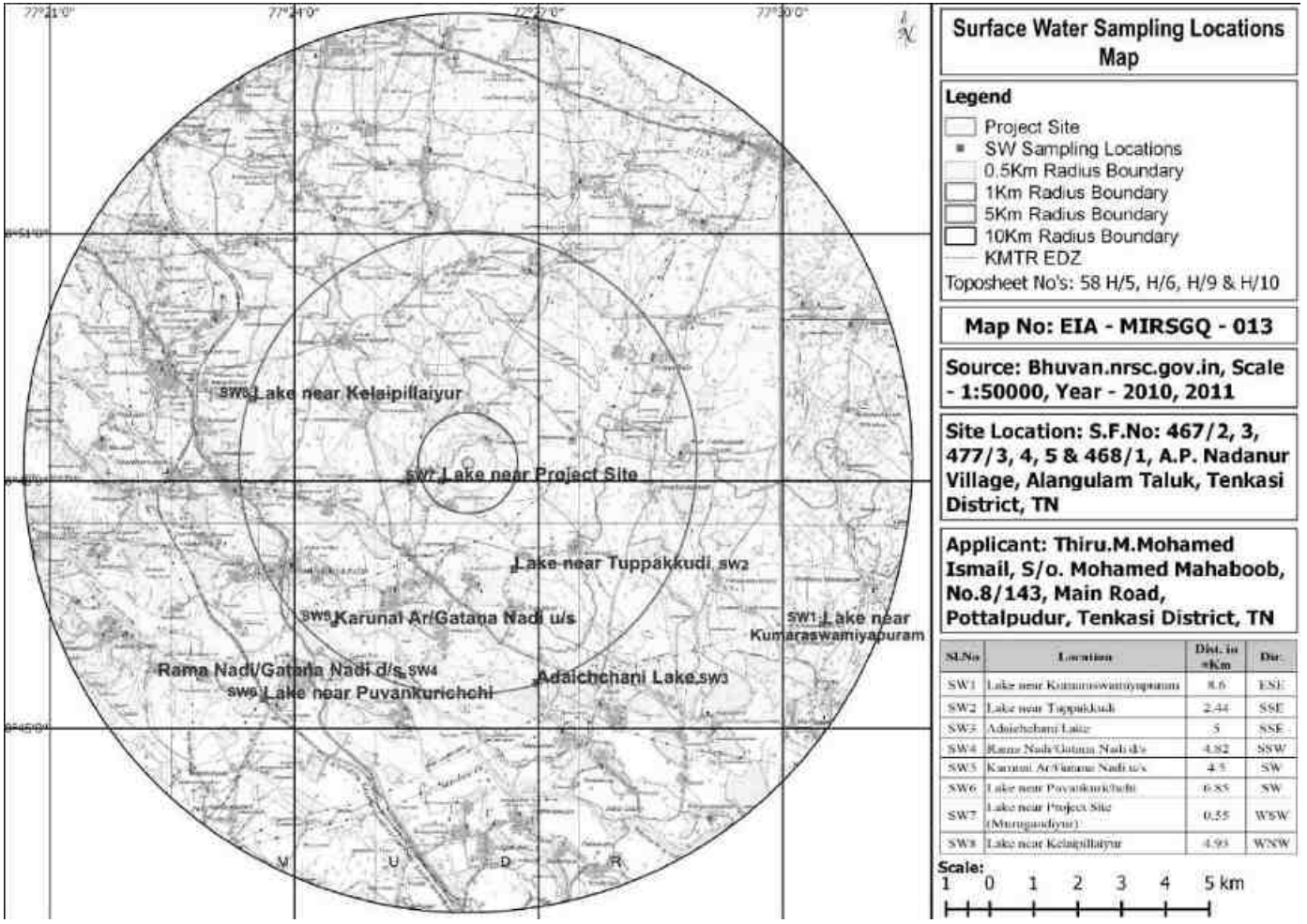
Figure 3-10 Map showing the noise monitoring locations

3.9 Water Environment

3.9.1 Surface Water Quality Assessment

Water quality monitoring and assessment can be used to determine ambient water quality, the extent and causes of a water quality problem, or to measure the effectiveness of best management practices being implemented in water system. Monitoring helps to determine the trends in the quality of the aquatic environment and the impact due to the release of contaminants, other anthropogenic activities, and/or by waste treatment operations (impact monitoring).To establish the baseline status of water environment, the representative sampling locations for surface water within a radial distance of 10Km 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 3-8**. Water sampling and map of sampling location are given in and **Figure 3-7**.



Sl.No	Location	Dist. in *Km	Dir.
SW1	Lake near Kumaraswamiyapuram	8.6	ESE
SW2	Lake near Tuppakkudi	2.44	SSE
SW3	Adaichchani Lake	5	SSE
SW4	Rama Nadi/Gatana Nadi d/s	4.82	SSW
SW5	Karunal Ar/Gatana Nadi u/s	4.5	SW
SW6	Lake near Puvankurichchi	6.85	SW
SW7	Lake near Project Site (Murugandiyur)	0.55	WSW
SW8	Lake near Kelaipillaiyur	4.93	WNW

Table 3-8 Test methods used for the analysis of water quality parameters

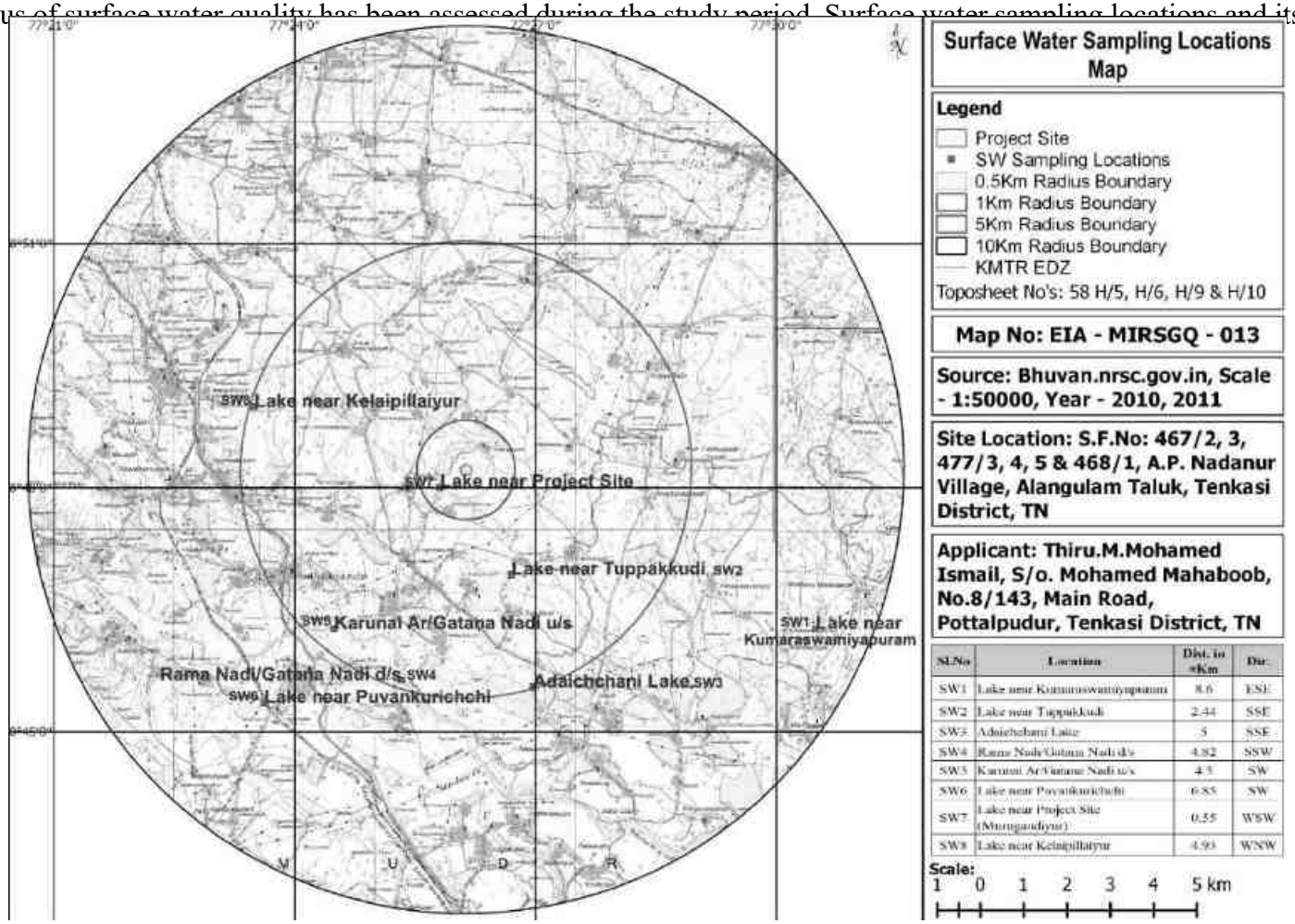
S. No	Parameter Measured	Test Method
1	Turbidity	APHA 23rd Edition 2017 /2130B/P 2-9 Nephelometric Method/ IS 3025(Part 10): 1984 RA
2	Color	APHA 23rd Edition 2017 2120B /P2-2 Visual Comparision Method / IS 3025(Part 4) : 1983 RA
3	pH	APHA 23rd Edition 2017 4500 H+ / P 4-90 Electrometric Method/IS 3025(Part 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
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

S. No	Parameter Measured	Test Method
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 22rd 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
33	COD	IS:3025 (Part – 44) : 1993

Table 3-9 Surface water Standards

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

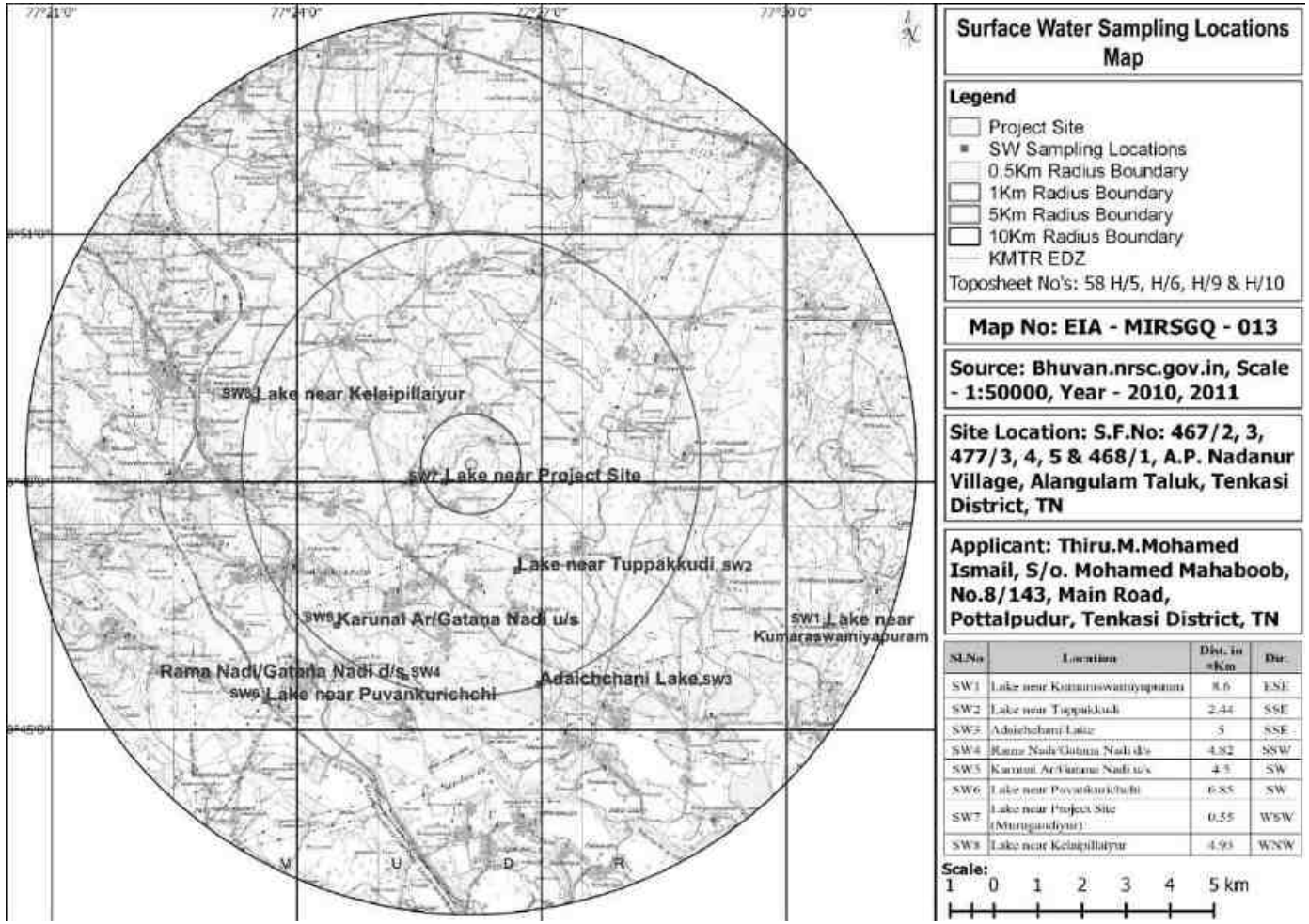


Sl.No	Location	Dist. in +Km	Dir.
SW1	Lake near Kumaraswamiyapuram	8.6	ESE
SW2	Lake near Tuppakkudi	2.44	SSE
SW3	Adaichchani Lake	5	SSE
SW4	Rama Nadi/Gatana Nadi d/s	4.82	SSW
SW5	Karunal Ar/Gatana Nadi u/s	4.5	SW
SW6	Lake near Puvankurichchi	6.85	SW
SW7	Lake near Project Site (Murugandiyur)	0.55	WSW
SW8	Lake near Kelaipillaiyur	4.93	WNW

in **Table 3-10** and **Figure 3-711** respectively results are provided in **Table 3-11**.

Table 3-10 Details of Surface water sampling locations

Code	Location Name	Distance in Km ~	Direction
SW1	Lake near Kumaraswamiyapuram	8.6	ESE
SW2	Lake near Tuppakkudi	2.44	SSE
SW3	Adaichchani Lake	5	SSE
SW4`	Rama Nadi/Gatana Nadi d/s	4.82	SSW
SW5	Karunai Ar/Gatana Nadi u/s	4.5	SW
SW6	Lake near Puvankurichchi	6.85	SW
SW7	Lake near Project Site (Murugandiyur)	0.55	WSW
SW8	Lake near Kelaipillaiyur	4.93	WNW



Sl.No	Location	Dist. in *Km	Dir.
SW1	Lake near Kumaraswamiyapuram	8.6	ESE
SW2	Lake near Tuppakkudi	2.44	SSE
SW3	Adaichchani Lake	5	SSE
SW4	Rama Nadi/Gatana Nadi d/s	4.82	SSW
SW5	Karunai Ar/Gatana Nadi u/s	4.5	SW
SW6	Lake near Puvankurichchi	6.85	SW
SW7	Lake near Project Site (Murugandiyur)	0.55	WSW
SW8	Lake near Kelaipillaiyur	4.93	WNW

Figure 3-71 Map showing the surface water monitoring locations.

