

DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT

For

ROUGH STONE, WEATHERED ROCK & GRAVEL QUARRY OVER AN EXTENT OF 2.45.5 Ha.

Patta Land (Proponant Obtained Lease from Pattadhar)

Schedule & Project Category : 1(a) Mining of Minerals 'B1' (Cluster)

TOR No. & Date : SEIAA-TN/F.No.9608/SEAC/ToR-1335/2022, 10.02.2023

Baseline period : March 2023 to May 2023

At

**SF. No. 3, Surandai Part-I Village
V.K. Pudur Taluk, Tenkasi District
TamilNadu.**

Proponent/Leasee

Thiru. K. Arumugasamy

S/o. Kajendran,

No. 14/1/185, Near Anna Statue, Surandai,

V. K. Pudur Taluk,

Tenkasi District - 627859

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. K. Arumugasamy

S/o. Kajendran,

No. 14/1/185, Near Anna Statue, Surandai,

V. K. Pudur Taluk,

Tenkasi District - 627859

DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT

For

“Rough Stone, Weathered Rock & Gravel Quarry Over an Extent of 2.45.5Ha”.

Patta Land (Proponant Obtained Lease from Pattadhar)

Lease Period: 6 years

SF. No. 3, Surandai Part-I Village,

V.K. Pudur Taluk, Tenkasi District

TamilNadu.

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

Approved by: Santhoshkumar. A

Signature: A-S



Designation: CEO

Date:

The report has been prepared in line with the prescribed ToR vide Lr. No. **SEIAA-TN/F.No.9608/SEAC/ToR-1335/2022, 10.02.2023** issued 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 proponant.

Document Control			
Name of the Document	Environmental Impact Assessment report for “Thiru. K. Arumugasamy’s Rough stone, Weathered Rock & Gravel Quarry over an extent of 2.45.5Ha. located at Located at SF. No. 3, Surandai Part-I Village, V.K. Pudur 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. K. Arumugasamy’s Rough Stone, Weathered Rock & Gravel Quarry over an extent of 2.45.5 Ha located at Located at SF. No. 3, Surandai Part-I Village, V.K. Pudur 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


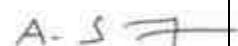

Name: Tatiparthi Rajani








Date: 11.05.2023






Period of Involvement : November 2022 to till date.



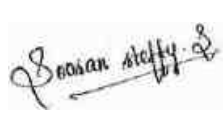
Contact Information : M/s. EHS360 Labs Pvt. Ltd.
10/2 - Ground Floor, 50th Street, 7th Avenue,
Ashok Nagar, Chennai - 600083
Phone: 044 45493644:
Email id: santhosh@ehs360labs.com
Website: www.ehs360labs.com

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, identification and assessing quantum of emission, 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	
		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 EIA 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. Vivek Prabhakar Navare	Period: Nov 2022 to Till date Task: site visit and Checking of noise and vibration sampling results, analysis of data identification of impacts and mitigation measures, and contribution to EIA documentation	V.P. Navare
		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	N.V. Natarajan
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	N.V. Natarajan
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, dentifying 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, dentifying 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 collection, compilation of data regarding the project and cooperating in the report on Environmental Impact Assessment Report (EIA) of “Thiru. K. Arumugasamy’s Rough Stone, Weathered Rock & Gravel Quarry over an extent of 2.45.5 Ha located at Located at SF. No. 3, Surandai Part-I Village, V.K. Pudur 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. Monisha

**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. K. Arumugasamy’s Rough Stone, Weathered Rock & Gravel Quarry over an extent of 2.45.5 Ha located at Located at SF. No. 3, Surandai Part-I Village, V.K. Pudur 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



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

1 INTRODUCTION.....23

1.1 PROJECT BACKGROUND23

1.2 IDENTIFICATION OF PROJECT & PROJECT PROPONENT.....24

1.2.1 PROJECT.....24

1.2.2 PROJECT PROPONENT.....24

1.3 LETTER OF INTENT (LOI) & MINING PLAN APPROVAL DETAILS.....24

1.4 LAND ACQUISITION STATUS.....25

1.5 PURPOSE AND STATUS OF THE REPORT.....25

1.6 BRIEF DESCRIPTION OF THE PROJECT25

1.6.1 NATURE OF THE PROJECT.....25

1.6.2 SIZE OF THE PROJECT26

1.6.3 LOCATION OF THE PROJECT.....27

1.6.4 NEED FOR THE PROJECT AND ITS IMPORTANCE TO THE COUNTRY AND OR REGION.27

1.6.4.1 Demand –Supply Gap28

1.6.4.2 Imports Vs Indigenous28

1.6.4.3 Export possibility28

1.6.4.4 Domestic/export markets28

1.7 EIA STUDY.....28

1.8 EIA COST28

1.9 SCOPE OF THE STUDY29

1.9.1 OBJECTIVES OF THE STUDY.....31

1.9.2 METHODOLOGY ADOPTED FOR THE STUDY.....31

1.9.3 APPLICABLE REGULATORY FRAMEWORK31

1.9.4 LEGAL COMPLICABILITY32

1.9.5 TERMS OF REFERNCE COMPLIANCE32

2 PROJECT DESCRIPTION.....46

2.1 TYPE OF PROJECT INCLUDING INTERLINKED AND INTERDEPENDENT PROJECTS.....46

2.2 NEED OF THE PROJECT.....46

2.3 LOCATION OF THE QUARRY47

2.4	TOPOGRAPHY	54
2.5	GENERAL GEOLOGY	54
2.6	SIZE OR MAGNITUDE OF OPERATION.....	55
2.6.1	TOTAL GEOLOGICAL RESOURCES	55
2.6.2	TOTAL MINEABLE RESERVES	56
2.6.3	MAGNITUDE OF OPERATIONS.....	57
2.7	PROJECT COST.....	63
2.8	TECHNOLOGY & PROCESS DESCRIPTION	63
2.8.1	TECHNOLOGY	63
2.8.2	METHOD OF MINING –OPEN CAST MECHANISED WORKING	63
2.9	PROCESS DESCRIPTION	64
2.9.1	MINING.....	64
2.9.2	LOADING & TRANSPORTATION	67
2.9.3	STORAGE OF EXPLOSIVES	67
2.9.4	DISPOSAL OF WASTE	67
2.9.5	TOPSOIL MANAGEMENT	67
2.10	REQUIREMENTS	68
2.10.1	LAND REQUIREMENT AND LAND USE PLANNING.....	68
2.10.2	WATER REQUIREMENT	68
2.10.3	POWER & FUEL REQUIREMENT	68
2.10.4	LIST OF EQUIPMENTS	69
2.10.5	MANPOWER REQUIREMENT	69
2.10.5.1	Solid Waste Management	69
2.10.6	HAZARDOUS WASTE MANAGEMENT	70
2.11	INFRASTRUCTURE FACILITIES	70
2.12	RESOURCE OPTIMIZATION/RECYCLING AND REUSE ENVISAGED IN THE PROJECT.....	70
2.13	AVAILABILITY OF WATER ITS SOURCE, ENERGY/POWER REQUIREMENT AND SOURCE.....	70
2.14	SCHEMATIC REPRESENTATIONS OF THE FEASIBILITY DRAWING WHICH GIVE INFORMATION IMPORTANT FOR EIA PURPOSE	70
2.15	DESCRIPTION OF MITIGATION MEASURES INCORPORATED INTO THE PROJECT TO MEET THE ENVIRONMENTAL STANDARDS	72
2.15.1	LAND ENVIRONMENT.....	72

2.15.2	AIR ENVIRONMENT	73
2.15.3	SOURCES OF AIR POLLUTION-SINGLE SOURCES.....	73
2.15.3.1	Drilling	73
2.15.3.2	Loading	73
2.15.3.3	Unloading	73
2.15.3.4	LineSources.....	74
2.15.3.5	Transportation	74
2.15.3.6	Area Sources/Multiple Sources.....	74
2.15.3.7	Instantaneous Sources	74
2.15.4	NOISE & VIBRATION ENVIRONMENT	75
2.15.4.1	Noise Levels.....	75
2.15.4.2	Vibration	76
2.15.5	WATER ENVIRONMENT	77
2.15.5.1	Impacts on Surface Water Bodies	78
2.15.5.2	Impact on Ground Water.....	78
2.15.6	BIOLOGICAL ENVIRONMENT	78
2.15.7	DUMP MANAGEMENT	79
2.15.8	SOLID WASTE MANAGEMENT.....	79
2.15.8.1	Impact due to Solid Waste Generation.....	79
2.15.8.2	Solid Waste Management	79
2.15.9	AFFORESTATION	80
2.15.10	OCCUPATION HEATH AND SAFETY	80
2.15.11	ASSESSMENT OF NEW AND UNTESTED TECHNOLOGY FOR THE RISK OF TECHNOLOGICAL FAILURE.....	81
3	DESCRIPTION OF ENVIRONMENT.....	82
3.1	PREAMBLE.....	82
3.2	STUDY AREA	82
3.3	DESCRIPTION OF THE STUDY AREA	84
3.4	ENVIRONMENTALLY/ECOLOGICALLY SENSITIVE AREAS	84
3.5	PHYSICAL CONDITIONS.....	99
3.5.1	PIA DISTRICT PROFILE	99

3.5.2	CLIMATIC CONDITIONS	99
3.5.3	NATURAL RESOURCES OF PIA DISTRICT	100
3.5.3.1	Irrigation of PIA district.....	100
3.5.3.2	Agricultural Resources & Irrigation	100
3.5.4	LAND USE & LAND COVER.....	100
3.5.4.1	Land Use and Land Cover of the Study Area	100
3.5.5	TOPOGRAPHY OF PIA DISTRICT	103
3.5.6	GEOMORPHOLOGY OF THE STUDY AREA	103
3.5.7	GEOLOGY OF PIA DISTRICT.....	105
3.5.8	DRAINAGE PATTERN IN PIA DISTRICT.....	105
3.5.9	DRAINAGE PATTERN OF STUDY AREA.....	105
3.5.10	SOILS IN PIA DISTRICT	107
3.5.11	SEISMICITY	107
3.6	AIR ENVIRONMENT.....	108
3.6.1	METEOROLOGICAL CONDITIONS.....	108
3.6.2	METEOROLOGICAL DATA COLLECTION	108
3.7	AMBIENT AIR QUALITY	109
3.7.1	AMBIENT AIR QUALITY MONITORING STATIONS.....	109
3.7.2	AMBIENT AIR QUALITY MONITORING TECHNIQUES AND FREQUENCY	111
3.7.2.1	Results and Discussions	111
3.7.2.2	Observations.....	114
3.8	NOISE ENVIRONMENT.....	114
3.8.1	RESULTS AND DISCUSSIONS.....	114
	The observations of day equivalent and night equivalent noise levels at all locations are given below.....	116
3.9	WATER ENVIRONMENT.....	118
3.9.1	SURFACE WATER QUALITY ASSESSMENT.....	118
3.9.1.1	Interpretations of Results	125
3.9.2	GROUNDWATER RESOURCES OF PIA DISTRICT.....	125
3.9.2.1	Groundwater Quality.....	125
3.9.2.2	Interpretations of Results:	130
3.10	SOIL AS A RESOURCE AND ITS QUALITY	130

3.11	BIOLOGICAL ENVIRONMENT	134
3.11.1	FLORA.....	134
3.11.2	FAUNA	135
3.12	SOCIO ECONOMIC PROFILE OF PROJECT INFLUENCED AREA	137
3.12.1	POPULATION DENSITY	137
3.12.2	SEX RATIO	137
3.12.3	SCHEDULED CASTES AND SCHEDULED TRIBES	138
3.12.4	SOCIO ECONOMIC ASPECTS	138
3.12.5	SOCIAL ECONOMIC PROFILE OF THE STUDY AREA	138
3.12.6	EMPLOYMENT AND LIVELIHOOD	140

4 ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES
..... **144**

4.1	LAND ENVIRONMENT	148
4.1.1	ANTICIPATED IMPACT	148
4.1.2	PROPOSED MITIGATION MEASURES	148
4.2	AIR ENVIRONMENT.....	149
4.2.1	ANTICIPATED IMPACTS	149
4.2.1.1	Emission Inventory	149
4.2.1.2	Prediction of Fugitive Emissions in the Project.....	149
4.2.2	MITIGATION MEASURES	149
4.2.2.1	During Mining.....	149
4.2.2.2	Green Belt	150
4.3	NOISE ENVIRONMENT.....	150
4.3.1	ANTICIPATED IMPACT	158
4.3.2	MITIGATION MEASURES	158
4.4	WATER ENVIRONMENT (SURFACE & GROUND WATER).....	159
4.4.1	IMPACT ON HYDROLOGY, ALTERATION IN NATURAL DRAINAGE ETC.	159
4.4.2	ANTICIPATED IMPACT:.....	159
4.4.3	MITIGATION MEASURES	159
4.4.4	RAINWATER HARVESTING AND PLAN FOR WATER CONSERVATION	160
4.5	BIOLOGICAL ENVIRONMENT.....	160

4.5.1	ANTICIPATED IMPACT	160
4.5.2	MITIGATION MEASURES	160
4.6	SOCIOECONOMIC & HEALTH	160
4.6.1	ANTICIPATED IMPACTS	160
4.6.2	MITIGATION MEASURES	160
4.7	MINE WASTES	161
4.7.1	ANTICIPATED IMPACTS	161
4.7.2	MITIGATION MEASURES	161
4.8	OCCUPATIONAL HEALTH HAZARDS.....	161
4.8.1	PHYSICAL HAZARDS	161
4.8.2	BIOLOGICAL HAZARDS	162
4.8.3	ERGONOMIC HAZARDS	162
4.8.4	PSYCHOLOGICAL HAZARDS	162
4.8.5	MITIGATION MEASURES	162
4.9	TRAFFIC DENSITY.....	163
4.9.1	MITIGATION MEASURES	163
4.10	SOIL.....	163
4.10.1	ANTICIPATED IMPACT	163
4.10.2	MITIGATION MEASURES	164
4.11	SUMMARY.....	164
5	ANALYSIS OF ALTERNATIVES.....	165
5.1	GENERAL.....	165
5.2	SITE STUDIES.....	165
5.3	ALTERNATE METHOD OF MINING.....	165
6	ENVIRONMENTAL MONITORING PROGRAMME	166
6.1	GENERAL.....	166
6.2	OBJECTIVE OF MONITORING PROGRAMME	167
7	ADDITIONAL STUDIES.....	170
7.1	INTRODUCTION.....	170

7.1.1	PUBLIC CONSULTATION	170
7.1.2	RISK IDENTIFICATION & MANAGEMENT	170
7.1.2.1	Introduction	170
7.1.2.2	Identification of Hazards in Open Cast Mining	172
7.1.2.3	Drilling	172
7.1.2.4	Blasting	173
7.1.2.5	Heavy Machinery	173
7.1.2.6	Overburden Handling	173
7.1.2.7	Storage of Explosive	173
7.1.2.8	Fuel Storage	173
7.1.2.9	Water Logging	173
7.1.2.10	Safety Measures at the Proposed Open Cast mining Project.....	174
7.1.2.11	Measures Suggested to Avoid Accidents due to Blasting.	174
7.1.2.12	Measures to Prevent Failure of Overburden Dump	175
7.1.2.13	Precautionary Measures to Prevent Accidents due to Trucks and Dumpers	175
7.1.3	DISASTER MANAGEMENT PLAN.....	175
7.1.3.1	Emergency Services	177
7.1.3.2	Fire Protection System	177
7.1.3.3	Off-Site Emergency Plan	177
7.1.4	MINE CLOSURE PLAN	177
7.1.4.1	Progressive Mine Closure Plan	178
7.1.4.2	Water Quality Management	178
7.1.4.3	Mines Seepage Water.....	178
7.1.4.4	Air Quality Management	178
7.1.4.5	Solid waste Management	179
7.1.4.6	Mine Drainage.....	179
7.1.4.7	Disposal of Waste	179
7.1.4.8	Topsoil Management.....	179
7.1.4.9	Disposal of Mining Machinery	180
7.1.4.10	Other Infrastructure	180
8	PROJECT BENEFITS.....	181

8.1 PROJECT BENEFITS	181
9 ENVIRONMENTAL COST & BENEFIT ANALYSIS.....	182
9.1 ENVIRONMENTAL COST BENEFIT	182
10 ENVIRONMENTAL MANAGEMENT PLAN	183
10.1 ENVIRONMENTAL MANAGEMENT PLAN	183
10.2 PURPOSE OF ENVIRONMENTAL MANAGEMENT PLAN	183
10.2.1 AIR ENVIRONMENT	184
10.2.2 WATER ENVIRONMENT	185
10.2.3 LAND ENVIRONMENT.....	186
10.2.4 NOISE ENVIRONMENT	187
10.2.5 ECOLOGY AND BIODIVERSITY ENVIRONMENT	188
10.2.6 SOCIO ECONOMIC	188
10.2.7 OCCUPATIONAL HEALTH & SAFETY	189
10.2.8 CORPORATE ENVIRONMENTAL RESPONSIBILITY:.....	189
10.2.9 ENVIRONMENT MANAGEMENT CELL	189
10.2.10 BUDGET FOR ENVIRONMENTAL PROTECTION.....	190
10.3 CLUSTER ENVIRONMENT MANAGEMENT PLAN-BUDGET	195
11 SUMMARY & CONCLUSION	197
11.1 INTRODUCTION	197
11.2 PROJECT DESCRIPTION.....	198
11.2.1 PROPOSED METHOD OF MINING.....	199
11.3 DESCRIPTION OF ENVIRONMENT	199
11.4 ANTICIPATED ENVIRONMENTAL IMPACTS	202
11.5 ALTERNATIVE STUDIES	206
11.6 ENVIRONMENTAL MONITORING PROGRAM	206
11.7 ADDITIONAL STUDIES.....	206
11.8 BENEFITS OF THE PROPOSED PROJECT	206
11.9 ENVIRONMENTAL BENEFIT ANALYSIS	207
11.10 ENVIRONMENT MANAGEMENT PLAN.....	207

11.11 CONCLUSION207

12 DISCLOSURE OF CONSULTANTS208

12.1 CHANGE OF CONSULTANT DETAILS **ERROR! BOOKMARK NOT DEFINED.**

12.2 BRIEF AND NATURE OF CONSULTANCY208

12.3 TEAM MEMBER FOR EIA REPORT.....208

12.4 COPY OF QCI NABET ACCREDITATION.....210



LIST OF TABLES

Table 1-1 Estimated Geological and Mineable Reserves	27
Table 1-2 Boundary Coordinates of the project.....	27
Table 2-1 Salient Features within 15km radius of the lease area	52
Table 2-2 Project summary.....	53
Table 2-3 Land use breakup of the quarry area	55
Table 2-4 Mineable Reserves.....	56
Table 2-5 Proposed Production Plan during Plan Period.....	57
Table 2-6 Proposed Project Cost.....	63
Table 2-7 Quarry Land details	68
Table 2-8 Land Use Pattern of the lease area	68
Table 2-9 Water requirement breakup	68
Table 2-10 Power Requirements.....	68
Table 2-11 Lists of Machineries	69
Table 2-12 Manpower Details	69
Table 2-13 Municipal Solid Waste generation & Management	69
Table 2-14 Hazardous Waste Management	70
Table 2-15 Afforestation Plan details	80
Table 3-1 Environmental Sensitive Areas within 15km from Project Boundary	84
Table 3-2 Land Use Pattern of the Study Area	100
Table 3-3 Geomorphology of the Study Area.....	103
Table 3-4 Details of Ambient Air Quality Monitoring Locations	109
Table 3-5 Analytical Methods for Analysis of Ambient Air Quality Parameters	111
Table 3-6 Summary of the average baseline concentrations of pollutants	112
Table 3-7 Day and Night Equivalent Noise Levels	116
Table 3-8 Test methods used for the analysis of water quality parameters.	118
Table 3-9 Details of Surface water sampling locations	120
Table 3-10 Physicochemical Parameters of Surface water samples from study area.....	123
Table 3-11 Details of Groundwater Quality Monitoring Locations	125
Table 3-12 Physico chemical analysis of Ground water samples from study area.....	128
Table 3-13 Test methods used for the analysis of Soil.	131
Table 3-14 Soil & Sediment Quality Monitoring Locations	131

Table 3-15 Soil Quality Monitoring Results.....	133
Table 3-16 List of flora reported/observed in the study area.....	134
Table 3-17 List of fauna reported/observed in the study area.....	136
Table 3-18 Population profile within study area.....	139
Table 3-19 Summary of Socioeconomic indicators within the study area.....	140
Table 3-20 Classification of workers within study area.....	140
Table 3-21 Details of Literacy population in the study area.....	142
Table 4-1 Impact Identification from proposed project.....	146
Table 4-2 Sources of air pollution at quarry.....	149
Table 4-3 Fugitive dust & Particulate matter control in quarry.....	150
Table 6-1 Environmental Monitoring Plan.....	168
Table 10-1 Green Belt program Year wise.....	188
Table 10-2 Environmental Management Cell.....	190
Table 10-3 Environmental Management Plan Cost.....	191
Table 10-4 EMP Budget for each year.....	194

LIST OF FIGURES

Figure 2-1 Project Location map	47
Figure 2-2 Google image of the lease area	48
Figure 2-3 500m radius Google imagery of the lease area	49
Figure 2-4 Google Imagery of 1, 5 & 10 km radius of the lease area	50
Figure 2-5 Topo map of the study area	51
Figure 2-6 Surface Geological Plan of the Quarry	58
Figure 2-7 Surface Geological Plan of the Quarry	59
Figure 2-8 Yearwise Development & Production Plan and Sections	60
Figure 2-9 Conceptual Plan & Sections.....	61
Figure 2-10 Environment Plan of the Quarry	62
Figure 2-11 Feasibility & Environmental Assessment Process	71
Figure 2-12 Waste Management Concepts	80
Figure 3-1 Topo Map of Study area	83
Figure 3-2 Environmental sensitive areas within 15 km from project boundary	98
Figure 3-3 Land use Pattern of the Study Area.....	101
Figure 3-4 Land Use Land Cover map of the study area	102
Figure 3-5 Contour map of Study Area	103
Figure 3-6 Geomorphology map of the study area	103
Figure 3-7 Geomorphology map of the study area	104
Figure 3-8 Drainage map of the study area.....	106
Figure 3-9 Seismicity map of India	107
Figure 3-10 Map showing the Ambient Air Quality monitoring locations.	110
Figure 3-11 Map showing the noise monitoring location.....	117
Figure 3-12 Map showing the surface water monitoring locations.	121
Figure 3-13 Map showing the groundwater monitoring locations.....	127
Figure 3-14 Map showing the soil monitoring location.....	132
Figure 7-1 Identification of hazards in opencast mine.....	172

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 Appraisal Committee
TOR	Terms of Reference
kVA	kilovolt-ampere

1 INTRODUCTION

1.1 Project background

Project proponent Thiru. K. Arumugasamy, a resident of Surandai Village, in Tenkasi District of TamilNadu. He had proposed to extract Rough Stone, Weathered Rock & Gravel in an extent of 2.45.5 Hectares of Patta land, located in SF. No. 3 of Surandai Part I Village, V.K. Pudur Taluk of Tenkasi District in TamilNadu State. The Proposed land has Patta in the name of Thiru. M.Abdul Ali (Pattadhar), where the proponent had obtained consent from the Pattadhar and lease agreement had been registered in the year 2020. The Proponent had obtained lease for a period of 6 years (2020-2026).

The Proponent had proposed to quarry Rough stone, Weathered Rock & Gravel over an extent of 2.45.5Ha of Patta land located in the SF. No. 3 of Surandai Part I Village, V.K. Pudur Taluk of Tenkasi District in 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. M1/23755/2020, Dated: 22.10.2021 to submit the Approved Mining Plan and Environmental Clearance 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. M1/23755/2020, dated: 22.10.2021.

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, TamilNadu had issued the Standard Terms of Reference (ToR) vide **Letter No. SEIAA-TN/F.No.9608/SEAC/ToR-1335/2022, Dated: 10.02.2023** 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 2,83,500m³ of rough stone, 87,300m³ of weathered rock and 38,400m³ 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 10km radius from the project site.

1.2.2 Project Proponent

Thiru. K. Arumugasamy is an individual proponent who is residing at Surandai Village in Tenkasi District. The contact Details of the project proponent, are as under:

Name : Thiru. K. Arumugasamy, Project Propoenet.

Address : Thiru. K. Arumugasamy
S/o. Kajendarn
No: 14/1/185, near Anna Statue,
Surandai, V.K. Pudur Taluk,
Tenkasi District-627 859.

Contact No. : 98429 10139

Email ID : *arumugasamy848@gmail.com*

Thiru. K. Arumugasamy had engaged S. Ilavarsan of Salem, as their RQP, for preparation of the mining/quarry plan for mining of Rough Stone, Weathered Rock & Gravel quarry over an extent of 2.45.5 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. M1/23755/2020, dated: 22.10.2021.

After submitting the mining plan by the proponent, The Mining Plan has been approved by the Assistant Director, Department of Geology and Mining, Tenkasi vide Rc. No. M1/23755/2020, dated: 20.11.2021.

1.4 Land Acquisition Status

The entire quarry land over an extent of 2.45.5Ha is a Patta land in the name of Thiru. Abdul Ali vide Patta No. 4018, The applicant had obtained a lease from the Pattadhar for a period of 6 years.

1.5 Purpose and Status of the Report

The proposed proposal is quarrying of rough stone, weathered rock and gravel over an extent of 2.45.5 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/407459/2022 and the same was acknowledged by SEIAA-TN vide Letter No. SEIAA-TN/F. No. 9608/2022, dated: 23.11.2022. Later the file has been placed in the 346th SEAC Meeting which is held on 12.01.2023 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. K. Arumugasamy proposed to quarry Rough stone, Weathered Rock & Gravel over an extent of 2.45.5Ha of Patta land located in the SF. No. 3 of Surandai Part I Village, V.K. Pudur Taluk of Tenkasi District in TamilNadu State. The proponent has obtained lease from the Pattadhar Thiru. Abdul Ali in the year 2020 for a period of 6 years which is valid up 2026. The Assistant Director, Department of Geology and Mining, Tenkasi District has issued a Precise area communication letter vide Rc. No.

M1/23755/2020, Dated: 22.10.2021 to submit the Approved Mining Plan and Environmental Clearance 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. M1/23755/2020, dated: 22.10.2021.

The proposed quarry is located between the Latitude $08^{\circ}59'54.28''$ N & $08^{\circ}59'54.68''$ N and Longitude $77^{\circ}28'29.24''$ E to $77^{\circ}28'31.60''$ E. There are two proposed quarries and three abandoned quarries located within 500m radius from the project site. Considering the active/working quarries, the total extent of the area is 5.82.0Ha. 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/407459/2022 and the same was acknowledged by SEIAA-TN vide Letter No. SEIAA-TN/F. No. 9608/2022, dated: 23.11.2022. Later the file has been placed in the 346th SEAC Meeting which is held on 12.01.2023 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 study has been carried out 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. 3 of Surandai Part I Village, V.K. Pudur 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 Bench Width.

The total Geological Resources of the minerals to be mined out upto a depth of 42m below ground level is worked out to be 49100m^3 of gravel formation, $1,22,750\text{m}^3$ of weathered rock and $8,59,250\text{m}^3$ of Rough stone. Considering the safety distance and the bench loss the total

mineable reserves calculated as 38,400m³ of Gravel, 87,300m³ of Weathered rock and 2,83,500m³ of Rough stone upto a depth of 42m (2m Gravel + 5m Weatherd Rock + 35m Rough stone) for a period of 5 years.

Table 1-1 Estimated Geological and Mineable Reserves

Description	Geological Reserves (m ³)	Mineable Reserves (m ³)
Gravel	49,100	38,400
Weathered Rock	1,22,750	87,300
Rough Stone	8,59,250	2,83,500

1.6.3 Location of the project

The proposed quarry is located between the Latitude 08°59'54.28" N & 08°59'54.68" N and Longitude 77°28'29.24" E to 77°28'31.60" E. The quarrying is Non-Forest Patta Land, bearing SF. No. 3 of Surandai Part I Village, V. K. Pudur 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

DATUM: WGS-84		
BP. No	Latitude	Longitude
1	08°59'54.28" N	77°28'29.24" E
2	08°59'55.69" N	77°28'28.97" E
3	08°59'57.95" N	77°28'29.20" E
4	08°59'58.75" N	77°28'34.79" E
5	08°59'56.65" N	77°28'36.14" E
6	08°59'54.65" N	77°28'36.17" E
7	08°59'54.66" N	77°28'33.76" E
8	08°59'54.68" N	77°28'31.60" E

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 product, 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 36 members. Mineral Industries of the state of Tamilnadu provides employment opportunities for the peoples 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, specially 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 report has been prepared and is being 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 it will be submitted for EC appraisal.

1.8 EIA Cost

Validation of EIA and Apraisal of the project was undertaken by M/s. 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 negative that, the mining activities may have on the environment, together consisting of the natural, social, and economic aspects, i.e., aiming at “Sustainable Development” due to the project activities.

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

The basic structure of the EIA report will be having the following chapters.

Chapter No	Description of Content
Chapter 1	Introduction Gives the 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 This chapter should include benefits accruing to the locality, neighbourhood, region and nation as a whole.
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 site boundary.

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-TN/F.No.9608/SEAC/ToR-1335/2022, Dated: 10.02.2023 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	Not applicable. This is a fresh project proposed to quarry out rough stone, weathered rock and gravel.

Rough stone, Weathered Rock & Gravel Quarry over an extent of 2.45.5 Ha.

	into force w.r.t. the highest production achieved prior to 1994.	
2	A copy of the document in support of the fact that the Proponent is the rightful lessee of the mine should be given.	This is Patta land registered in the name of Thiru. Abdul Ali. The applicant had obtained consent from the Pattadhar. The lease documents are enclosed along with the Mining Plan as Annexure III .
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).	The Topo-sheet of 10km radial distance around the proposed lease is enclosed in Chapter 2 Figure 2-5 . The geomorphology and geology of the area is shown in Chapter 3, Section 3.5.6 . The land use and other ecological features of the study area is given in Chapter 3, Section 3.5.4 .
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.	Toposheet showing the project area, and 10 km buffer zone around it, in 1:50000 scale is enclosed in Chapter 2, Figure 2-5 . The geomorphology and geology of the area is shown in Chapter 3, Section 3.5.6 . The land use and other ecological features of the study area is given in Chapter 3, Section 3.5.4 .
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 mining should have approval from landuse board or the concerned authorities.	The proposed quarry area is Patta Land, and the proponent has obtained the lease from Pattadhar. Also, the approval from The Assistant Director, Department of Geology and Mining, Tenkasi District was obtained vide Letter No. Letter Rc. No. M1/23755/2020, dated: 22.10.2021. The details are enclosed in the Annexure-III .
7	It should be clearly stated whether the proponent company have a well laid down Environmnet policy approved by its Board of Directors? If so, it may be spelt out in the EIA report with description of the prescribed operating process/ procedures to bring into focus any infringement/ deviation/violation	Yes, the Environmental Policy (approved by the Proponent) is enclosed, as Annexure-IV of this Report.