Table 3-11 Physicochemical Parameters of Surface water samples from study area

S. No	Parameter	Unit	Surface water standards (IS 2296 Class-A)	Lake near Kumaraswamiyapuram	Lake near Tuppakkudi	Adaichchani Lake	Rama Nadi/Gatana Nadi d/s	Karunai Ar/Gatana Nadi u/s	Lake near Puvankurichchi	Lake near Project Site (Murugandiyur)	Lake near Kelaipillaiyur
				SW 1	SW 2	SW 3	SW 4	SW 5	SW 6	SW 7	SW 8
1	pH (at 25°C)	--	6.5-8.5	7.53	6.91	7.36	6.83	7.26	7.3	7.8	7.6
2	Electrical Conductivity	µS/cm	-	1528	1723	1255	2358	1968	1522	1499	1864
3	Total Dissolved Solids	mg/l	500	1045	1199	873	1542	1374	1027	1044	1217
4	Total Alkalinity as $CaCO_3$	mg/l	-	161.5	167.2	129.5	268.0	243.4	137.7	220.7	241.8
5	Total Hardness as $CaCO_3$	mg/l	300	326.0	348.1	192.8	390.1	336.6	316.1	355.5	324.6
6	Sodium as Na	mg/l	-	157.6	227.3	162.3	304.2	276.3	184.2	141.8	162.5
7	Potassium as K	mg/l	-	53.1	28.9	33.7	63.9	49.8	40.3	66.7	89.4
8	Calcium as Ca	mg/l	-	90.4	107.3	56.2	117.2	98.9	107.5	114.7	105.3
9	Magnesium as Mg	mg/l	-	24.3	19.4	12.7	23.6	21.7	11.5	16.7	14.9
10	Chloride as Cl	mg/l	250	264.9	327	243.6	349	319.6	237.4	205.6	268
11	Sulphate as SO_4	mg/l	400	128.3	136.7	97.7	164.9	140.2	146.3	99.8	128.6
12	Nitrate as NO_3	mg/l	20	2.4	3.4	2.8	6.9	4.8	7.1	2.6	6.3
13	Phosphate as PO4	mg/l	-	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14	Fluorides as F	mg/l	1.5	0.63	0.42	0.29	0.37	0.52	0.43	0.3	0.29
15	Cyanide	mg/l	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
16	Arsenic	mg/l	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17	Boron as B	mg/l	-	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18	Cadmium as Cd	mg/l	0.01	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
19	Chromium, Total	mg/l	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

20	Lead as Pb	mg/l	0.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21	Manganese as Mn	mg/l	0.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22	Mercury	mg/l	0.001	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
23	Nickel as Ni	mg/l	-	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24	Selenium as Se	mg/l	0.01	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25	Zinc	mg/l	15	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
26	Dissolved Oxygen	mg/l	6	5.3	5.5	5.2	6	5.8	5.2	5.8	5.7
27	Chemical Oxygen Demand as O_2	mg/l	-	27.6	21.6	30.5	11.3	17.6	32.6	17.2	18.1
28	BOD, 3 days @ 27°C as O_2	mg/l	2	10.2	13.7	18.3	6.9	9.4	20.7	9.6	10.2

3.9.1.1 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 6.83 to 7.8 and within the limits (6.5 – 8.5) of IS 2296:1992.
- The Electrical Conductivity (EC) of the collected surface water ranges from 1255 µS/cm to 2358 µS/cm.
- The chloride content in the collected surface water ranges from 205.6 mg/l to 349 mg/l.
- The sulphate content in the collected surface water sample ranges from 97.7 mg/l to 164.9 mg/l.
- COD of the collected surface water sample ranges from 11.3 mg/l to 32.6 mg/l.
- BOD of the collected surface water sample ranges from 6.9 mg/l to 20.7 mg/l.

3.9.2 Groundwater resources of PIA district

3.9.2.1 Groundwater Quality

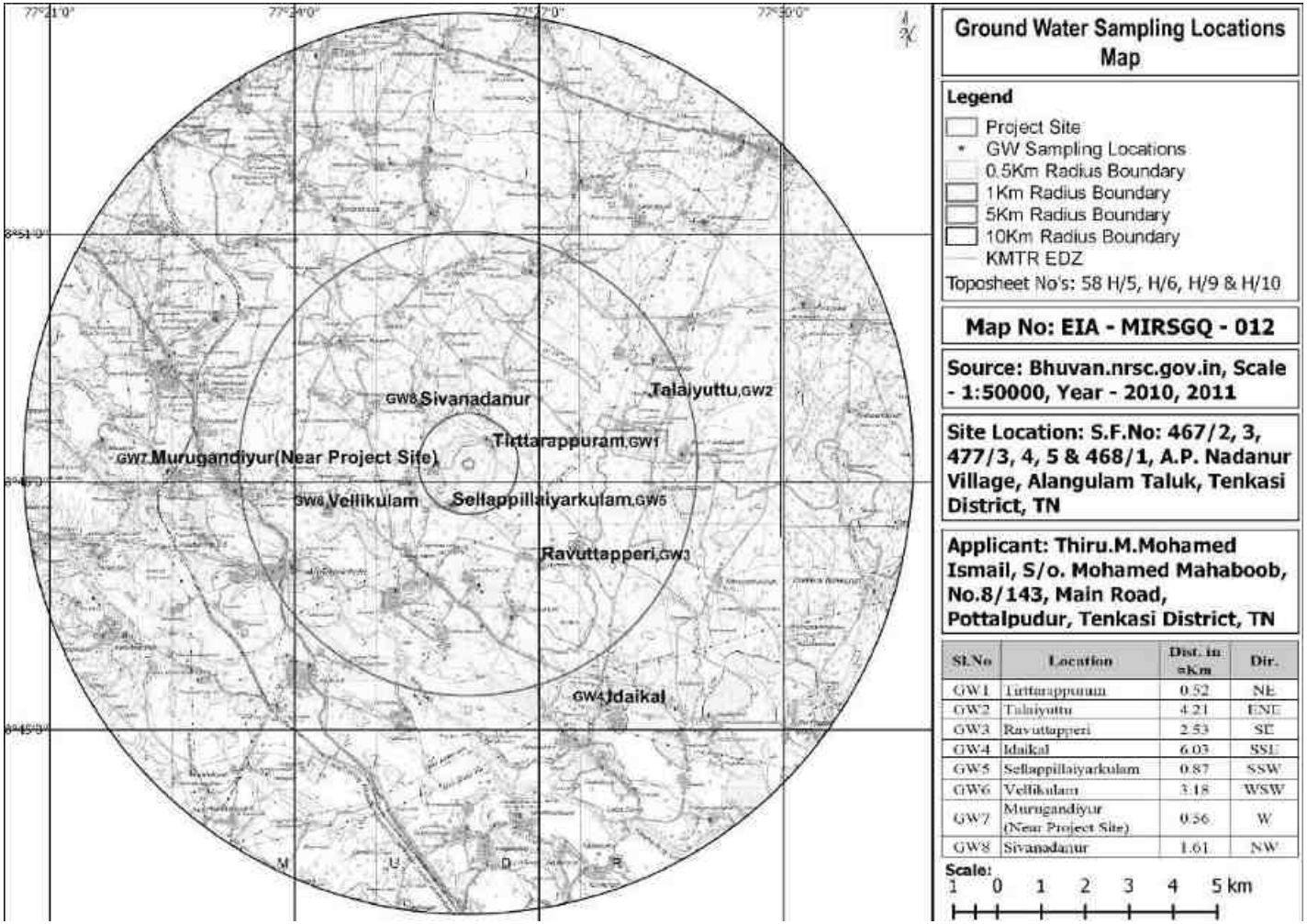
Total Eight (08) ground water monitoring locations were identified for assessment in different villages around the project site. The groundwater results are compared with the acceptable and permissible water quality standards as per IS: 10500 (2012) for drinking water. Groundwater quality monitoring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

Table 3-12 and**Error! Reference source not found.** respectively. A map showing the groundwater monitoring locations is given in Error! Reference source not found.**2.**

Table 3-12 Details of Groundwater Quality Monitoring Locations

Station Code	Location	Distance from Project boundary in ~ km	Direction
GW1	Tirttarappuram	0.52	NE
GW2	Talaiyuttu	4.21	ENE
GW3	Ravuttapperi	2.53	SE
GW4	Idaikal	6.03	SSE
GW5	Sellappillaiyarkulam	0.87	SSW
GW6	Vellikulam	3.18	WSW
GW7	Murugandiyur (Near Project Site)	0.56	W

Station Code	Location	Distance from Project boundary in ~ km	Direction
GW8	Sivanadanur	1.61	NW



Sl.No	Location	Dist. in nKm	Dir.
GW1	Tirttarappuram	0.52	NE
GW2	Talaiyuttu	4.21	ENE
GW3	Ravuttapperi	2.53	SE
GW4	Idaikal	6.03	SSE
GW5	Sellappillaiyarkulam	0.87	SSW
GW6	Vellikulam	3.18	WSW
GW7	Murugandiyur (Near Project Site)	0.56	W
GW8	Sivanadanur	1.61	NW

Figure 3-12 Map showing the groundwater monitoring locations

Table 3-13 Physico chemical analysis of Ground water samples from study area

S. No	Parameters	Unit	Drinking water Standard (IS 10500: 2012) Acceptable Limit	Drinking water Standard (IS 10500: 2012) Permissible Limit	Tirttarappuram	Talaiyuttu	Ravuttapperi	Idaikal	Sellappillaiyarkulam	Vellikulam	Murugandiyur (Near Project Site)	Sivanadanur
					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	7.55	7.69	8.1	7.3	6.94	7.5	7.26	7.39
4	Conductivity	µS/cm	-	-	1532	1736	1698	1611	1841	1902	2105	1796
5	Total Dissolve Solids	mg/l	500	2000	1020	1131	1135	1048	1216	1220	1350	1253
6	Total Suspended Solids		-	-	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
7	Alkalinity as $CaCO_3$	mg/l	200	600	220	219	203	187	241	251	253	255
8	Total Hardness as $CaCO_3$	mg/l	200	600	425	420	403	398	399	482	381	444
9	Sodium as Na	mg/l	-	-	99.6	115.3	135.6	106.9	177.6	115.8	219.5	218.2
10	Potassium as K	mg/l	-	-	9.9	24.3	15.8	10.2	34.6	42.3	18.6	25.6
11	Calcium as Ca	mg/l	75	200	128.3	140	128	131	125.9	142.5	120.7	134.2
12	Magnesium as Mg	mg/l	30	100	25.3	16.9	20.5	16.9	20.5	30.6	19.2	26.4
13	Chloride as Cl	mg/l	250	1000	269.3	326.6	339.4	294.6	316.2	342.5	328.2	294.6

S. No	Parameters	Unit	Drinking water Standard (IS 10500: 2012) Acceptable Limit	Drinking water Standard (IS 10500: 2012) Permissible Limit	Tirttarappuram	Talaiyuttu	Ravuttapperi	Idaikal	Sellappillaiyarkulam	Vellikulam	Murugandiyur (Near Project Site)	Sivanadanur
					GW1	GW2	GW3	GW4	GW5	GW6	GW7	GW8
14	Sulphate SO_4	mg/l	200	400	125.6	136.9	142.8	164.2	135.9	129.6	211.4	128.3
15	Nitrate as NO_3	mg/l	45	NR	3.60	5.20	6.40	3.60	6.33	4.90	7.30	6.70
16	Phosphate PO4	mg/l	-	-	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17	Fluorides as F	mg/l	1	1.5	0.64	0.59	0.38	0.43	0.55	0.63	0.29	0.59
0	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	Lead	mg/l	0.01	NR	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25	Manganese as Mn	mg/l	0.1	0.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
26	Mercury	mg/l	0.001	NR	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
27	Nickel as Ni	mg/l	0.02	NR	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28	Selenium as Se	mg/l	0.01	NR	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29	Zinc as Zn	mg/l	5	15	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

3.9.2.2 Interpretations of Results:

Physio-chemical characteristics of ground water samples collected from the selected villages. 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 6.94 and 8.1. It is observed that the pH range is within the limit of IS 10500:2012.
- The Total Dissolved Solids range is varied between 1020 mg/l – 1350 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 the study area ranges between 269.3 mg/l – 342.5 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 125.6 mg/l – 211.4 mg/l. It is observed that all the samples are within the 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. 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.

3.10 Soil as a resource and its 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 3-14**. Soil quality monitoring locations & results are given in

Table 3-15 & Map showing the soil monitoring locations is given in **Figure 3-13.** Soil Quality Monitoring Results are shown in **Table 3-15.**

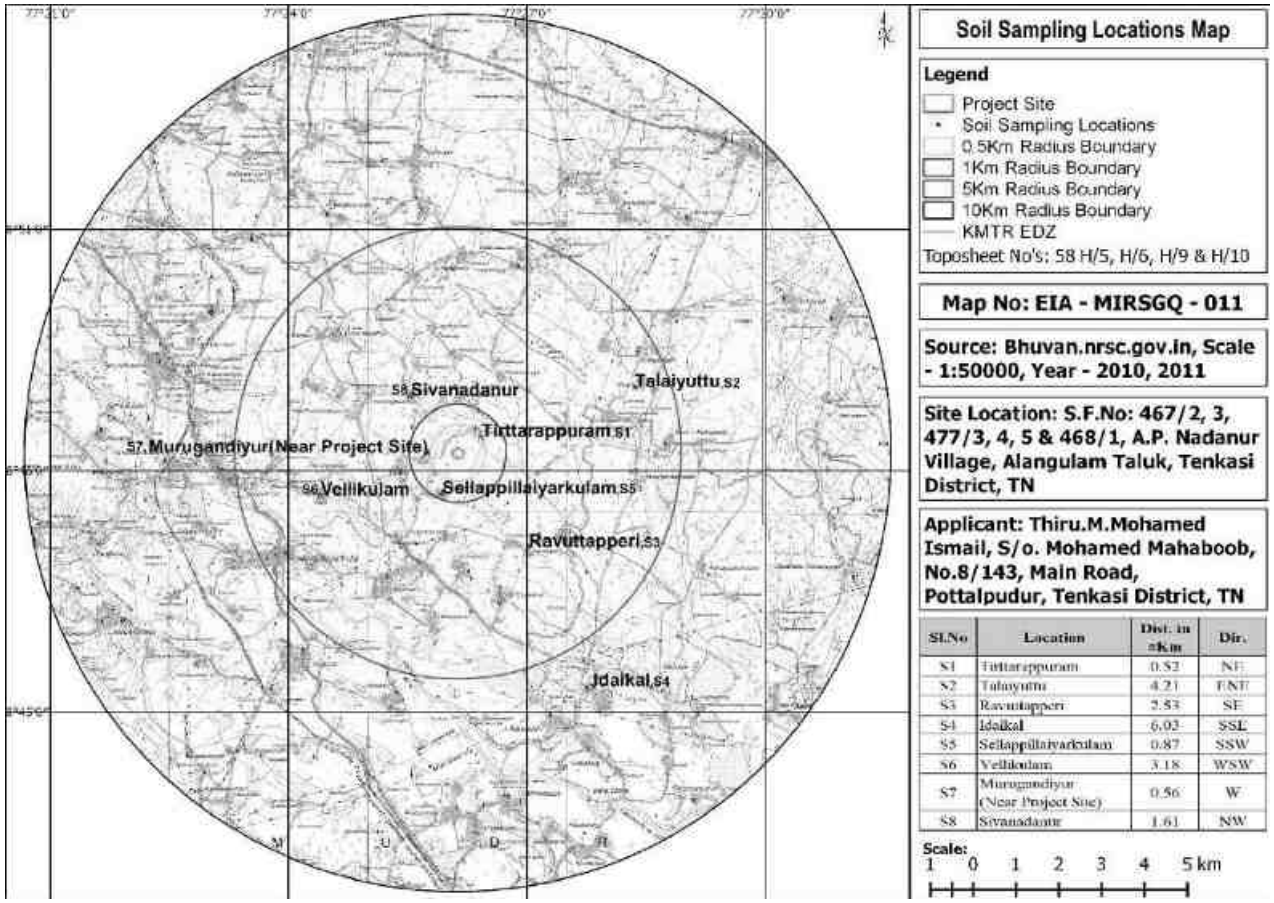
Table 3-14 Test methods used for the analysis of Soil

S. No	Parameter Measured	Test Method
1	pH @ 25 C	IS 2720 (Part 26): 1987

S. No	Parameter Measured	Test Method
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
6	Bulk Density	IS 2720(Part 3) Sec 2 : 1980 / RA
7	Organic Carbon/ Organic Matter	IS 2720 (Part 22): 1972
8	Cation exchange capacity	SOP No. CB/CL/SOP/S- 9 by Calculation Method

Table 3-15 Soil & Sediment Quality Monitoring Locations

Location Code	Location	Distance (~Km) w.r.t project site	Direction w.r.t. project site
S1	Tirttarappuram	0.52	NE
S2	Talaiyuttu	4.21	ENE
S3	Ravuttapperi	2.53	SE
S4	Idaikal	6.03	SSE
S5	Sellappillaiyarkulam	0.87	SSW
S6	Vellikulam	3.18	WSW
S7	Murugandiyur (Near Project Site)	0.56	W
S8	Sivanadanur	1.61	NW



Sl.No	Location	Dist. in ±Km	Dir.
S1	Tirttarappuram	0.52	NE
S2	Talaiyuttu	4.21	ENE
S3	Ravuttapperi	2.53	SE
S4	Idaikal	6.02	SSE
S5	Sellappillaiyarkulam	0.87	SSW
S6	Vellikulam	3.18	WSW
S7	Murugandiyur (Near Project Site)	0.56	W
S8	Sivanadanur	1.61	NW

Figure 3-13 Map showing the soil monitoring location

Table 3-16 Soil Quality Monitoring Results

S. No	Parameters	Units	Tirttarappuram	Talaiyuttu	Ravuttapperi	Idaikal	Sellappillaiyarkulam	Vellikulam	Murugandiyur (Near Project Site)	Sivanadanur
			S1	S2	S3	S4	S5	S6	S7	S8
1	Soil Texture	-	Sandy Loam	Sandy clay loam	Sandy Loam	Sandy clay loam	Sandy loam	Sandy loam	Sandy clay loam	Sandy clay loam
2	Sand	%	52	55	63	61	58	56	63	59
3	Silt	%	27	21	19	18	22	23	19	17
4	Clay	%	21	24	18	21	20	21	18	24
5	pH	-	7.33	7.25	7.19	6.8	7.43	7.59	7.91	7.7
6	Electrical conductivity	mmhos/cm	194	183	204	153	167	182	144	139
7	Nitrogen as N	Kg/ha	227	216	194	311	153	168	194	236
8	Phosphorus	Kg/ha	67.0	52.0	59.0	46.0	58.0	73.0	61.0	46.0
9	Potassium	Kg/ha	91	49	67	82	59	66	83	59
10	Cation Exchange Capacity	meq/100 gm	2.5	3.8	0.9	2.2	2.0	2.3	1.1	4.1
11	Organic Carbon	%	0.710	0.650	0.680	0.630	0.700	0.660	0.730	0.742
12	Organic matter	%	1.224	1.121	1.172	1.086	1.207	1.138	1.259	1.279

Interpretations of Results:

Summary of analytical results

- ✓ The pH of the soil samples ranged from 6.8 to 7.91.
- ✓ The potassium content ranged from 49 mg/kg to 91 mg/kg.
- ✓ Nitrogen content ranged from 153 mg/kg to 311 mg/kg.
- ✓ Phosphorous ranged from 46 mg/kg to 73 mg/kg .

3.11 Biological Environment

Biodiversity encompasses the variety and variability of life on Earth. It refers to the differences between all living organisms at their different levels of biological organization – genus, individuals, species, and ecosystems. Diversity depends not only on the rate of species input (by immigration and speciation), species output (emigration and extinction) but also on the ecological history of the region. Terrestrial flora and fauna are important features of the environment. Each plant and animal in the world bring something to the environment that another plant or animal including man will rely on. This creates a balance of life that enables the life cycle to survive. The flora and fauna are imperative because they form the fine net of life, where each life has something to contribute even if in a very small way.

3.11.1 Flora

To characterize vegetation of the study area, the primary data was collected and analyzed to describe the properties of vegetation with reference to species composition and structural attributes expressed. The identification of the flora in the radius of 10 km was done based on personal observations, management plan of Forest Division, authentic secondary literature, and in-depth exploration of the entire area. List of species observed during the study period are listed **Table 3-17**. There are no rare and endangered species identified in the study area.

Table 3-17 List of flora reported/observed in the study area.

S. No	Botanical Name	Family Name	Local Name (Tamil)	IUCN Red List of Threatened Species
Trees				
1.	*Acacia auriculoformis*	Fabaceae.	Kaththi Savukku	-
2.	*Acacia nilotica*	Fabaceae	Karuvelamaram	LC
3.	*Albezia lebbeck*	Fabaceae	Siridam	VU

S. No	Botanical Name	Family Name	Local Name (Tamil)	IUCN Red List of Threatened Species
4.	*Alstonia scholaris*	Apocynaceae	Ezhilai pillai	LC
5.	*Annona squamosa*	Annonaceae	Sitapalam	NA
6.	*Azadirachta indica*	Meliaceae	Veppamaram	NA
7.	*Cocos nucifera*	Arecaceae	Thennai	NA
8.	*Ficus religiosa*	Moraceae	Arasamaram	NA
9.	*Fluggea leucopyrus*	Malvaceae	Mulluppulatti	NA
10.	*Mangifera indica*	Anacardiaceae	Mamaram	DD
11.	*Manilkara zapota (L.) P.Royen*	Sapotaceae	Sappotta	NA
12.	*Prosopis juliflora*	Fabaceae	Seemai karuvel	LC
13.	*Psidium guajava L.*	Myrtaceae	Koiyya	NA
14.	*Spondias mangifera*	Anacardiaceae	Pulicha kaai	NA
15.	*Syzygium cumini*	Myrtaceae	Navva Pazham	NA
16.	*Tamarindus indica*	Legumes	Puliyamaram	NT
17.	*Terminalia arjuna*	Combretaceae	Marudha maram	EW
18.	*Thespesia Populnea*	Mallows	Poovarasu	NA
19.	*Thevetia pervuannia*	Apocynaceae	Ponnarali	NA
20.	*Ziziphus mauritiana*	Rhamnaceae	Elenthai	LC
Grass				
21.	*Digitaria bicornis*	Poaceae	Menmaiyana kutai pul	DD
22.	*Chloris montana*	Poaceae	-	LC
23.	*Heteropogan contortus*	Poaceae	-	LC
24.	*Saccharum officinarum*	poaceae	Karumpu	LC
Herbs				
25.	*Solanum trilobatum*	Nightshade	Thoodhuvalai	NA
26.	*Crotolaria verrucose*	legume	Salangaichedi	DD
27.	*Barringtonia acutangula*	Lecythidaceae	Samudra Pazham	LC
28.	*Abutilon indicum*	Mallows	Thuthi	CR
29.	*Abrus precatorius*	Legumes	Kundumani	DD
30.	*Asparagus racemosus*	Asparagaceae	Thannir-vittan	LC

3.11.2 Fauna

This area hosts common animals. Indian Dogs, Jungle and Domestic cat, Rhesus macaque, Domestic Cows, Buffaloes, Bullocks, and Goat etc. are found amongst mammals. Indian cobra, bande Kraits and other common snakes, and lizards like garden lizards are commonly found amongst reptiles. List of animals observed during the field survey are provided in following Table

S. No	Botanical Name	Family Name	Common Name	IUCN Red List of Threatened Species
Amphibians				
1.	*Bufo melanostictus*	Bufonidae	Toad	LC
2.	*Hyla arborea*	Hylidae	Tree frog	LC
3.	*Rana cyanophlyctis*	Bufonidae	Frog	LC
4.	*Hoplobatrachus tigerinus*	Bufonidae	Bull Frog	LC
5.	*Rhacophorus bimaculatus*	Rhacophoridae	Asiatic Tree Frog	VU
Mammals				
6.	*Bandicota bengalensis*	Muridae	Sind Rice Rat	LC
7.	*Cynopterus sphinx*	Megabat	Short-nosed Fruit Bat	LC
8.	*Funambulus palmaram*	Sciuridae	Three striped palm Squirrel	LC
9.	*Herpestes edwardii*	Herpestidae	Indian Grey Mongoose	LC
10.	*Rattus norvegicus*	Muridae	Field mouse	LC
Reptiles				
11.	*Bungarus fasciatus*	Elapidae	Banded Krait	LC
12.	*Calotes ellioti*	Agamidae	Elliot's Forest Lizard	LC
13.	*Chameleo zeylanicus*	Chamaeleonidae	Indian chameleon	LC
14.	*Eryx johnii*	Boidae	Indian sand boa	LC
15.	*Ophiophagus hannah*	Elapidae	Indian Rattle snake	VU
Butterflies				
16.	*Graphium agamemnos*	Papilionidae	Tailed jay	NA
17.	*Hypolimnas bolina*	Nymphalidae	Great egg fly	NA
18.	*Junoria almanac*	Nymphalidae	Peacock pansy	LC
19.	*Pachliopta hector Lin.*	Papilionidae	Crimson rose	NA
20.	*Papilio demoleu*	Papilionidae	Lime butterfly	NA
Birds				
21.	*Ardea purpurea*	Ardeidae	Purple Heron	LC
22.	*Alcedo atthis*	Alcedinidae	Common Kingfisher	LC
23.	*Athene brama*	Strigidae	Spotted Owlet	LC
24.	*Bubulcus ibis*	Ardeidae	Cattle egret	LC
25.	*Centropus sinensis*	Cuculidae	Crow Pheasant	LC
26.	*Chloropsis aurifrons*	Chloropseidae	Golden-fronted Leafbird	LC
27.	*Clamator jacobinus*	Cuculidae	Pied Crested Cuckoo	LC
28.	*Copsychus saularis*	Muscicapidae	Magpie robin	LC
29.	*Dicrurus paradiseus*	Dicruridae	Racket tailed drongo	LC
30.	*Dicrurus adsimilis*	Dicruridae	King Crow	LC
31.	*Egretta garzetta*	Ardeidae	Little egret	LC
32.	*Elanus caeruleus*	Accipitridae	Kite	LC

S. No	Botanical Name	Family Name	Common Name	IUCN Red List of Threatened Species
33.	*Francolinus pondicerianus*	Phasianidae	Grey Francolin	LC
34.	*Galerida cristata*	Alaudidae	Crested Lark	LC
35.	*Gallus sonneratii*	Phasianidae	Grey jungle fowl	LC
36.	*Motacilla maderaspatensis*	Motacillidae	Large, pied Wagtail	LC
37.	*Nectarinia asiatica*	Nectariniidae	Purple Sun Bird	LC
38.	*Pavo cristatus*	Phasianidae	Indian Peafowl	LC
39.	*Psittacula eupatria*	Psittacidae	Alexandrine Parakeet	NT
40.	*Psittacula krameri*	Psittacidae	Rose ringed Parakeet	LC
41.	*Pycnonotus cafer*	Pycnonotidae	Red vented Bulbul	LC
42.	*Spilornis cheela*	Accipitridae	Crested Serpent-eagle	LC

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

3.12 Socio Economic profile of Project Influenced Area

As per the Census 2011, Tenkasi had population of 70,545 of which 34,920 are males and 35,625 are females respectively. Population of Children with age of 0-6 is 7413 which is 10.51 % of total population of Tenkasi (M).

Source : ***ttps://www.census2011.co.in/data/town/803846-tenkasi***

3.12.1 Population Density

As per the Census India 2011, Tenkasi Taluk has 103380 households, population of 399946 of which 199442 are males and 200504 are females. The population of children between age 0-6 is 42275 which is 10.57% of total population.

Source: *https://www.censusindia2011.com/tamil-nadu/tirunelveli/tenkasi-population.html*

3.12.2 Sex Ratio

The sex-ratio of Tenkasi Taluk is around 1005 compared to 996 which is average of Tamil Nadu state. The literacy rate of Tenkasi Taluk is 71.56% out of which 78.29% males are literate and 64.87% females are literate. The total area of Tenkasi is 511.59 sq.km with population density of 782 per sq.km.

Source : *https://www.censusindia2011.com/tamil-nadu/tirunelveli/tenkasi-population.html*

3.12.3 Scheduled Castes and Scheduled Tribes

Out of total population, 42.83% of population lives in Urban area and 57.17% lives in Rural area. There are 18.48% Scheduled Caste (SC) and 0.3% Scheduled Tribe (ST) of total population in Tenkasi Taluk.

Source : *https://www.censusindia2011.com/tamil-nadu/tirunelveli/tenkasi-population.html*

3.12.4 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 characteristic helps in identification, prediction, and evaluation of impacts on socio-economic and parameters of human interest due to proposed project developments. The parameters are:

1. Demographic structure
2. Infrastructure Facility
3. Economic Status
4. Health status
5. Cultural attributes
6. Awareness and opinion of people about the project and Industries in the area.

3.12.5 Social Economic Profile of the study area

The total population of the project area is 394418. The area has 193647 male (49.10%) and 200771 female (50.90%) population. The percentage of Scheduled caste is 15.74 % and Scheduled tribe population is 0.48%. The child population (0 to 6 years) is 9.94 % of the total population of the area. Table 3-18 provides the details on population profile within study area. Table 3-19 show the socio-economic indicator within the study area.