Rough stone, Weathered Rock & Gravel Quarry over an extent of 2.45.5 Ha.

	of the environmental or forest norms/ conditions? The hierarchical system or administrative order of the Company to deal with the environmental issues and for ensuring compliance with the EC conditions may also be given. The system of reporting of non-compliances / violations of environmental norms to the Board of Directors of the Company and/or shareholders or stakeholders at large may also be detailed in the EIA report.	
8	Issues relating to Mine Safety, including subsidence study in case of underground mining and slope study in case of open cast mining, blasting study etc. should be detailed. The proposed safeguard measures in each case should also be provided.	In the proposed Rough stone, Weathered rock and gravel quarry, controlled blasting will be carried out. The parameters related to blasting have been given in Chapter 2 of Section 2.9.1 of the report. Being an opencast mechanized method, it is proposed to follow a bench slope of 45° by way of benches of 5m 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 and submitted. Impact, if any, of change of land use should be given.	The Land Use details of the study area including forest area, agricultural land, grazing land, wildlife sanctuary, national park, migratory routes of fauna, water bodies, human settlements and other ecological use features is detailed in Chapter 3, from Section 3.5.4. to Section 3.12.6
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 Patta 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	NOC from the Forest Department has been obtained and the same is enclosed as Annexure V .

Rough stone, Weathered Rock & Gravel Quarry over an extent of 2.45.5 Ha.

	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.	
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 Patta 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 Patta 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 list of RF/PF located in the 15km radius from the project site are given in Chapter 3, Section 3.4, Table 3-2
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 wildlife 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	No National Parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, Tiger/ Elephant Reserves are existing as well as proposed within 10 Km of mine lease area. Therefore, no clearance is required.

Rough stone, Weathered Rock & Gravel Quarry over an extent of 2.45.5 Ha.

	areas as mentioned above, should be obtained from the State Wildlife Department/Chief Wildlife Warden under the Wildlife (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 Chapter 3, Section 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 area does not fall under CRZ area.
21	R&R Plan/compensation details for the	Not applicable since land is already notified in

Rough stone, Weathered Rock & Gravel Quarry over an extent of 2.45.5 Ha.

	<p>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.</p>	<p>favour of the Project Proponent. Therefore, R & R not applicable.</p>
<p>22</p>	<p>One season (non-monsoon) [i.e., March-May (Summer Season); October-December (post monsoon season); December-February (winter season)] primary baseline data on ambient air quality as per CPCB Notification of 2009, water quality, noise level, soil, 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 predominant 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.</p>	<p>The primary baseline data monitoring covering one season (three (3) months) i.e., from March 2023 to May 2023 has been carried as per CPCB Notification of 2009, water quality, noise level, soil and flora and fauna had been collected. Site-specific meteorological data collected were collected. The location of the monitoring stations with predominant wind directions, and the baseline data collected were included in the Chapter 3, Section 3.6.</p>
<p>23</p>	<p>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</p>	<p>The proposal involves controlled blasting, with delayed electric detonators. It will be carried-out in open area, during a specific time of the day. The details of blasting parameters and the safety measures to be adopted in blasting are</p>

	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.	given in Section 2.15.3.
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 3.0 KLD for different purposes like Domestic, Dust suppression, plantation purposes which sourced from Private Tankers and also is detailed in Chapter 2, Section 2.10.2.
25	Necessary clearance from the competent authority for drawl of requisite quantity of water for the Project should be provided.	Water required will be met from the private tankers.
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 details is given in Chapter 4, Section 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.	Detailed impacts and mitigation measures 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 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.	The working depth of the proposed quarry will not intersect with the ground water, as the proposed depth is 42m below ground level. Though the area receives normal rainfall, the ground water level is at 70m depth. Hence the permission from Central Ground Water Authority, is not required for this proposal.
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 were no streams (seasonal or perennial) are flowing from 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.	Schematic Representation of the sectional plates were enclosed as Annexure IV .
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.	The proponent ensures to develop the greenbelt in an area of 3200 Sq. m. Also, they have proposed to plant the native species of 1200 No's and the details are enclosed in Chapter 10, Section 10.2.5 .
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	Based on estimated production, vehicles are used for transporting the materials. the average no. of trips per day will be about 25-30 and considering an 8 hours operating schedule per day, Tippers of 20T capacity will be used for transportation purpose. The traffic density details are given in Chapter 4, Section 4.9 .
33	Details of the onsite shelter and facilities to 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 (with plans and with adequate number of sections) should be given in	The Conceptual plan and its section are given in the sectional plate attached along with the Mining Plan.

	the EIA report.	
35	Occupational Health impacts of the Project should be anticipated, and the proposed preventive measures spelt out in detail. Details of pre-placement medical examination and periodical medical examination schedules should be incorporated in the EMP. The project specific occupational health mitigation measures with required facilities proposed in the mining area may be detailed.	Occupational Health Impact is furnished in Chapter 4, Section 4.8 . Medical Examination of the employee carried out as per DGMS Guideline.
36	Public health implications of the Project and related activities for the population in the impact zone should be systematically evaluated and the proposed remedial measures should be detailed along with budgetary allocations.	The nearest habitation is Vadiyur village, at a distance of ~1.0 km (SW) from the proposed lease area. Hence there will not be any public health implications due to the project.
37	Measures of socio-economic significance and influence on the local community proposed to be provided by the Project Proponent should be indicated. As far as possible, quantitative dimensions may be given with time frames for implementation.	The CER Activities has been planned to propose at a cost of Rs. 2,81,500/- and the details were enclosed in the CER Affidavit as Annexure .
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.	The Environmental Management Plan to mitigate the environmental impacts is detailed in the Chapter 10, Section 10.2 . The EMP budget cost is calculated to be Rs. 73,00,054/- for a period of 5 years.
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 is a Draft EIA Report prepared for the submission of Public Hearing. Upon completion of the Public Hearing and after obtaining the minutes, the same will be incorporated in the Final EIA Report at the time of appraisal.
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 against 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.	The total cost of the project is given in Table 2-6 and the breakup for the EMP budget is enclosed in Table 10-3 and Table 10-4 .

42	A Disaster Management Plan shall be prepared and included in the EIA/ EMP Report	The Disaster Management Plan has been included in the Chapter 7, Section 7.1.3.
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.	The Project Benefits are given in the Chapter 8 of the report.
44	Besides the above, the below mentioned	general points are also to be followed;
a.	Executive Summary of the EIA/EMP Report	Executive Summary is prepared and enclosed as a separate booklet.
b.	All documents to be properly referenced with index and continuous page numbering	The document is properly referenced with the index and numbering is done continuously.
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.	The datas are given in table format and the source is mentioned in the report.
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.	The EIA Report and Executive summary has been prepared in English. Where the Executive summary translated in Tamil Language (Vernacular Language) for public hearing purpose.
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	As such there are no changes in the scope and project parameters.

	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.	
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.	The Surface plan, geological maps and sections and sections of mine pit and external dumps were enclosed along with the Mining plan as Sectional Plates
B ADDITIONAL TERMS OF REFERENCE		
The Executive summary of the EIA/EMP report is about 8-10 pages should be prepared incorporating the information on following points.		
1	Project name and location (Village, District, State, Industrial Estate (if applicable)).	Name and location of the project is included in the Executive summary.
2	Process description in brief, specifically indicating the gaseous emission, liquid effluent and solid and hazardous wastes	Noted.
3	Measures for mitigating the impact on the environment and mode of discharge or disposal	Noted.
4	Capital cost of the project, estimated time of completion.	Noted.
5	The proponent shall furnish the contour map of the water table detailing the number of wells located around the site and impacts on the wells due to mining activity.	Noted.
6	A detailed study report of the lithology of the mining lease area shall be furnished.	Noted.
7	Details of village map, "A" register and FMB sketch shall be furnished.	The Village Map, A register and FMB sketch is enclosed as a seperate Annexure
8	Detailed mining closure plan for the	The detailed mine closure plan is included the

Rough stone, Weathered Rock & Gravel Quarry over an extent of 2.45.5 Ha.

	proposed project approved by the Geology of Mining department shall be submitted along with EIA report.	Approved Mining Plan.
9	Obtain a letter/certificate from the Assistant Director of Geology and Mining stating that there is no other Minerals/resources like sand in the quarrying area within the approved depth of mining and below depth of mining and the same shall be furnished in the EIA report.	Noted.
10	EIA report should strictly follow the Environmental Impact Assessment Guidance Manual for Mining of Minerals published February 2010.	The Environmental Impact Assessment Guidance Manual for Mining of Minerals published February 2010 is followed for the preparation of EIA Report.
11	Detail plan on rehabilitation and reclamation carried out for the stabilization and restoration of mined areas.	Noted.
12	The EIA study report shall include the surrounding mining activity, if any.	The quarrying activities carried out within 500m radius from the proposed lease area is enclosed in the 500m cluster AD Mines letter and the same is attached as Annexure.
13	Modelling study for Air, Water and noise shall be carried out in this field and incremental increase in the above study shall be substained with mitigation measures.	Noted.
14	A study on the geological resources available shall be carried out and reported.	The study on geological resources of the proposed lease area is carried out by the Recognised Qualified Person and the same is approved by AD G&M. The details area enclosed in the Chapter 2, Section 2.6.1.
15	A specific study on agriculture & livelihood shall be carried out and reported.	Noted.
16	Impact of soil erosion, soil physical chemical and biological property changes may be assumed.	Noted.
17	Site selected for the project – Nature of land – Agricultural (single/double/crop), barren, Govt./private land, status of its acquisition, nearby (in 2-3 km) water body, population, within 10km other industries, forest, eco-sensitive zones, accessibility, (note – in case of industrial estate this information may not be necessary)	The details given in Chapter 3.

Rough stone, Weathered Rock & Gravel Quarry over an extent of 2.45.5 Ha.

18	Baseline environmental data – air quality, surface and ground water quality, soil characteristic, flora and fauna, socio-economic condition of the nearby population.	The Baseline data's are given in detail in the Chapter 3, from Section 3.6 to 3.12.
19	Identification of hazards handling, processing and storage of hazardous material and Safety system provided to mitigate the risk.	There is no handling of storage of hazardous minerals. During quarrying operation, the workers will be provided with all the safety equipments.
20	Likely impact of the project on air, water, land, flora-fauna and nearby population.	The impacts on air, water, land, flora-fauna etc is detailed in Chapter 4.
21	Emergency preparedness plan in case of natural or in plant emergencies.	The Emergency services were given in the Chapter 7, Section 7.1.3.1.
22	Issues raised during public hearing (if applicable) and response given.	The details will be included after completion of public hearing.
23	CER plan with proposed expenditure.	The proponent ensures to implement the CER activities as stated in the CER Affidavit. Also, the activities will be carried out as per the Committee's recommendation.
24	Occupational Health Measures	The Occupational Health & Safety details were given in Chapter 10, Section 10.2.7.
25	Post project monitoring plan	As per the EC conditions the Post project monitoring will be planned.
26	The project proponent shall carry out detailed hydro geological study through intuitions NABET Accredited agencies.	Noted.
27	A detailed report on the greenbelt development already undertaken is to be furnished and also submit the proposal for green belt activities.	The greenbelt development details were included in the Chapter 6.
28	The proponent shall propose the suitable control measure to control the fugitive emissions during the operations of the mines.	The fugitive emission will be controlled by suitable control measures.
29	A specific study should include impact on flora & fauna, disturbance to migratory pattern of animals.	Suitable mitigation measures for the impact caused on flora and fauna is detailed in the Chapter 4.
30	Reserve funds should be earmarked for proper closure plan.	Noted.
31	A detailed plan on plastic waste management shall be furnished. Further, the proponent should strictly comply with, Tamil Nadu Government Order (Ms) No.84 Environment and forests (EC.2) Department dated 25.06.2018 regarding ban on one time use and throw away plastics irrespective of thickness with effect from 01.01.2019 under	Noted.

Rough stone, Weathered Rock & Gravel Quarry over an extent of 2.45.5 Ha.

	Environment (Protection) Act, 1986. In this connection, the project proponent has to furnish the action plan	
Besides the above, the below mentioned general points should be followed.		
a.	A note confirming compliance of the TOR, with cross referencing of the relevant sections/pages of the EIA report should be provided.	The ToR compliance with proper cross referencing of the relevant section is provided.
b.	All documents may be properly referenced with index, page numbers and continuous page numbering.	The document is completely cross referenced with relevant section, index, tables and figures.
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.
d.	While preparing the EIA report, the instructions for the proponents and instructions for the consultants issued by MoEF & CC vide O.M. No. J-1 101314112006-1A. II (I) dated 4th August, 2009, which are available on the website of this Ministry should also be followed.	Noted.
e.	The consultants involved in the preparation of EIA/EMP report after accreditation with Quality Council of India (QCI)/National Accreditation Board of Education and Training (NABET) would need to include a certificate in this regard in the EIA/EMP reports prepared by them and data provided by other organization/Laboratories including their status of approvals etc. In this regard circular no F. No. J -11013/77/2004-1A-II(I) dated 2nd December 2009, 18th March 2010, 28th May 2010, 28th June 2010, 31st December 2010 & 30th September 2011 posted on the Ministry's website http://www.moef.nic.in/ may be referred.	Noted.

2 PROJECT DESCRIPTION

2.1 Type of Project including interlinked and interdependent projects

The proposed project 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 2,83,500m³ of rough stone, 87,300m³ of weathered rock and 38,400m³ of gravel over an extent of 2.45.5Ha. for a period of 5 years. The proposed location is a Non-Forest Private Land, bearing SF. No. 3 of Surandai Part I Village, V.K. Pudur Taluk, Tenkasi District, TamilNadu. The proponent has obtained lease from Pattadhar Thiru. Abdul Ali in the year 2020 for a period of 6 years which is valid up 2026. The Assistant Director, Department of Geology and Mining, Tenkasi District has issued a Precise area communication letter vide Rc. No. M1/23755/2020, Dated: 22.10.2021 to submit the Approved Mining Plan and Environmental Clearance 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. M1/23755/2020, dated: 22.10.2021.

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 an important commercial product, 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 36 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 our country's economic development.

Considering the growing demand of the mineral, it necessitates the operation of this mining project.

2.3 Location of the Quarry

The proposed quarry is located between the Latitude 08°59'54.28" N to 08°59'54.68" N and Longitude 77°28'29.24" E to 77°28'31.60" E. The quarrying is Non-Forest Patta Land, bearing SF. No. 3 of Surandai Part I Village, V. K. Pudur Taluk, Tenkasi District, TamilNadu. The proposed Quarry Lease area falls on the Survey of India Topo Sheet No. 58 H/5

The area is ~1.0 km Southeast of Karaiyalanur Village. The quarry location is located at ~ 4.72km (WNW) from the nearest Major District Road (MDR-440) Surandai – Senthamaram Road. The nearest National Highway NH-744 Kollam to Madurai Road is located at ~ 15.28km (WNW). There is also a State Highway SH-39A, Sengottai-Pavoorchathiram located at ~ 6.60km (SW) 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.

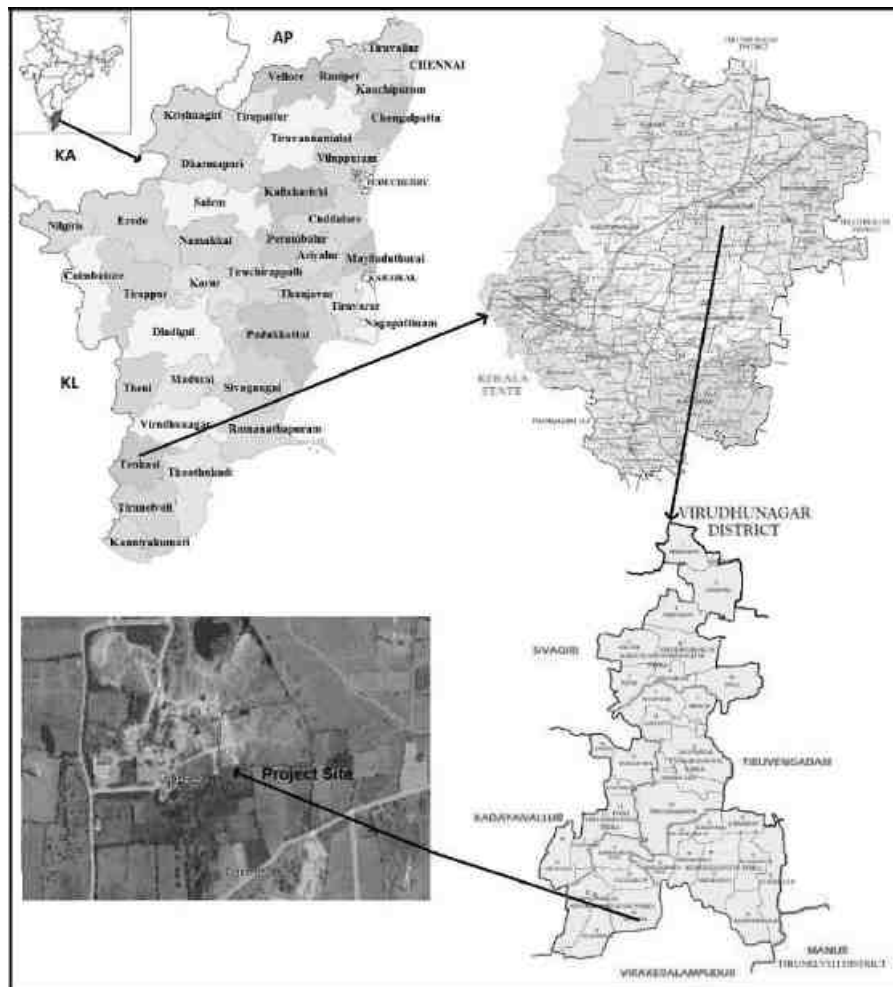


Figure 2-1 Index map



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

Rough stone, Weathered Rock & Gravel Quarry over an extent of 2.45.5 Ha.

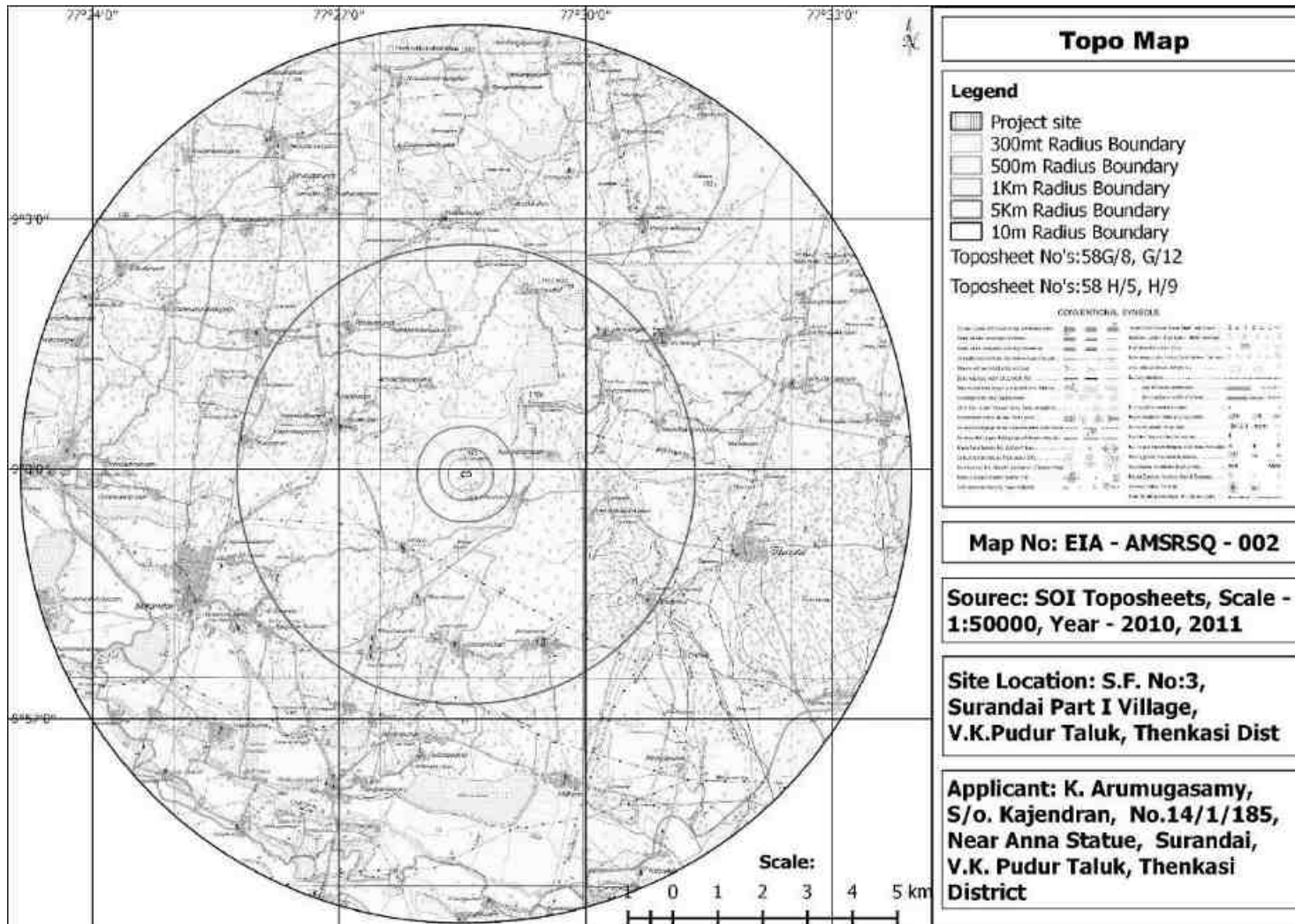


Figure 2-5 Topo map of the study area

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

S. No	Particulars	Details			
1.	Latitude & Longitude	08°59'54.28" N to 08°59'54.68" N 77°28'29.24" E to 77°28'31.60" E			
2.	Site Elevation above MSL (m)	172m MSL			
3.	Topography	Flat terrain			
4.	Lease area Topo Sheet details	58 H/5			
5.	Land classification	Patta Land			
6.	Nearest Village	Karaiyalanur Village ~ 1.0 km (SE)			
7.	Nearest Highway	<ul style="list-style-type: none"> ➤ NH-744: Kollam – Madurai Road ~ 15.28km (WNW) ➤ SH-39A Sengottai – Pavoorchatram (via) Suranadai Road ~ 6.60km (SW) 			
8.	Nearest City/Town	Nearest Town: Surandai, ~ 5.64km (WSW) Nearest City: Tirunelveli, ~ 36.85km (SE)			
9.	Nearest Railway station	Pavurchatram Railway Station, ~ 14.24km (SW)			
10.	Nearest Airport	Tuticorin Airport, ~ 65.75km (ESE)			
11.	Areas which are important or sensitive for ecological reasons – Wetlands, Watercourses or other water bodies, coastal zone, biospheres, mountains, forests	Water Bodies:			
		S. No	Name	Dist. (~ km)	Dir.
		1	Pond Near Site	0.17	S
		2	Lake Near Uchchipottai	1.16	ENE
		3	Lake Near Karuppinankulam	2.72	ENE
		4	Periya Devan Kulam	3.60	E
		5	Lake Near Kil Kalangal	5.60	E
		6	Lake Near Kulasekaramangalam	9.07	N
		7	Lake near Thannuthu	6.91	NNW
		8	Lake Near Kulayaneri	4.34	WNW
		9	Lake Near Dooraiswamipuram	6.19	W
		10	Lake Near Sundarapandiyapuram	8.86	W
		11	Lake Near Surandai	7.49	WSW
		12	Arundavarpiratti Kulam	5.84	SSW
		13	Viranamkulam	6.77	S
		14	Lake near Kidarakkulam	9.59	SE
		15	Chittar river	7.74	SSW
		16	Manur Channel	8.12	SSW
		17	Marantai Channel	9.18	S
18	Canal	8.83	W		
19	Chittar Ar/Karuppa Nadi	6.29	SW		

Rough stone, Weathered Rock & Gravel Quarry over an extent of 2.45.5 Ha.

		20	Hanuman Nadi	13.61	W
		21	Pappan Channel	13.51	NW
		22	Canal	11.21	NNW
		23	Nettur Channel	9.34	SSE
		24	Pallikottai Channel	11.04	SSE
		25	Ukkirankottai Canal	13.39	SE
		Reserve Forest:			
		S. No	Name	Dist. (~ km)	Dir.
		1	Reserve Forest	4.97	S
		2	Okkanindran Pottai RF	11.5	S
		3	Kottaimalai PF	12.86	SSE
		4	Uttumalai RF	9.31	E
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.)	2.45.5
3.	Quarry Lease	It's a Patta land in the name of Thiru. Abdul Ali vide Patta No: 4018, The applicant has obtained lease from the Pattadhar.
4.	Lease Period	6 years
5.	Estimated Geological Reserves	Rough stone : 8,59,250m ³ Weathered rock: 1,22,750m ³ Gravel : 49,100m ³

Rough stone, Weathered Rock & Gravel Quarry over an extent of 2.45.5 Ha.

6.	Estimated Mineable Reserves	Rough stone : 2,83,500m ³ Weathered rock: 87,300m ³ Gravel : 38,400m ³
7.	Total Mineable reserves	Rough stone : 2,83,500m ³ Weathered rock: 87,300m ³ Gravel : 38,400m ³
8.	Depth of Mining	42m Below Ground Level ((2m Gravel + 5m Weathered Rock+ 35m Rough Stone)
9.	Method of Mining	Open cast semi mechanized method
10.	Water Requirement (KLD)	3.0
11.	Source of Water	Private tankers
12.	Fuel requirements for Machineries & vehicles	2,33,200 Litres for entire project life
13.	Manpower (Nos)	36
14.	Municipal Solid Waste Generation (kg/day)	16.2
15.	Project Cost INR. (Lakhs)	140.72
16.	EMP Cost in (Lakhs) INR.	73.00

2.4 Topography

The proposed land is a Patta land which is classified as non-Government land. The topography of the area is flat terrain with a gentle slope towards Southern side and altitude of the area is 148m above the Mean Seal Level. The proposed area lies in the topo sheet No's. 58 H/5. The **Topo map of the study area** is shown in **Figure 2-5**. The area is covered 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 massive formation of Charnockite lies over with rich accumulation of recent quaternary formation. On regional scale of the Charnokite body is N40°E – S40°W with dipping towards SE60°.

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

Rough stone, Weathered Rock & Gravel Quarry over an extent of 2.45.5 Ha.

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

Proposed production capacity is 2,83,500m³ of Rough stone, 87,300m³ of Weathered Rock and 38,400m³ of Gravel at the rate of 100% recovery upto a depth of 42m (2m Gravel, 5m Weathered Rock and 35m Rough Stone) below the ground level for a period of 5 years.

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	1.92.0
2	Infrastructure	Nil	0.01.0
3	Roads	Nil	0.02.0
4	Greenbelt	Nil	0.32.0
5	Unutilized Area	2.45.5	0.18.5
Grand Total		2.45.5	2.45.5

2.6.1 Total Geological Resources

The Geological Resources of rough stone, weathered rock, and gravel is calculated up to a maximum depth of 42m (2m Gravel, 5m Weatherd rock and 35m 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 = 2.45.5 Ha.

Area is square meter = 2.45.5 x 10,000

Rough stone, Weathered Rock & Gravel Quarry over an extent of 2.45.5 Ha.

= 24,550 sq. m

Gravel formation = 2m below ground level
 = 24,550 sq.m x 2m depth
 = **49,100m³ of Gravel Formation**

Weathered Rock = 5m below ground level
 = 24,550 sq. m x 5m depth
 = **1,22,750m³ of Weathered Rock**

Rough Stone = 35m below ground level
 = 24,550 sq. m x 35m depth
 = **8,59,250m³ of Rough Stone**

The Geological Resources of Gravel formation = 49,100m³

The Geological Resources of Weathered Rock = 1,22,750m³

The Geological Resources of Rough Stone = 8,59,250m³

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)	Mineable Reserves of Rough Stone (m ³)	Gravel (m ³)	Weathered Rock (m ³)
XY - AB	I	200	96	2		38400	
	II	194	90	5			87300
	III	184	80	5	73600		
	IV	174	70	5	60900		
	V	164	60	5	49200		
	VI	154	50	5	38500		
	VII	144	40	5	28800		
	VIII	134	30	5	20100		
	IX	124	20	5	12400		
Total					283500	38400	87300

Total Mineable Reserves of Gravel = 38,400m³

Total Mineable Reserves of Weathered Rock = 87,300m³

Total Mineable Reserves of Rough Stone@ 100% = 2,83,500m³

The mineable reserves have been computed as 2,83,500m³ of Rough Stone, 87,300m³ of Weathered Rock and 38,400m of Gravel at the rate of 100% recovery upto a depth of 42m (2m

Rough stone, Weathered Rock & Gravel Quarry over an extent of 2.45.5 Ha.

Gravel + 5m Weathered Rock+ 35m Rough Stone) below from the general 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 (slurry explosives), excavation, loading and transportation of minerals.
- ▶ Mineable Production: 2,83,500m³ of Rough Stone, 87,300m³ of Weathered Rock and 38,400m³ of Gravel.
- ▶ Total Mineral Rejects/ Waste: NIL during the lease period.

Table 2-5 Proposed Production Plan during Plan Period

Section	Year	Bench	Length (m)	Width (m)	Depth (m)	Mineable Reserves of Rough Stone (m ³)	Gravel (m ³)	Weathered Rock (m ³)
XY - AB	I	I	100	96	2		19200	
		II	94	90	5			42300
		III	80	80	5	32000		
		Total					32000	19200
	II	I	82	96	2		15744	
		II	82	90	5			36900
		III	90	80	5	36000		
		Total					36000	15744
	III	I	18	96	2		3456	
		II	18	90	5			8100
		III	14	80	5	5600		
		IV	174	70	5	60900		
		Total					66500	3456
	IV	V	164	60	5	49200		
		VI	114	50	5	28500		
		Total					77700	
	V	VI	40	50	5	10000		
		VII	144	40	5	28800		
		VIII	134	30	5	20100		
		IX	124	20	5	12400		
	Total					71300		
Grand Total						283500	38400	87300

Rough stone, Weathered Rock & Gravel Quarry over an extent of 2.45.5 Ha.