Table 3-18 Population profile within study area

Name	Household	Population	Male	Female	Children below 6	Scheduled Caste	Scheduled Tribe
0-5 km							
Madathoor	439	1594	779	815	117	252	0
Pottapudur (1)	1697	6622	3144	3478	734	1138	9
Anjankattalai	921	3539	1740	1799	487	174	0
Anaindaperumalmadanur	1459	5297	2573	2724	591	539	30
Rawthaperi	176	666	323	343	91	78	0
Pappankulam	1419	5192	2602	2590	590	1261	9
Idaikkal	812	3054	1534	1520	289	939	15
Kila ambur	1747	6233	3068	3165	635	1591	0
Adaichchani	861	3073	1523	1550	361	920	0
Ayan Thiruvaleeswaram	576	2113	1070	1043	281	409	0
5-10 km							
Poolankulam	1897	8249	4357	3892	897	285	0
Andipati	892	3546	1745	1801	400	369	3
Vengadampatti	2882	10438	5190	5248	1141	790	7
Therkumadathur	1057	3964	1944	2020	427	81	0
Virasamudram	358	1654	793	861	195	194	0

Alwarkurichi (TP)	2793	10045	4907	5138	986	2399	45
Mela ambur	1236	4385	2194	2191	465	879	0
Vikramasingapuram (TP)	13558	47241	22955	24286	4198	3831	538
Mannarkovil	1499	5168	2543	2625	514	805	0
Adaiya Karungulam	916	3321	1690	1631	316	645	0
Pallakkal	718	2699	1358	1341	300	338	0
Brahmadesam	1775	6371	3083	3288	667	2524	0
Vaigaikulam	1169	4489	2228	2261	570	704	0
Ambasamudram (TP)	67559	245245	120194	125051	23916	36892	1044
Panajadi	66	220	110	110	21	0	0
Sattupattu	260	886	425	461	64	19	0
Rengasamudram	706	2381	1189	1192	242	689	0
Sengulam	682	2692	1336	1356	285	380	0
Kasidharman	1281	4664	2293	2371	536	631	91
Pappakudi	1855	6651	3227	3424	679	337	87
Pudupati	1359	5171	2527	2644	677	618	0
Kuthapanjan	2244	8748	4336	4412	1125	1351	6
TOTAL	**108482**	**394418**	**193647**	**200771**	**39189**	**62062**	**1884**

Source: Census 2011

Table 3-19 Summary of Socioeconomic indicators within the study area

S. No	Particulars	Study Area	Unit
1	Number of villages in the Study Area	29	Nos.
2	Number of Towns/Municipality in study area	3	Nos.
3	Total Households	108482	Nos.
4	Total Population	394418	Nos.
5	Children Population (<6 Years Old)	39189	Nos.
6	SC Population	62062	Nos.
7	ST Population	1884	Nos.
8	Total Working Population	202268	Nos.
9	Main Workers	180334	Nos.
10	Marginal Workers	21710	Nos.
11	Agricultural Workers	32231	Nos.
12	Household Workers	47607	Nos.
13	Other Workers	110856	Nos.
14	Literates	205250	Nos.

(Source: Census 2011)

3.12.6 Employment and livelihood

Table 3-20 shows the classification of workers within the study area. Details of Literacy population in the study area is given in **Table 3-21.**

Table 3-20 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											
Madathoor	822	690	132	124	109	0	109	296	161	9	161
Pottapudur (1)	2740	2647	49	80	390	1	9	538	1639	17	61

Anjankattalai	1910	1869	41	291	231	2	2	805	542	19	18
Anaindaperumalmadanur	2933	2709	224	204	667	204	51	1254	584	53	113
Rawthaperi	373	344	29	45	121	1	15	134	44	4	9
Pappankulam	2733	2631	102	395	653	14	25	801	782	14	49
Idaikkal	1507	930	577	49	272	8	311	58	488	117	141
Kila ambur	3294	2936	358	433	832	21	47	698	764	81	209
Adaichchani	1760	1686	74	83	605	5	22	636	287	8	39
Ayan Thiruvaleeswaram	1077	820	138	239	273	79	71	137	171	0	107
5-10 km											
Poolankulam	4396	4163	233	445	789	18	111	1862	1607	50	54
Andipati	2103	1948	155	225	209	6	17	888	596	29	103
Vengadampatti	5757	5060	697	354	689	27	169	2223	2110	202	304
Therkumadathur	2292	2232	60	158	515	1	14	978	581	10	35
Virasamudram	631	498	113	6	2	3	75	6	484	3	52
Alwarkurichi (TP)	5101	4881	220	279	949	12	81	926	2730	31	96
Mela ambur	2336	1646	690	117	297	23	200	403	769	95	372
Vikramasingapuram (TP)	19811	17385	2426	242	862	13	413	2916	13366	549	1451
Mannarkovil	2437	2250	187	67	258	4	39	518	1398	15	129
Adaiya Karungulam	1661	1533	128	123	132	8	3	244	1034	9	75
Pallakkal	1437	1422	15	61	389	0	1	402	570	4	10
Brahmadesam	3577	3306	271	271	644	4	158	1096	962	25	84
Vaigaikulam	2453	2191	262	303	770	7	223	597	521	9	23
Ambasamudram (TP)	111555	98522	13033	4476	13488	239	2297	18463	62095	2760	7737
Panajadi	107	107	0	2	27	0	0	38	40	0	0

Sattupattu	604	537	26	228	36	11	22	171	102	27	7
Rengasamudram	1425	1251	174	218	299	6	122	309	425	30	16
Sengulam	1298	1266	32	273	444	1	3	131	418	0	26
Kasidharman	2658	2493	165	157	139	13	15	1190	942	88	49
Pappakudi	3484	3133	351	493	847	13	34	1023	770	57	247
Pudupati	3003	2912	91	194	591	5	12	1411	716	28	46
Kuthapanjan	4993	4336	657	504	838	11	193	2049	945	63	390
TOTAL	**202268**	**180334**	**21710**	**11139**	**2736 7**	**760**	**4864**	**43201**	**98643**	**4406**	**12213**

(Source: Census 2011)

Table 3-21 Details of Literacy population in the study area

Name	Literates Population	Male Literates	Female Literates	Literates %
0-5 km				
Madathoor	1168	631	537	0.57
Pottapudur (1)	4766	2477	2289	2.32
Anjankattalai	2240	1214	1206	1.09
Anaindaperumalmadanur	3730	2018	1712	1.82
Rawthaperi	453	245	208	0.22
Pappankulam	3774	2057	1717	1.84
Idaikkal	2126	1186	940	1.04
Kila ambur	4417	2391	2026	2.15
Adaichchani	1835	1016	819	0.89
Ayan Thiruvaleeswaram	1423	794	629	0.69
5-10 km				
Poolankulam	6027	3445	2582	2.94

Andipati	2630	1390	1240	1.28
Vengadampatti	7375	3995	3380	3.59
Therkumadathur	2961	1598	1363	1.44
Virasamudram	1263	655	608	0.62
Alwarkurichi (TP)	7866	4059	3807	3.83
Mela ambur	3093	1653	1440	1.51
Vikramasingapuram (TP)	38398	19708	18690	18.71
Mannarkovil	3976	2109	1867	1.94
Adaiya Karungulam	2639	1407	1232	1.29
Pallakkal	1972	1077	895	0.96
Brahmadesam	4719	2506	2213	2.30
Vaigaikulam	2927	1613	1314	1.43
Ambasamudram (TP)	93294	51249	19492	45.45
Panajadi	178	94	84	0.09
Sattupattu	683	357	326	0.33
Rengasamudram	1581	886	695	0.77
Sengulam	2091	1106	985	1.02
Kasidharman	3185	1752	1433	1.55
Pappakudi	4610	2468	2142	2.25
Pudupati	3501	1870	1631	1.71
Kuthapanjan	6051	3283	2768	2.95
Total	**205250**	**110587**	**72290**	**100**

(Source: Census 2011)

Interpretation of Results:

The study area has more than 50% non-workers. There is a need to establish more industries so that 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, blasting, excavation, and handling & transportation of materials. If adequate control measures are not taken to prevent/mitigate the adverse environmental impacts, these operations may cause environmental degradation and lead to irreversible damage to the ecosystem. Various environmental impacts, which have been identified due to the mining operations, 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 area will be converted to water reservoir. AQ (-) : Dust emission due to leveling. EB (+) : Some area will be converted to water reservoir. SE (+) : generation of water reservoir

4.1 Land Environment

4.1.1 Anticipated Impact

On Topography

Lease area is 4.38.0 Hectares and is a part of hilly terrain. The proposed quarry land is not a grazing or agriculture land. It is a Non-Government Land (Patta land), for which, the project authorities have obtained the approval from the Dept. of Mines & Geology, Tenkasi. The proposed quarry area is newly allotted to the proponent. There is no evidence of any earlier workings in the proposed area. There are no streams originating within the lease area.

There is no topsoil and waste generated during the proposed plan period. There is no agriculture within the proposed lease area and its immediate surroundings.

4.1.2 Proposed Mitigation Measures

- ✓ Plantation will be carried out as per mining plan.
- ✓ Generation of Debris will be Stored in designated area.
- ✓ Dust suppression on dust exposed areas using water tankers.
- ✓ Contour overburden dump to minimize erosion.
- ✓ Plantation around service building, along road, in and around safety zone using native plant sapling.
- ✓ Compliance with quarry decommissioning plan.
- ✓ Drainage control structures like garland drain to be made around OB dump area to avoid water flow during monsoon below the OB dump.
- ✓ Levelling, 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. entry of public and cattle.
- ✓ Management plan for topsoil utilization and conservation.
- ✓ Progressive year-wise green belt development inside.

4.2 Air Environment

The main source of air pollution from open cast mining activities is dust generation from excavation of Rough stone, weathered rock and gravel, movement of vehicles for transportation of product to consumers, drilling, Blating, loading and unloading operation and wind erosion

of dumps and also gaseous emission due to operation of diesel driven mining equipment. The sources of air emission are detailed below in **Error! Reference source not found.**.

Table 4-2 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
3.	Transportation of product	PM

4.2.1 Aniticipated Impacts

The emissions mainly generated from the mining activities are Drilling, Blasting, Excavation, Loading, Unloading, and transportation etc. Machinery like compressors and jack hammers are used for Drilling.

4.2.1.1 Emission Inventory

At present there is no activity over the proposed lease area. There are no sources of gaseous pollutants. Processing of rough stone, weathered rock and gravel within the lease area is not proposed. There will not be any crushing & grinding etc. within the quarry area. Hence Sulphur dioxide, nitrous oxides will not be contributed during the quarrying operations.

4.2.1.2 Prediction of Fugitive Emissions in the Project

In the proposed rough stone, weathered rock and gravel quarry, it is envisaged to adopt wet drilling followed by controlled blasting for separation of boulders from the primary rock. Hence, there will be some nominal fugitive particulate matter emissions. However, the net increase in the Ground Level Concentrations, found to be negligible.

4.2.2 Mitigation measures

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.
- ✓ 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.
- ✓ It is proposed to take-up plantation, on both sides of approach road, and also in the

vacant government land, with trees of wide canopy like gulmohor, neem etc.

- ✓ There is some topsoil, scattered at places, within the lease area and will be utilized for plantation purpose, on both sides of the approach road, to support trees.

Table 4-3 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 (dry or 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 Meterological Data

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

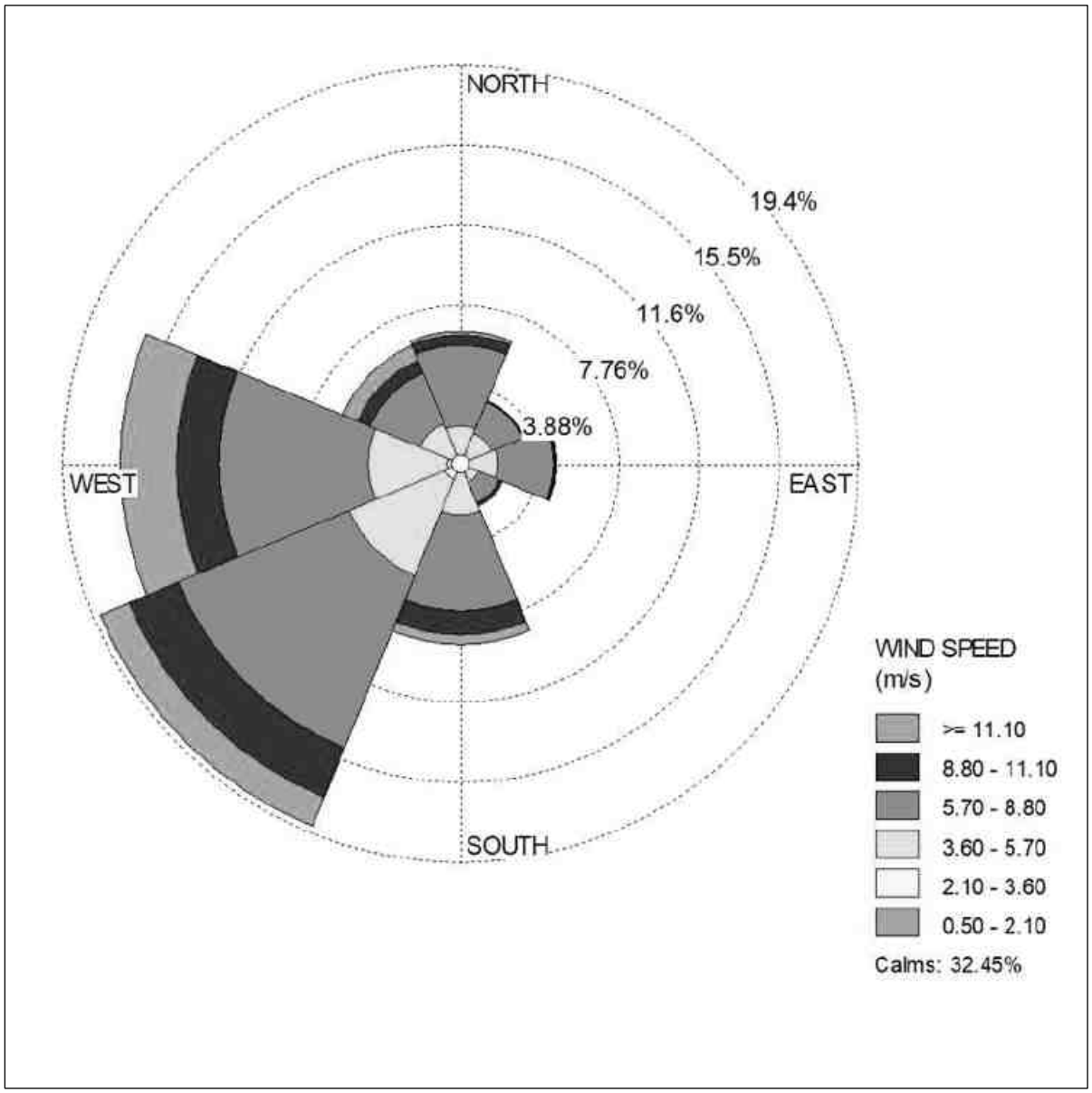


Figure 4-1 Wind Rose Diagram Considered for dispersion modeling (March 2023 to May 2023)

4.2.3.1 AERMET Process

For the 3 phase AERMET processing of the meteorological data, specifications of the land use in the area are required to determine the terrain roughness for modeling. The land use was characterized in and around the site. The surface characteristics for the site and surroundings were selected and used to calculate the Albedo, Bowen ratio and surface roughness parameter. The meteorological data were processed in the AERMET software to generate wind flow pattern & to generate surface meteorological data and profile meteorological data in a prescribed format that can be fed to AERMOD for modeling.

4.2.3.2 AERMOD Process

AERMOD Software Version 11.0.1 was used for air dispersion modeling and is applicable to a wide range of buoyant or neutrally buoyant emissions up to a range of 50km. 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 4.1**

Maximum concentration value for PM_{10}, $PM_{2.5}$, SO_2, NO_x obtained through modelling is shown in **Figures 4.2-4.5** and the first ten highest values of Ground Level Concentration (GLC) for proposed stacks is given in **Table 4.3** & **4.4** respectively.

4.2.3.3 Emission calculations:

Each mining activity is a source of emission, and the estimation of emissions depends on parameters such as meteorological, topographic conditions and material characteristics. It is necessary to calculate the amount 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.

Mining Operational data

Table 4-5 Overview of the Source Parameters

S. No	Description	Symbol	Quantity
1.	Moisture Content (%)	M	12
2.	Silt Content (%)	s	5
3.	Production / Day (m^3)		919.6
4.	Production / Day (Ton)		1563.24
5.	No. of vehicles with categorization		4 no. HW 2 no. 4W
6.	Working Hours per day (hrs)		8

7.	Control Efficiency Loading/Unloading, Excavation Operations (%)	ŋ	97%

Emission factors

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 PM_{10} /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 PM_{10} /ton	
Unloading	1.60E-05 lbs PM_{10} /ton	
Haulage	6.2 lbs PM_{10} / 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	0.020	kg TSP/t	USEPA (2008)
2	$35.6\frac{s^{1.5}}{M^{1.4}}$	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	$1.38\left(\frac{s}{12}\right)^{0.7}\left(\frac{W}{3}\right)^{0.45}(1-\eta_1)(1-\eta_2)$	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	$0.423\left(\frac{s}{12}\right)^{0.9}\left(\frac{W}{3}\right)^{0.45}(1-\eta_1)(1-\eta_2)$	kg PM_{10}/VKT	USEPA (2006a), Cowherd (1988)

4.2.3.4 Emission Dispersion Models:

Each mining activity is a source of emission, and the estimation of emissions depends on parameters such as meteorological, topographic conditions and material characteristics. The emission factors for $PM_{2.5}$, which is particulate matter of 2.5µm or less in diameter, were not available in literature. Thus, $PM_{2.5}$ emissions have been calculated considering an assumption that 60% of PM_{10} emissions contribute to $PM_{2.5}$.

Table 4-4 Emissions considered from area Sources.

S.No	Activities	Emission rate (g/s)	
		PM10	**PM2.5**
1	Topsoil excavation	2.69E-03	1.61E-03
2	Wet drilling	6.56E-04	3.94E-04
3	Hauling	5.06E-02	3.03E-02
4	Conveyor loading	8.21E-04	4.92E-04
5	Unloading	1.31E-04	7.88E-05
	Total (g/s)	**5.49E-02**	**3.29E-02**

Table 4-5 Emissions considered from Line Sources

S. No	Activities	Emission rate (g/s)		
		PM_{10}	**$PM_{2.5}$**	**NOx**
1	4Wheels (Tippers & tankers)-4 Nos	3.47E-04	2.08E-04	1.39E-07
2	HW (Excavator)-2Nos	5.56E-04	3.33E-04	2.78E-07

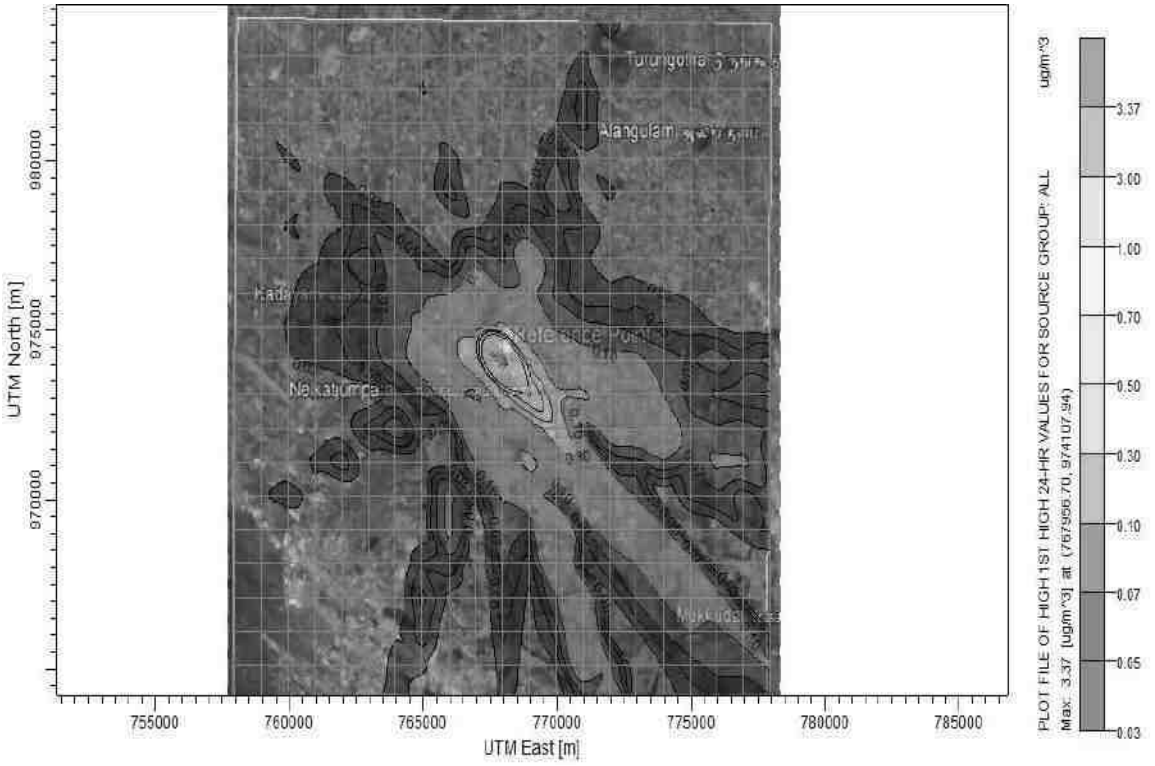


Figure 4-3 Predicted 24-Hrs GLC of Particulate matter (PM10.)

Table 4-6 Predicted Top 10 Highest Concentrations of PM_{10}

S. No	UTM Coordinates		Conc. (µg/m³)	Distance(km)	Direction
	E	N			
1	767956.7	974107.9	3.37464	Project Site	-
2	768956.7	973107.9	1.02686	1.41	SE
3	766956.7	974107.9	0.47843	1.00	W
4	769956.7	972107.9	0.46788	4.20	W
5	768956.7	974107.9	0.41963	1.00	SE
6	767956.7	973107.9	0.41794	1.00	W
7	768956.7	971107.9	0.37156	4.12	NE
8	770956.7	973107.9	0.33436	1.00	E
9	767956.7	975107.9	0.32755	1.00	NW
10	769956.7	973107.9	0.31408	3.16	W

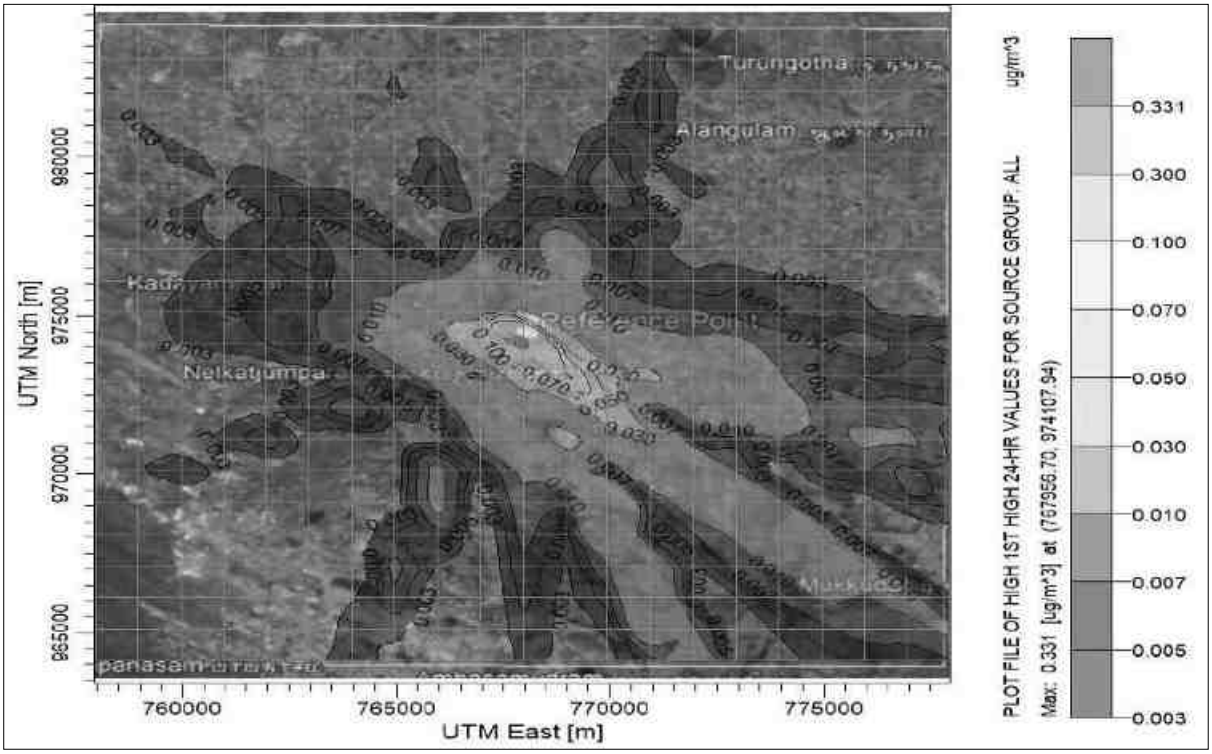


Figure 4-1 Predicted 24-Hrs GLC of Particulate matter ($PM_{2.5}$)

Table 4-7 Predicted Top 10 Highest Concentrations of $PM_{2.5}$

S. No	UTM Coordinates		Conc. (µg/m³)	Distance(km)	Direction
	E	N			
1	767956.7	974107.9	0.33095	Project Site	-
2	768956.7	973107.9	0.10877	1.00	SE
3	766956.7	974107.9	0.05123	1.00	W
4	769956.7	972107.9	0.04965	3.16	SE
5	767956.7	973107.9	0.04346	1.00	S
6	768956.7	974107.9	0.04165	1.00	E
7	768956.7	971107.9	0.03902	4.12	SE
8	770956.7	973107.9	0.03446	3.12	E
9	769956.7	973107.9	0.03247	2.23	E
10	767956.7	975107.9	0.03228	1.00	N

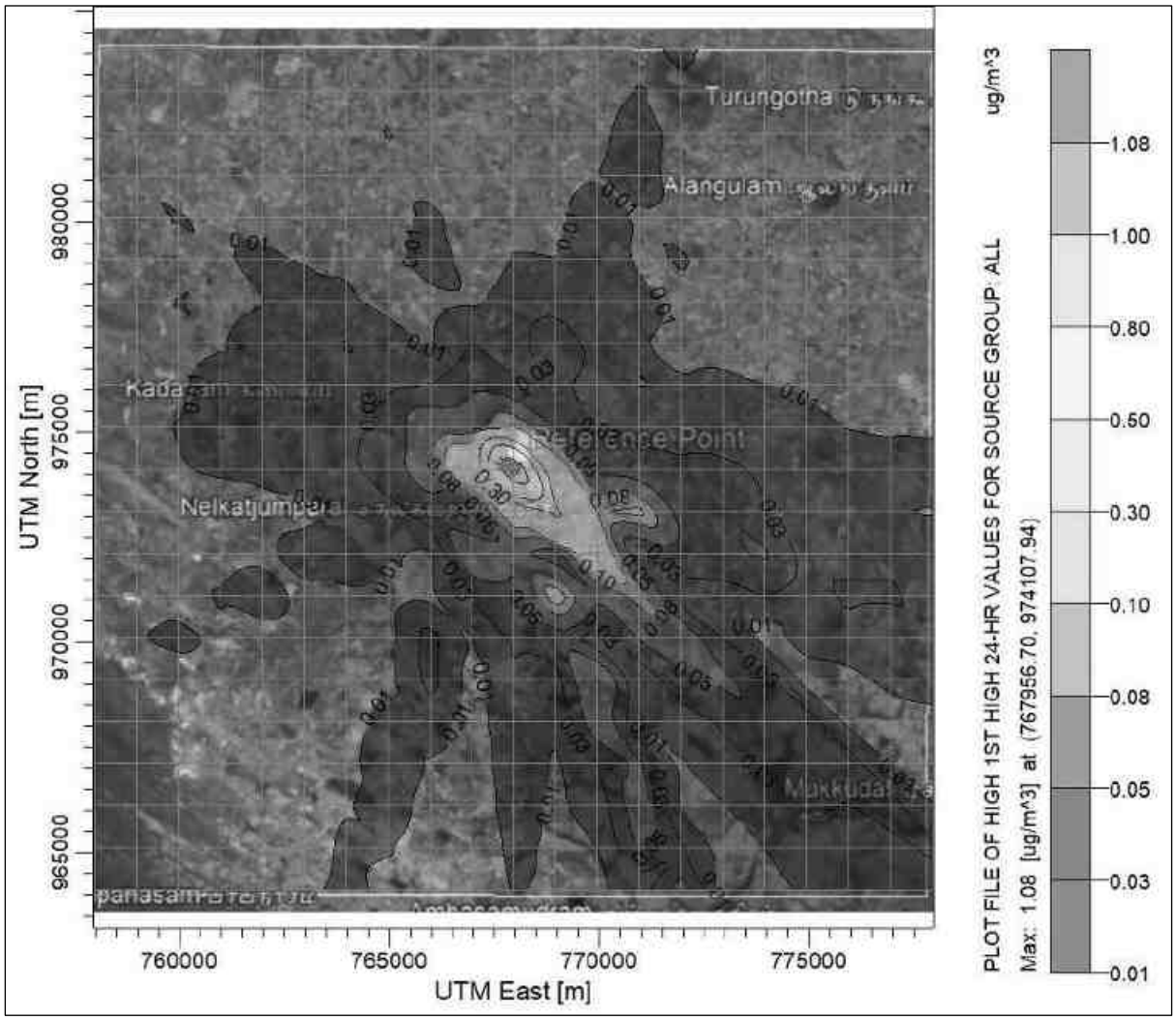


Figure 4-2 Predicted 24-Hrs GLC of Nox

Table 4-8 Predicted Top 10 Highest Concentrations of NOx

S. No	UTM Coordinates		Conc. (µg/m³)	Distance(km)	Direction
	E	N			
1	767956.7	974107.9	1.0788	Project Site	-
2	768956.7	973107.9	0.32312	1.00	SE
3	766956.7	974107.9	0.1502	1.00	W
4	769956.7	972107.9	0.14717	3.60	SE
5	768956.7	974107.9	0.13383	1.00	E
6	767956.7	973107.9	0.13203	1.00	S
7	768956.7	971107.9	0.11713	4.12	SE
8	770956.7	973107.9	0.10582	1.00	SE
9	767956.7	975107.9	0.10461	1.00	N
10	769956.7	973107.9	0.09934	2.23	SE

4.2.3.5 Conclusion

The maximum ground level concentration observed due to mining activities and traffic movement without mitigative measures for PM_{10}, $PM_{2.5}$, and NO_x are 3.37464 µg/m^3, 0.33 µg/m^3, and 1.0788 µg/m^3 respectively. So, it can be concluded that during operation of quarry the impact envisaged is moderate. The high concentration levels limited to the lease area.