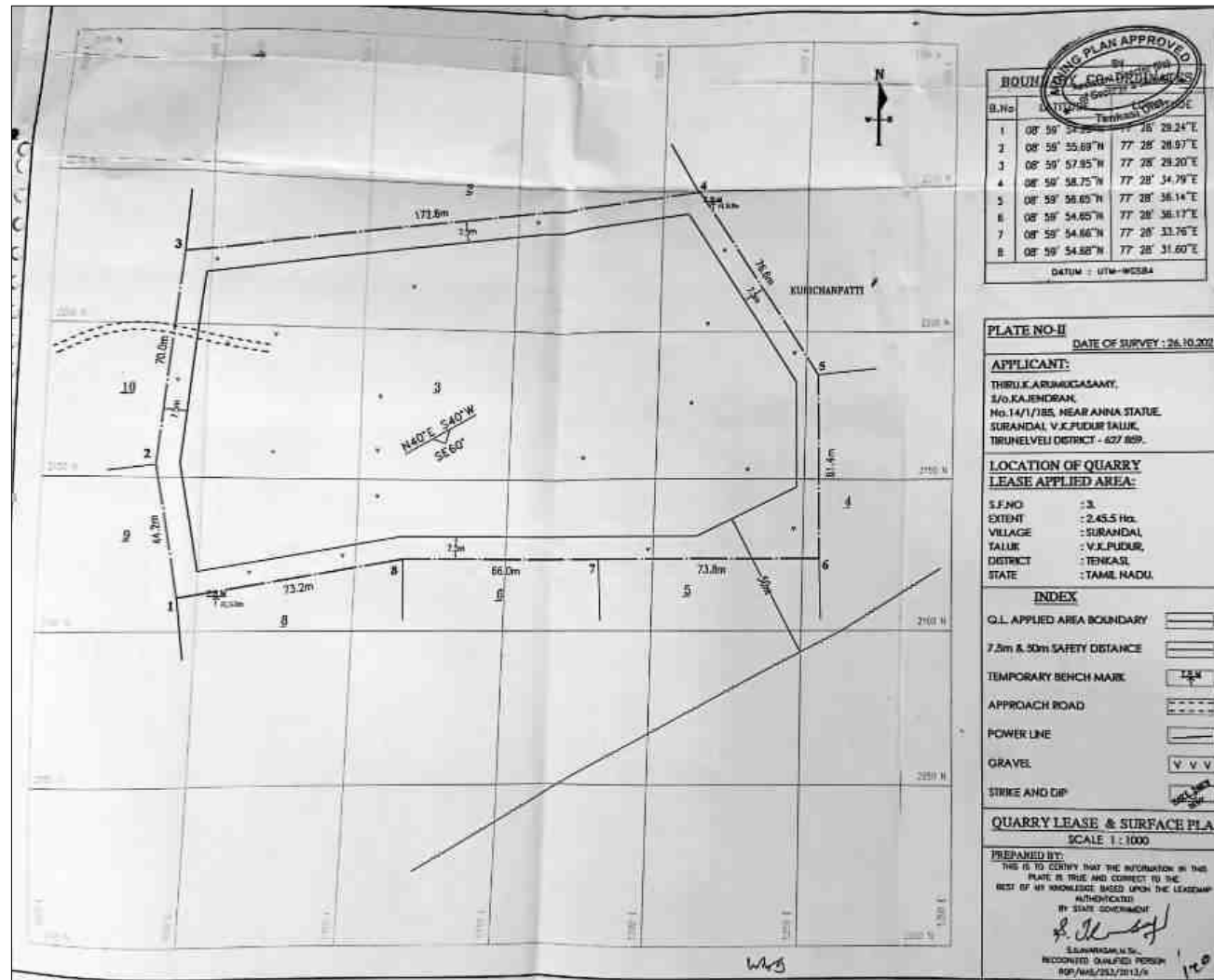


Figure 2-6 Surface Geological Plan of the Quarry

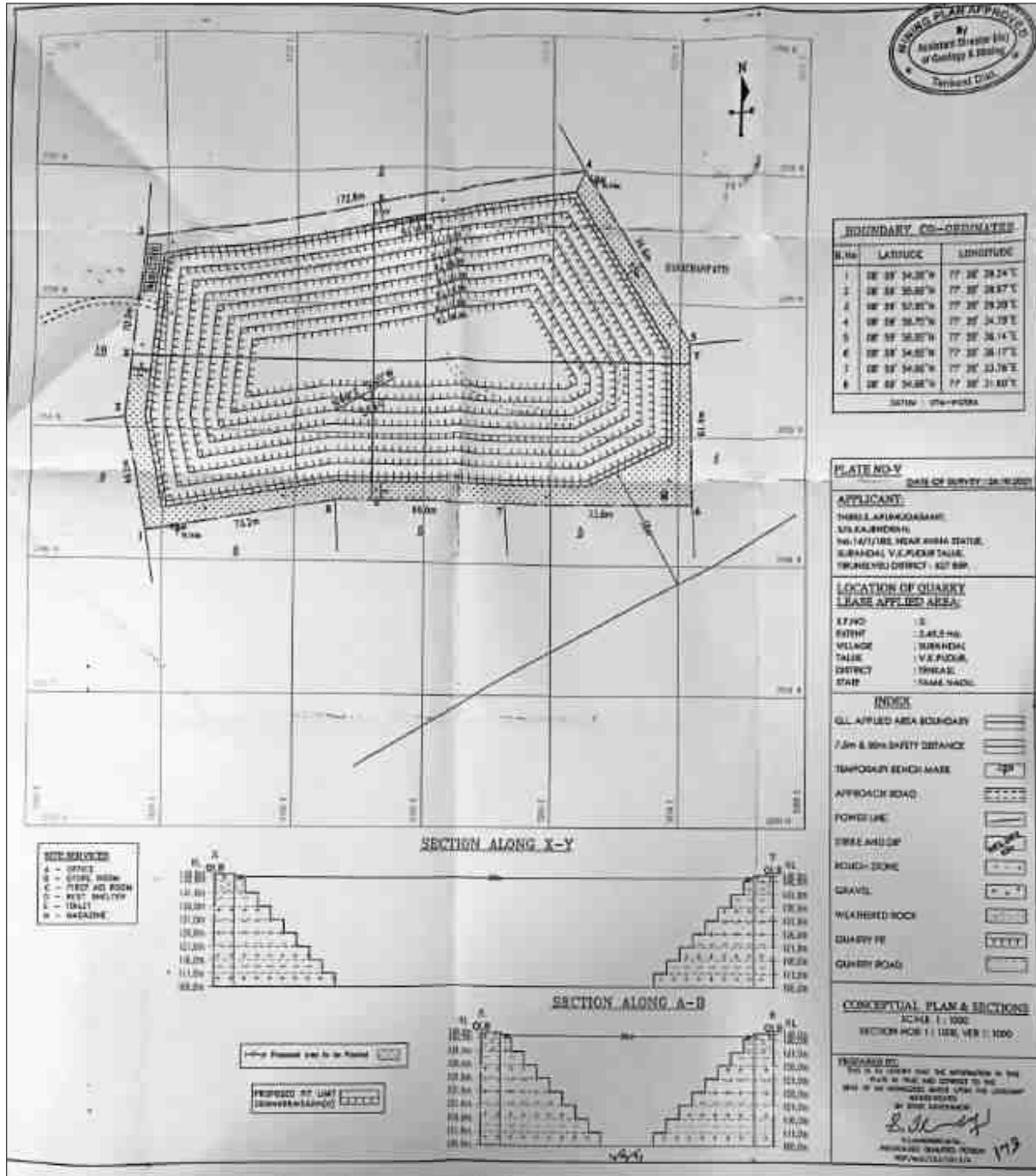


Figure 2-7 Surface Geological Plan of the Quarry

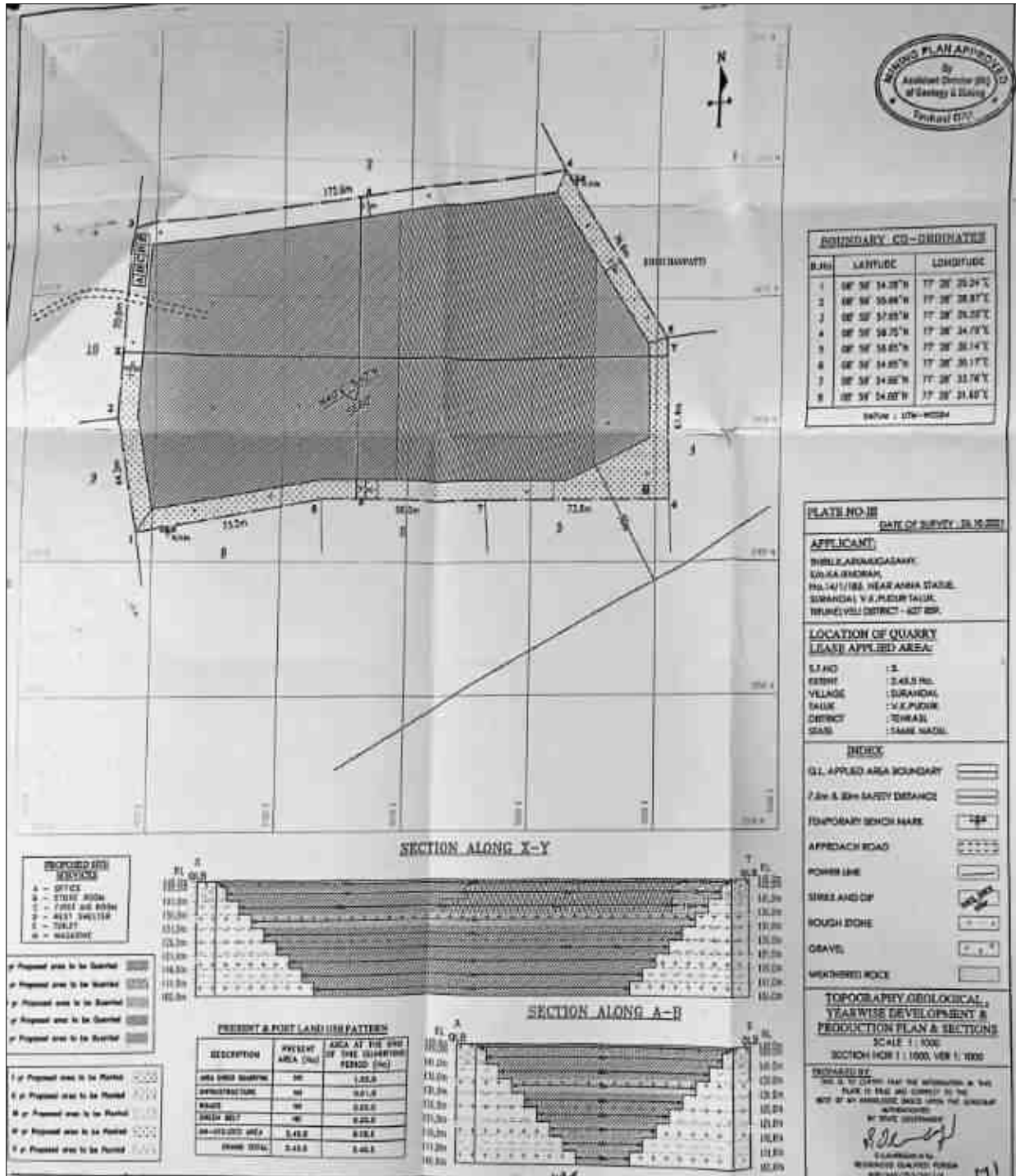


Figure 2-8 Yearwise Development & Production Plan and Sections

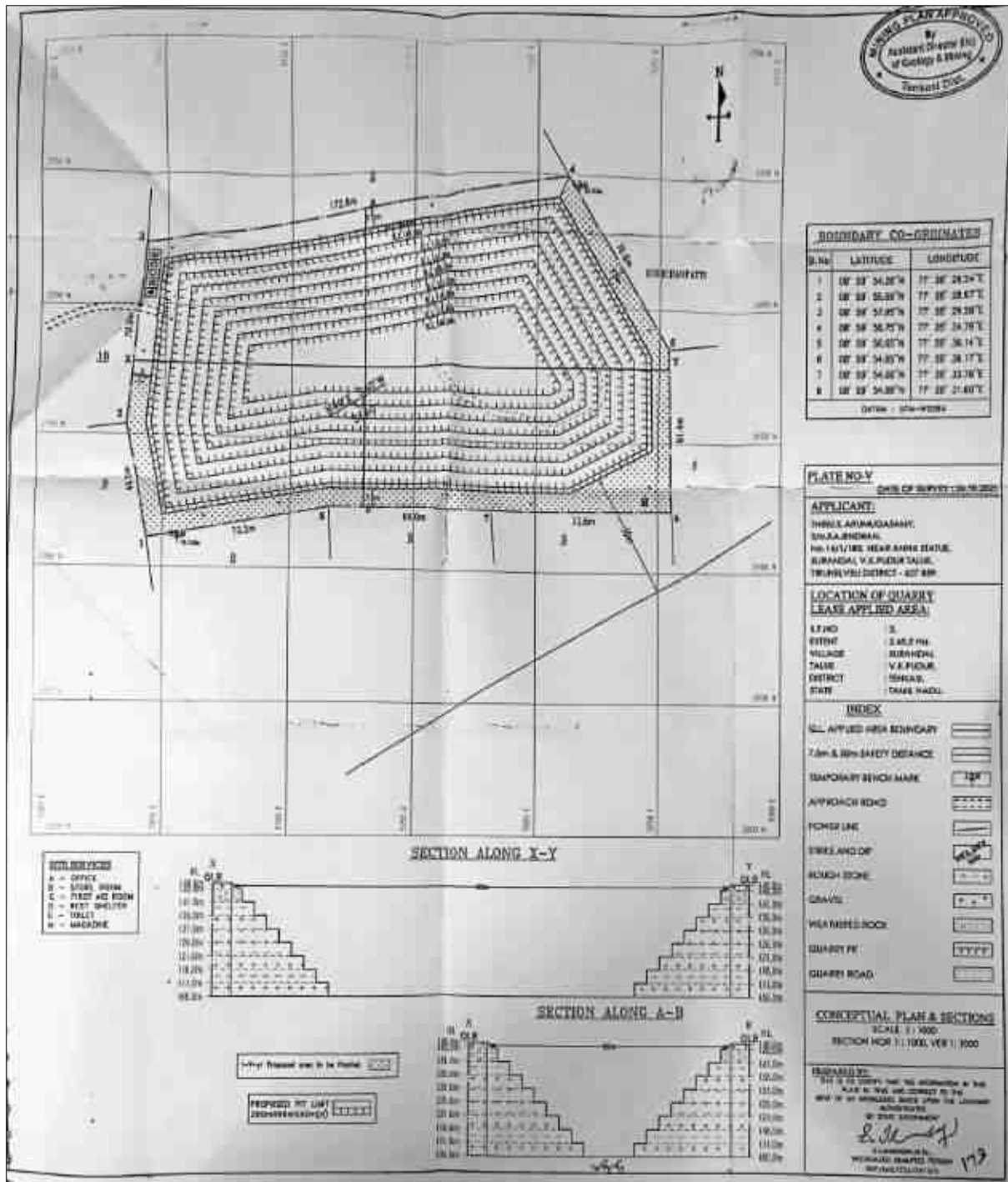


Figure 2-9 Conceptual Plan & Sections

Rough stone, Weathered Rock & Gravel Quarry over an extent of 2.45.5 Ha.

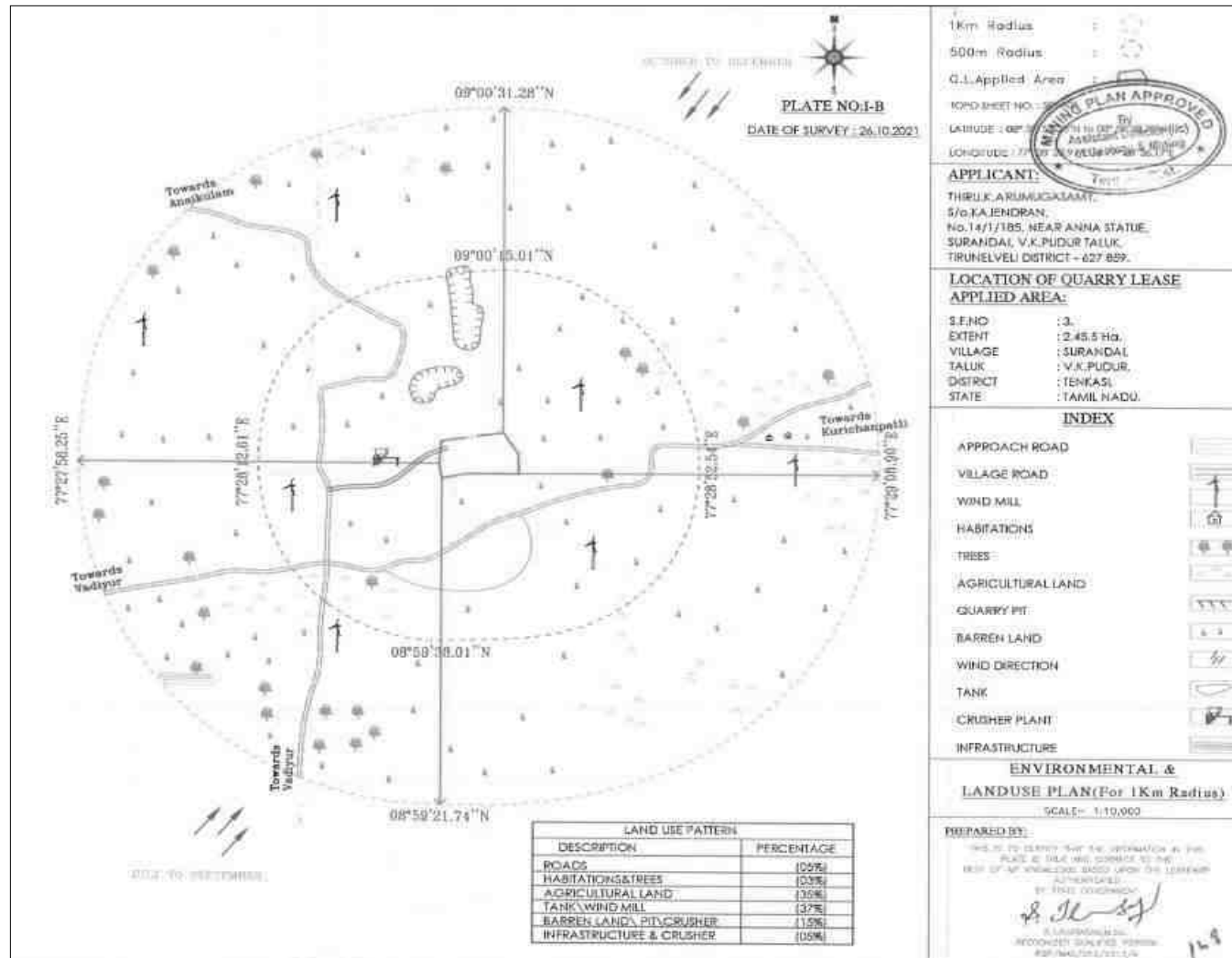


Figure 2-10 Environment Plan of the Quarry

2.7 Project Cost

The project cost estimated as Rs. 1,40,72,054/-

Table 2-6 Proposed Project Cost

S. No	Description	Amount (INR in Lakhs)
A. Project Cost/investment		
1	Land Cost	12,34,000/-
2	Machinery cost	40,00,000/-
3	Refilling/Fencing	1,89,000/-
4	Labours shed	2,00,000/-
5	Sanitary Facilities	2,00,000/-
6	Other items	1,20,000/-
7	Drinking water facilities	2,00,000/-
8	Safety kit	2,00,000/-
9	Water Sprinkling	2,00,000/-
10	Garland drains	1,74,000/-
11	Greenbelt development	55,000/-
	Total	67,72,000/-
B. EMP Cost (for 5 years)		73,00,054/-
Total Project Cost		1,40,72,054/-

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 2.45.50Ha. 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 20T capacity shall be utilized for all transportation purposes. In addition, certain service equipment like water tankers (for dust suppression), pick-up vehicle etc. 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 carried out by Opencast mechanized method which involves drilling, blasting and excavation. The drilling & blasting patterns are given below:

Depth of each hole	: 1.5m
Dia of hole	: 30-32mm
Spacing between the holes	: 1.2m
Burden for hole	: 1.0m
Pattern of hole	: Zig zag – Multi rows
Inclination of holes	: 80°from horizontal
Use of delay detonator	: 25millisecond relays
Detonating 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, 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

No. of holes proosed per day = 164Holes

Small dia of 25mm 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 tonnes per Kg. of explosives.

It is proposed to use slurry explosive. The charge per hole is 0.5 Kg; charging will be by cordtex fuse and with the combination of electric detonators and slurry explosive. Th etotal quantity of explosives required is about 82Kg of slurry explosives. Blasting will be carried out only in daytime.

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 & Transportation

The mode of transport of the excavated materials by road based through trucks to nearby crushers as needed. The estimated average saleable production of 2,83,500 m³ of Rough stone, 87,300m³ of Weathered rock and 38,400m³ of Gravel for 5 years. Each truck carries about 20T per trip and there were 5 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 a extraction of Rough stone, weathered rock & gravel quarry for a depth of 42m 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. 16.2 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. The entire 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	V.K. Pudur	Surandai Part I	3	2.45.5	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	1.92.0
Infrastructure	Nil	0.01.0
Roads	Nil	0.02.0
Greenbelt	Nil	0.32.0
Unutilized Area	2.45.5	0.18.5
Total	2.45.5	2.45.5

2.10.2 Water Requirement

The total water requirement is 3.0 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 (0.64 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	0.8
2	Dust Suppression	1.0
3	Greenbelt	1.2
	Total	3.0

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)	2,33,200

2.10.4 List of Machineries

The list of machineries 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	300 kg	3
2	Tippers	20 Tonnes	5
3	Jack Hammers	1.2m to 2.0m size capacity	7
4	Compressors	400psi	2

2.10.5 Manpower Requirement

Manpower details are given in Table 2-12.

Table 2-12 Manpower Details

S. No	Description	No of persons (Direct)
A. Mine official & Competent Persons:		
	Mines manager/Mines Foreman	1
	Mate/Blaster	1
B. Machinery Operators		
	Jack hammer operator	14
	Excavator Operator	3
	Tippers Driver	5
C. Ordinary Employee		
	Helper	3
	Cleaner & Co-operator	8
	Security	1
Total		36

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)	9.72	Municipal bin including food waste
2	Non-Biodegradable waste (Inorganic)	6.48	Disposed through authorized vendors
Total		16.2	

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

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

Rough stone, Weathered Rock & Gravel Quarry over an extent of 2.45.5 Ha.

- Screening & Scoping
- Environmental Pre-Feasibility study & application for approval of TOR
- Collection of detailed project management plan/report
- Baseline collection
- Impact identification, Prediction & Evaluation
- Mitigation measures & delineation of EMP
- Risk Assessment, 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.

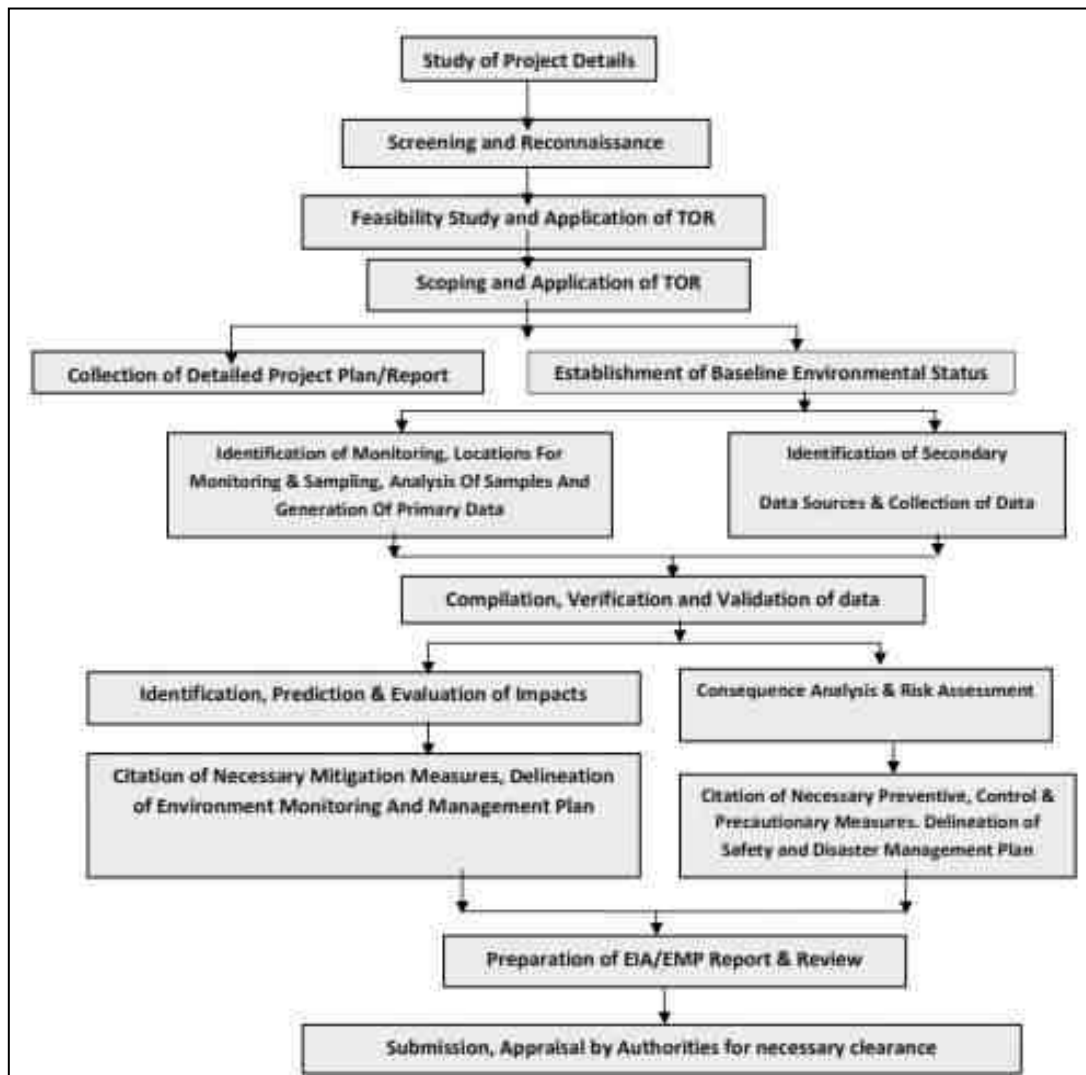


Figure 2-11 Feasibility & Environmental Assessment Process

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 6 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.

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 will be generated from quarry machinery and the same will be 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, SO₂ and Hydrocarbons. The sources of pollutants from the mining activity include:

- ✓ Operation of Mining machaneries 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 SO₂, 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 SO₂, 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

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

Stationary sources due to operation of heavyduty machinery at the project site like Compressors, Jack hummer, drilling machinery and transportation 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 levels of machinery can be categorized as noise due to static machinery like excavators, another category is noise generated due to moving machinery and noise due to tippers.

The noise levels from various activities are,

1. Tipper Empty- 88 to 91 dB (A)
2. Tipper Loaded - 95 to 103 dB (A)
3. Proclaim - 90 to 96 dB (A)

Another major source of noise is from blasting activity. Blasting noise is of very short duration achieving a peak level of 140 dB.

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, Excavator, etc, will be enclosed in an acoustic enclosure designed for an insertion loss of 25 dB (A) and silencers to other equipment etc.
- Drilling will be carried out with the help of sharp drill bits which will help in reducing noise.
- Secondary blasting will be totally avoided.
- Controlled blasting with proper spacing, burden, stemming and optimum charge/delay will be maintained.
- The blasting will be carried out during favorable atmospheric condition and less human activity timings i.e., during lunch interval or during change of shifts.

Rough stone, Weathered Rock & Gravel Quarry over an extent of 2.45.5 Ha.

- 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.
- 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 3.0 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 to that there 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. As, the mine lease area is a Hilly area, elevated at 175m (Max) AMSL. Hence, there will not be any groundwater level intersect as the planned depth of mining is 42m below ground Level.

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 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 reclamation.

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 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. Waste oil will be generated from quarry machinery and the same will be disposed through TNPCB Authorized dealers.

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**.

Rough stone, Weathered Rock & Gravel Quarry over an extent of 2.45.5 Ha.



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. 1200 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	Survival Rate	No. of Trees expected to grow	Total Area (Sq.m)
Ist	240	80%	192	640
IInd	240	80%	192	640
IIIrd	240	80%	192	640
IVth	240	80%	192	640
Vth	240	80%	192	640
Total	1200	80%	960	3200

2.15.10 Occupation Health 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 2.45.5 Hectares of Patta Land, located at SF. No. 3 of Surandai Part I Village, V. K. Pudur Taluk, Tenkasi District, TamilNadu State. 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 for Public Consultation. The details of the baseline conducted and the results we described in this chapter.

Table 3-1 Brief Description of the 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 site. The Topo Map of the study area is given in **Figure 3-1**.

Rough stone, Weathered Rock & Gravel Quarry over an extent of 2.45.5 Ha.