The total increase in concentrations above baseline status will be increased, without mitigative measures, The Maximum GLCs from the proposed mining emissions are summarised in **Table 4-9.**

Table 4-9 Total Maximum GLCs from the Mining Emissions

Pollutant	Max. Baseline Conc. (µg/m^3)	Estimated Incremental Conc. (µg/m^3)	Total Conc. (µg/m^3)	NAAQ standard	% Increase
PM_{10}	66.3	3.374	69.674	100	5.08
$PM_{2.5}$	31.3	0.33	31.63	60	1.05
NO_X	29.3	1.0788	30.378	80	3.68

4.3 Noise Environment

The source of noise during mining operation is due to loading/unloading 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.

4.3.1 Anticipated Impact

There are no industrial noise sources in the lease area. There are no sensitive receptors like hospitals, schools, old age homes etc., within 1 km radial distance. Only source during mine operation would be drilling, blasting and movement of quarrying machinery. Drillers would be exposed to about 75-80 dB(A).

4.3.2 Mitigation Measures

- ✓ In case of rough stone, weathered rock and gravel quarrying, there will be involvement

of blasting, for extraction of boulders. Due to this, moderate noise pollution is anticipated, intermittently. The vibrations during drilling will be absorbed by the mother rock. Hence, there would not be any major adverse impact.

- ✓ Drillers would be given personal protection equipment.
- ✓ There are no structures over the lease area.

4.4 Water Environment (Surface & Ground Water)

4.4.1 Impact on hydrology, alteration in natural drainage etc.

There are no surface sources viz. rivers/ lake within the proposed quarry lease area. The proposed quarrying activity will be limited to a maximum depth of 52m below the ground level (2m Gravel + 5m Weathered rock + 45m Rough stone). Hence there will not be any kind of disturbance to ground water.

Dewatering of working pits will not be required since there will not be any kind of pit formation. Therefore, ground water regime will be undisturbed.

4.4.2 Anticipated Impact:

The surface sources and ground water regime will not be altered during mining. There would not be any impact if rainwater is stored in the quarry pits and used for dust control.

4.4.3 Mitigation Measures

- ✓ With respect to the first order streams, it is proposed to construct garland drain, gully plugs, using the boulders from the quarry, along the southern and northern boundary of the quarry, to prevent soil erosion and consequent washing of loose particles into the first order stream, originating outside the quarry lease area.
- ✓ It is proposed to provide silt traps, to the first order streams, before they join the second order stream.
- ✓ Entry to un-authorized persons will be prohibited.
- ✓ Ground water in khondalite deposit areas, will be free from fluoride.
- ✓ A Caution Board would be put at mine that mine pit water is unfit for drinking. All well/hand pump water will be tested for fluoride and other parameters and suitability or otherwise will be displayed.

- ✓ In absence of alternate sources in nearby village, a water treatment plant will be installed at a hand pump for supply of drinking water. Treatment plant based on electrochemical method of treatment will be suitable.
- ✓ Unused/abandoned pits will be converted in to rain water harvesting structures so that ground water recharge is assured.

4.4.4 Rainwater Harvesting and Plan for Water Conservation:

Ground water recharge is not probable, as there is no scope for rain water collection. Rain water collected on the quarry surface will flow down the hillock and will enter into the nearby streams. Hence, no accumulation of storm water is anticipated in the proposed quarry. However, as a responsible corporate citizen, we will do rain water harvesting pits in the nearby government land.

4.5 Biological Environment

4.5.1 Anticipated Impact:

There is no sensitive fauna and flora or endangered species in 10 km radius of the lease. Lease is not a part of any forest area.

4.5.2 Mitigation Measures

Project proponent will carry out plantation in scientific way. It will choose local species in consultation with local forest department. Secondly State Fisheries department will be requested to carry out fish culture in abandoned mine pits.

4.6 Socioeconomic &Health:

4.6.1 Anticipated Impacts:

There will not be any displacement on account of this project.

4.6.2 Mitigation Measures:

It is proposed to a) prefer employment to deserving local persons in mining related trades like loading/unloading of boulders/ waste, drilling etc. b) train residents of nearby villages, for

harvesting rain water, and sanitation practices etc., c) training in fish culture also is one activity which will be useful to local population.

4.7 Mine wastes:

4.7.1 Anticipated Impacts:

As per the approved quarry plan, there is no waste generation of any kind. 100% of the mined quantity will be used either in one or the other form, resulting in ZERO waste. Hence, no impacts are anticipated due to ZERO waste generation.

4.7.2 Mitigation Measures:

- ✓ During proposed mining, all the excavated quantity will be used for various construction purposes. Hence no waste generation.
- ✓ Reclamation/Closure Plan:
- ✓ Lease area is 4.38.0 Ha. and the entire area will be opened during the lease period, for execution of this project.
- ✓ All mineable reserves are not expected to be exhausted at the end of present lease period. Hence, as per the prevailing practice, the lessee will apply for the extension of the lease period, in the form of renewal.
- ✓ Reclamation or closure of mine will be planned only, at the time of the final closure of the quarry. There would not be any municipal waste since any residential colony is not proposed over the lease.

4.8 Occupational Health Hazards

4.8.1 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. This can cause or exacerbate pre-existing spinal disorders. 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.

4.8.2 Biological Hazards

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

4.8.3 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.

4.8.4 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.

4.8.5 Mitigation Measures:

- ✓ 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 emergencyresponse 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.

4.9 Traffic Density:

4.9.1 Anticipated Impact:

Impact on the approach road

This road, is an existing road connecting the proposed quarry area and this will be exclusively used by the proposed quarry and other quarries being hired by the proponent. Hence it may not cause any significant impact on this approach road.

4.9.2 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.

4.10 Soil

4.10.1 Anticipated Impact

As such there is some top soil/ OB is expected to be generated during the lease period. The top soil will be used for approach road development and also for plantation purposes on either side of the approach road. Also the gravel will be sold to the construction industry in the nearby towns and for road works. They have not caused any adverse impact on prevailing mine lease environment.

As per the approved Mining Plan, there is no waste generation of any kind, i.e. 100% of the mined material will be used for some or the other purposes. Hence no impact due to waste generation, since there is no waste generation.

4.10.2 Mitigation Measures

Not applicable, since there is no waste generation.

4.11 SUMMARY

- ✓ Mining activity will lead to creation of benches, on an extent of 4.38.0 Hectares.
- ✓ Environmental impacts can be managed by implementation of management plan.
- ✓ Mining activity will create direct and indirect employment.
- ✓ Though interception of ground water is not involved.
- ✓ Mining activity will lead to create green belt.
- ✓ Up to some extent socioeconomic needs of village will be addressed through project activities.

5 ANALYSIS OF ALTERNATIVES

5.1 General

Present proposal is for Rough stone, Weathered rock and gravel quarry mining from 4.38.0 Hectares of Non-government land. The proponent, Thiru. M.Mohamed Ismail, have got the lease, from the the Pattadhar, Thiru. Mohamed Mahaboob for a period of 15 years. As per regulations they had engaged an RQP (Recognized Qualified Person) to prepare a mining plan for approval by Dept. of Mines & Geology. No choice of alternative for site is available.

5.2 Site Studies

Both Thiru. M.Mohamed Ismail's officials and the RQP have inspected the site and studied the occurrence of Rough stone, Weathered rock and gravel deposits at the site and other geological features in order that the same could be mined safely, economically and in an environment friendly manner. On completion of Mapping mapping the rough stone, weathered rock and gravel. the section wise details of reserves were worked.

There is no mining being carried over the lease at present, except some test pits.

It was decided that it would be appropriate to opt for "Open Cast Semi-Mechanized Method" which would enable economical mining.

5.3 Alternate Method of Mining

Other alternatives for method of opencast mining like manual mining would be unscientific and economically not viable. Use of surface- miner equipment is not possible for rough stone, weathered rock and gravel mining.

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. An Environmental Monitoring Program shall be scheduled for the following major objectives:

Based on the identified aspects from the proposed activities on air, noise, water, land, ecology and biodiversity and socio-economic environment, scoring was done based on its severity and likelihood of occurrence as discussed in **Chapter 4**. Thus, monitoring programs are required based on their consequences. The preliminary budgetary monitoring plans are as discussed in this chapter.

The Project proponent will be overseeing/reviewing following activities:

- ✓ To observe the implementation of environmental control measures.
- ✓ To ensure implementation of planned plantation programme with monitoring of survival rate, etc.
- ✓ To keep monitoring records properly for submission of periodical returns to statutory authorities and for checking by them.
- ✓ To evaluate periodically the performance of existing pollution control equipment and systems for taking prompt action in this respect to rectify the defects.
- ✓ Conducting safety audits and programmes to create safety awareness in workers/staff.

- ✓ Monitoring of dumps and benches for slope stability, monitoring of OB dumps, laying of check dams, garland drains around the dumps and excavated areas and their regular maintenance for de-silting.
- ✓ To study the effects of project activities on the environment.
- ✓ To interact and liaise with State and Central Government Departments.
- ✓ To take immediate preventive action in case of some unforeseen environmental pollution attributable to the project.
- ✓ Imparting training on safety and conducting safety drills to educate employees.
- ✓ To ensure that firefighting equipment, etc, are kept in ready-to-use condition.

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

6.2 Objective of Monitoring Programme

- ✓ 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.

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.**

Table 6-1 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 (PM_{10}, $PM_{2.5}$)	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

7 ADDITIONAL STUDIES

7.1 Introduction

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

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

7.1.1 Public Consultation

This is the draft EIA report, prepared in line with the Terms of Reference (TOR) and additional Terms of Reference, issued by State Environment Impact Assessment Authority (SEIAA), Tamil Nadu, following the SEAC (State Expert Appraisal committee) meeting. This report will be circulated prior to public hearing under the auspices of TNPCB (Tamil Nadu Pollution Control Board). Issues raised during public hearing will be addressed in the Final EIA/EMP Report.

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:

1. Identification of potential hazard areas.
2. Identification of representative failure cases.
3. Assess the overall damage potential of the identified hazardous events and the impact zones from the accidental scenarios.

4. Assess the overall suitability of the site from hazard minimization and disaster mitigation point of view.
5. Furnish specific recommendations on the minimization of the worst accident possibilities.
6. Preparation of broad DMP, On-site and Off-site Emergency Plan.
7. 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 precautions and provisions of the Mine Act, 1952, the MMR 1961 and the Mines Rules, 1955 will be strictly followed during all mining operations
- ✓ Entry of unauthorized persons will be prohibited.
- ✓ Firefighting and first-aid provisions in the mine's office complex and mining area.
- ✓ Provisions of all the safety appliances such as safety boot, helmets, goggles etc. will be made available to the employees and regular check for their use.
- ✓ Training and refresher courses for all the employees working in hazardous premises; Under mines rules all employees of mines will have to undergo the training at a regular interval.
- ✓ Working off mine, as per approved plans and regularly updating the mine plans.
- ✓ Cleaning of mine faces will be regularly done.
- ✓ Handling of explosives, charging, and blasting will be carried out by competent persons only.
- ✓ Regular maintenance and testing of all mining equipment as per manufacturer's guidelines.
- ✓ Suppression of dust on the haulage roads

- ✓ Increasing the awareness of safety and disaster through competitions, posters, and other similar drives.

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:

1. Drilling
2. Blasting
3. Handling of materials
4. Heavy Machinery

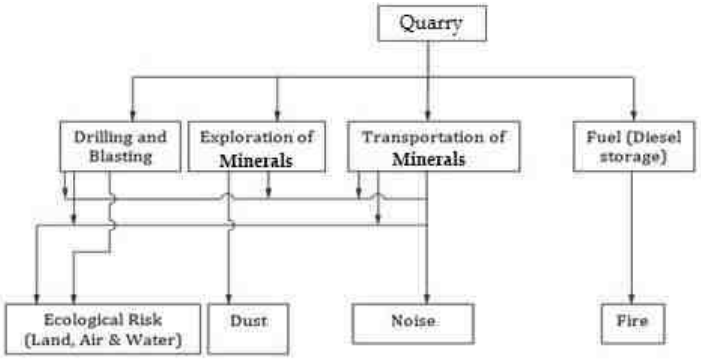


Figure 7-1 Identification of hazards in opencast mine

7.1.2.3 Drilling

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

- Drill hole diameter : 30-32 mm
- Depth and inclination of drill hole : 1.5m.
- Spacing between the holes : 1.2m
- Explosive type : Detonator Fuse

7.1.2.4 Blasting

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

7.1.2.5 Heavy Machinery

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

7.1.2.6 Overburden Handling

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

7.1.2.7 Storage of Explosive

The applicant will take license from controller of explosive, to store explosive in magazine. The storage of explosives will be done in accordance with the Indian Explosive Act, 1984 and the Rules made there under. The explosives will be supplied by the explosive van approved by Chief Controller of Explosive, Chennai. The main hazard associated with the storage, transport and handling of explosives is fire and explosion.

7.1.2.8 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

7.1.2.9 Water Logging

Water logging in the mine site has been avoided by adopting the following measures.

- ✓ 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.

7.1.2.10 Safety Measures at the Proposed Open Cast mining Project

1. 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 80° 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).
2. The quarries will be protected by garland drains around the periphery for storm water drainage.

3. A minimum safe distance of 100 m 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 200 m 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.
4. 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

7.1.2.11 Measures Suggested to Avoid Accidents due to Blasting

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

7.1.2.12 Measures to Prevent Failure of Overburden Dump

1. In flat areas where the dumping operations have come to an end, the slope angle should be flattened by about 15° lower than the angle of repose which varies from the site to site but not less than 25°.
2. Planting vegetation as early as possible over the overburden dump slopes.
3. Provide drainage channels along the overburden dump for additional protection, in such a way that 15m should be maintained left between the overburden dump and the bench.
4. 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.

7.1.2.13 Precautionary Measures to Prevent Accidents due to Trucks and Dumpers

1. All transportation within the main working shall be carried out directly under the supervision and control of the management.
2. 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.
3. Road signs shall be provided at each turning point, especially for the guidance of the drivers.
4. 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.
5. The statutory provision of fences, constant education, training etc. will go a long way in reducing the incidents of such accidents.
6. Generally, oversize rocks shall be dealt with in the pit by secondary blasting.
7. A Load consisting of large rocks must not be over the edge. This is unsafe and may damage the equipment.
8. 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 for the needs of relatives.
- ✓ Provide authoritative information to the news media.