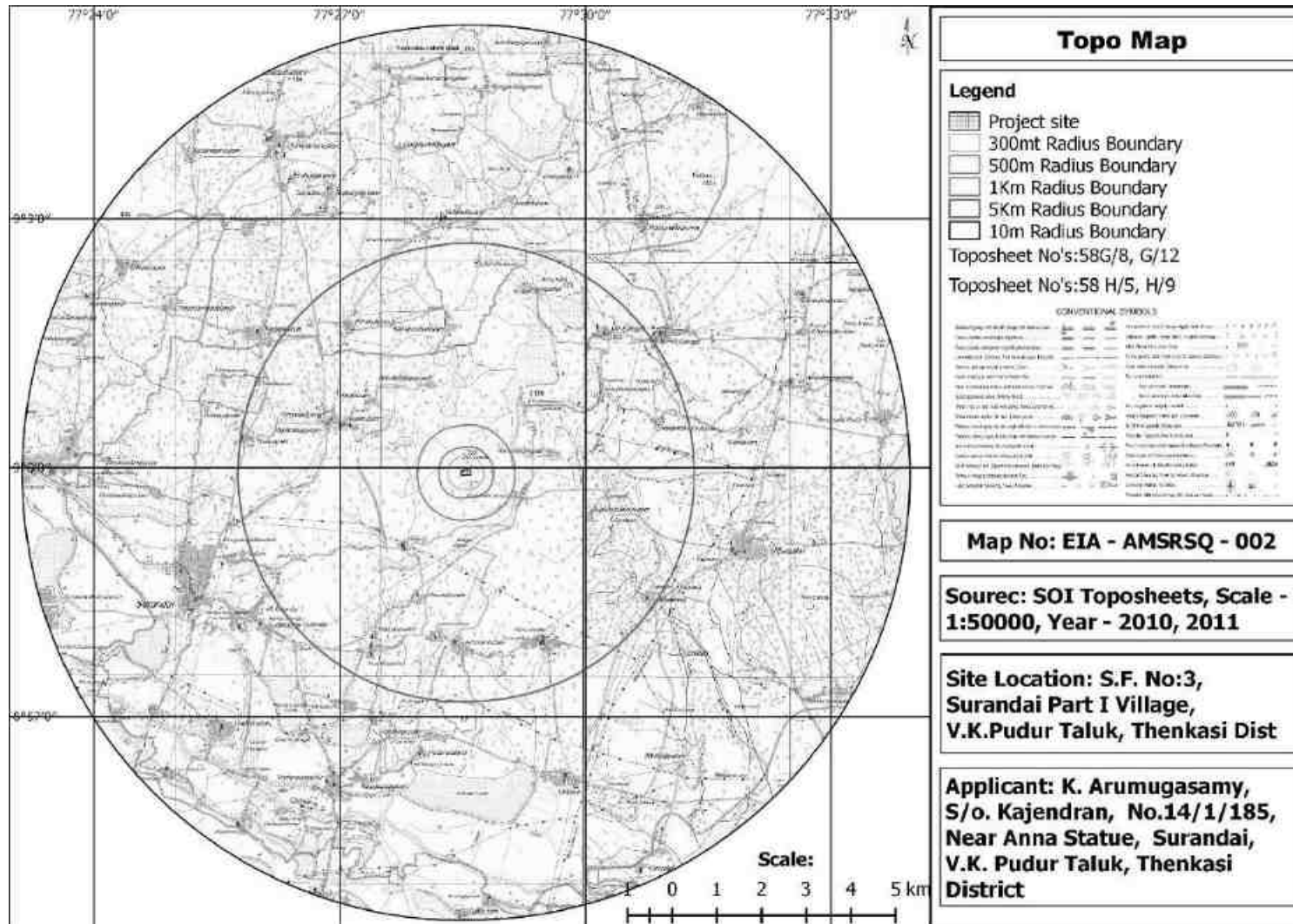


Figure 3-1 Topo Map of Study area

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 3-2**.

Table 3-2 Environmental Sensitive Areas within 15km from Project Boundary

S. No	Areas	Name/ Identity	Aerial distance (within 15 km.) Proposed project location boundary
1	Areas protected under international conventions, national or local legislation for their ecological, landscape, cultural or other related value	No	Nil

Rough stone, Weathered Rock & Gravel Quarry over an extent of 2.45.5 Ha.

2	Areas which are important or sensitive for ecological reasons - Wetlands, watercourses or other water bodies, coastal zone, biospheres, mountains, forests	Yes	Water Bodies:			
			S. No	Name	Distance (~ km)	Dir.
			1	Pond Near Site	0.17	S
			2	Lake Near Uchchipottai	1.16	ENE
			3	Lake Near Karuppinankulam	2.72	ENE
			4	Periya Devan Kulam	3.60	E
			5	Lake Near Kil Kalangal	5.60	E
			6	Lake Near Kulasekaramangalam	9.07	N
			7	Lake near Thannuthu	6.91	NNW
			8	Lake Near Kulayaneri	4.34	WNW
			9	Lake Near Dooraiswamipuram	6.19	W
			10	Lake Near Sundarapandiyapuram	8.86	W
			11	Lake Near Surandai	7.49	WSW
			12	Arundavarpiratti Kulam	5.84	SSW
			13	Viranamkulam	6.77	S
			14	Lake near Kidarakkulam	9.59	SE
			15	Chittar river	7.74	SSW
			16	Manur Channel	8.12	SSW
			17	Marantai Channel	9.18	S
			18	Canal	8.83	W
			19	Chittar Ar/Karuppa Nadi	6.29	SW
			20	Hanuman Nadi	13.61	W
			21	Pappan Channel	13.51	NW
			22	Canal	11.21	NNW
			23	Nettur Channel	9.34	SSE
			24	Pallikottai Channel	11.04	SSE
			25	Ukkirankottai Canal	13.39	SE
Reserve Forest:						
S. No	Name	Distance (~ km)	Direction			
1	Reserve Forest	4.97	S			
2	Okkanindran Pottai RF	11.5	S			
3	Kottaimalai PF	12.86	SSE			
4	Uttumalai RF	9.31	E			

3	Areas used by protected, important or sensitive species of flora or fauna for breeding, nesting, foraging, resting, over wintering, migration	No	Nil																																																																																																								
4	Inland, coastal, marine or underground waters	Yes	<table border="1"> <thead> <tr> <th>S. No</th> <th>Name</th> <th>Distance (~ km)</th> <th>Dir.</th> </tr> </thead> <tbody> <tr><td>1</td><td>Pond Near Site</td><td>0.17</td><td>S</td></tr> <tr><td>2</td><td>Lake Near Uchchipottai</td><td>1.16</td><td>ENE</td></tr> <tr><td>3</td><td>Lake Near Karuppinankulam</td><td>2.72</td><td>ENE</td></tr> <tr><td>4</td><td>Periya Devan Kulam</td><td>3.60</td><td>E</td></tr> <tr><td>5</td><td>Lake Near Kil Kalangal</td><td>5.60</td><td>E</td></tr> <tr><td>6</td><td>Lake Near Kulasekaramangalam</td><td>9.07</td><td>N</td></tr> <tr><td>7</td><td>Lake near Thannuthu</td><td>6.91</td><td>NNW</td></tr> <tr><td>8</td><td>Lake Near Kulayaneri</td><td>4.34</td><td>WNW</td></tr> <tr><td>9</td><td>Lake Near Dooraiswamipuram</td><td>6.19</td><td>W</td></tr> <tr><td>10</td><td>Lake Near Sundarapandiyapuram</td><td>8.86</td><td>W</td></tr> <tr><td>11</td><td>Lake Near Surandai</td><td>7.49</td><td>WSW</td></tr> <tr><td>12</td><td>Arundavarpiratti Kulam</td><td>5.84</td><td>SSW</td></tr> <tr><td>13</td><td>Viranamkulam</td><td>6.77</td><td>S</td></tr> <tr><td>14</td><td>Lake near Kidarakkulam</td><td>9.59</td><td>SE</td></tr> <tr><td>15</td><td>Chittar river</td><td>7.74</td><td>SSW</td></tr> <tr><td>16</td><td>Manur Channel</td><td>8.12</td><td>SSW</td></tr> <tr><td>17</td><td>Marantai Channel</td><td>9.18</td><td>S</td></tr> <tr><td>18</td><td>Canal</td><td>8.83</td><td>W</td></tr> <tr><td>19</td><td>Chittar Ar/Karuppa Nadi</td><td>6.29</td><td>SW</td></tr> <tr><td>20</td><td>Hanuman Nadi</td><td>13.61</td><td>W</td></tr> <tr><td>21</td><td>Pappan Channel</td><td>13.51</td><td>NW</td></tr> <tr><td>22</td><td>Canal</td><td>11.21</td><td>NNW</td></tr> <tr><td>23</td><td>Nettur Channel</td><td>9.34</td><td>SSE</td></tr> <tr><td>24</td><td>Pallikottai Channel</td><td>11.04</td><td>SSE</td></tr> <tr><td>25</td><td>Ukkirankottai Canal</td><td>13.39</td><td>SE</td></tr> </tbody> </table>	S. No	Name	Distance (~ km)	Dir.	1	Pond Near Site	0.17	S	2	Lake Near Uchchipottai	1.16	ENE	3	Lake Near Karuppinankulam	2.72	ENE	4	Periya Devan Kulam	3.60	E	5	Lake Near Kil Kalangal	5.60	E	6	Lake Near Kulasekaramangalam	9.07	N	7	Lake near Thannuthu	6.91	NNW	8	Lake Near Kulayaneri	4.34	WNW	9	Lake Near Dooraiswamipuram	6.19	W	10	Lake Near Sundarapandiyapuram	8.86	W	11	Lake Near Surandai	7.49	WSW	12	Arundavarpiratti Kulam	5.84	SSW	13	Viranamkulam	6.77	S	14	Lake near Kidarakkulam	9.59	SE	15	Chittar river	7.74	SSW	16	Manur Channel	8.12	SSW	17	Marantai Channel	9.18	S	18	Canal	8.83	W	19	Chittar Ar/Karuppa Nadi	6.29	SW	20	Hanuman Nadi	13.61	W	21	Pappan Channel	13.51	NW	22	Canal	11.21	NNW	23	Nettur Channel	9.34	SSE	24	Pallikottai Channel	11.04	SSE	25	Ukkirankottai Canal	13.39	SE
S. No	Name	Distance (~ km)	Dir.																																																																																																								
1	Pond Near Site	0.17	S																																																																																																								
2	Lake Near Uchchipottai	1.16	ENE																																																																																																								
3	Lake Near Karuppinankulam	2.72	ENE																																																																																																								
4	Periya Devan Kulam	3.60	E																																																																																																								
5	Lake Near Kil Kalangal	5.60	E																																																																																																								
6	Lake Near Kulasekaramangalam	9.07	N																																																																																																								
7	Lake near Thannuthu	6.91	NNW																																																																																																								
8	Lake Near Kulayaneri	4.34	WNW																																																																																																								
9	Lake Near Dooraiswamipuram	6.19	W																																																																																																								
10	Lake Near Sundarapandiyapuram	8.86	W																																																																																																								
11	Lake Near Surandai	7.49	WSW																																																																																																								
12	Arundavarpiratti Kulam	5.84	SSW																																																																																																								
13	Viranamkulam	6.77	S																																																																																																								
14	Lake near Kidarakkulam	9.59	SE																																																																																																								
15	Chittar river	7.74	SSW																																																																																																								
16	Manur Channel	8.12	SSW																																																																																																								
17	Marantai Channel	9.18	S																																																																																																								
18	Canal	8.83	W																																																																																																								
19	Chittar Ar/Karuppa Nadi	6.29	SW																																																																																																								
20	Hanuman Nadi	13.61	W																																																																																																								
21	Pappan Channel	13.51	NW																																																																																																								
22	Canal	11.21	NNW																																																																																																								
23	Nettur Channel	9.34	SSE																																																																																																								
24	Pallikottai Channel	11.04	SSE																																																																																																								
25	Ukkirankottai Canal	13.39	SE																																																																																																								
5	State, National boundaries	No	Nil																																																																																																								

Rough stone, Weathered Rock & Gravel Quarry over an extent of 2.45.5 Ha.

6	Routes or facilities used by the public for access to recreation or other tourist, pilgrim areas	Yes de	<ul style="list-style-type: none"> ➤ MDR-541: Surandai – Senthamaram Road, ~ 4.72km (WNW) ➤ SH-39A: Sengottai – Pavorchatram (via) Surandai, ~ 6.6km (WSW) ➤ NH-744: Kollam (Kerala) – Madurai (TN), ~ 15.28km (WNW) 																																																																																																				
7	Defense installations	No	Nil																																																																																																				
8	Densely populated or built-up area	Yes	<table border="1"> <thead> <tr> <th>S. No</th> <th>Name of the Village</th> <th>Approximate distance & Direction from lease applied area</th> <th>Population as per the Census 2011</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>Kurichanpatti</td> <td>2.0km (NE)</td> <td>1500</td> </tr> <tr> <td>2.</td> <td>Karaiyalanur</td> <td>1.0km (SE)</td> <td>1700</td> </tr> <tr> <td>3.</td> <td>Vadiyur</td> <td>1.0km (SW)</td> <td>2100</td> </tr> </tbody> </table>	S. No	Name of the Village	Approximate distance & Direction from lease applied area	Population as per the Census 2011	1.	Kurichanpatti	2.0km (NE)	1500	2.	Karaiyalanur	1.0km (SE)	1700	3.	Vadiyur	1.0km (SW)	2100																																																																																				
S. No	Name of the Village	Approximate distance & Direction from lease applied area	Population as per the Census 2011																																																																																																				
1.	Kurichanpatti	2.0km (NE)	1500																																																																																																				
2.	Karaiyalanur	1.0km (SE)	1700																																																																																																				
3.	Vadiyur	1.0km (SW)	2100																																																																																																				
9	Areas occupied by sensitive man-made land uses (Hospitals, schools, places of worship, community facilities)	Yes	<p>List of Schools & Colleges</p> <table border="1"> <thead> <tr> <th>S. No</th> <th>Name</th> <th>Dist. (~ km)</th> <th>Dir.</th> </tr> </thead> <tbody> <tr><td>1</td><td>GHSS</td><td>2.67</td><td>WNW</td></tr> <tr><td>2</td><td>GHS</td><td>2.77</td><td>WNW</td></tr> <tr><td>3</td><td>PUPS</td><td>2.5</td><td>NW</td></tr> <tr><td>4</td><td>Hindu Nadar High School</td><td>5.19</td><td>NW</td></tr> <tr><td>5</td><td>Sri Ramakrishna Nursery & Primary School</td><td>7.19</td><td>NW</td></tr> <tr><td>6</td><td>Ramar Middle School</td><td>7.15</td><td>NW</td></tr> <tr><td>7</td><td>Primary School</td><td>9.37</td><td>NW</td></tr> <tr><td>8</td><td>R.C. Elementary School</td><td>10.43</td><td>NW</td></tr> <tr><td>9</td><td>RC Primary School</td><td>4.35</td><td>NE</td></tr> <tr><td>10</td><td>Harijan Middle School</td><td>5.43</td><td>NE</td></tr> <tr><td>11</td><td>CET Tennyson High School</td><td>6.22</td><td>ENE</td></tr> <tr><td>12</td><td>PUPS</td><td>3.44</td><td>ENE</td></tr> <tr><td>13</td><td>GPS</td><td>2.83</td><td>ESE</td></tr> <tr><td>14</td><td>TDTA Primary School</td><td>6.44</td><td>ESE</td></tr> <tr><td>15</td><td>GHSS</td><td>7.95</td><td>ESE</td></tr> <tr><td>16</td><td>Harijan Middle school</td><td>10.48</td><td>ENE</td></tr> <tr><td>17</td><td>TDTA Primary School</td><td>6.67</td><td>NE</td></tr> <tr><td>18</td><td>Shri Bharath Kanna Matriculation School</td><td>7.27</td><td>NE</td></tr> <tr><td>19</td><td>GHSS Naduvakurichi</td><td>11.14</td><td>N</td></tr> <tr><td>20</td><td>Vivekananda Global School</td><td>10.28</td><td>NNW</td></tr> <tr><td>21</td><td>GHSS Veerasigamani</td><td>10.68</td><td>NNW</td></tr> <tr><td>22</td><td>Anganwadi Veerasigamani</td><td>10.42</td><td>NNW</td></tr> <tr><td>23</td><td>Hindu Elementary School</td><td>10.43</td><td>NNW</td></tr> <tr><td>24</td><td>TDTA middle school solaiseri</td><td>7.42</td><td>SSE</td></tr> </tbody> </table>	S. No	Name	Dist. (~ km)	Dir.	1	GHSS	2.67	WNW	2	GHS	2.77	WNW	3	PUPS	2.5	NW	4	Hindu Nadar High School	5.19	NW	5	Sri Ramakrishna Nursery & Primary School	7.19	NW	6	Ramar Middle School	7.15	NW	7	Primary School	9.37	NW	8	R.C. Elementary School	10.43	NW	9	RC Primary School	4.35	NE	10	Harijan Middle School	5.43	NE	11	CET Tennyson High School	6.22	ENE	12	PUPS	3.44	ENE	13	GPS	2.83	ESE	14	TDTA Primary School	6.44	ESE	15	GHSS	7.95	ESE	16	Harijan Middle school	10.48	ENE	17	TDTA Primary School	6.67	NE	18	Shri Bharath Kanna Matriculation School	7.27	NE	19	GHSS Naduvakurichi	11.14	N	20	Vivekananda Global School	10.28	NNW	21	GHSS Veerasigamani	10.68	NNW	22	Anganwadi Veerasigamani	10.42	NNW	23	Hindu Elementary School	10.43	NNW	24	TDTA middle school solaiseri	7.42	SSE
S. No	Name	Dist. (~ km)	Dir.																																																																																																				
1	GHSS	2.67	WNW																																																																																																				
2	GHS	2.77	WNW																																																																																																				
3	PUPS	2.5	NW																																																																																																				
4	Hindu Nadar High School	5.19	NW																																																																																																				
5	Sri Ramakrishna Nursery & Primary School	7.19	NW																																																																																																				
6	Ramar Middle School	7.15	NW																																																																																																				
7	Primary School	9.37	NW																																																																																																				
8	R.C. Elementary School	10.43	NW																																																																																																				
9	RC Primary School	4.35	NE																																																																																																				
10	Harijan Middle School	5.43	NE																																																																																																				
11	CET Tennyson High School	6.22	ENE																																																																																																				
12	PUPS	3.44	ENE																																																																																																				
13	GPS	2.83	ESE																																																																																																				
14	TDTA Primary School	6.44	ESE																																																																																																				
15	GHSS	7.95	ESE																																																																																																				
16	Harijan Middle school	10.48	ENE																																																																																																				
17	TDTA Primary School	6.67	NE																																																																																																				
18	Shri Bharath Kanna Matriculation School	7.27	NE																																																																																																				
19	GHSS Naduvakurichi	11.14	N																																																																																																				
20	Vivekananda Global School	10.28	NNW																																																																																																				
21	GHSS Veerasigamani	10.68	NNW																																																																																																				
22	Anganwadi Veerasigamani	10.42	NNW																																																																																																				
23	Hindu Elementary School	10.43	NNW																																																																																																				
24	TDTA middle school solaiseri	7.42	SSE																																																																																																				

Rough stone, Weathered Rock & Gravel Quarry over an extent of 2.45.5 Ha.

25	Vivekananda Kendra Middle School	3.66	SE
26	Kamarajar Govt. Arts & Science College	6.56	SW
27	Hindu Primary School	8.78	WNW
28	GHSS	7.6	NNW
29	St. Joseph Public School	7.41	NW
30	TDTA middle school Karuvantha	4.31	SSE
31	MSU Member Collage Naduvakurichi	13.22	N
32	Govt. Elementry School	13.62	N
33	Madathiyammal Hindu Middle School	9.71	NNE
34	St. Joseph GHSS	8.39	NNW
35	TADA Primary School	1.73	ENE
36	Govt School	10.45	ESE
37	Govt High School Nelliyankulam	6.66	ESE
38	PUPS Vadakkukavalakurichi	9.38	ESE
39	Jesus Loves Nursery & Primary School	12.37	SE
40	BVM Matriculation School	12.81	SE
41	Jesus Loves MHSS	12.51	SE
42	Jackson Matriculation School	13.21	ESE
43	Bharathi Vidhya Mandhir	13.37	SE
44	Govt Primary School	5.35	N
45	Govt. Arts & Science College-Women	14.37	S
46	Jeeva MM HSS	13.5	S
47	CSI JA College	14.64	SSE
48	SVS School	14.74	SSE
49	Annasamy rajammal Collehe of Nursing	13.84	S
50	Sardar Raja College of Engineering	13.33	S
51	Hindu High School	12.08	SSW
52	SMA MHSS	13.15	SSW
53	Jeeva Morden School	14.11	SSW
54	TDTA Middle School	14.26	SSW
55	Hindu Pr. School	13.26	SSW
56	Avviyar GHSS	13.84	SW
57	Appu Play School	13.87	SW
58	St. Assisi MHSS	13.64	SW

Rough stone, Weathered Rock & Gravel Quarry over an extent of 2.45.5 Ha.

			59	M.S.P. Velayutha Nadar Lakshmi Thaimmal Polytechnic College	13.5	SW
			60	Shalom MHSS	14.1	SW
			61	Sri Nellai ITI	14.3	SW
			62	Hindu PS	13.97	SW
			63	SS Kids Play School	13.07	SW
			64	Creative Nursery & Primary School	5.44	WSW
			65	Rajendra wisdom school	6.02	WSW
			66	A.G Matriculation School	6.23	WSW
			67	Jawaharlal Middle School	6.27	WSW
			68	Sri Jayendra Matriculation Higher Secondary School	6.57	WSW
			69	GHSS Surandai	7.21	WSW
			70	Parasakthi Matriculation School (Sermathai Vasan)	7.23	WSW
			71	Barenbruck Higher Secondary School	5.59	SW
			72	Barenbruck Primary School	5.58	SW
			73	Anna Boys Higher Secondary School	7.12	SSW
			74	St. Antony's girls Higher Secondary School	7.26	SSW
			75	Government Primary School	7.24	SSW
			76	Anna Teacher Training Institute	7.3	SSW
			77	RC Primary School	7.44	SSW
			78	Government Higher Secondary School	7.44	SSW
			79	T.D.T.A School	6.25	SSW
			80	Muslim Primary School	6.96	SSE
			81	Nachiyarpuram School	8.14	SE
			82	Grama Committee HSS	12.11	SE
			83	Saraswathi Vidyasalai ES	11.64	SE
			84	PUPS Agaram	8.82	SSE
			85	Brighton School	8.05	W
			86	Govt. PS	8.89	W
			87	GHSS	9.03	W
			88	Salvation army matric school	9.19	W
			89	GPS	9.62	W
			90	GPS	14.08	NNW
			List of Hospitals:			

Rough stone, Weathered Rock & Gravel Quarry over an extent of 2.45.5 Ha.

S. No	Name	Dist. (~ km)	Dir.
1	PHC Alangulam	13.65	N
2	Kamala Nursing Home	5.26	NE
3	GH	4.67	W
4	GH	2.76	WNW
5	GH Serndamaram	6.69	WNW
6	St. Luck Hospital	3	SSW
7	Hospital Parankuntrapuram	4.42	SSW
8	GH	5.83	ESE
9	Rex Clinic	6.19	ESE
10	Jai Sriram Polyclinic	6.27	ESE
11	Siddha Hospital	6.53	ESE
12	Vijayan Hospital	5.53	WSW
13	Rithika Hospital	13.08	NNW
14	Latha Hospital	13.12	NNW
15	Susila Hospital	13.08	NNW
16	GH/PHC	13.19	NNW
17	Dr. P. M. Hospital	13.61	NNW
18	NKT Nature care & Yoga hospital	13.65	NNW
19	Raja Hospital	13.72	NNW
20	Bell Hospital	14.4	NNW
21	Sri Alagu Hospital	7.67	SSW
22	Sakthi Hospital	14.72	S
23	GH	14.69	S
24	PHC	14.75	S
25	RK Hospital	14.21	S
26	Jayalakshmi M.S. Hospital	14.63	S
27	Sriram Hospital	14.39	S
28	Mani Hospital	14.5	S
29	Christ Hospital	7.13	WNW
30	Veterinary Hospital	11.76	N
31	Dhanya Clinic	10.46	NNW
32	Varma Clinic	12.67	NNW
33	Tirumalai Clinic	5.75	NE

Rough stone, Weathered Rock & Gravel Quarry over an extent of 2.45.5 Ha.

34	GH Sambavarvadakarai	7.97	W
35	Suba Hospital	14.54	W
36	GH Surandai	6.6	WSW
37	Madura Hospital	5.96	SW
38	Ponra Hospital	6.1	WSW
39	Shanthi Nursing Home	6.09	WSW
40	Shri Gurudatt Hospital	6.37	WSW
41	Kamala Hospital	6.45	WSW
42	Mahalakshmi Hospital	6.49	WSW
43	Maris Hospital	6.64	SW
44	GH	9.84	SW
45	Govt. Sidhdha Hospital	11.08	SW
46	Hospital	5.87	S
47	GH VK. Pudur	7.11	SSW
48	SLP City Hospital	9.51	S
49	GH	6.88	SSE
50	Tamilselvan Hospital	12.75	SE

List of Common Buildings:

S. No	Name	Dist. (~ km)	Dir.
1	New Post office Uthumalai	6.12	ESE
2	Post office	2.85	WNW
3	Kurichan patti Post office	1.77	ENE
4	Post office	4.32	SSW
5	Anaikulam Panchayat Office	2.89	WNW
6	Kulaiyaneri Post Office	4.95	W
7	Police Station	6.22	E
8	Police Station	14.7	NE
9	Veerasingamani Police Station	10.57	NNW
11	Serndamaram Police Station	7.89	NNW
12	Panchayat Office	11.21	N
13	Public Library	14.62	S
14	Dr.APJ AK Library	13.62	SSW
15	Public Library	9.84	SSW
16	Public Library	11.89	SW
17	Sailapathy Ninaivu Tidal	12.14	SW
18	GFC Stadium	14.42	S
19	Keela Veerasingamani Panchayat office	13.69	N
20	Post Office Pavoorchatram	13.66	SW
21	Police Station Pavoorchatram	13.57	SW
22	Police Station Surandai	6.91	WSW
23	Surandai Post Office	6.37	SW

Rough stone, Weathered Rock & Gravel Quarry over an extent of 2.45.5 Ha.

24	Surandai Library	6.69	WSW
25	Abraham Memorial Library	5.54	SW
26	Public Library	4.46	SSW
27	Lakshmpuram Library	3.61	S
28	Govt. Library	8.05	SW
29	Govt. Library	9.8	WSW
30	Library	13.32	SW
31	Kulaiyaneri Library	4.92	W
32	Public Library	14.53	W
33	Poigai Library	10.29	NW
34	Post office	9.18	W

List of Religious Places:

S. No	Name	Dist. (~ km)	Dir.
1	Kompumadan Temple	6.19	NNW
2	Mariyamman Temple	6.29	NNW
3	Ayyanar Koil	7.13	NNW
4	Madan Koil	7.1	NNW
5	Pillaiyar Koil	6.76	NNW
6	Palvannanathar Temple	6.73	NNW
7	Vairavar Tempel	7.25	NNW
8	Arockiya Madha Church	7.4	NNW
9	Church of God	8.03	NNW
11	St. Peter & Paul Church	8.28	NNW
12	Assemlies of God church	8.37	NNW
13	St.Joseph church	5.51	N
14	Vinayagar Temple	5.44	N
15	St.Antony's Church	10.49	NW
16	Amman Koil	10.47	NW
17	Masjid	10.48	NNW.
18	Jumma Masjid	10.84	NNW
19	Santhiamman Temple	10.19	NNW
20	Arasadi Vinayagar Temple	10.3	NNW
21	Bhrammaratchi Amman Koil	10.44	NNW
22	Shri Sivan Koil	10.84	NNW
23	Sri Krishna Temple	13.73	N
24	CSI Church	13.79	N
25	Lord Jesus Christ church	13.51	N
26	Vadakasi Amman Temple	13.02	N
27	Makalai Amman Temple	11.49	N
28	Sivasakthi Temple	10.98	N
29	Harihara Puthuthera Ayyanar Kovil	10.69	N

Rough stone, Weathered Rock & Gravel Quarry over an extent of 2.45.5 Ha.

30	Kanni Amman Temple	9.77	N
31	Shri Vannar Madasamy Kovil	9.82	N
32	Anakkari Madan Temple	5.9	N
33	Alagu Parvathy Amman temple	6.76	NE
34	Vadakasi Amman Temple	6.5	NE
35	Madan Koil	7.08	NNE
36	Sri Muppuli Madasamy Temple	7.03	NNE
37	Arulmigu Shri Vadakasi Amman Kovil	7.15	NNE
38	Malaikali Amman Kovil	4.58	NNE
39	Shri Pillaiyar Kovil	4.21	NE
40	RC Church	4.38	NE
41	CSI Christ Church	5.18	NE
42	Christu Arasar Church	5.15	NE
43	Matha Kovil	5.32	NE
44	Periya Pillaiyar Kovil	5.17	NE
45	The Pentecoastal Mission	5.64	ENE
46	Jumma	5.45	NE
47	Dhargha	5.05	NE
48	Arulmigu Vadakasi Amman Temple	4.46	NE
49	CSI Church	4.44	NE
50	Shrinivasaperumal Temple	7.55	ENE
51	Varasithi Vinayagar Kovil	7.33	ENE
52	Sivan Temple	9.42	E
53	Kaliamman Temple	8.25	ENE
54	Sambutha Madasamy Temple	10.83	ENE
55	Vinayagar Temple	4.52	NNW
56	Karuppusamy Kovil	4.71	NNW
57	Sri Vadakasi Amman Kovil	4.95	NE
58	Arulmigu Oomaiyapper Temple	11.93	NNE
59	Maravan Kottai Temple	13.26	NNE
60	Sri Batrakali Amman Temple	6.61	E
61	Uchinimakali Amman Koil	6.43	ESE
62	Maravar Amman Kovil	6.08	ESE
63	Shri Kaliyamman Kovil	6.57	ESE
64	Maalayamman Temple	6.01	ESE
65	Shri Murugan Kovil	6.07	ESE
66	CSI Church	3.27	SSE
67	Shri Amman Kovil	3.53	SSE
68	BG Church	6.91	ESE

Rough stone, Weathered Rock & Gravel Quarry over an extent of 2.45.5 Ha.

69	St. John's Church	5.97	ESE
70	CSI St. Paul's Church	6.35	ESE
71	CSI St. Michael's Church	4.84	SE
72	Seventhday Adventist Church	4.99	SE
73	Jumma Mosque	6.23	ESE
74	Patrakalai Amman Kovil	4.09	SSE
75	Om Sakthi Kovil	3.93	SSE
76	Sri Thiripura Sundari Amman Temple	3.99	SSE
77	Karaiyadi Madasamy Temple	4.02	SSE
78	Sudalaimadasamy Temple	4.17	SSE
79	Good Saviour Prayer House	3.87	SSE
80	St. Francis Xavier Church	3.96	SSE
81	CSI St. Matthew's Church	4.07	SSE
82	St. Andrews Church	4.14	SSW
83	Sudalai Madasamy Temple	5.1	SW
84	CSI St. Stephen's Church	5.63	WSW
85	Arulmigu Parumbadi Madasamy Kovil	5.01	W
86	Ammayapuram Church	3.12	NW
87	Periyandavar Kovil	3.16	NW
88	Shri Santhana Mariyamman Kovil	3.24	NW
89	Shri Ponvandu Ayyanar Temple	2.14	NNW
90	Kaliyamman Temple	2.1	NNW
91	Pillaiyar Temple	2.12	NNW
92	Om Sakthi Kovil	3.25	N
93	Sri Mariamman Temple	3.21	N
94	Sadalaimadasamy Temple	4.07	NW
95	CSI St. James Church	5.52	WNW
96	CSI St. Paul's Church	4.77	WNW
97	Sri Palaya Kottai Iyyanar Kovil	5.07	NW
98	Arulmigu aasoori Amman Kovil	5.24	NW
99	Maariamman Kovil	7.11	NW
100	Shri Murukar Kovil	7.12	NW
101	CSI Transfiguration Church	14.82	S
102	Good Shepherd Church	14.58	S
103	Holy Redeemers Church	14.8	S
104	Shri Murugan Kovil	14.55	S
105	Shri Batrakaliamman Temple	14.47	SSE
106	Sakthi Kovil	13.55	SSW

Rough stone, Weathered Rock & Gravel Quarry over an extent of 2.45.5 Ha.

107	Kaliamman Kovil	13.39	SSW
108	St. Pauls Church	13.05	SSW
109	Sastha Temple	13.14	SSW
110	St. Peters Church	12.55	SSW
111	KNV Muppudathi Amman Kovil	12.94	SSW
112	Good Samaritan Church	14.6	SSW
113	Good Shepherd Church	13.27	SSW
114	Jumma	9.92	SSW
115	Pillaiyar Koil	4.14	NW
116	Selvaragava Perumal Temple	7.52	ENE
117	Selva Vinayagar Temple	1.05	SE
118	Manikka Iyyanar Kovil	0.91	SE
119	St. Thomas Believers Eastern Church	7.5	SSE
120	CSI Holy Trinity Church	7.19	SSE
121	AG Church	7.25	SSE
122	Kuruvankottai Mariyamman Temple	12.77	SSE
123	Amman Temple	13.61	SW
124	Pillaiyar Koil	13.75	SW
125	Vennimalai Murugan Temple	13.51	SW
126	CSI Church	13.71	SW
127	RC Church	13.75	SW
128	CSI St. Paul's Church	12.42	SW
129	Gethsemane Prayer Garden	13.75	SW
130	Gospel Church	14.62	SW
131	Maranatha Church	13.29	SW
132	KHAJA BEEDI MOSQUE	14.31	SW
133	Mohideen Jumma masjid	12.07	WSW
134	Shri Vinayagar temple	9.44	WSW
135	Shri Sivan Temple	9.52	SW
136	Sri Muppudathi Amman Temple	6.76	SW
137	Shri Saptha Kannai Amman Kovil	7.45	WSW
138	Swamy Ayyappan Temple	8.73	W
139	Sri Vetri Vinayagar Temple	9.33	W
140	Shri Balasubrahmanya Swami Temple	14.72	W

Rough stone, Weathered Rock & Gravel Quarry over an extent of 2.45.5 Ha.

10	Areas containing important, high quality or scarce resources. (Ground water resources, surface resources, forestry, agriculture, fisheries, tourism, minerals)	Yes	<u>Water Bodies:</u>			
			S. No	Name	Dist. (~km)	Dir.
			1	Pond Near Site	0.17	S
			2	Lake Near Uchchipottai	1.16	ENE
			3	Lake Near Karuppinankulam	2.72	ENE
			4	Periya Devan Kulam	3.60	E
			5	Lake Near Kil Kalangal	5.60	E
			6	Lake Near Kulasekaramangalam	9.07	N
			7	Lake near Thannuthu	6.91	NNW
			8	Lake Near Kulayaneri	4.34	WNW
			9	Lake Near Dooraiswamipuram	6.19	W
			10	Lake Near Sundarapandiyapuram	8.86	W
			11	Lake Near Surandai	7.49	WSW
			12	Arundavarpiratti Kulam	5.84	SSW
			13	Viranamkulam	6.77	S
			14	Lake near Kidarakkulam	9.59	SE
			15	Chittar river	7.74	SSW
			16	Manur Channel	8.12	SSW
			17	Marantai Channel	9.18	S
			18	Canal	8.83	W
			19	Chittar Ar/Karuppa Nadi	6.29	SW
			20	Hanuman Nadi	13.61	W
			21	Pappan Channel	13.51	NW
			22	Canal	11.21	NNW
			23	Nettur Channel	9.34	SSE
			24	Pallikottai Channel	11.04	SSE
			25	Ukkirankottai Canal	13.39	SE
<u>Reserve Forest:</u>						
S. No	Name	Distance (~km)	Direction			
1	Reserve Forest	4.97	S			
2	Okkanindran Pottai RF	11.5	S			
3	Kottaimalai PF	12.86	SSE			
4	Uttumalai RF	9.31	E			

11	Areas already subjected to pollution or environmental damage. <i>(Those where existing legal environmental standards are exceeded)</i>	No	Nil
12	Areas susceptible to natural hazard which could cause the project to present environmental problems. <i>(Rough stone and Earthquakes, subsidence, landslides, erosion, flooding or extreme or adverse climatic conditions)</i>	No	The Project Site falls under the Zone –II

Rough stone, Weathered Rock & Gravel Quarry over an extent of 2.45.5 Ha.

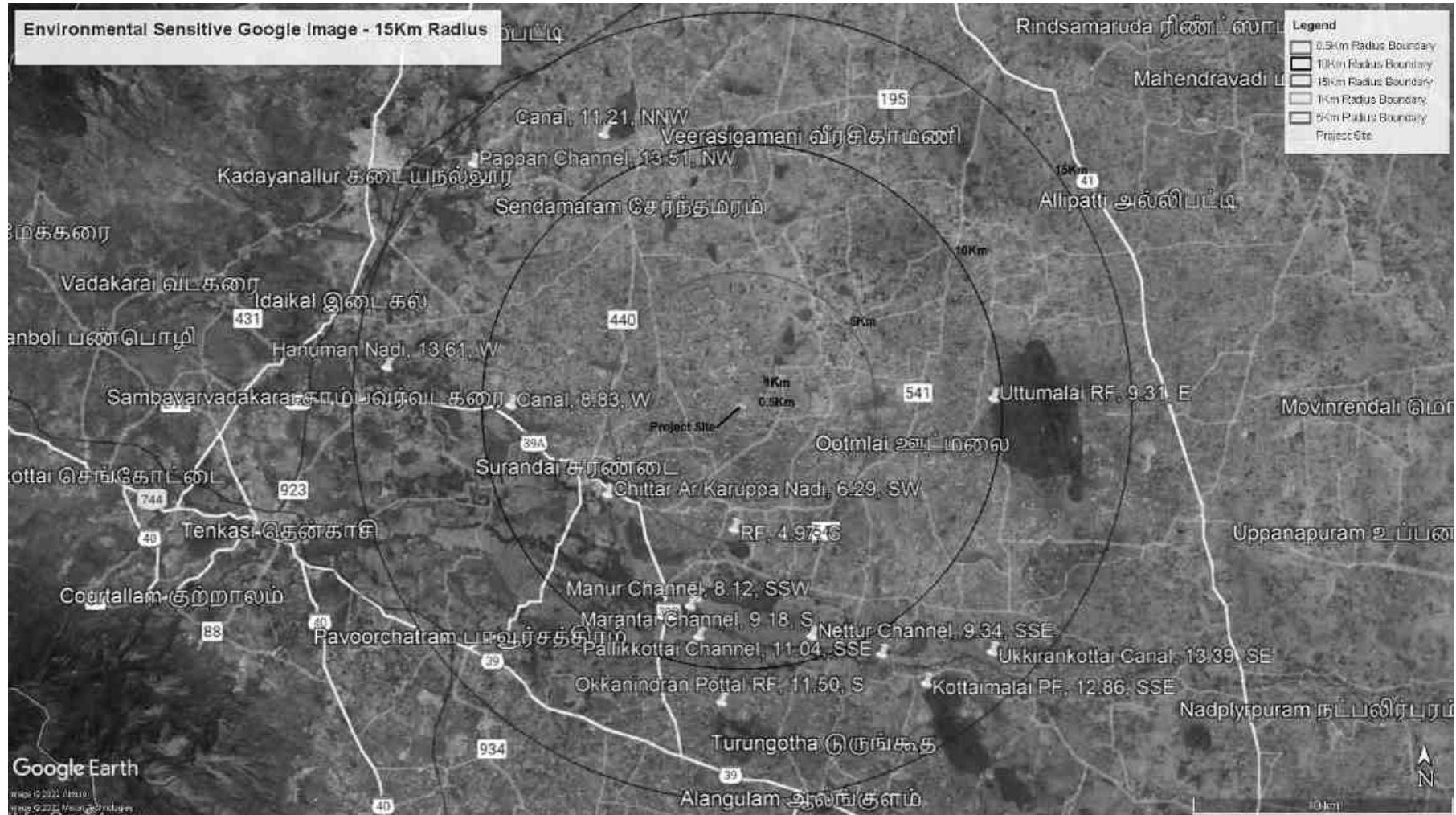


Figure 3-2 Environmental sensitive areas within 15 km from project boundary

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 Administration 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 Southwestern part of Tamil Nadu, surrounded by Virudhunagar district in the north, Western Ghats and Kerala in the west, the Southeast is covered by Tirunelveli district and Northeast 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 receives 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 320.6 Sq.km. The Land Use Pattern is given in **Table 3-3**. The Land Use Pattern and Land Use Map of the Study area are given in **Figure 3-3** and **Figure 3-4** respectively.

Table 3-3 Land Use Pattern of the Study Area

S. No	Description	Area (Sq. Km)	Area (Acres)	Area (Hectares)	Percentage (%)
1	Barren rocky	0.43	106.26	43	0.13
2	Crop land	212.55	52522.17	21255	66.30
3	Deciduous	1.54	380.54	154	0.48
4	Mining	0.65	160.62	65	0.20
5	Plantation	42.62	10531.62	4262	13.29

Rough stone, Weathered Rock & Gravel Quarry over an extent of 2.45.5 Ha.

6	River / Stream / Canals	1.8	444.79	180	0.56
7	Rural	15.28	3775.76	1528	4.77
8	Scrub land	23.65	5844.03	2365	7.38
9	Waterbodies/ ponds, lakes	22.08	5456.08	2208	6.89
Total		320.6	79221.86	32060	100.00

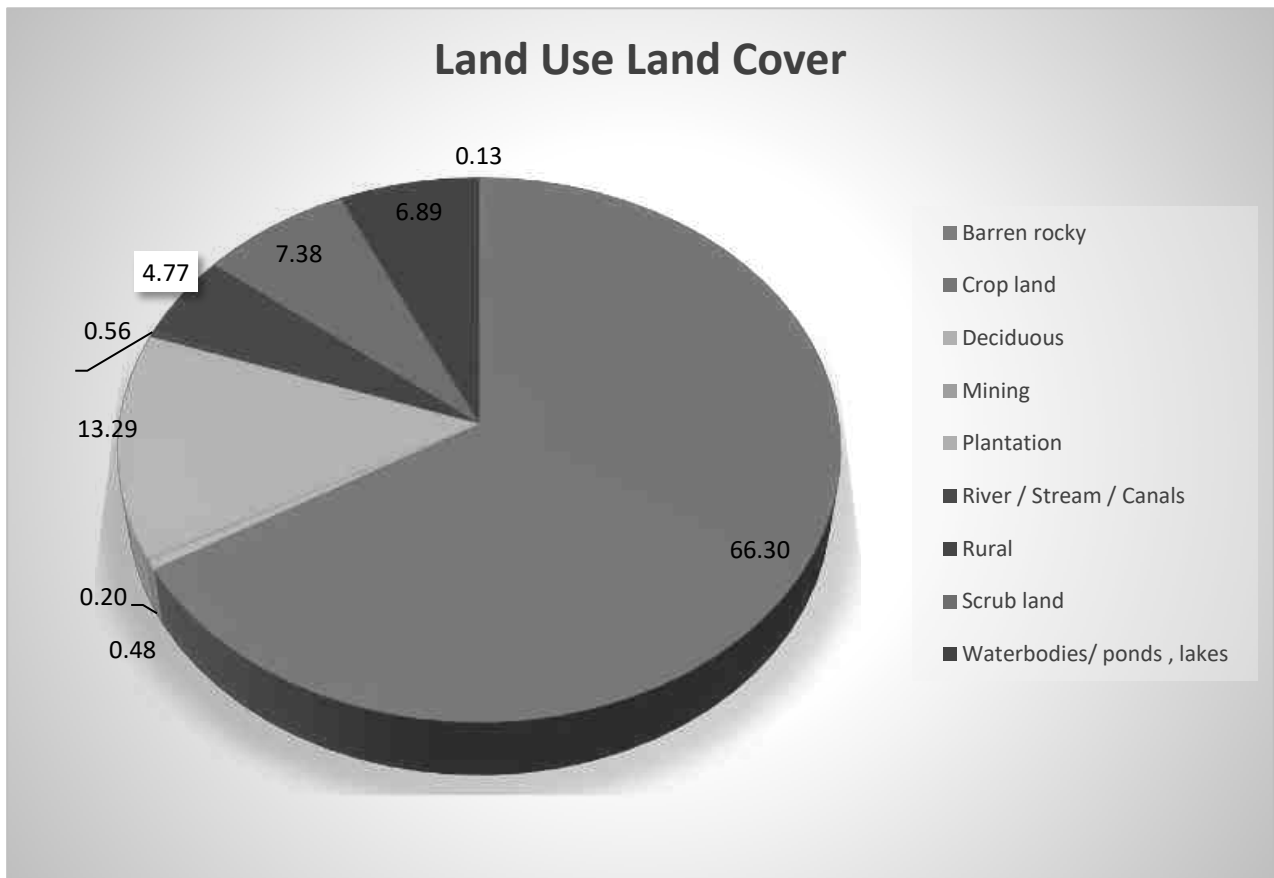


Figure 3-3 Land use Land cover Pattern of the Study Area

Rough stone, Weathered Rock & Gravel Quarry over an extent of 2.45.5 Ha.

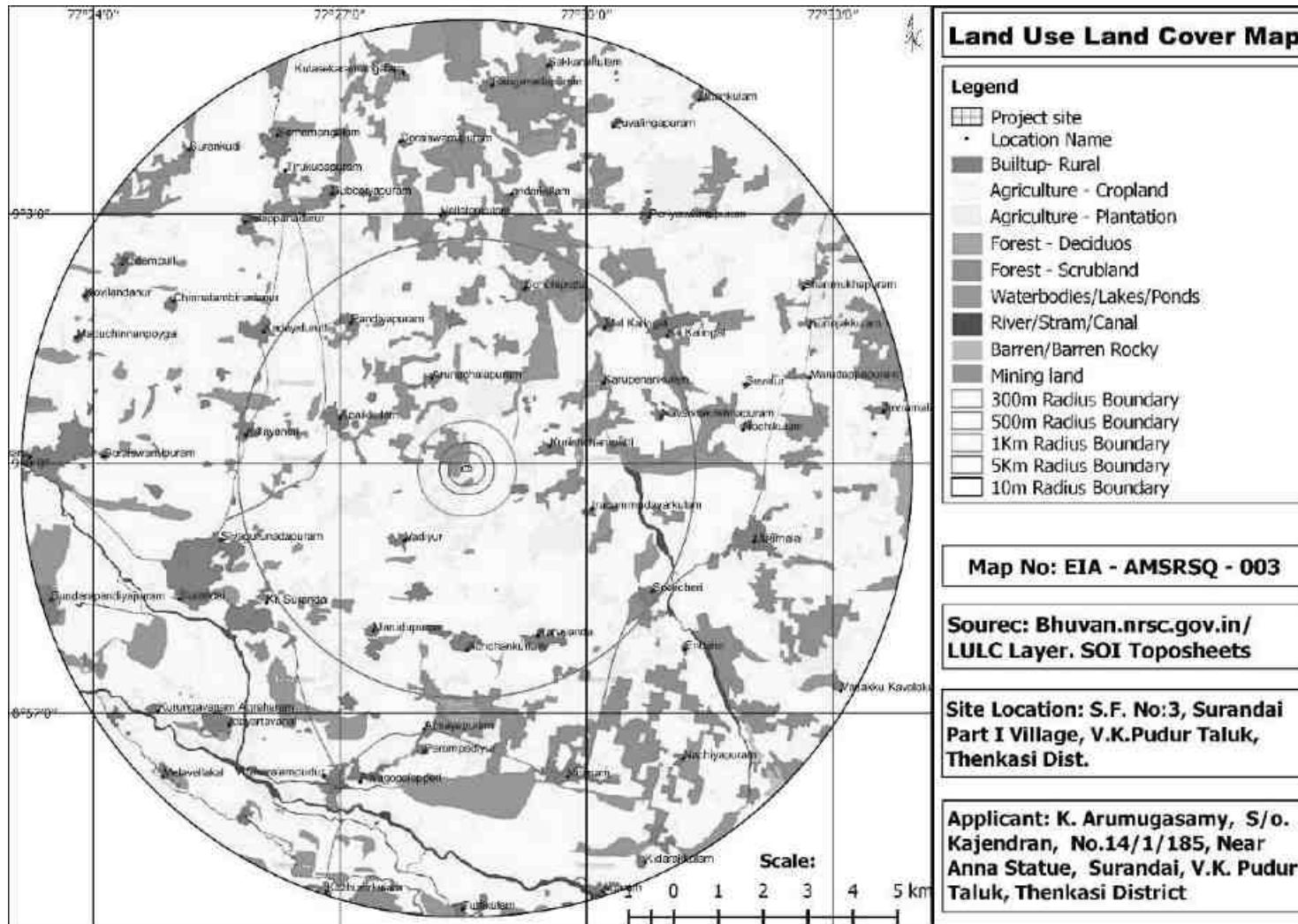


Figure 3-4 Land Use Land Cover map of the study area

3.5.5 Topography of PIA district

The district is located in the Southwestern part of Tamil Nadu, surrounded by Virudhunagar district in the north, Western Ghats and Kerala in the west, the Southeast is covered by Tirunelveli district and Northeast by Thoothukudi district. Chitharu, Gundaru, Karuppanathi, Gadana, Ramanathi and Hanuman nathi are main source of irrigation for Agriculture and Allied activities. The contour map of study area is given in **Figure 3-5**.

Source:

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

Figure 3-5 Contour map of Study Area

3.5.6 Geomorphology of the study area

The total Geographical area of the study area is 320.6 Sq.Km. The Geomorphology of the study area is given in **Table 3-4** and Geomorphology pattern and Geomorphology Map of the study area is given in **Figure 3-6** and **Figure 3-7** respectively.

Table 3-4 Geomorphology of the Study Area

S. No	Geomorphology	Area in Sq. Km	Total Area %
1	Structural Origin-Low Dissected Hills and Valleys	0.16	0.05
2	Denudational Origin-Low Dissected Hills and Valleys	0.37	0.12
3	Denudational Origin-Pediment-PediPlain Complex	296.01	92.33
4	Anthropogenic Origin-Anthropogenic Terrain	0.18	0.06
5	Waterbodies	23.88	7.45
	Total	320.6	100.00

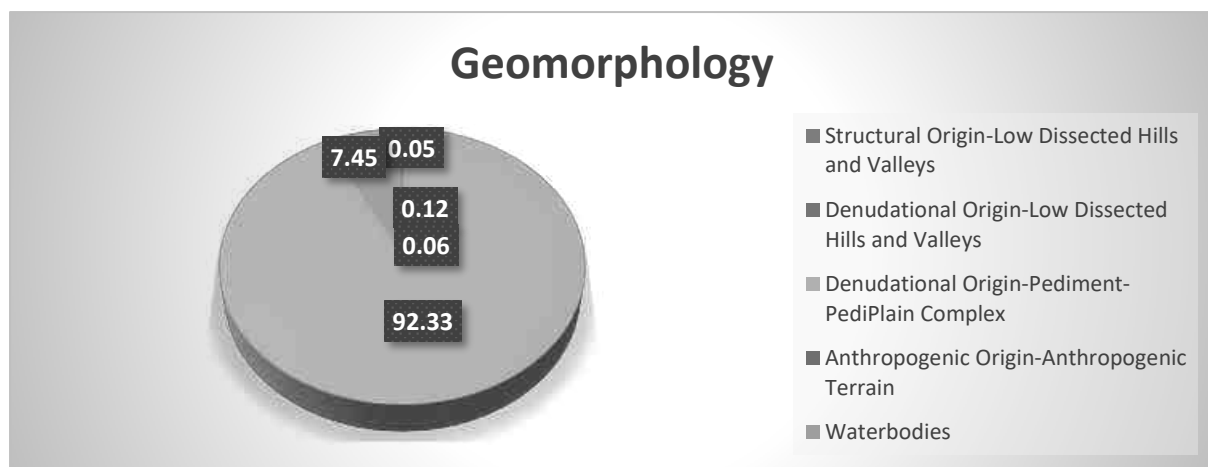


Figure 3-6 Geomorphology map of the study area

Rough stone, Weathered Rock & Gravel Quarry over an extent of 2.45.5 Ha.

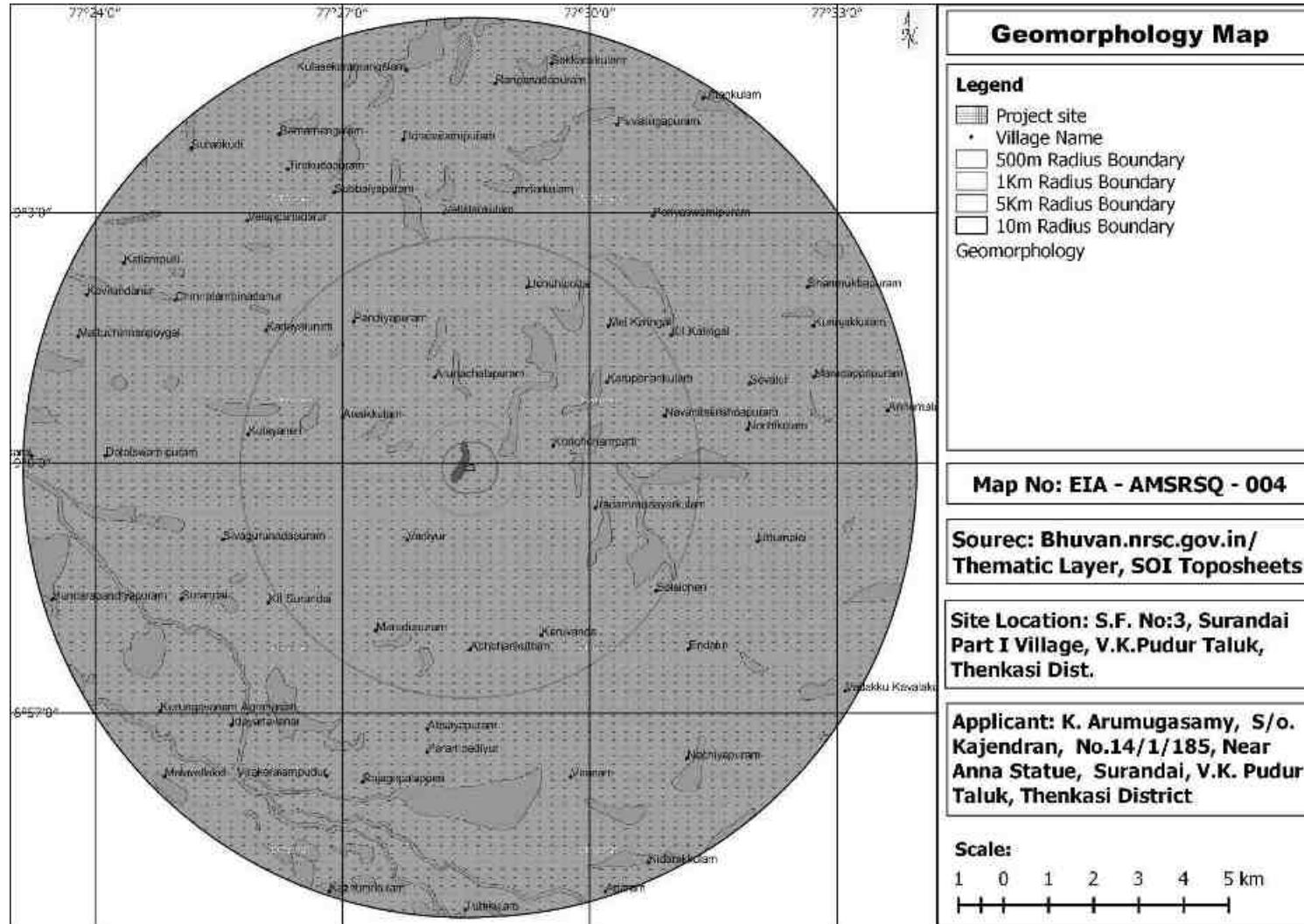


Figure 3-7 Geomorphology map of the study area

3.5.7 Geology of PIA District

Hard rock, Charnockite, Gneiss, 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, Gadanathi, 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 be formed 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 in **Figure 3-8**.

Rough stone, Weathered Rock & Gravel Quarry over an extent of 2.45.5 Ha.

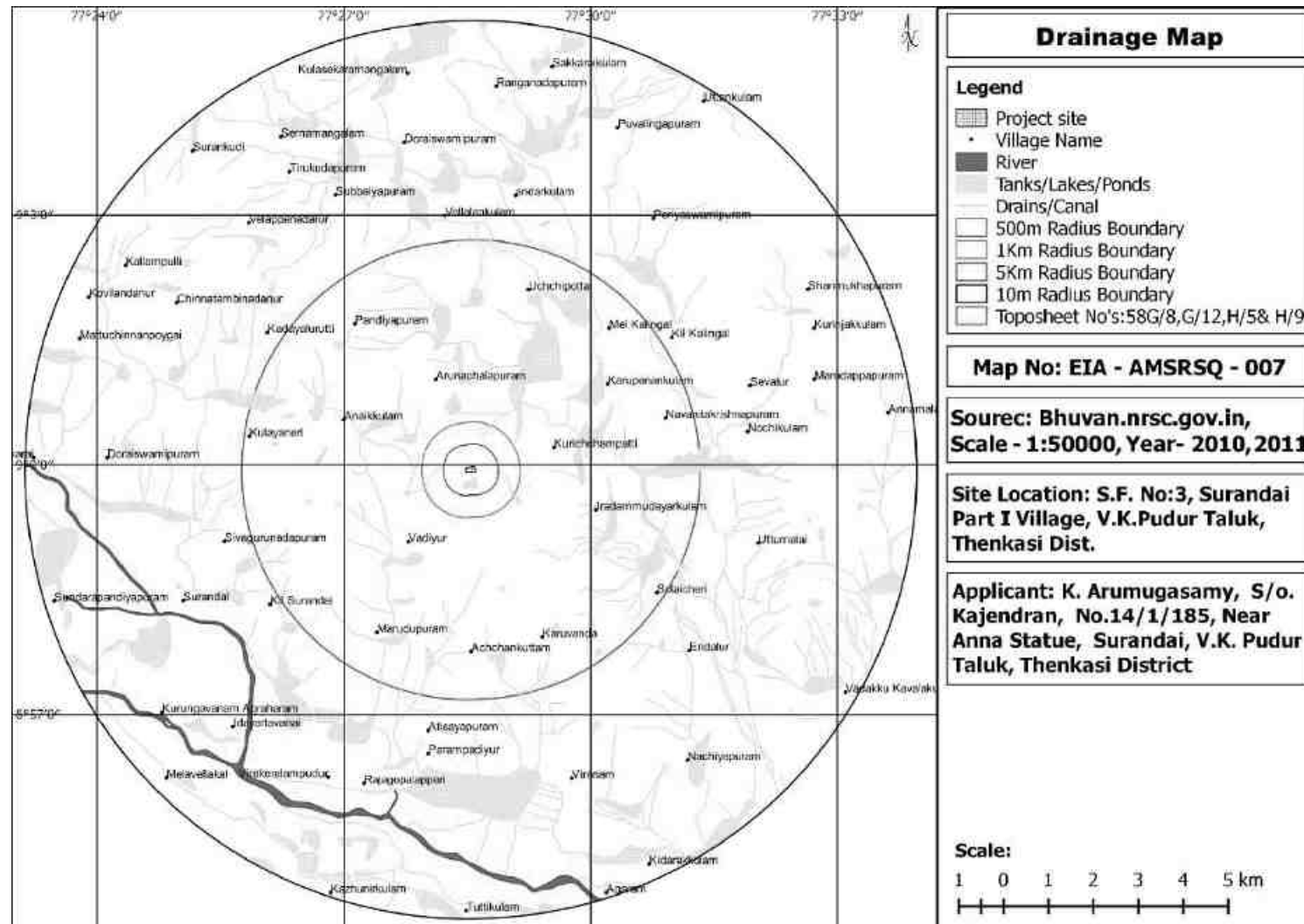


Figure 3-8 Drainage map of the study area

3.5.10 Soils in PIA District

Tenkasi town has predominantly red soil. The soil of the wetlands 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 **Figure 3-9**.



Figure 3-9 Seismicity map of India

Source: <https://bmtpc.org/>

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 Northwest to Southeast. Map showing the Ambient Air Quality (AAQ) monitoring locations is given in **Figure 3-10** and the details of the locations are given in **Table 3-5**. Summary of the average baseline concentrations of pollutants are given **Table 3-13**.

Table 3-5 Details of Ambient Air Quality Monitoring Locations

S. No	Village	Wind Pattern	Distance (~ km)	Direction
1	Kil Kalingal	c/w	5.57	NE
2	Karaiyalankudiyiruppu	d/w	1.01	ESE
3	Solaicheri	d/w	4.92	SE
4	Achchankuttam	c/w	3.57	S
5	Vadiyur	c/w	2.07	SW
6	Surandai	c/w	5.88	WSW
7	Aiyapuram	u/w	2.45	NW
8	Arunachalapuram	c/w	2.06	NNW

Rough stone, Weathered Rock & Gravel Quarry over an extent of 2.45.5 Ha.