- ✓ Secure the safe rehabilitation of affected area.
- ✓ Preserve relevant records and equipment for the subsequent inquiry into the cause and circumstances of the emergency.
- ✓ In effect, it is to optimize operational efficiency to rescue rehabilitation and render medical help and to restore normalcy.

Emergency Organization (EO)

It is recommended to 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

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 have to be promptly initiated to deal with the situation in consultation with Collector and other revenue officials

7.1.4 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 52m Below Ground Level 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 52m Below Ground Level and there is possibility of technological up-gradation in mining for greater depths. The site boundaries shall be safely fenced and used as a reservoir after mining activities are over

7.1.4.1 Progressive Mine Closure Plan

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

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

7.1.4.2 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 side dumps. These drains will be aligned in such a way that all the surface drainage water will be carried away from the mining zone to settling tanks.

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

7.1.4.3 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.

7.1.4.4 Air Quality Management

Ambient air quality was monitored twice in a week for One (01) season (shall cover 12 weeks), i.e., during Pre-Monsoon season. PM_{10}, $PM_{2.5}$, SO_2, NOx, Pb, NH_3, C_6H_6, $C_{20}H_{12}$, As, Ni, were monitored. Sampling was carried out as per Central Pollution Control Board (CPCB) monitoring guidelines at each location.

The following precautions have been considered for abatement of air pollution in the proposed mining area:

1. Water sprinkling shall be carried out at the active working faces, on all haul-roads and the dump surfaces.
2. Proper and regular maintenance of mining equipments and vehicles.
3. Development of comprehensive green belt around overburden 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 equipments i.e., hydraulic excavators / shovels and dumpers combination with ancillary mining equipment like compressor, wire cutting machine, generator etc.

There is no waste generation in the proposed quarry.9 Kg/day of municipal solid waste is estimated as per manpower proposed, is disposed through Municipal Disposal bins

7.1.4.6 Mine Drainage

The lease applied area is Flat terrain with the elevation of 172m AMSL. Though the area receives normal rainfall, the ground water level is at 70m depth. The Production faces are operated at shallow depths. During the rainy seasons the surface run of water and the gorund water are collected at one point called as sump and dewatered nearby agricultural field with the help of engines/motors.

7.1.4.7 Disposal of Waste

The anticipated recovery (saleable production) is 100% of the mined quantity, resulting in ZERO waste. 9 Kg/day of municipal solid waste is estimated as per manpower proposed, is disposed through Municipal Disposal bins. Waste oil from machinery and vehicles will be disposed of through authorized dealers.

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 mined areas and backfilled areas. 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 material dump.

7.1.4.9 Disposal of Mining Machinery

Mining operations are planned to be operated using Company owned machinery/ranted. i.e Excavators, Mining Tippers, compressors, jack hammers, and other mining equipment. These machines are compliant with the RTO conditions and CPCB conditions. Further, the company also operates a central workshop nearby, 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.

7.1.4.10 Other Infrastructure

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

8 PROJECT BENEFITS

8.1 Project Benefits

Rough stone, Weathered rock and gravel deposits at Tenkasi area are of good quality. It has been being extracted by many lease holders, for quite some time. However, there is a very good market potential for rough stone, gravel and weathered rock deposits from nearby cities, used for the construction industry. The proposed quarry lease area is non- productive and unsuitable for agriculture.

Therefore mining will be in the interest of State revenue and of the people around. Direct and indirect employment of locals is assured.

Improvement in Physical Infrastructure

1. Implementation of time bound corporate social responsibility will lead to installation of drinking water plant in the nearby villages.
2. A provision for implementation of fish culture activity (optional) will lead to improve the skills of local needy people.

Employment

Direct employment of 20 persons is expected. Out of which 3 persons will be of skilled and 3 will semi-skilled category and will be sourced from nearby villages.

Land Use

There will be a small change in Land Use of the area due to the proposed mining activity. But Project activity will lead 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 ENVIRONMENTAL COST & BENEFIT ANALYSIS

9.1 Environmental Cost Benefit

- Lease is a non-forest land. It has no major tree cover. There is sheet rock. Therefore, there will not be any damage to environmental quality.
- Initiation of mining by Thiru. M.Mohamed Ismail will improve revenue to the state without deterioration in environmental quality. On the contrary, population in nearby villages will become aware of importance of potable water quality and sanitation.
- Openings for indirect employment to locals in plantation, fish culture (optional) are possible.
- Project will create green inventory of 300 trees.
- Apart from it project authority will implement village biodiversity conservation plan to conserve village flora, faunas etc.
- Detailed budget is earmarked for the activities in Chapter 10. Recharge practices will lead to charge the aquifer.
- Not recommended in the scoping stage.

10 ENVIRONMENTAL MANAGEMENT PLAN

10.1 Environmental Management Plan

The EIA study for the proposed project has identified impacts that are likely to arise during different phases of the project. The study has also examined the extent to which the adverse impacts identified can be controlled through the adoption of mitigation measures. The Environment Management Plan describes both generic good practice measures and site-specific measures, the implementation of which is aimed at mitigating potential impacts associated with the proposed activities.

10.2 Purpose of Environmental Management Plan

The environment management plan is prepared with a view to facilitate effective environmental management of the project, in general, and implementation of the mitigation measures. The EMP provides a delivery mechanism to address potential adverse impacts and to introduce standards of good practice to be adopted for all project works. For each stage of the programme, the EMP lists all the requirements to ensure effective mitigation of every potential biophysical and socio-economic impact identified in the EIA. For each impact or operation, which could otherwise give rise to impact, the following information is presented:

- ✓ A comprehensive listing of the mitigation measures (actions) that Project Proponent will implement.
- ✓ The parameters that will be monitored to ensure effective implementation of the action.
- ✓ The timings for implementation of the action are also included to ensure the objectives of mitigation are fully met.

10.2.1 Air Environment

The Project Proponent is proposed Open Cast Semi mechanized to carry out the mining operations, and there is involvement of labours 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.

Objective		To reduce air emission due to the proposed project						
Concern		Increase in air pollution to the proposed project						
Benefits of EMP		Reduce impact on ambient air quality in and around the site						
Impacting activities	**Aspects**	**Mitigation Measures and Rationale**	**Implementation and Management**					**Remarks**
			Location	**Timing**	**Responsibility**	**Monitoring**	**Records**	
Excavation & Loader & other Machinery, workers / labors etc.	Dust Generation	Water sprinkling will be carried out.	At site	Once in a day during mining	Proponent	Random by Mine Manager	Water consumption record, ambient air monitoring	-
Vehicular movement for transportation on mined out material	Dust generation	Water sprinkling will be carried out, PUC certified vehicle will be used	Along the vehicle movement track	Water sprinkling will be done twice during the day, random check of PUC certificate	Proponent	Random by Mine Manager	Water consumption record, ambient air monitoring, record of vehicle without PUC	-

Stacking of mined out material	Dust generation	Water Sprinkling	At the stacking site	During operation phase	Proponent	Random by Mine Manager	Water consumption record, ambient air monitoring	

10.2.2 Water Environment

Objective	To ensure that the water environment during mining is properly managed							
Concern	Storage, handling, and disposal of wastewater can deteriorate water quality							
Benefits of EMP	Reduce deterioration of water quality in and around the site							
Impacting activities	**Aspects**	**Mitigation Measures and Rationale**	**Implementation and Management**					**Remarks**
			Location	**Timing**	**Responsibility**	**Monitoring**	**Records**	
Excavation at site, Movement of JCBs, other machinery, workers / labors etc	Consumption of water in dust suppression and Greenbelt development	Rainwater will be harvested in mined out pits for recharge/re use	At site	On completion of each pit	Proponent /Mine manager	Checking the proper storm water drainage for collection of rainwater in mined out pit	Observation by Mine Manager	-

Generation of domestic wastewater	Sewage Generation	Provision of septic tank and soak pit	At site	During mining operation	Proponent /Mine manager	Maintenance of septic tank soak pit	Maintenance record	-

10.2.3 Land Environment

Objective		To ensure that the Soil environment during mining is properly managed						
Concern		Mining of Weathered rock and stacked material may deteriorate Land and soil environment						
Benefits of EMP		Reduce deterioration of land/soil quality in and around the site						
Impacting activities	**Aspects**	**Mitigation Measures and Rationale**	**Implementation and Management**					**Remarks**
			Location	**Timing**	**Responsibility**	**Monitoring**	**Records**	
Site Selection	Change in land use	Lease rent	At site	Monthly during mining operation	Project proponent /Mine manager	Check the receipt of Lease rent and royalty payment Amount of material excavated	Production register and Record of Royalty payment	-
Removal of vegetation	Change in land Cover	Plantation as per mining plan	At site	As per mining plan	Project proponent /Mine manager	Number of saplings planted per year and growth of sapling per year	Type of species planted with number	-
Excavation at site, Movement of JCBs, other machinery,	Generation of debris	OB will be backfilled into pit	At site	At the end of five years	Project proponent /Mine manager	Monitoring of Backfilling as per Mining plan	Area back filled every year	-

workers / labors etc	Generation of Pit leading to Change in Topography	Backfilling will be done	At site	At the end of five years	Project proponent /Mine manager	Monitoring of Backfilling as per Mining plan	Area back filled every year	-
	Sewage Generation	Construction of Septic tank and soak pit	At site	During mining operation	Project proponent /Mine manager	Maintenance of septic tank soak pit	Maintenance record	-

10.2.4 Noise Environment

Objective	To reduce and manage noise level due to the proposed project						
Concern	Increase in Ambient Noise level due to the proposed project						
Benefits of EMP	Ambient noise levels of the area will not be impacted by the proposed activities						
Impacting activities	**Mitigation Measures and Rationale**	**Implementation and Management**					**Remarks**
		Location	**Timing**	**Responsibility**	**Monitoring**	**Records**	
Preparation of the site & movement of vehicles at site	Periodic Maintenance and servicing of mechanized equipment and vehicles used for site clearing, Use of sharp equipment	Site office construction	Once in a week	PP/Environmental Engineer	Periodic noise level monitoring	Noise level monitoring records	-

Mining, Excavation of Mine Pit	Maintenance and servicing of mechanized equipment and vehicles	Mine site	During mine working	PP/Environmental Engineer	monthly noise level monitoring	Vehicle servicing records Noise monitoring records	-
	Project activities to be undertaken during regular working hours	Mine site	During mine working	PP/Environmental Engineer	Random checks	Attendance Sheets	-
	Erection of temporary barriers	At site boundary	During mine working	PP/Environmental Engineer	Visual checks	Photographs	-
Ambient noise levels in surrounding villages	Noise control measures adopted at mine site	Nearby villages	24 hourly noise monitoring	PP/Environmental Engineer	monthly monitoring of Hourly ambient noise levels for a duration of 24 hours	Noise monitoring records	-

10.2.5 Ecology and Biodiversity Environment

Loss of vegetation and wildlife habitat.

Proposed Mitigation Measure to implement under EMP:

- There is no endangered and endemic species are found within the 10km radius of the project site.
- There are no National Parks, Sanctuary, Biosphere Reserve, Tiger Reserve, Elephant Reserve, wildlife migratory routes in core and buffer zones within the 10 km 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.

Green Belt Development

Over 0.50 Ha will be used for Green belt development. About 300 saplings will be planted on either side haulage road and also in the vacant government land. One cubic metre pit will be made and will be filled with local soils from lease. Refuse or garbage will be added as per availability. Growth in the first year will be observed. Species will be chosen from the following and depending on availability. Budget of Rs. 70,000 is earmarked for implementation of the plantation programme.

10.2.6 Socio Economic

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.

10.2.7 Occupational Health & Safety

1. Medical Facilities & Detail of Occupational Health Safety
2. A well-equipped hospital with trained doctors, nursing staff members, and a pool of

visiting doctors.

3. At Mine site First-Aid Room shall be provided for the site workers. An ambulance facility will be provided at our central hospital and the company mobile van visits the village during designated dates.

10.2.8 Corporate Environmental Responsibility:

As per the provisions of MOEFCC office memorandum F-22-65/2017IA.III dated 1.05.2018, The proponent have earmarked an investment of 1.63 Lakhs towards CER (being 2% of the total capital cost) and this budget is earmarked for carrying out sanitation work and solid waste management for by project proponent.

10.2.9 Environment Management Cell

Project Proponent will develop a team consisting of officers from various departments to co-ordinate the activities concerned with management and implementation of the environmental control measures. This team undertakes the activity of monitoring the stack emissions, ambient air quality, noise level etc. either departmentally or by appointing external agencies wherever necessary. Regular monitoring of environmental parameters shall be carried out to find out any deterioration in environmental quality and to take corrective steps accordingly, if required, through respective internal departments.

An environment management cell performs the following functions.

ii) Achieve objectives of the 'Environment Protection Policy' of the management.

iii) Collect information from regular monitoring and create a database.

iv) Discuss the reports of study on environment and disseminate the information.

v) Work out 'Action plan' for implementation of the recommendations made in the reports.

Table 10-1 Environmental Management Cell

Designation	Proposed responsibility
Proponent/ Mine Manager	✓ Overall responsible for Environmental Issues of the mine, Environmental policy, and directions. ✓ In case of non-compliances / violations of environmental norms and non-compliance of any EC condition.
Mine Engineer	✓ Ensure environmental monitoring as per appropriate procedures ✓ Ensure correct records of generation, handling, storage, transportation, and disposal of solid hazardous wastes. ✓ Ensuring legal compliance by properly undertaking activities as laid down by various regulatory agencies from time to time and interacting with the same and arranging

	✓ awareness programme among the workers ✓ In case of non-compliances / violations of environmental norms and non-compliance of any EC condition, Mine engineer shall report to Mine Manager

10.3 Cluster Environment Management Plan-Budget

The proposed rough stone, weathered rock and gravel quarry of Thiru. M.Mohamed Ismail, with an extent of 4.38.0 Hectares, is located in SF. No467/2,3,477/3,4,5 & 468/1, A.P.Nadanur Village, Alangulam Taluk, Tenkasi District, TamilNadu.

As per the Clause No. (b) (i) of the Gazette Notification No. S.O. 2269 (E), dated 01st July 2016, issued by the Ministry of Environment, Forests & Climate Change, Government of India (Amendment of the EIA Notification 2006), "A cluster shall be formed when the distance between the peripheries of one lease is less than 500 meters from the periphery of other lease in a homogeneous mineral area which shall be applicable to the mine leases or quarry licenses granted on and after 9th September, 2013".

Further, as per Clause No. (5) of the said Notification, "The leases not operative for three years or more and leases which have got environmental clearance as on 15th January 2016, shall not be counted for calculating the area of cluster, but shall be included in the Environmental Management Plan and the Regional Environmental Management Plan".