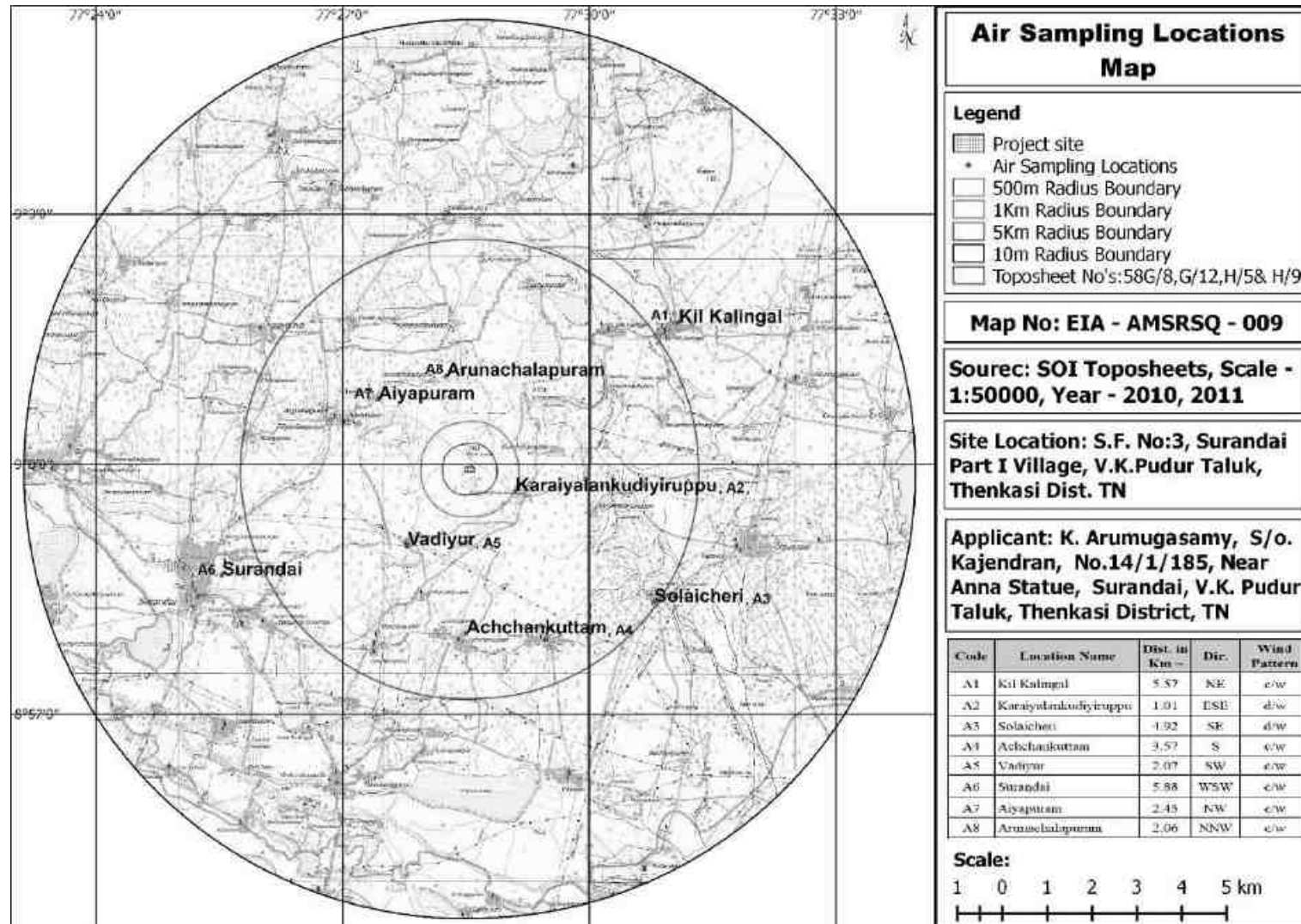


Figure 3-10 Map showing the Ambient Air Quality monitoring locations.

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) PM₁₀, PM_{2.5}, SO₂, NO_x, Pb, NH₃, C₆H₆, C₂₀H₁₂, As and Ni were monitored and the Summary of the average baseline concentrations of pollutants is given in **Table 3-7 Summary of the average baseline concentrations of pollutants**

Table 3-6 Analytical Methods for Analysis of Ambient Air Quality Parameters

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

3.7.2.1 Results and Discussions

The variations of the pollutants PM₁₀, PM_{2.5}, SO₂, NO_x, Pb, NH₃, C₆H₆, C₂₀H₁₂, 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 3-7**.

Table 3-7 Summary of the average baseline concentrations of pollutants

Parameters	Conc.	NAAQ Standards	Locations							
			Kil Kalingal	Karaiyalank udiyiruppu	Solaicheri	Achchank uttam	Vadiyur	Surandai	Aiyapuram	Arunachal apuram
			AAQ 1	AAQ 2	AAQ 3	AAQ 4	AAQ 5	AAQ 6	AAQ 7	AAQ 8
PM ₁₀ Conc. (µg/m ³)	Max	100 (24 Hours)	45.8	42.8	43.8	41.9	46.6	44.4	42.7	44.2
	Min.		65.3	61.0	62.4	59.7	66.4	63.3	60.8	63.0
	Avg.		55.0	51.4	52.5	50.3	55.9	53.3	51.2	53.0
	98 th 'tile		65.0	60.7	62.0	59.4	66.0	62.9	60.5	62.6
PM _{2.5} Conc. (µg/m ³)	Max	60 (24 Hours)	20.9	19.0	17.3	22.1	20.7	20.1	21.9	20.5
	Min.		29.8	27.1	24.6	31.5	29.5	28.6	31.2	29.2
	Avg.		25.1	22.8	20.7	26.5	24.9	24.1	26.3	24.6
	98 th 'tile		29.7	26.9	24.5	31.3	29.4	28.4	31.0	29.0
SO ₂ Conc. (µg/m ³)	Max	80 (24 Hours)	10.8	7.6	8.7	8.0	10.6	8.8	9.1	10.2
	Min.		15.4	10.8	12.4	11.4	15.1	12.5	13.0	14.6
	Avg.		13.0	9.1	10.4	9.6	12.7	10.6	11.0	12.3
	98 th 'tile		15.3	10.7	12.3	11.4	15.0	12.5	12.9	14.5
NO ₂ Conc.(µg/m ³)	Max	80 (24 Hours)	18.1	15.3	12.7	13.9	17.8	15.9	17.5	16.5
	Min.		25.8	21.8	18.1	19.8	25.4	22.6	24.9	23.6
	Avg.		21.7	18.4	15.2	16.6	21.4	19.0	21.0	19.8
	98 th 'tile		25.6	21.7	18.0	19.7	25.3	22.5	24.8	23.4
CO (mg/m ³)	Avg.	4 (1hour)	0.46	0.28	0.51	0.34	0.22	0.37	0.47	0.38
Pb (µg/m ³)	Avg.	1 (24 hour)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Parameters	Conc.	NAAQ Standards	Locations							
			Kil Kalingal	Karaiyalankudiyiruppu	Solaicheri	Achchankuttam	Vadiyur	Surandai	Aiyapuram	Arunachalapuram
			AAQ 1	AAQ 2	AAQ 3	AAQ 4	AAQ 5	AAQ 6	AAQ 7	AAQ 8
O ₃ ($\mu\text{g}/\text{m}^3$)	Avg.	180 (1hour)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
NH ₃ ($\mu\text{g}/\text{m}^3$)	Avg.	400 (24 hours)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzene ($\mu\text{g}/\text{m}^3$)	Avg.	5 (Annual)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzo (a) pyrene, (ng/m^3)	Avg.	1 (Annual)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Arsenic (ng/m^3)	Avg.	6 (Annual)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Nickel (ng/m^3)	Avg.	20 (Annual)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

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 PM₁₀ (41.9– 66.4 µg/m³), PM_{2.5} (17.3– 31.5 µg/m³), SO₂ (7.6 – 15.4µg/m³), NO₂ (12.7 – 25.8 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 **Figure 3-11 Map showing the noise monitoring location..**

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 3-8**.

Table 3-8 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	Kil Kalingal	N1	5.57	NE	52.8	42.2	75	70	Industrial
2	Karaiyalankudiyiruppu	N2	1.01	ESE	51.6	43.8	55	45	Residential
3	Solaicheri	N3	4.92	SE	52.9	41.3	55	45	Residential
4	Achchankuttam	N4	3.57	S	50.9	40.9	55	45	Residential
5	Vadiyur	N5	2.07	SW	52.6	38.2	55	45	Residential
6	Surandai	N6	5.88	WSW	49.8	40.1	55	45	Residential
7	Aiyapuram	N7	2.45	NW	51.6	41.5	55	45	Residential
8	Arunachalapuram	N8	2.06	NNW	50.3	41.7	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 52.8 dB(A) and 42.2 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 49.8 dB(A) to 52.9 dB(A) and nighttime noise levels varied from 38.2 dB(A) to 43.8 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.

Rough stone, Weathered Rock & Gravel Quarry over an extent of 2.45.5 Ha.

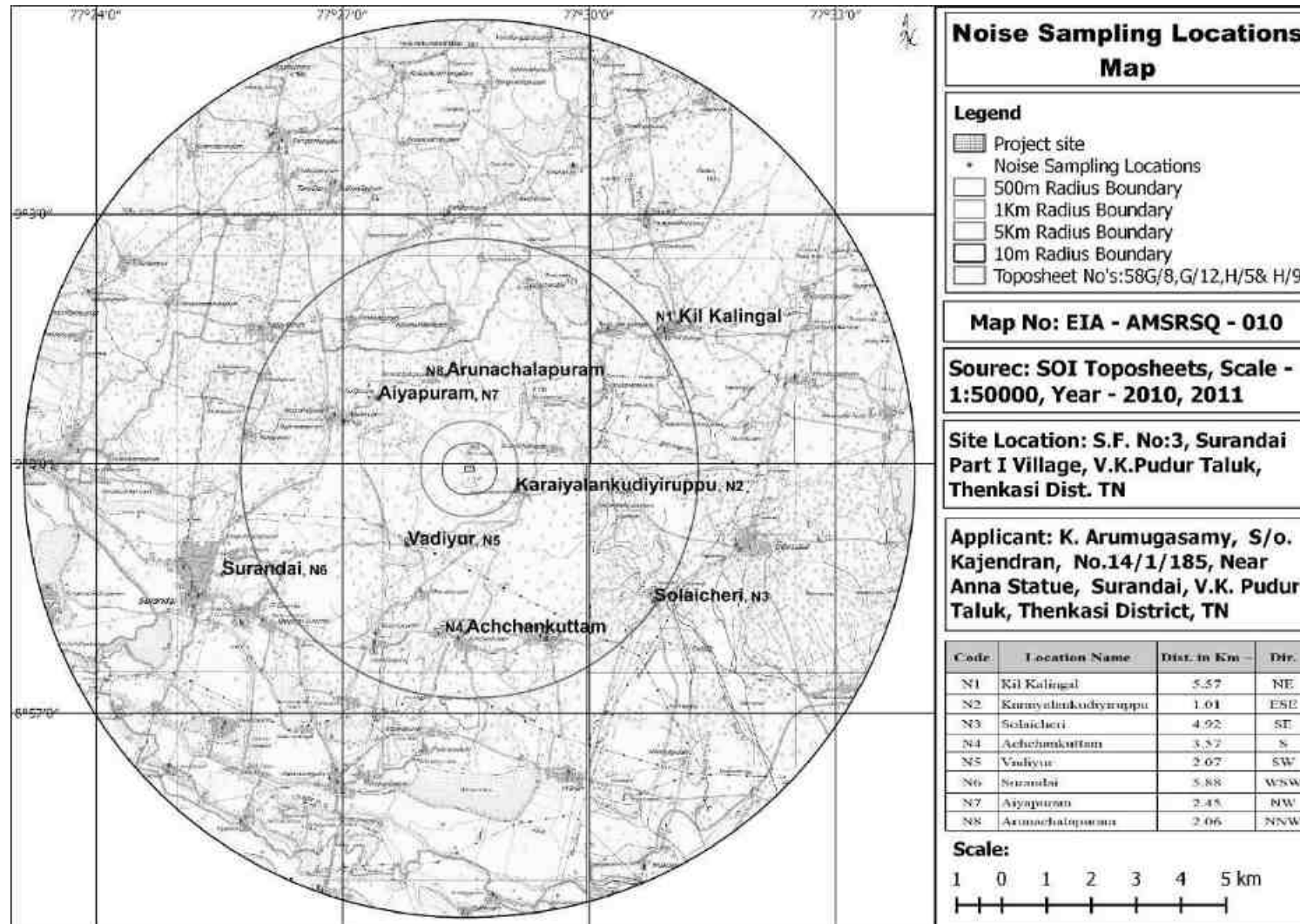


Figure 3-11 Map showing the noise monitoring location.

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 3-9**. Water sampling and map of sampling location are given in **Figure 3-12** and **Figure 3-13**

Table 3-9 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 Comparison 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 CaCO ₃	APHA 23rd Edition 2017/2320 B / P 2 – 27 Titrimetric Method/IS3025(Part 23) : 1986 RA
8	Total Hardness as CaCO ₃	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 Argometric Method
14	Sulphate SO ₄	APHA 23rd Edition 2017 4500 SO ₄ - E / P 4-188 Turbidity Method/IS 3025(Part 24) : 1986 RA
15	Nitrate as NO ₃	APHA 23rd Edition 2017 4500 NO ₃ B Ultraviolet Spectro Photometric Screening Method
16	Phosphate	IS 3025 Part 31: 1988 Chapter-12
17	Fluorides as F	APHA23rd Edition F-D: 2017
18	Cyanide	APHA 23rd Edition 2017 4500- CN- E/ P 4-42 Calorimetric Method
19	Arsenic	APHA 23rd Edition 2017 3500- As / P 3-61 Silver Diethyldithiocarbamate Method
20	Boron	APHA 23rd Edition 2017 :4500 BB/P4-23
21	Cadmium	IS 3025 (Part - 41)1991
22	Chromium, total	IS 3025(Part 52) RA / APHA 23rd Edition 2017/3500 Cr / P 3- 67 1,5Diphenylcarbazide Method
23	Copper	APHA 23rd Edition 2017 3500 Cu B/P 3-72 Atomic Absorption Spectrometric Method / IS 3025(Part 42): 1992 RA
24	Iron	APHA 23rd Edition 2017 3500 Fe- B/ P 3-77 1,10 Phenanthroline Method /IS 3025(Part 53): 2003 RA
25	Lead	APHA 23rd Edition 2017 3500 Pb B / P 3 -80 Atomic Absorption Spectrometric Method / IS 3025(Part 47): 1994 RA
26	Manganese	IS 3025(Part 46): RA /APHA 23rd Edition 2017 2340 C / P 3-84Calculation Method
27	Mercury	IS 3025 (Part48):1994 RA 1999
28	Nickel	IS 3025:(Part-54):2003(Reaff 2009)
29	Selenium	IS 3025 Part (56)2003
30	Zinc	APHA 22nd Edition 2017/ 3500 Zn B / P 3 – 106 Atomic Absorption Spectrometric Method/IS 3025(Part 49): 1994 RA
31	Dissolved Oxygen	IS:3025 (Part - 38)1989 (Reaff 2009)
32	BOD at 27 ^o C for 3 days	IS:3025 (Part – 58): 2006
33	COD	IS:3025 (Part – 44): 1993

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

Rough stone, Weathered Rock & Gravel Quarry over an extent of 2.45.5 Ha.

The prevailing status of surface water quality has been assessed during the study period. Surface water sampling Locations are given in **Table 3-10** and **Figure 3-12** respectively and Its results are provided in **Table 3-11**.

Table 3-10 Details of Surface water sampling locations

Code	Location Name	Distance in Km ~	Direction
SW1	Pond Near Arunachalapuram	1.42	N
SW2	Lake near Kurichchampatti	2.3	ENE
SW3	Lake near iradamudayarkulam	3.62	E
SW4	Viranam Kulam	6.78	SSE
SW5	Lake near Ramanur	5.97	SSW
SW6	Arundavarpiratti kulam	5.89	SW
SW7	Lake near Puvandiyapuram	4.72	WNW
SW8	Lake near Serndamangalam	8.18	NNW

Rough stone, Weathered Rock & Gravel Quarry over an extent of 2.45.5 Ha.

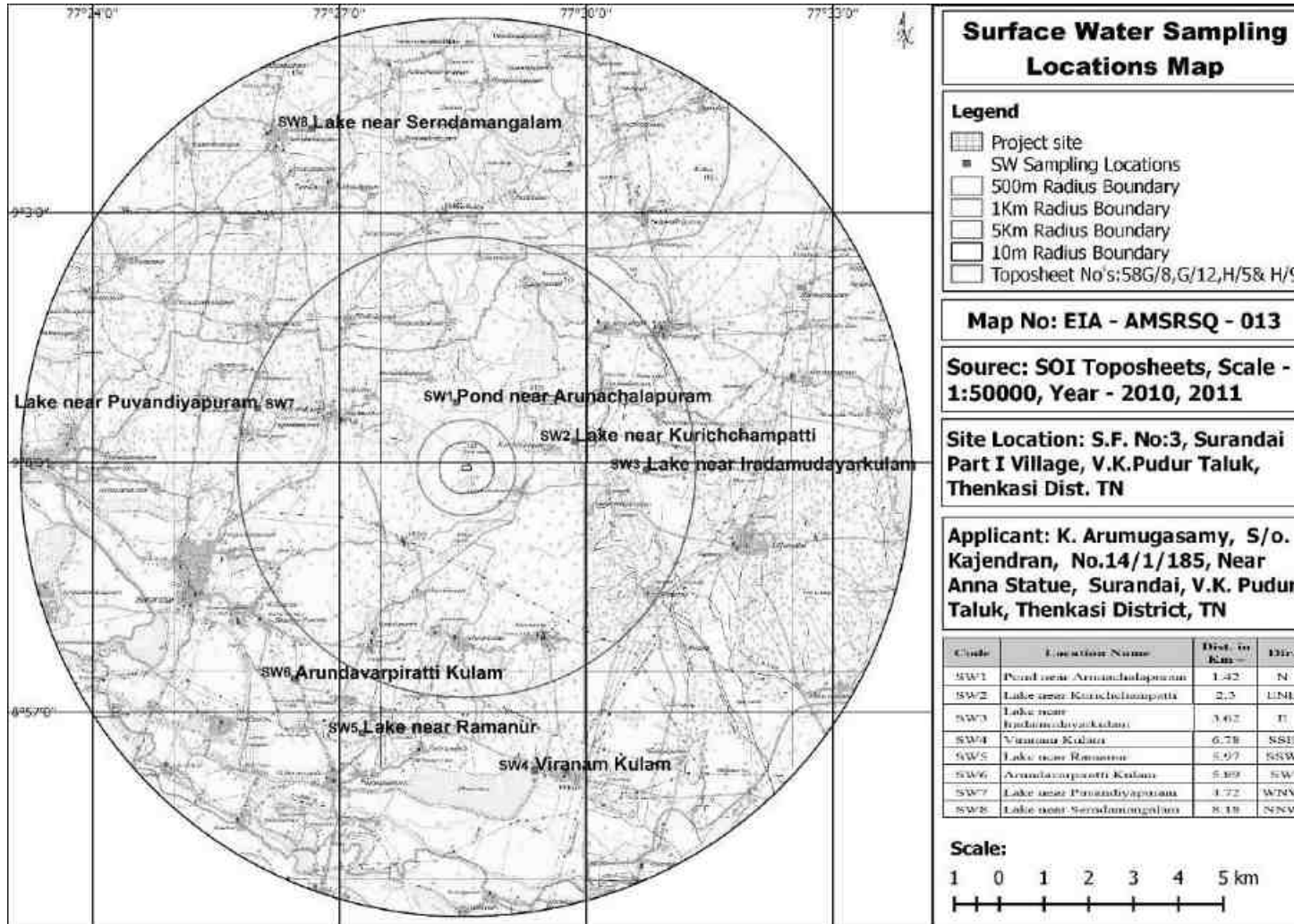


Figure 3-12 Map showing the surface water monitoring locations.

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

S. No	Parameter	Unit	Surface water standards (IS 2296 Class-A)	Pond Near Arunachalapuram	Lake near Kurichcham patti	Lake near iradamu dayarkulam	Viranam Kulam	Lake near Ramanur	Arundavarpirati kulam	Lake near Puvandiyapuram	Lake near Serndamangalam
				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	7.66	7.06	7.28	6.91	7.4	7.58	7.92	7.7
2	Electrical Conductivity	µS/cm	-	1758	1549	1814	1358	2241	1794	1722	1955
3	Total Dissolved Solids	mg/l	500	1210	1082	1217	907	1533	1106	1047	1311
4	Total Alkalinity as CaCO ₃	mg/l	-	242.6	179.5	249.2	200.8	274.6	186.9	207.4	226.2
5	Total Hardness as CaCO ₃	mg/l	300	299.0	285.5	194.0	253.0	354.3	304.9	268.3	367.6
6	Sodium as Na	mg/l	-	219.3	164.9	285.7	128.7	317.3	214.7	158.6	208.6
7	Potassium as K	mg/l	-	60.2	20.5	40.2	42.9	58.6	34.5	67.3	91.4
8	Calcium as Ca	mg/l	-	82.4	94.6	55.2	83.6	104.5	97.6	90.7	112.8
9	Magnesium as Mg	mg/l	-	22.6	11.9	13.6	10.7	22.6	14.8	10.1	20.8
10	Chloride as Cl	mg/l	250	236.9	307.3	273.5	194.6	349.6	250.8	228.4	283.5
11	Sulphate as SO ₄	mg/l	400	142.3	128.6	90.7	88.1	152.8	126.7	105.6	154.3
12	Nitrate as NO ₃	mg/l	20	3.8	4.1	7.3	2.9	8.1	5.2	6.7	5.3
13	Phosphate as PO ₄	mg/l	-	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14	Fluorides as F	mg/l	1.5	0.53	0.61	0.42	0.44	0.39	0.18	0.52	0.4
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

Rough stone, Weathered Rock & Gravel Quarry over an extent of 2.45.5 Ha.

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	5.7	5.3	4.9	6	5.5	5.2	5.8	5.3
27	Chemical Oxygen Demand as O ₂	mg/l	-	19.4	35.9	42.8	12.4	21.3	30.6	15.4	33.7
28	BOD, 3 days @ 27°C as O ₂	mg/l	2	11.2	14.2	20.3	7.2	12.8	18.3	10.8	18.5

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 6.91 to 7.92 and within the limits (6.5 – 8.5) of IS 2296:1992.
- The Electrical Conductivity (EC) of the collected surface water ranges from 1358 $\mu\text{S/cm}$ to 2241 $\mu\text{S/cm}$.
- The chloride content in the collected surface water ranges from 194.6 mg/l to 349.6 mg/l.
- The sulphate content in the collected surface water sample ranges from 88.1 mg/l to 154.3 mg/l.
- COD of the collected surface water sample ranges from 12.4 mg/l to 42.8 mg/l.
- BOD of the collected surface water sample ranges from 7.2 mg/l to 20.3 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 **Figure 3-13**

Table 3-12 and **Table 3-13** respectively. A map showing the groundwater monitoring locations is given in **Figure 3-13**

Table 3-12 Details of Groundwater Quality Monitoring Locations

Station Code	Location	Distance from Project boundary (~Km)	Direction
GW1	Kil Kalingal	5.57	NE
GW2	Karaiyalankudiyiruppu	1.01	ESE
GW3	Solaicheri	4.92	SE
GW4	Achchankuttam	3.57	S
GW5	Vadiyur	2.07	SW

Station Code	Location	Distance from Project boundary (~Km)	Direction
GW6	Surandai	5.88	WSW
GW7	Aiyapuram	2.45	NW
GW8	Arunachalapuram	2.06	NNW

Rough stone, Weathered Rock & Gravel Quarry over an extent of 2.45.5 Ha.

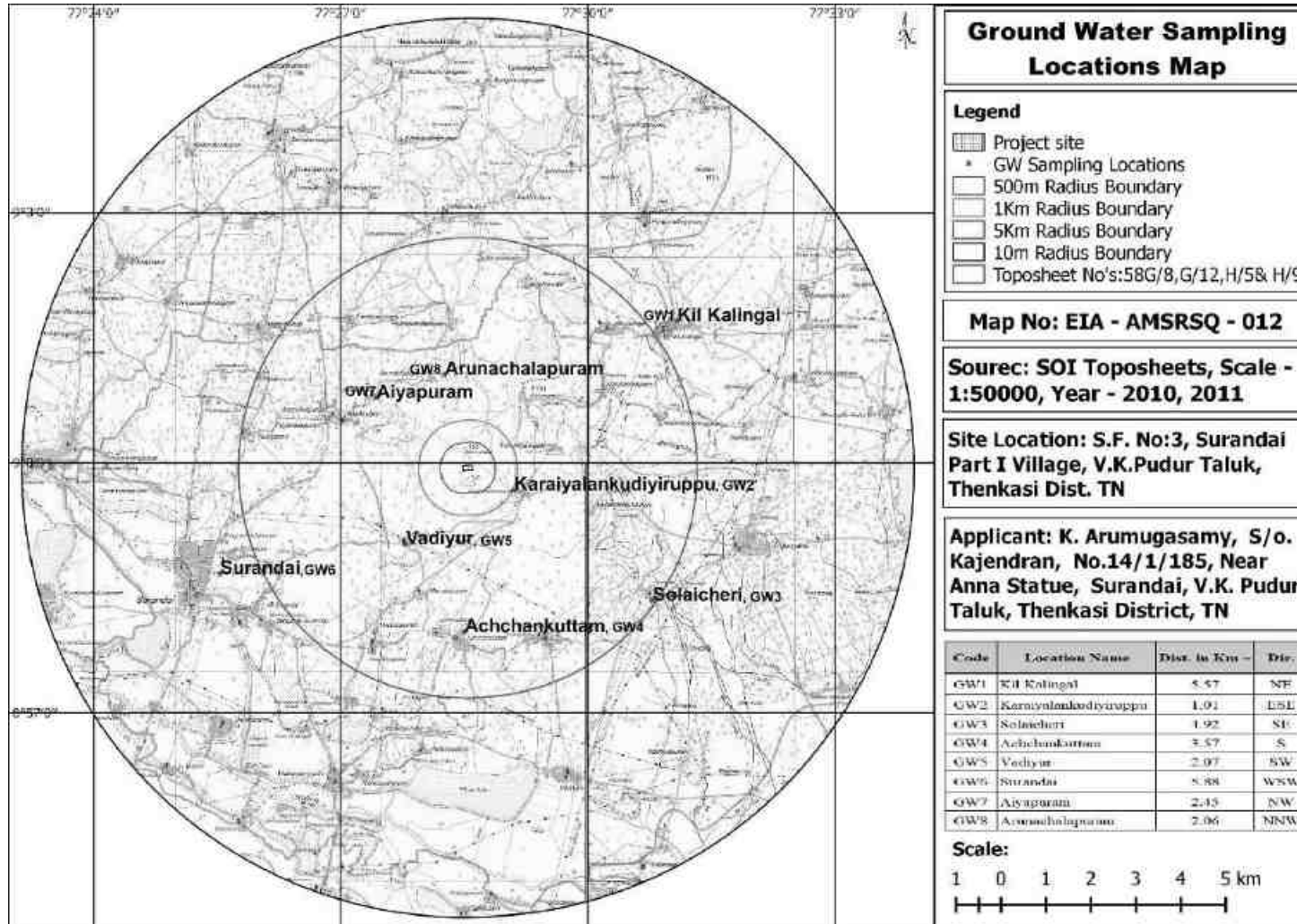


Figure 3-13 Map showing the groundwater monitoring locations

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	Kil Kalingal	Karaiyalankur	Solaicheri	Achankuttam	Vadiyur	Surandai	Aiyapuram	Arunachalapuram
					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	6.88	7.29	7.05	7.83	7.7	7.49	6.9	7.52
4	Conductivity	µS/cm	-	-	1532	1736	1698	1611	1841	1902	2105	1796
5	Total Dissolve Solids	mg/l	500	2000	1031	1179	1243	1140	1296	803	1381	1207
6	Total Suspended Solids		-	-	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
7	Alkalinity as CaCO ₃	mg/l	200	600	234	239	219	238	265	167	244	267
8	Total Hardness as CaCO ₃	mg/l	200	600	435	406	471	432	535	253	438	461
9	Sodium as Na	mg/l	-	-	89.6	127.5	142.7	112.5	158.2	97.5	224.8	182.5
10	Potassium as K	mg/l	-	-	10.7	31.5	20.5	44.7	31.6	26.8	31.8	32.4
11	Calcium as Ca	mg/l	75	200	142.5	129	137	141	176.3	83.6	142.5	143.5
12	Magnesium as Mg	mg/l	30	100	19.2	20.5	31.2	19.4	22.8	10.7	19.9	24.9
13	Chloride as Cl	mg/l	250	1000	249.5	342.5	392.4	283.5	311.4	197.6	312.7	246.9
14	Sulphate SO ₄	mg/l	200	400	137.8	128.3	137.5	146.4	152.6	107.2	227.3	138.2
15	Nitrate as NO ₃	mg/l	45	NR	5.70	6.90	7.10	3.70	8.40	2.60	5.80	7.50

S. No	Parameters	Unit	Drinking water Standard (IS 10500: 2012) Acceptable Limit	Drinking water Standard (IS 10500: 2012) Permissible Limit	Kil Kalingal	Karaiyalanku diyirupu	Solaicheri	Achchankuttam	Vadiyur	Surandai	Aiyapuram	Arunachalapuram
					GW1	GW2	GW3	GW4	GW5	GW6	GW7	GW8
16	Phosphate PO ₄	mg/l	-	-	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17	Fluorides as F	mg/l	1	1.5	0.52	0.34	0.29	0.55	0.38	0.46	0.22	0.56
18	Cyanide	mg/l	0.05	NR	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
19	Arsenic as As	mg/l	0.01	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20	Boron as B	mg/l	0.5	1.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21	Cadmium as Cd	mg/l	0.003	NR	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22	Chromium as Cr	mg/l	0.05	NR	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
23	Copper	mg/l	0.05	1.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24	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 during Pre-monsoon 2022. 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 6.88 and 7.83. It is observed that the pH range is within the limit of IS 10500:2012.
- The Total Dissolved Solids range is varied between 803 mg/l – 1381 mg/l for the ground water. All the samples are well within the permissible limit of IS 10500: 2012.
- The acceptable limit of the chloride content is 250 mg/l and permissible limit is 1000 mg/l. The chloride content in the ground water for study area ranges between 197.6 mg/l – 392.4 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 107.2 mg/l – 227.3 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 & Table 3-16.** Map showing the soil monitoring locations is given in **Figure 3-14.**

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
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	Kil Kalingal	5.57	NE
S2	Karaiyalankudiyiruppu	1.01	ESE
S3	Solaicheri	4.92	SE
S4	Achchankuttam	3.57	S
S5	Vadiyur	2.07	SW
S6	Surandai	5.88	WSW
S7	Aiyapuram	2.45	NW
S8	Arunachalapuram	2.06	NNW

Rough stone, Weathered Rock & Gravel Quarry over an extent of 2.45.5 Ha.

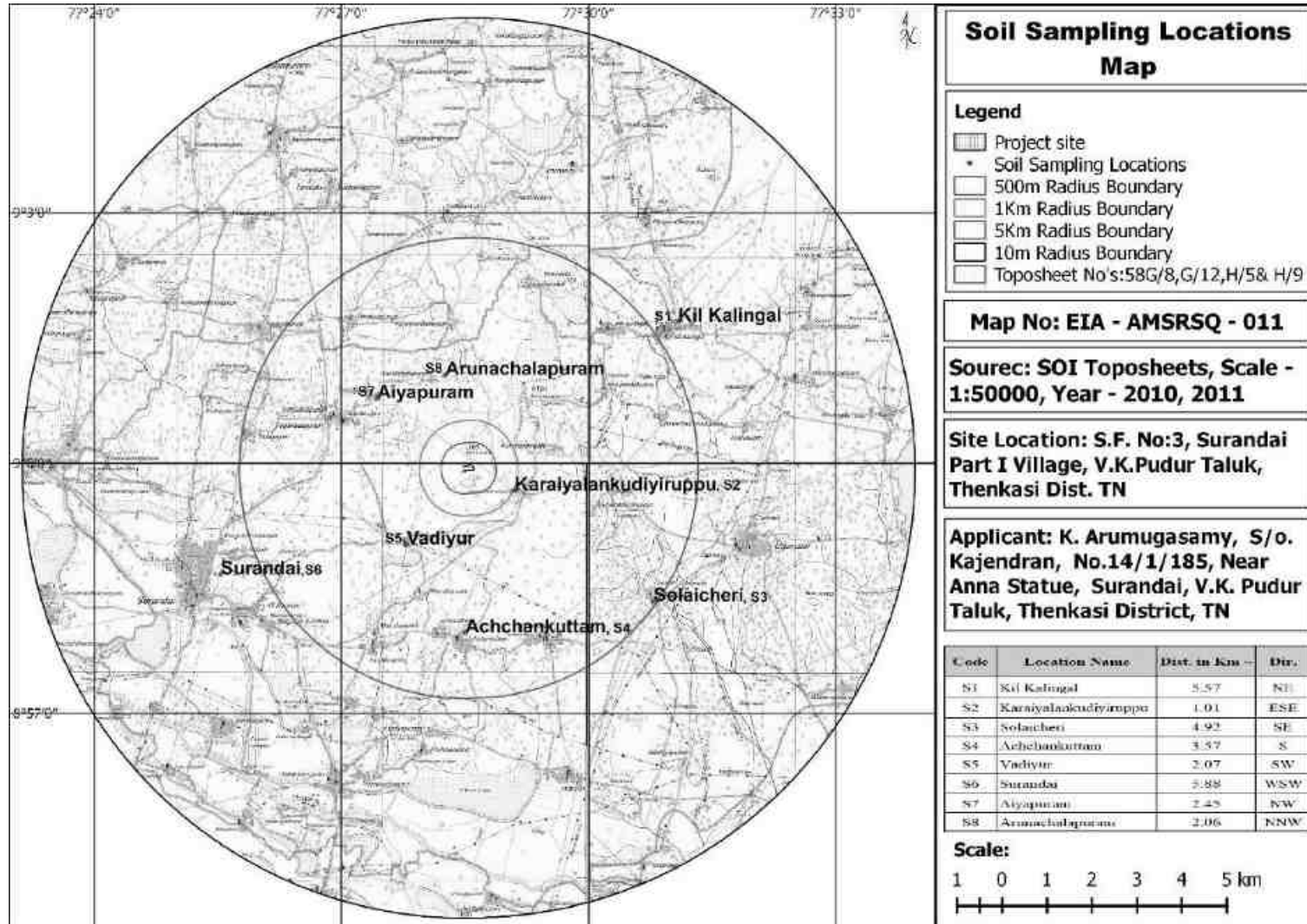


Figure 3-14 Map showing the soil monitoring location.

Table 3-16 Soil Quality Monitoring Results

S. No	Parameters	Units	Kil Kalingal	Karaiyalank udiyiruppu	Solaicheri	Achchankuttam	Vadiyur	Surandai	Aiyapuram	Arunachala puram
			S1	S2	S3	S4	S5	S6	S7	S8
1	Soil Texture	-	Sandy Loam	Sandy loam	Sandy Loam	Sandy clay loam	Sandy clay loam	Sandy loam	Sandy clay loam	Sandy clay loam
2	Sand	%	54	60	61	55	57	59	53	55
3	Silt	%	28	18	20	18	24	20	19	18
4	Clay	%	18	22	19	27	19	21	28	27
5	pH	-	7.41	7.9	6.8	7.43	7.52	7.7	6.8	7.3
6	Electrical conductivity	mmhos/cm	185	143	248	153	128	167	194	185
7	Nitrogen as N	Kg/ha	183	146	207	166	138	159	214	233
8	Phosphorus	Kg/ha	55.0	61.0	42.0	39.0	44.0	81.0	40.0	64.0
9	Potassium	Kg/ha	71	52	64	43	92	48	73	59
10	Cation Exchange Capacity	meq/100 gm	0.7	2.8	1.3	5.5	1.5	2.6	5.8	5.4
11	Organic Carbon	%	0.630	0.660	0.650	0.710	0.723	0.750	0.658	0.690
12	Organic matter	%	1.086	1.138	1.121	1.224	1.246	1.293	1.134	1.190

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 43 Kg/ha to 92 Kg/ha.
- ✓ Nitrogen content ranged from 138 Kg/ha to 233 Kg/ha.
- ✓ Phosphorous ranged from 39 Kg/ha to 81 Kg/ha.

3.11 Biological Environment

Biodiversity encompasses the variety and variability of life on Earth. It refers to the differences between and 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 in **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.	<i>Acacia auriculoformis</i>	Fabaceae.	Kaththi Savukku	
2.	<i>Acacia nilotica</i>	Fabaceae	Karuvelamaram	LC
3.	<i>Albezia lebbeck</i>	Fabaceae	Siridam	VU

S. No	Botanical Name	Family Name	Local Name (Tamil)	IUCN Red List of Threatened Species
4.	<i>Alstonia scholaris</i>	Apocynaceae	Ezhilai pillai	LC
5.	<i>Annona squamosa</i>	Annonaceae	Sitapalam	NA
6.	<i>Azadirachta indica</i>	Meliaceae	Veppamaram	NA
7.	<i>Cocos nucifera</i>	Arecaceae	Thennai	NA
8.	<i>Ficus religiosa</i>	Moraceae	Arasamaram	NA
9.	<i>Fluggea leucopyrus</i>	Malvaceae	Mullupulatti	NA
10.	<i>Mangifera indica</i>	Anacardiaceae	Mamaram	DD
11.	<i>Manilkara zapota (L.) P.Royen</i>	Sapotaceae	Sappotta	NA
12.	<i>Prosopis juliflora</i>	Fabaceae	Seemai karuvel	LC
13.	<i>Psidium guajava L.</i>	Myrtaceae	Koiyya	NA
14.	<i>Spondias mangifera</i>	Anacardiaceae	Pulichha kaai	NA
15.	<i>Syzygium cumini</i>	Myrtaceae	Navva Pazham	NA
16.	<i>Tamarindus indica</i>	Legumes	Puliyamaram	NT
17.	<i>Terminalia arjuna</i>	Combretaceae	Marudha maram	EW
18.	<i>Thespesia Populnea</i>	Mallows	Poovarasu	NA
19.	<i>Thevetia peruvannia</i>	Apocynaceae	Ponnarali	NA
20.	<i>Ziziphus mauritiana</i>	Rhamnaceae	Elenthai	LC
Grass				
21.	<i>Digitaria bicornis</i>	Poaceae	Menmaiyyana kutai pul	DD
22.	<i>Chloris montana</i>	Poaceae	-	LC
23.	<i>Heteropogon contortus</i>	Poaceae	-	LC
24.	<i>Saccharum officinarum</i>	poaceae	Karumpu	LC
Herbs				
25.	<i>Solanum trilobatum</i>	Nightshade	Thoodhuvalai	NA
26.	<i>Crotolaria verrucosa</i>	legume	Salangaichedi	DD
27.	<i>Barringtonia acutangula</i>	Lecythidaceae	Samudra Pazham	LC
28.	<i>Abutilon indicum</i>	Mallows	Thuthi	CR
29.	<i>Abrus precatorius</i>	Legumes	Kundumani	DD
30.	<i>Asparagus racemosus</i>	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 3-18.

Table 3-18 List of fauna reported/observed in the study area.

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

S. No	Botanical Name	Family Name	Common Name	IUCN Red List of Threatened Species
31.	<i>Egretta garzetta</i>	Ardeidae	Little egret	LC
32.	<i>Elanus caeruleus</i>	Accipitridae	Kite	LC
33.	<i>Francolinus pondicerianus</i>	Phasianidae	Grey Francolin	LC
34.	<i>Galerida cristata</i>	Alaudidae	Crested Lark	LC
35.	<i>Gallus sonneratii</i>	Phasianidae	Grey jungle fowl	LC
36.	<i>Motacilla maderaspatensis</i>	Motacillidae	Large, pied Wagtail	LC
37.	<i>Nectarinia asiatica</i>	Nectariniidae	Purple Sun Bird	LC
38.	<i>Pavo cristatus</i>	Phasianidae	Indian Peafowl	LC
39.	<i>Psittacula eupatria</i>	Psittacidae	Alexandrine Parakeet	NT
40.	<i>Psittacula krameri</i>	Psittacidae	Rose ringed Parakeet	LC
41.	<i>Pycnonotus cafer</i>	Pycnonotidae	Red vented Bulbul	LC
42.	<i>Spilornis cheela</i>	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 : <https://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

Table 3-19 provides the details on population profile within study area. **Table 3-20** show the socio-economic indicator within the study area.

Table 3-19 Population profile within study area

Name	Household	Population	Male	Female	Children below 6	Scheduled Caste	Scheduled Tribe
0-5 km							
Anaikulam	748	2794	1388	1406	137	237	0
Kuruchampatti	622	2213	1112	1101	94	271	0
Karuvanda	1818	6821	3399	3422	367	447	0
Achankuttam	1047	4072	2057	2015	207	84	0
Vadi	1362	4806	2447	2359	227	298	0
Anaikulam	962	3726	1846	1880	170	342	0
Surandai (TP)	9511	35272	17488	17784	1917	3013	4
5-10 km							
Naranapuram	1537	5197	2565	2632	248	2266	0
Poigai	231	809	410	399	34	141	0
Kulasekaramangalam	1678	6212	3149	3063	314	1688	0
Vellalankulam	936	3561	1789	1772	181	533	1
Echchanda	1055	3744	1857	1887	195	487	0
Keelakalangal	1036	3874	1920	1954	203	553	0
Melamarudappapuram	958	3289	1566	1723	170	552	0
Melakaangal	809	2991	1444	1547	134	311	0
Kulaiyaneri	1639	6198	3056	3142	425	378	0
Uthumalai	2168	7737	3788	3949	404	1302	0
Rajagopalaperi	1188	4120	2047	2073	194	934	0
Veerakeralampudur	1986	7158	3451	3707	329	231	0
Veeranam	2042	7796	3871	3925	411	846	0
Agaram	270	968	494	474	59	2	0
Tiruchitrabalam	484	1731	869	862	86	1050	0
Thuthikulam	392	1310	642	668	61	140	0

Naranapuram	831	3000	1430	1570	149	1541	0
Soundarapandiapuram	595	2212	1093	1119	113	747	0
Sambavar Vadagarai (TP)	4423	16709	8347	8362	874	2236	35
TOTAL	40328	148320	73525	74795	7703	20630	40

Source: Census 2011

Table 3-20 Summary of Socioeconomic indicators within the study area

S. No	Particulars	Study Area	Unit
1	Number of villages and towns in the Study Area	26	Nos.
2	Total Households	40328	Nos.
3	Total Population	148320	Nos.
4	Children Population (<6 Years Old)	7703	Nos.
5	SC Population	20630	Nos.
6	ST Population	40	Nos.
7	Total Working Population	81432	Nos.
8	Literates	101574	Nos.

(Source: Census 2011)

3.12.6 Employment and livelihood

Table 3-21 shows the classification of workers within the study area. Details of Literacy population in the study area is given in Table 3-22.

Table 3-21 Classification of workers within study area

Name	Total Workers	Main Workers	Marginal Workers	Agriculture Workers				Main		Marginal	
				Main		Marginal		Household	Others	Household	Others
				Cultivators	Agri.	Cultivators	Agri.				
0-5 km											

Rough stone, Weathered Rock & Gravel Quarry over an extent of 2.45.5 Ha.

Anaikulam	1562	1485	77	226	202	2	3	564	493	15	43
Kuruchampatti	1431	1337	94	639	333	14	33	242	123	11	5
Karuvanda	3787	3713	74	381	543	4	12	1595	1194	27	27
Achankuttam	2407	2214	193	317	254	11	35	1023	620	63	74
Vadi	2754	2649	105	259	178	15	10	809	1403	11	62
Anaikulam	1624	1276	348	101	630	15	142	127	418	45	103
Surandai (TP)	18855	17835	1020	1021	1473	12	105	5756	9585	458	384
5-10 km											
Naranapuram	2851	2851	390	148	1936	34	308	66	311	11	37
Poigai	453	453	38	63	148	1	23	19	185	2	12
Kulasekaramangalam	3480	3480	428	376	1051	16	188	808	817	86	138
Vellalankulam	2082	2082	40	335	679	1	2	553	475	15	22
Echchanda	2239	2239	214	280	1497	125	56	122	126	13	20
Keelakalangal	2156	2156	386	232	582	7	223	398	558	63	93
Melamarudappapuram	1856	1856	405	449	642	28	324	20	340	25	28
Melakaangal	1700	1700	61	189	770	3	10	380	300	8	40
Kulaiyaneri	3648	3648	411	392	530	29	46	1084	1231	109	227
Uthumalai	4220	4220	562	479	1294	18	347	867	1018	48	149
Rajagopalaperi	2367	2367	357	349	375	4	209	724	562	117	27
Veerakeralampudur	3672	3672	253	319	812	7	96	937	1351	36	114
Veeranam	4132	4132	446	528	1301	17	309	1034	823	31	89
Agaram	518	518	53	77	162	5	22	113	113	4	22
Tiruchitrambalam	1025	1025	10	235	413	0	10	234	133	0	0
Thuthikulam	804	804	1	173	206	0	0	325	99	0	1
Naranapuram	1768	1768	66	478	775	19	31	323	126	1	15
Soundarapandiapuram	914	914	350	33	249	4	51	14	268	20	275
Sambavar Vadagarai (TP)	9127	9127	248	757	2450	7	78	3273	2399	53	110

TOTAL	81432	79521	6630	8836	19485	398	2673	21410	25071	1272	2117
--------------	--------------	--------------	-------------	-------------	--------------	------------	-------------	--------------	--------------	-------------	-------------

(Source: Census 2011)

Table 3-22 Details of Literacy population in the study area

Name	Literates Population	Male Literates	Female Literates	Literates %
0-5 km				
Anaikulam	1810	1029	781	1.78
Kuruchampatti	1361	780	581	1.34
Karuvanda	4647	2602	2045	4.57
Achankuttam	2970	1638	1332	2.92
Vadi	3555	1948	1607	3.50
Anaikulam	3027	1556	1471	2.98
Surandai (TP)	25792	13891	11901	25.39
5-10 km				
Naranapuram	2828	1596	1232	2.78
Poigai	497	287	210	0.49
Kulasekaramangalam	4316	2430	1886	4.25
Vellalankulam	2496	1407	1089	2.46
Echchanda	2111	1176	935	2.08
Keelakalangal	2643	1460	1183	2.60
Melamarudappapuram	2190	1168	1022	2.16
Melakaangal	1740	991	749	1.71
Kulaiyaneri	3654	2099	1555	3.60
Uthumalai	5324	2894	2430	5.24
Rajagopalaperi	2879	1577	1302	2.83
Veerakeralampudur	5050	2724	2326	4.97
Veeranam	5363	2985	2378	5.28

Rough stone, Weathered Rock & Gravel Quarry over an extent of 2.45.5 Ha.

Agaram	735	401	334	0.72
Tiruchitrambalam	1025	579	446	1.01
Thuthikulam	785	437	348	0.77
Naranapuram	1980	1057	923	1.95
Soundarapandiapuram	1731	893	838	1.70
Sambavar Vadagarai (TP)	11065	6159	4906	10.89
Total	101574	55764	45810	100.00

(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	<i>a-Ve</i>	-	-	-	-	-	-	<i>b +Ve</i>	-	LU/LC (-) : Potential change in land cover SE (+) : Economic development and Employment to local
2	Preparation of site - Clearance of vegetation at site	<i>a-Ve</i>	-	-	-	-	<i>a-Ve</i>	<i>a-Ve</i>	-	-	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	<i>a-Ve</i>	<i>a-Ve</i>	<i>a-Ve</i>	<i>a-Ve</i>	<i>a-Ve</i>	<i>a-Ve</i>	<i>a-Ve</i>	<i>b +Ve</i>		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	-	<i>a-Ve</i>	<i>a-Ve</i>	-	-	-	<i>a-Ve</i>	-	-	AQ (-) : generation of dust NV (-) : generation of noise EB (-) : generation of noise and dust emission
5	Transportation of mining material	-	<i>a-Ve</i>	<i>a-Ve</i>	-	-	-	<i>a-Ve</i>	<i>b +Ve</i>	-	AQ (-) : generation of dust NV (-) : generation of noise EB (-) : generation of noise SE (+) : Employment Generation
6	Land Reclamation	<i>a-Ve</i>	<i>a-Ve</i>	-	-	<i>a-Ve</i>	<i>a-Ve</i>	<i>b +Ve</i>	<i>b +Ve</i>	-	LU (-) : some areas will be converted to water reservoir. AQ (-) : Dust emission due to leveling. EB (+) : Some areas 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 2.45.5 Hectares and is a part of hilly terrain. The proposed quarry land is not 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. The quarry lease area is located with an elevation 172m above MSL within the quarry lease SF. No. 3 of total area 2.45.5 hectares.

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 Anticipated 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 and 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 Meteorological 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.

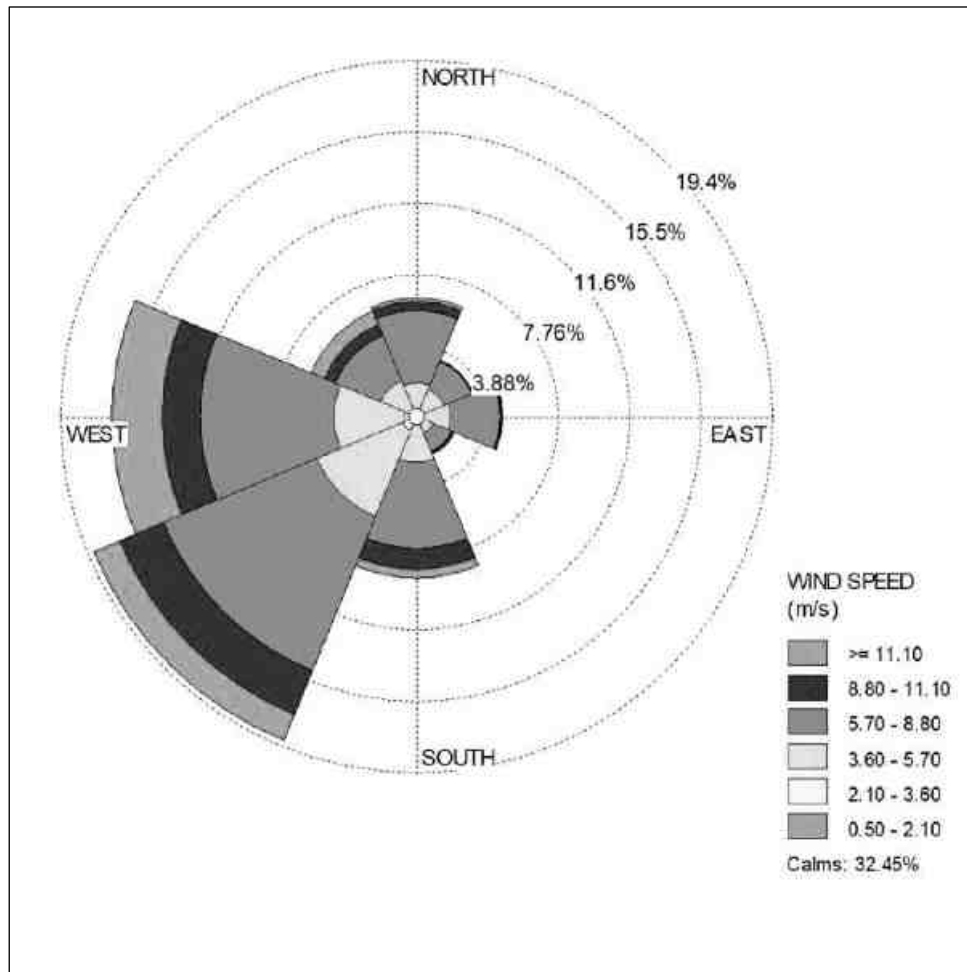


Figure 4-1 Wind Rose Diagram Considered for dispersion modeling (March 2023 to May 2023)

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 PM₁₀, PM_{2.5}, SO₂, 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 are 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

Rough stone, Weathered Rock & Gravel Quarry over an extent of 2.45.5 Ha.

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 (%)	η	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. <table border="1"> <thead> <tr> <th>Operation</th> <th>Activity</th> <th>Equation ID</th> <th>TSP</th> <th>PM₁₀</th> </tr> </thead> <tbody> <tr> <td>Topsoil handling</td> <td>Top soil removal by stump</td> <td>1</td> <td>0</td> <td></td> </tr> <tr> <td></td> <td>Bulldozing</td> <td>2</td> <td>20</td> <td></td> </tr> <tr> <td></td> <td>Loading</td> <td>3</td> <td>21</td> <td></td> </tr> <tr> <td></td> <td>Transportation</td> <td>4</td> <td>22</td> <td></td> </tr> <tr> <td></td> <td>Unloading</td> <td>5</td> <td>21</td> <td></td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th>Equation ID</th> <th>Equation</th> <th>Units</th> <th>Reference</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>0.029</td> <td>kg TSP/t</td> <td>USEPA (2008)</td> </tr> <tr> <td>2</td> <td>$35.6 \frac{L}{M^2}$</td> <td>kg TSP/h</td> <td>USEPA (2008)</td> </tr> <tr> <td>3</td> <td>$0.0012 \frac{(L/2.7)^{0.3}}{(M/2)^{0.4}} + 0.018$</td> <td>kg TSP/t</td> <td>USEPA (2006b)</td> </tr> <tr> <td>4</td> <td>$1.38 \left(\frac{L}{M}\right)^{0.1} \left(\frac{M}{2}\right)^{0.45} (1 - \eta_c)(1 - \eta_u)$</td> <td>kg TSP/VKT</td> <td>USEPA (2006a), Cowherd (1988)</td> </tr> <tr> <td>5</td> <td>$0.0012 \frac{(L/2.7)^{0.3}}{(M/2)^{0.4}} + 0.02$</td> <td>kg TSP/t</td> <td>USEPA (2006b, 2008)</td> </tr> <tr> <td>20</td> <td>$0.75(8.44) \frac{L^{0.2}}{M^{0.2}}$</td> <td>kg PM₁₀/(h bulldozer)</td> <td>USEPA (2008)</td> </tr> <tr> <td>21</td> <td>$0.00056 \frac{(L/2.7)^{0.3}}{(M/2)^{0.4}}$</td> <td>kg PM₁₀/t</td> <td>USEPA (2006a, b)</td> </tr> <tr> <td>22</td> <td>$0.423 \left(\frac{L}{M}\right)^{0.2} \left(\frac{M}{2}\right)^{0.45} (1 - \eta_c)(1 - \eta_u)$</td> <td>kg PM₁₀/VKT</td> <td>USEPA (2006a), Cowherd (1988)</td> </tr> </tbody> </table>	Operation	Activity	Equation ID	TSP	PM ₁₀	Topsoil handling	Top soil removal by stump	1	0			Bulldozing	2	20			Loading	3	21			Transportation	4	22			Unloading	5	21		Equation ID	Equation	Units	Reference	1	0.029	kg TSP/t	USEPA (2008)	2	$35.6 \frac{L}{M^2}$	kg TSP/h	USEPA (2008)	3	$0.0012 \frac{(L/2.7)^{0.3}}{(M/2)^{0.4}} + 0.018$	kg TSP/t	USEPA (2006b)	4	$1.38 \left(\frac{L}{M}\right)^{0.1} \left(\frac{M}{2}\right)^{0.45} (1 - \eta_c)(1 - \eta_u)$	kg TSP/VKT	USEPA (2006a), Cowherd (1988)	5	$0.0012 \frac{(L/2.7)^{0.3}}{(M/2)^{0.4}} + 0.02$	kg TSP/t	USEPA (2006b, 2008)	20	$0.75(8.44) \frac{L^{0.2}}{M^{0.2}}$	kg PM ₁₀ /(h bulldozer)	USEPA (2008)	21	$0.00056 \frac{(L/2.7)^{0.3}}{(M/2)^{0.4}}$	kg PM ₁₀ /t	USEPA (2006a, b)	22	$0.423 \left(\frac{L}{M}\right)^{0.2} \left(\frac{M}{2}\right)^{0.45} (1 - \eta_c)(1 - \eta_u)$	kg PM ₁₀ /VKT	USEPA (2006a), Cowherd (1988)
Operation	Activity	Equation ID	TSP	PM ₁₀																																																																
Topsoil handling	Top soil removal by stump	1	0																																																																	
	Bulldozing	2	20																																																																	
	Loading	3	21																																																																	
	Transportation	4	22																																																																	
	Unloading	5	21																																																																	
Equation ID	Equation	Units	Reference																																																																	
1	0.029	kg TSP/t	USEPA (2008)																																																																	
2	$35.6 \frac{L}{M^2}$	kg TSP/h	USEPA (2008)																																																																	
3	$0.0012 \frac{(L/2.7)^{0.3}}{(M/2)^{0.4}} + 0.018$	kg TSP/t	USEPA (2006b)																																																																	
4	$1.38 \left(\frac{L}{M}\right)^{0.1} \left(\frac{M}{2}\right)^{0.45} (1 - \eta_c)(1 - \eta_u)$	kg TSP/VKT	USEPA (2006a), Cowherd (1988)																																																																	
5	$0.0012 \frac{(L/2.7)^{0.3}}{(M/2)^{0.4}} + 0.02$	kg TSP/t	USEPA (2006b, 2008)																																																																	
20	$0.75(8.44) \frac{L^{0.2}}{M^{0.2}}$	kg PM ₁₀ /(h bulldozer)	USEPA (2008)																																																																	
21	$0.00056 \frac{(L/2.7)^{0.3}}{(M/2)^{0.4}}$	kg PM ₁₀ /t	USEPA (2006a, b)																																																																	
22	$0.423 \left(\frac{L}{M}\right)^{0.2} \left(\frac{M}{2}\right)^{0.45} (1 - \eta_c)(1 - \eta_u)$	kg PM ₁₀ /VKT	USEPA (2006a), Cowherd (1988)																																																																	
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																																																																			



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 PM₁₀ emissions contribute to PM_{2.5}.

Table 4-4 Emissions considered from area Sources.

S. No	Activities	Emission rate (g/s)	
		PM ₁₀	PM _{2.5}
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}	PM ₁₀
1	4 Wheels (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

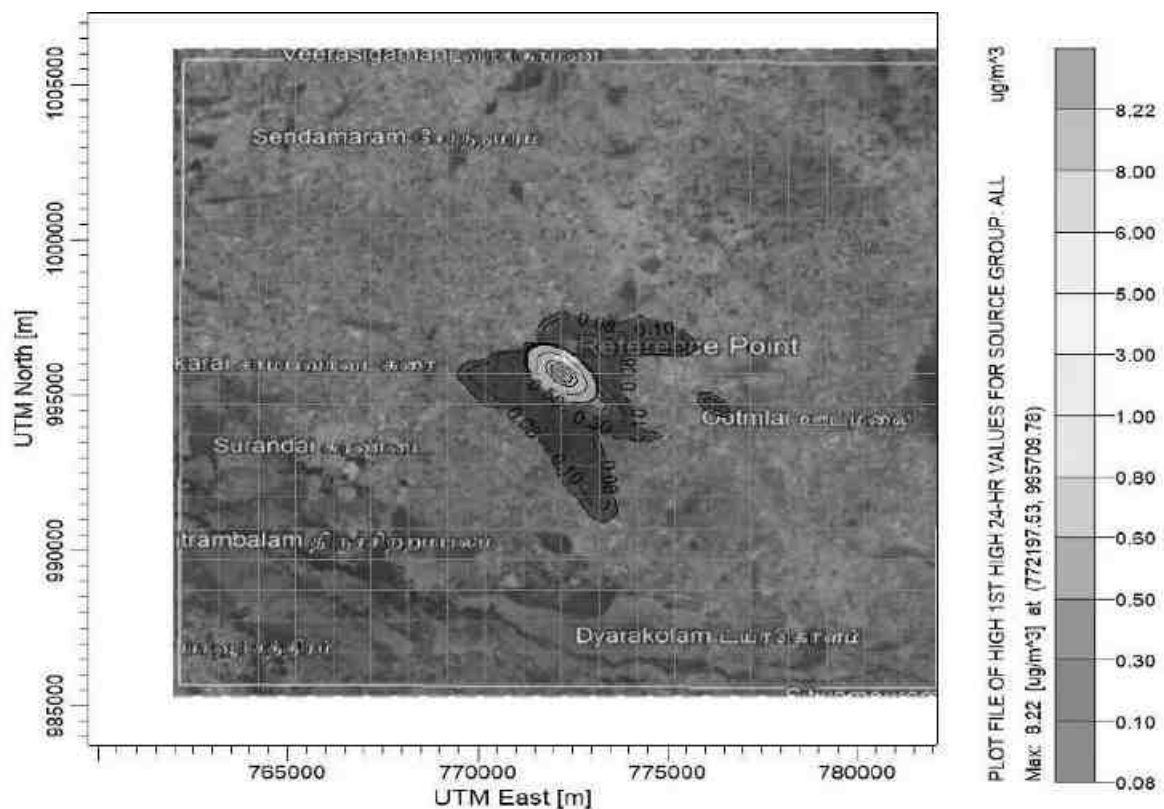


Figure 4-3 Predicted 24-Hrs GLC of Particulate matter (PM₁₀)

Table 4-6 Predicted Top 10 Highest Concentrations of PM₁₀

S. No	UTM Coordinates		Conc. (µg/m ³)	Distance(km)	Direction
	E	N			
1	772197.5	995709.8	8.22173	Project Site	-
2	773197.5	994709.8	0.7115	1.41	SE
3	772197.5	994709.8	0.33606	1.00	W
4	771197.5	995709.8	0.247	1.00	W
5	772197.5	993709.8	0.19191	2.00	SE
6	772197.5	996709.8	0.17306	1.00	W
7	773197.5	995709.8	0.15623	1.00	NE
8	775197.5	996709.8	0.13484	3.16	E
9	773197.5	996709.8	0.13309	1.41	NW
10	770197.5	995709.8	0.12598	2.00	W

Rough stone, Weathered Rock & Gravel Quarry over an extent of 2.45.5 Ha.