Accordingly, the proponent has obtained the Cluster Certificate from the Asst. Director, Dept. of Mines & Geology, Tenkasi, vide Letter No. Rc. No. M1/6695/2021, dated: 26.04.2022, which states that, there are no abandoned quarries, one (1) Existing quarry and three (03) proposed quarries, within 500m from the lease boundary of the above quarry. The details of these leases falling in the cluster, are as under:

Details of other quarries falling in the same cluster

S. No	Name of the Lessee	Location	Status
1	Thiru. Mohammed Mahaboob	A.P.Nadanoor (v) & SF.Nos 434/4C, 4E,4G,4I,4J 470/1, 471/2, 471/3, 472/1B & 472/1C	Existing
2	Thiru.K.Rajkumar	A.P.Nadanoor (v) & SF.Nos.469/1B, 469/2B,469/3B, 469/4B,469/5B, 469/6B,476/1,476/2,476/3	Proposed

3	M/s Svart sten	A.P.Nadanoor village SF.Nos.477/1,477/2,477/6,478/2(P),478/3(P) & 478/4(P)	Proposed
4	M/s M.Mohammed Ismail	A.P.Nadanoor Village S.F.Nos 467/2,3,477/3,4,5 & 468/1.	Proposed

Conclusion

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 programme, the EMP lists all the requirements to ensure effective mitigation of significant biophysical and socio-economic impacts identified in the EIA. The EMP covers the following:

- ✓ A comprehensive listing of the mitigation measures (actions) will be prepared and implemented.
- ✓ The parameters that will be monitored to ensure effective implementation of the action.
- ✓ The timing for implementation of the action to ensure that the objectives of mitigation are fully met.

11 SUMMARY & CONCLUSION

11.1 Introduction

Project proponent Thiru. Mohammed Ismail, a resident of Pottalpudur Village, in Tenkasi District of TamilNadu. He proposed to extract Rough Stone, Weathered Rock & Gravel in an extent of 4.38.0 Hectares of Patta land, located in SF. No. 467/2,3,477/3,4,5 & 468/1, A.P.Nadanur Village, Alangulam Taluk, Tenkasi District, TamilNadu. The Proposed land has Patta in the name of Thiru. Mohamed Mahaboob, where the proponent had obtained consent from the Pattadhar and lease agreement had been registered in the year 2021. The Proponant had obtained lease for a period of 15 years (2021-2036).

The Proponant proposed to quarry Rough stone, Weathered Rock & Gravel over an extent of 4.38.0 Ha of Patta land located in the SF. No. 467/2,3,477/3,4,5 & 468/1, A.P.Nadanur Village, Alangulam Taluk, Tenkasi District, Tamil Nadu State under Rule 19(1) of TamilNadu Minor Mineral Concession Rules, 1959. The Assistant Director, Department of Geology and Mining, Tenkasi District has issued a Precise area communication letter vide Rc. No. M1/6695/2021, Dated: 09.04.2022 to submit the Approved Mining Plan and Environmnetal Clerance from State Level Impact Assessment Authority (SEIAA) under the Rule 42 of TamilNadu Minor Mineral Concession Rules,1959.

The Mining Plan has prepared by Recognised Qualified Person and the same was submitted to Department of Geology and Mining, Tenkasi for the approval. The Mining plan was approved by the Assistant Director, Department of G&M, Tenkasi vide Letter Rc.No.M1/6695/2021 dated 26.04.2022.

Now, the Proponent had applied for Environmental Clearance (EC) from State level Environment Impact Assessment Authority (SEIAA), TamilNadu. In line with the provisions of Environment Impact Assessment (EIA) Notification 2006 (incl. its amendments from time to time), the SEIAA, TamilNadu had issued the Standard Terms of Reference (ToR) vide Letter No. SEIAA-TN/F.No.9520/SEAC/ToR-1342/2022**,** Dated: 09.02.2023 along with additional Terms of Reference, for carrying-out EIA Studies and preparation of an EIA/EMP Report. Copy of the ToR issued by SEIAA, TamilNadu, is enclosed as **Annexure 1**.

This EIA report contains information as per TOR and has been prepared as per generic structure given in Appendix III of EIA notification 2006 by MOEF & CC, Govt. of India.

The draft EIA prepared will be submitted for Public Consultation. Upon incorporating the minutes of the public consultation along with proponent action plan the final EIA will be submitted to SEIAA-TN for further appraisal of the project and obtaining Environmental Clearance.

11.2 Project Description

Project summary

S. No	Particulars	Details
1.	Land classification	Non- Forest Land (Patta Land)
2.	Extent of lease area (Ha.)	4.38.0
3.	Quarry Lease	The Proposed land has Patta in the name of Thiru. Mohamed Mahaboob vide Patta No-2666 & 2090, where the proponent had obtained consent from the Pattadhar and lease agreement had been registered in the year 2021. The Proponant had obtained lease for a period of 15 years(2021-2036)
4.	Lease Period	15 years
5.	Estimated Geological Reserves M^3	Rough Stone: 19,70,685 m^3 Weathered rock: 2,18,965 m^3 Gravel: 87,586 m^3
6.	Estimated Mineable Reserves M^3	Rough Stone: 10,24,965 m^3 Weathered rock: 1,85,470 m^3 Gravel: 76,944 m^3
7.	Average production per annum M^3	Rough Stone: 10,24,965 m^3 Weathered rock: 1,85,470 m^3 Gravel: 76,944 m^3
8.	Depth of Mining	52m Below Ground Level ((2m Gravel + 5m Weathered Rock+ 45m Rough Stone)
9.	Method of Mining	Open cast semi mechanized method
10.	Water Requirement (KLD)	2.5
11.	Source of Water	Private tankers
12.	Fuel requirements (Lts/Day) for Machineries&vehicles	8,32,788 Litres for entire project life
13.	Direct Manpower (Nos)	20

14.	Municipal Solid Waste Generation (kg/day)	9
15.	Project Cost in Lakhs Rs.	101.25
16.	EMP Cost in Lakhs Rs.	18.08

11.2.1 Proposed Method of Mining

The method of mining is by semi-mechanized open cast mining method, with controlled sequential blasting.

Since it is an erupted deposit, it requires blasting. Excavation can be done by Excavators, Rock Breakers etc., and blasting will be carried-out by Class II slurry explosives with delayed detonators. Mining will be using Semi Mechanized Methods as per Regulation 109 and 127 of Metalliferrous Mines Regulations.

The excavated materials will be loaded into trucks/ tippers using excavators or JCB etc. All loose materials will be directly sent to the customers and the hard material, in the form of boulders, will be sent to the nearby crusher(s), for further processing. Tippers shall be utilized for all transportation purposes. In addition, certain service equipment like water tanker (for dust suppression), pick-up vehicle etc. will be used.

11.3 Descrption of Environment

Study Period: The baseline environmental surveys were carried out during (March 2023 to May 2023) within the study area.

Ambient Air Quality

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} (41.7– 66.3 µg/m³), $PM_{2.5}$ (17.2– 31.3 µg/m³), SO_2 (6.6 – 13.4µg/m³), NO_2 (14.4 – 29.3 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.

Noise Environment

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

- ✓ In Industrial areas daytime noise levels were about 53.7 dB(A) and 43.2 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 49.2 dB(A) to 52.1 dB(A) and nighttime noise levels varied from 39.9 dB(A) to 42.7 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).

Water Environment

The prevailing status of water quality at 08 locations for surface water and 8 locations for ground water were 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

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 6.83 to 7.8 and within the limits (6.5 – 8.5) of IS 2296:1992.
- The Electrical Conductivity (EC) of the collected surface water ranges from 1255 µS/cm to 2358 µS/cm.
- The chloride content in the collected surface water ranges from 205.6 mg/l to 349 mg/l.
- The sulphate content in the collected surface water sample ranges from 97.7 mg/l to 164.9 mg/l.
- COD of the collected surface water sample ranges from 11.3 mg/l to 32.6 mg/l.

- BOD of the collected surface water sample ranges from 6.9 mg/l to 20.7 mg/l.

Ground Water Quality

Physio-chemical characteristics of ground water samples collected from the selected villages. 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 6.94 and 8.1. It is observed that the pH range is within the limit of IS 10500:2012.
- ✓ The Total Dissolved Solids range is varied between 1020 mg/l – 1350 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 the study area ranges between 269.3 mg/l – 342.5 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 125.6 mg/l – 211.4 mg/l. It is observed that all the samples are within the 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. 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 Environment

Assessment of soil characteristics is of paramount importance since vegetation growth, agricultural practices and production is directly related to the soil fertility and quality. Soil sampling was carried out at eight (08) locations in the study area. It is observed that,

- ✓ The pH of the soil samples ranged from 6.8 to 7.91.
- ✓ The potassium content ranged from 49 mg/kg to 91 mg/kg.
- ✓ Nitrogen content ranged from 153 mg/kg to 311 mg/kg.
- ✓ Phosphorous ranged from 46 mg/kg to 73 mg/kg.

Biological 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.
- ✓ 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. No rare and endangered faunalspecies are found in the project area as well as the study area.

Socio Economic Environment

- ✓ In the 10 km radius study area, as per 2011 census, the study area consists of 394418 persons inhabited in 29 villages. The statistics regarding the list of villages, number of households and human population.

11.4 Anticipated Environmental Impacts

A. Air Environment

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 checkup 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.

B. Noise Environment:

Impacts:

- ✓ Noise Generation by mining activities,
- ✓ Impact of vibrations including damage to materials/structures due to blasting.
- ✓ Hearing impairment problems in workers and nearby area people due to mining activities. Impact on ambient noise level due to rock excavation, transportation, processing equipment and ancillaries.

Proposed Mitigation Measure:

- ✓ Wet Drilling and Controlled Blasting will be adopted.
- ✓ Providing earmuffs for the workers working in the high noise prone areas.
- ✓ Development of greenbelts all along the boundary of the mining lease area will act as an effective noise barrier.
- ✓ Using acoustic enclosures for noise generating machines like generators, compressors to reduce the noise level.
- ✓ Ear plugs and Earmuffs will be provided to the drill machine operators and dumped drivers.
- ✓ Proper gradient of haul roads to reduce cumulative noise levels.
- ✓ All machinery will be maintained as per the maintenance schedule to prevent undesirable noise.

C. Water 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.
- ✓ 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.
- ✓ Sewage will be send to septic tank followed by soak pit. There is no industrial effluent generation during quarry operation.
- ✓ Municipal Solid Wastes including food waste are being disposed of into municipal bins.

D. Biological Environment

Impacts:

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

Proposed Mitigation Measure:

- ✓ There is no endangered and endemic species are found within the 10km radius of the project site.
- ✓ There are no National Parks, Sanctuary, Biosphere Reserve, 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

E. Socio 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 nearest village peoples directly.
- Existing road 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 20 people are directly 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
- ✓ CSR is proposed to the nearby 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 sustainable method.

11.6 Environmental Monitoring Program

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

11.7 Additional Studies

Disaster Management Plan

- ✓ The salient features of Disaster Management Plan include
- ✓ Emergency shutdown procedure
- ✓ Fire protection system, Emergency safety equipment & Reporting and response to emergency. Emergency Help from nearby industries and tie up with nearby industries

Corporate Environmental Responsibility

No Relocation and Rehabilitation is involved in the proposed project since it is a pattaland. Most villages have benefitted where the mining industry has provided indirect jobs for labor and villages provide accommodation for the labor and staff. Supportive industries like food supply and essential shops are economic growth in the villages.

11.8 Benefits of the Proposed Project

- ✓ The quarrying activities in this belt will benefit to the local people both directly & 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

11.10 Environement 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 programme, the EMP lists all the requirements to ensure effective mitigation of significant biophysical and socio-economic impacts identified in the EIA.

Proposed Project EMP budget is allocated Rs.18,08,000/-.

11.11 Conclusion

The proposal is since the current market weathered rock Building stone & boulders material having a good requirement in the civil construction & other fields. The proposed quarry lease is well participating in “Corporate Responsibility Schemes”. The local employment is improving, and the local area development will be there.

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.

12 DISCLOSURE OF CONSULTANTS

12.1 Brief and Nature of Consultancy

EHS 360 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 1,21,38 & 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 (MoEF&CC) and State Pollution Control Boards. NABET certificate is attached at the end of this chapter.

12.2 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 to build their competencies for handling 1 sectors and functional areas:

EIA Team Members:

Name of Internal Team Member	Activity / Area	Involvement – Actual Work Performed	Under Approved Expert
Mr. Santhosh Kumar A	Site Visit along with team Quality check and Assistance in EIA report Preparation	Guidance in writing modification in Contents; Review of EIA report; Compiling the primary & secondary data for EIA report; assistance in EIA/EMP report preparation.	Mrs. Tatiparthi Rajani
Mr. Santhosh Kumar A	Water Pollution, Prevention and Control (WP)	Assisted FAE for validating and cross checking with secondary data of Results; impacts and relevant mitigation measures; preparation of management plan and report writing	Ms.Sonakshi Garg

	Risk and Hazard management (RH)	Assisted FAE for validating of impacts diagrams & mitigation measures, preparation of disaster management plan.	Mr.Ganesh Gopal Watve
Mrs. Tatiparthi Rajani	Air Pollution, Prevention and Control (AP)	Assisted FAE for validating the AAQ sampling stations and results and impacts along with relevant mitigation measures; preparation of management plan and report writing	Ms.Sonakshi Garg
Mr. Ramesh Kumaran M	Air Quality Modelling & prediction (AQ)	Coordination for data collection, data analysis, coordination with FAEs, team members;	Ms.Tushali Jagwani
	Air Pollution, Prev ention and Control (AP)	Assisted FAE for validating the AAQ results, Impacts and relevant mitigation measures; preparation of management plan and report writing.	Ms.Tushali Jagwani
Ms. Soosan Steffy	Solid Hazardous Waste Management (HW&SW)	Assisted FAE for Validating of waste generation, studying adequacy of mitigation measures for Management of Hazardous waste and contribution to EIA documentation	Mrs.Tatiparthi Rajani
	Air Pollution, Prevention and Control (AP)	Assisted FAE for validation of AAQ results, Impacts and along with relevant mitigation measures; preparation of management plan and report writing.	Ms.Tushali Jagwani

.

12.3 Copy of QCI NABET Accreditation

QUALITY COUNCIL OF INDIA
Creating an Ecosystem for Quality

NABET

National Accreditation Board for Education and Training

NABET

Certificate of Accreditation

EHS360 Labs Private Limited

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 Organizations, Version 3: for preparing EIA-EMP reports in the following Sectors –*

S. No	Sector Description	Sector (as per)		Cat.
		NABET	MoEFCC	
1	Mining of minerals-opencast mining only	1	1 (a) (i)	B
2	Synthetic organic chemicals industry	21	5 (f)	B
3	Building and construction projects	38	8 (a)	B
4	Townships and Area development projects	39	8 (b)	B

Note: Names of approved EIA Coordinators and Functional Area Experts are mentioned in IA AC minutes dated September 2, 2022 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.

NABET

Sr. Director, NABET
Dated: October 21, 2022

Certificate No.
NABET/EIA/2225/IA 0098

Valid up to
June 24, 2025

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