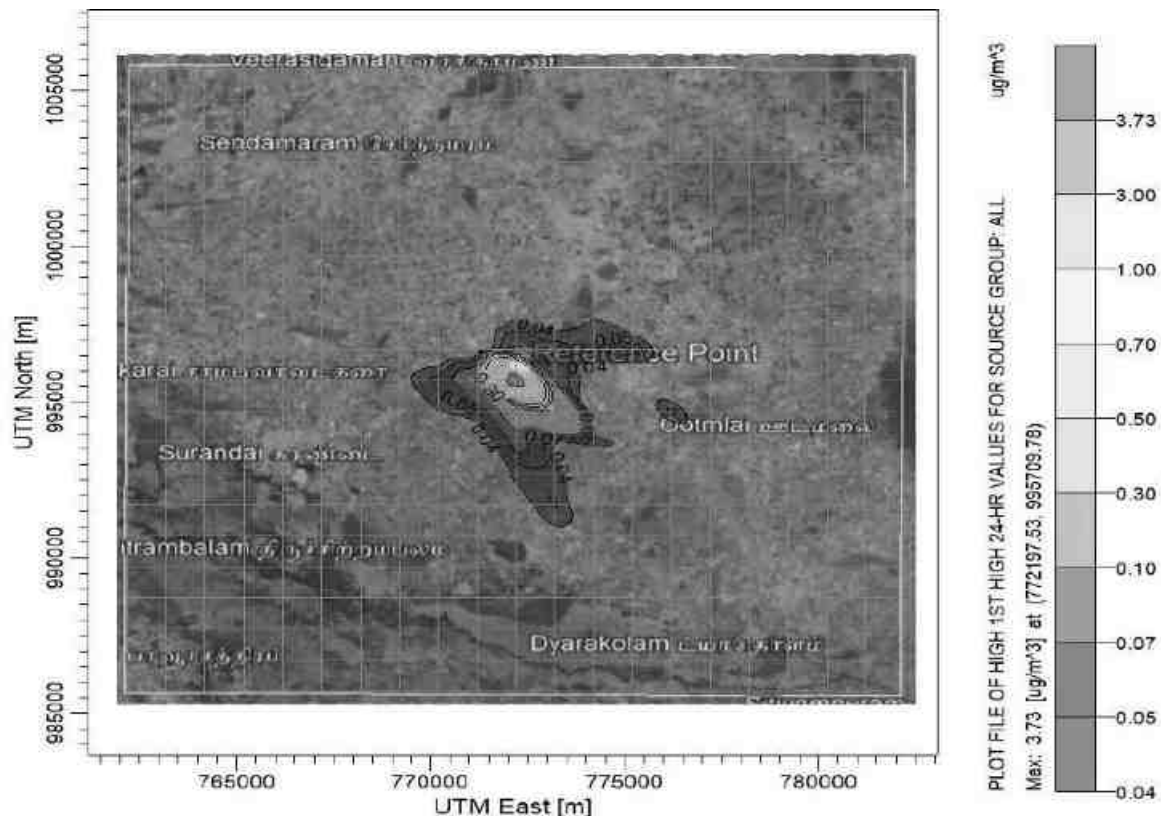


Figure 4-1 Predicted 24-Hrs GLC of Particulate matter (PM_{2.5})

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

S. No	UTM Coordinates		Conc. (µg/m ³)	Distance(km)	Direction
	E	N			
1	772197.5	995709.8	3.729	Project Site	-
2	773197.5	994709.8	0.30999	1.00	SE
3	772197.5	994709.8	0.14279	1.00	W
4	771197.5	995709.8	0.10962	1.00	SE
5	772197.5	993709.8	0.08288	2.00	S
6	772197.5	996709.8	0.07403	1.00	E
7	773197.5	995709.8	0.07095	1.00	SE
8	775197.5	996709.8	0.06084	3.16	E
9	773197.5	996709.8	0.05638	1.41	E
10	770197.5	995709.8	0.05589	2.00	N

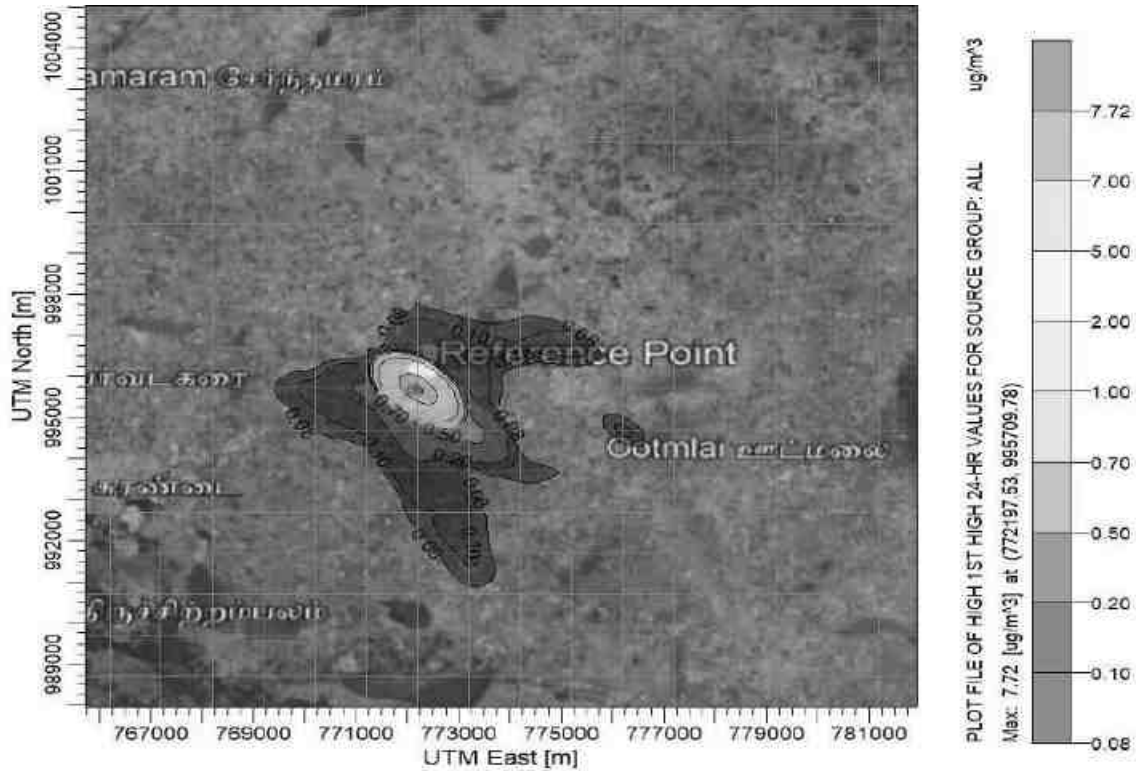


Figure 4-2 Predicted 24-Hrs GLC of NO_x

Table 4-8 Predicted Top 10 Highest Concentrations of NO_x

S. No	UTM Coordinates		Conc. (µg/m ³)	Distance(km)	Direction
	E	N			
1	772197.5	995709.8	7.72325	Project Site	-
2	773197.5	994709.8	0.69021	1.00	SE
3	772197.5	994709.8	0.33265	1.00	W
4	771197.5	995709.8	0.23617	1.00	SE
5	772197.5	993709.8	0.18744	2.23	E
6	772197.5	996709.8	0.17023	1.00	S
7	773197.5	995709.8	0.14661	1.00	SE
8	773197.5	996709.8	0.13186	1.41	SE
9	775197.5	996709.8	0.12721	2.83	N
10	770197.5	995709.8	0.12048	2.83	SE

4.2.3.5 Conclusion

The maximum ground level concentration observed due to mining activities and traffic movement without mitigative measures for PM₁₀, PM_{2.5}, and NO_x are 3.37464 µg/m³, 0.33 µg/m³, and 1.0788 µg/m³ 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. ($\mu\text{g}/\text{m}^3$)	Estimated Incremental Conc. ($\mu\text{g}/\text{m}^3$)	Total Conc. ($\mu\text{g}/\text{m}^3$)	NAAQ standard	% Increase
PM ₁₀	66.4	3.37	69.77	100	5.07
PM _{2.5}	31.5	0.33	31.83	60	1.05
NO _x	25.8	1.08	26.88	80	4.19

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 42m below the ground level (2m Gravel + 5m Weathered rock + 35m 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.

Hydrology: Average rainfall: 1184 mm/year

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.

The nearest water body to the proposed quarry lease area is a Pond located at 0.17km (S) from the project site, doesn't have any significant impact on its hydrology, Since the flow pattern from the above proposed quarry lease area, doesn't flow that side.

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 into rainwater harvesting structures so that ground water recharge is assured.

4.4.4 Rainwater Harvesting and Plan for Water Conservation

Ground water recharge is not expected, as there is no scope for rainwater collection. Rainwater collected on the quarry surface will flow down the hillock and will enter the nearby streams. Hence, no accumulation of storm water is anticipated in the proposed quarry. However, as a responsible corporate citizen, we will do rainwater 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. This area is not known for any kind of biodiversity.

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 because this is a lease land registered in the name of the applicant Thiru. K. Arumugasamy which is non – agriculture and is not being put to any use.

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 rainwater, 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 2.45.50 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 are 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 emergency response equipment to combat events such as fire.
- ✓ All personnel required to handle hazardous materials will be provided with personal protective equipment suitable for the hazardous material being handled.
- ✓ On-site first aid facilities will be provided, and employees will be extended to the local community in emergencies.

4.9 Traffic Density

The total production capacity is 2,83,500 m³ of rough stone, 87,300m³ of Weathered Rock and 38,400m³ of Gravel. Considering an operating calendar of 300 days per year, the average saleable production will be about 270 m³ per day. Considering an average carrying capacity of truck as 20 Tons, the number of truck trips will be about 25-30 trips per day. Further, considering an operation of 10 hours per day, about 3-5 trips will be added to the existing traffic of 5 Heavy vehicles per hour, on the nearby Road which is located at ~ 0.13km located at Southern side.

4.9.1 Mitigation Measures

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

4.10 Soil

4.10.1 Anticipated Impact

As such there is some topsoil/ OB is expected to be generated during the lease period. The topsoil 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 2.45.50 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 2.45.50 Hectares of patta land. The proponent, Thiru. K. Arumugasamy, have got the lease, from the the Pattadhar, Thiru. Abdul Ali for a period of 6 years. As per regulations they had engaged an RQP (Recognized Qualified Person) to prepare a mining plan for approval by Dept. of Mines & Geology.

5.2 Site Studies

Both Thiru. K. Arumugasamy'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 the rough stone, weathered rock and gravel. The section wise details of reserves were worked out by the qualified person and the same has been approved by Department of Geology and Mines.

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, at a maximum saleable production is 2,83,500 m³ of rough stone, 87,300m³ of Weathered Rock and 38,400m³ of Gravel.

5.3 Alternate Method of Mining

Other alternatives for methods 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 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.

Rough stone, Weathered Rock & Gravel Quarry over an extent of 2.45.5 Ha.

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), TamilNadu, following the SEAC (State Expert Appraisal committee) meeting. This report will be circulated prior to public hearing under the auspices of TNPCB (TamilNadu 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.
- ✓ Provision 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.
- ✓ For any type of above disaster, a rescue team will be formed by training the mining staff with specialized training.

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

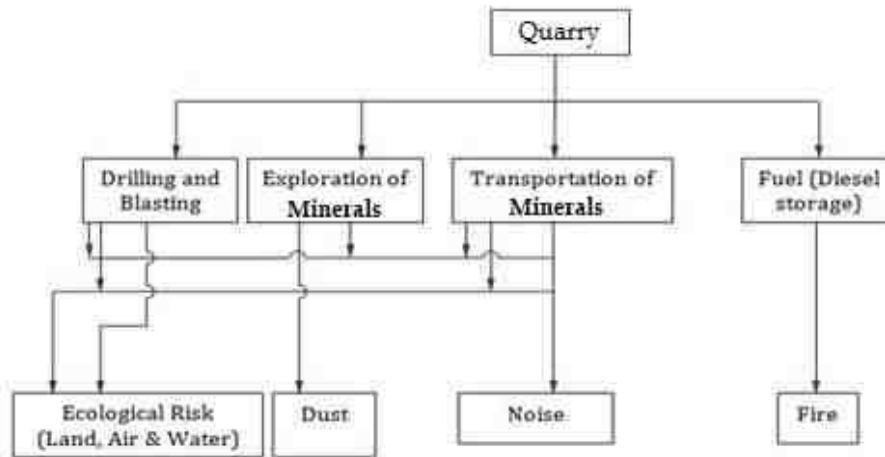


Figure 7-1 Identification of hazards in opencast mine

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 with blasting operations.

7.1.2.5 Heavy Machinery

Most of the accidents during transport of dumpers, proclams 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 lease 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 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.

- ✓ Draining of mine water by suitable capacity pumps

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

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
- ✓ Senior most operator- Medical coordinator

7.1.3.1 Emergency Services

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

- Fire Protection System
- Off Site Emergency Plan

7.1.3.2 Fire Protection System

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

7.1.3.3 Off-Site Emergency Plan

The offsite emergency plan defining the various steps to tackle any offsite emergencies, which may affect surrounding areas of the project, must be prepared after due finalizing discussion in this respect with local Panchayat official, Revenue officials and District Collector. As per this off-site plan, in case of any off-site emergencies, actions 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 42m 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 42m 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 the 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 a week for One (01) season (shall cover 12 weeks), i.e., during Pre-Monsoon season. PM₁₀, PM_{2.5}, SO₂, NO_x, Pb, NH₃, C₆H₆, C₂₀H₁₂, As, Ni, were monitored. Sampling was carried out as per Central Pollution Control Board (CPCB) monitoring guidelines at each location.

The following precautions will be 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.
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. 16.2 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 ground 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. 16.2 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 plants 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 36 persons is expected. Out of which 12 people will be of semiskilled and unskilled 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 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. K. Arumugasamy will improve revenue for 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 1200 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 proposed Open Cast Semi mechanized method 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 SO₂, 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, workers / labors etc	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	-
	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 10km 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

About 1200 saplings will be planted on either side of the haulage road and also in the vacant government land. One cubic metre pit (for new plant sapling) 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 depending on availability.

Table 10-1 Green Belt program Year wise

Year	No of trees	Survival Rate	No. of Trees expected to grow	Total Area (Sq.m)
Ist	240	80%	192	640
IInd	240	80%	192	640
IIIrd	240	80%	192	640
IVth	240	80%	192	640
Vth	240	80%	192	640
Total	1200	80%	960	3200

A budget of Rs. 3,60,000 is earmarked for implementation of 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 Check up.
2. A well-equipped hospital with trained doctors, nursing staff members, and a pool of visiting doctors with sufficient beds will be provided and maintained on the quarry premises.
3. At Mine site First-Aid Room shall be provided for the site workers. 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, Thiru. K. Arumugasamy, have earmarked an investment of Rs. 2,81,500/- towards CER (being 2% of the total capital cost) and this budget is earmarked for carrying out the facilities like water purifier, Cot and Bed facilities to the nearby Dispensary and Water purifier and table facilities to the nearby Government school, by the project proponent.

10.2.9 Environment Management Cell

The 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.

- i) Achieve objectives of the ‘Environment Protection Policy’ of the management.
- ii) Collect information from regular monitoring and create a database.
- iii) Discuss the reports of study on environment and disseminate the information.

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

Table 10-2 Environmental Management Cell

Designation	Proposed responsibility
Proponent/Mine Manager	<ul style="list-style-type: none"> ✓ 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 Manager shall report to Board of Directors.
Mine Engineer	<ul style="list-style-type: none"> ✓ 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

10.2.10 Budget for Environmental Protection

It is necessary to include the environmental cost as a part of the budgetary cost component. A total of Rs.73,00,054/- allocated for environmental protection activities. Environmental Management cost is given in **Error! Reference source not found. Table 10-3.**

Table 10-3 Environmental Management Plan Cost

Source	Mitigation Measure	Provision for Implementation	Capital Cost in Rs.	Recurring Cost in Rs.
Air Environment	Compaction, gradation and drainage on both sides for Haulage Road	Rental Dozer & drainage construction on haul road @ Rs. 10,000/- per hectare; and yearly maintenance @ Rs. 10,000/- per hectare	25000	25000
	Fixed Water Sprinkling Arrangements + Water sprinkling by own water tankers	Fixed Sprinkler Installation and New Water Tanker Cost for Capital; and Water Sprinkling (thrice a day) Cost for recurring	80000	40000
	Air Quality will be regularly monitored as per norms within ML area & Ambient Area	Yearly Compliance as per CPCB norms	20000	5000
	Muffle blasting – To control fly rocks during blasting	Blasting face will be covered with sandbags / steel mesh / old tyres / used conveyor belts	0	5000
	Wet drilling procedure / latest eco-friendly drill machine with separate dust extractor unit	Dust extractor @ Rs. 25,000/- per unit deployed as capital & @ Rs. 2500 per unit recurring cost for maintenance	100000	10000
	No overloading of trucks/tippers/tractors	Manual Monitoring through Security guard	0	5000
	Stone carrying trucks will be covered by tarpaulin	Monitoring if trucks will be covered by tarpaulin	0	5000
	Enforcing speed limits of 20 km/hr within ML area	Installation of Speed Governors @ Rs. 5000/- per Tipper/Dumper deployed	25000	0
	Regular monitoring of exhaust fumes as per RTO norms	Monitoring of Exhaust Fumes by Manual Labour	0	5000
	Regular sweeping and maintenance of approach roads for at least about 200 m from ML Area	Provision for 2 labours @ Rs.10,000/labour (Contractual) per Hectare		50000
	Installing wheel wash system near gate of quarry	Installation + Maintenance + Supervision	50000	20000

Noise Environment	Source of noise will be during operation of transportation vehicles, HEMM for this proper maintenance will be done at regular intervals.	Provision made in Operating Cost	0	0
	Oiling & greasing of Transport vehicles and HEMM at regular interval will be done	Provision made in Operating Cost	0	0
	Adequate silencers will be provided in all the diesel engines of vehicles.	Provision made in Operating Cost	0	0
	It will be ensured that all transportation vehicles carry a fitness certificate.	Provision made in Operating Cost	0	0
	Safety tools and implements that are required will be kept adequately near blasting site at the time of charging.	Provision made in OHS part	0	0
	Line Drilling all along the boundary to reduce the PPV from blasting activity and implementing controlled blasting.	Provision made in Operating Cost	0	0
	Proper warning system before blasting will be adopted and clearance of the area before blasting will be ensured.	Blowing Whistle by Mining Mate / Blaster / Compentent Person	0	0
	Provision for Portable blaster shed	Installation of Portable blasting shelter	35000	2000
	Shot hole Blasting will be practiced controlling Ground vibration and fly rocks	Rs. 30/- per 6 Tonnes of Blasted Material	0	655000
Water Environment	Water management	Provision for garland drain @ Rs. 10,000/- per Hectare with maintenance of Rs. 5,000/- per annum	25000	15000
Waste Management	Waste management (Spent Oil, Grease etc.,)	Provision for domestic waste collection and disposal through authorized agency	25000	10000
		Installation of dust bins	5000	2000
	Bio toilets will be made available outside mine lease on the land of owner itself	Provision made in Operating Cost	0	0

Implementation of EC, Mining Plan & DGMS Condition	Size 6' X 5' with blue background and white letters as mentioned in MoM Appendix II by the SEAC TN	Fixed Display Board at the Quarry Entrance as permanent structure mentioning Environmental Conditions	10000	1000
	Workers will be provided with Personal Protective Equipment's	Provision of PPE @ Rs. 4000/- per employee with recurring based on wear and tear (say, @ Rs. 1000/- per employee)	144000	36000
	Health check-up for workers will be provisioned	IME & PME Health check up @ Rs. 1000/- per employee	36000	18000
	First aid facility will be provided	Provision of 2 Kits per Hectare @ Rs. 2000/-	5000	2000
	Mine will have safety precaution signages, boards.	Provision for signages and boards made	10000	2000
	Barbed Wire Fencing to quarry area will be provisioned.	Per Hectare fencing Cost @ Rs. 2,00,000/- with Maintenance of Rs 10,000/- per annum	250000	25000
	No parking will be provided on the transport routes. Separate provision on the south side of the hill will be made for vehicles /HEMMS. Flaggers will be deployed for traffic management	Parking area with shelter and flags @ Rs. 50,000/- per hectare project and Rs. 10,000/- as maintenance cost	125000	25000
	Installation of CCTV cameras in the mines and mine entrance	Camera 4 Nos, DVR, Monitor with internet facility	30000	5000
	Implementation as per Mining Plan and ensure safe quarry working	Mines Manager (1 st Class / 2 nd Class / Mine Foreman) under regulation 34 / 34 (6) of MMR, 1961 and Mining Mate under regulation 116 of MMR,1961 @ 40,000/- for Manager & @ 25,000/- for Foreman / Mate	0	65000
Green Belt Development	Green belt development - 500 trees per one hectare (200 Inside Lease Area & 300 Outside Lease Area)	Site clearance, preparation of land, digging of pits / trenches, soil amendments, transplantation of	120000	18000

		saplings @ 200 per plant (capital) for plantation inside the lease area and @ 30 per plant maintenance (recurring)		
		Avenue Plantation @ 300 per plant (capital) for plantation outside the lease area and @ 30 per plant maintenance (recurring)	240000	24000
Total			1360000	1075000

The Environmental management Cost for each year is calculated at 5% cost inflation and total is worked out in the below **Table 10-4**.

Table 10-4 EMP Budget for each year

Year	Total Cost in Rs.
Ist (Capital Cost + Recuring Cost)	24,35,000
IIInd (Recuring Cost*5% + Recuring Cost)	11,28,750
IIIrd (Cost of IIInd year*5% + IIInd year cost)	11,85,188
IVth (Cost of IIIrd year*5% + IIIrd year cost)	12,44,447
Vth (Cost of IVth year*5% + IVth year cost)	13,06,669
Total	73,00,054

10.3 Cluster Environment Management Plan-Budget

The proposed rough stone, weathered rock and gravel quarry of Thiru. K. Arumugasamy, with an extent of 2.45.5 Hectares, is located in SF. No. 3 of Surandai Part I village in V.K. Pudur Taluk of 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. M1/23755/2020, dated: 20.11.2021, which states that, there are three (03) abandoned quarries 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:

Table 10-5 Details of other quarries falling in the same cluster.

S. No	Name of the Lessee	Location	Present Status
1	Thiru. M. Absul Ali	Area of Extent: 4.00.0 Ha. Surandai -I, SF. No. 1, 2, 11/2 & 12	Abandoned quarry
2	Thiru. N.H.M. Pandian	Area of Extent: 2.51.0 Ha. Anaikulam (V), SF. No. 302/1	Abandoned quarry
3	Thiru. N.H.M. Pandian	Area of Extent: 3.10.0 Ha. Anaikulam (V), SF. No. 303	Abandoned quarry

4	Thiru. D. Sankaranara	Area of Extent: 0.98.50 Ha. Anaikulam (V), SF. No. 279/3A(P) & 379/4(P)	Proposed quarry
5	Thiru. P. Rajendran	Area of Extent: 2.38.0 Ha. Anaikulam (V), SF. No. 280/6	Proposed quarry
6	Thiru. K. Arumugasamy	Area of Extent: 2.45.5 Ha. Surandai Part – I (V) SF. No. 3	Proposed quarry

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. K. Arumugasamy, a resident of Surandai Village, in Tenkasi District of TamilNadu. He had proposed to extract Rough Stone, Weathered Rock & Gravel in an extent of 2.45.5 Hectares of Patta land, located in SF. No. 3 of Surandai Part I Village, V.K. Pudur Taluk of Tenkasi District in TamilNadu State. The Proposed land having Patta in the name of Thiru. M.Abdul Ali (Pattadhar), where the proponent had obtained consent from the Pattadhar, and lease agreement had been registered in the year 2020. The Proponent had obtained lease for a period of 6 years (2020-2026).

The Proponent had proposed to quarry Rough stone, Weathered Rock & Gravel over an extent of 2.45.5Ha of Patta land located in the SF. No. 3 of Surandai Part I Village, V.K. Pudur Taluk of Tenkasi District in 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. M1/23755/2020, Dated: 22.10.2021 to submit the Approved Mining Plan and Environmental Clearance 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. M1/23755/2020, dated: 22.10.2021.

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, TamilNadu had issued the Standard Terms of Reference (ToR) vide **Letter No. SEIAA-TN/F.No.9608/SEAC/ToR-1335/2022, Dated: 10.02.2023** 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

Table 11-1 Project summary

S. No	Particulars	Details
1.	Land classification	Non- Forest Land (Patta Land)
2.	Extent of lease area (Ha.)	2.45.50
3.	Quarry Lease	It's a Patta land in the name of Thiru. Abdul Ali vide Patta No: 4018, The applicant has obtained lease from the Pattadhar.
4.	Lease Period	6 years
5.	Estimated Geological Reserves	Rough stone : 8,59,250m ³ Weathered rock: 1,22,750m ³ Gravel : 49,100m ³
6.	Estimated Mineable Reserves	Rough stone : 2,83,500m ³ Weathered rock: 87,300m ³ Gravel : 38,400m ³
7.	Average production per annum	Rough stone : 2,83,500m ³ Weathered rock: 87,300m ³ Gravel : 38,400m ³
8.	Depth of Mining	42m Below Ground Level ((2m Gravel + 5m Weathered Rock+ 35m Rough Stone)
9.	Method of Mining	Open cast semi mechanized method
10.	Water Requirement (KLD)	3.0
11.	Source of Water	Private tankers
12.	Fuel requirements (Lts/Day) for machineries & vehicles	2,33,200 Litres for entire project life
13.	Direct Manpower (Nos)	36
14.	Municipal Solid Waste Generation (kg/day)	16.2
15.	Project Cost in Lakhs Rs.	140.72
16.	EMP Cost in Lakhs Rs.	73.00

11.2.1 Proposed Method of Mining

The Rough stone, weathered rock and gravel quarry in the lease area is extended upto an area of 2.45.50Ha. 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 the 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 20T capacity shall be utilized for all transportation purposes. In addition, certain service equipment like water tankers (for dust suppression), pick-up vehicle etc. will be used.

11.3 Description 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 PM₁₀ (41.9– 66.4 µg/m³), PM_{2.5} (17.3– 31.5 µg/m³), SO₂ (7.6 – 15.4µg/m³), NO₂ (12.7 – 25.8 µg/m³). 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 52.8 dB(A) and 42.2 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 49.8 dB(A) to 52.9 dB(A) and nighttime noise levels varied from 38.2 dB(A) to 43.8 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 8 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 6.91 to 7.92 and within the limits (6.5 – 8.5) of IS 2296:1992.
- ✓ The Electrical Conductivity (EC) of the collected surface water ranges from 1358 μ S/cm to 2241 μ S/cm.
- ✓ The chloride content in the collected surface water ranges from 194.6 mg/l to 349.6 mg/l.
- ✓ The sulphate content in the collected surface water sample ranges from 88.1 mg/l to 154.3 mg/l.
- ✓ COD of the collected surface water sample ranges from 12.4 mg/l to 42.8 mg/l.
- ✓ BOD of the collected surface water sample ranges from 7.2 mg/l to 20.3 mg/l.

Ground Water Quality

Physio-chemical characteristics of ground water samples collected from the selected villages during Pre-monsoon 2022. 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 6.88 and 7.83. It is observed that the pH range is within the limit of IS 10500:2012.
- ✓ The Total Dissolved Solids range is varied between 803 mg/l – 1381 mg/l for the ground water. All the samples are well within the permissible limit of IS 10500: 2012.
- ✓ The acceptable limit of the chloride content is 250 mg/l and permissible limit is 1000 mg/l. The chloride content in the ground water for study area ranges between 197.6 mg/l – 392.4 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 107.2 mg/l – 227.3 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 productions are 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,

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 faunal species 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 148320 persons inhabited in 26 villages. The statistics regarding the list of villages, number of households and human population.

11.4 Anticipated Environmental Impacts

A. Air Environment

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

The maximum ground level concentration observed due to mining activities and traffic movement for PM₁₀, PM_{2.5}, and NO_x are 3.37464 µg/m³, 0.33 µg/m³, and 1.0788 µg/m³ respectively. So, it can be concluded that even during operation of quarry the impact envisaged is moderate.

Impacts:

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

Proposed Mitigation Measure:

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

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.
- ✓ The building stone will not produce any harmful toxic effluence in the form of solid, liquid or gas.
- ✓ Garland drains will be constructed on all sides of the quarry.
- ✓ All the garland drains will be routed through adequately sized catchpits or settling pits to remove suspended solids from flowing into storm water.
- ✓ The water will be used after settling for irrigation/greenbelt and dust suppression.
- ✓ The overall drainage planning will be done so that the existing pre-mining drainage conditions will be maintained to the extent possible so that run off distribution is not affected.
- ✓ Rainwater harvesting by constructing check dams on natural nallah and developing water bodies should be planned for recharging groundwater.
- ✓ Sewage (0.64KLD) is being sent 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, Tiger Reserve, Elephant Reserve, wildlife migratory routes in core and buffer zones within the 10km 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.

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 health of the workers and people from the nearest village directly.
- Existing roads shall be damaged due to heavy vehicle movement.
- Spillages of material during transportation
- Dust deposition on plants, trees and agriculture lands.
- 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 36 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.

Rough stone, Weathered Rock & Gravel Quarry over an extent of 2.45.5 Ha.

- ✓ Rainwater harvesting by constructing check dam on natural nallah and developing water bodies should be planned for recharging groundwater.
- ✓ CER 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 TamilNadu State Pollution Control Board (TNPCB) will be maintained.

11.7 Additional Studies

Public Hearing

Disaster Management Plan

- ✓ The salient features of Disaster Management Plan shall be included.
- ✓ 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 mutually at duddukuru 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 the local people (around 36 Nos will be employed).
- ✓ 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 Environment 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.73,00,000 and under recurring cost Rs.10,75,000/.

11.11 Conclusion

This is a proposal for mining Rough stone, Weathered Rock, and Gravel quarry over an extent of 2.45.50 Ha. where the material has a good requirement in the civil construction & other fields. The proposed quarry lease is well participating in “Corporate Responsibility Schemes”. The local employment will be improved, 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

M/s. EHS360 Labs Pvt. Ltd. (EHSL) is one of the pioneer companies in the field of Environmental Consultancy Service providers in India. We are NABET Accredited consultant for conducting Environmental Impact Assessment Studies (EIA) and obtaining Environmental Clearances for 1,21,38 & 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. A. Santhosh Kumar	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. A. Santhosh Kumar	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
Ms. Soosan Steffy S	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	Ms. 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
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, Prevention 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

12.3 Copy of QCI NABET Accreditation


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



**National Accreditation Board
for Education and Training**



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/ACQ/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.


 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.