DRAFT ENVIRONMENTAL IMPACT ASSESSMENT & ENVIRONMENTAL MANAGEMENT PLAN REPORT

(Submitted for Public Hearing as per the provisions of EIA Notification 2006 & amendments thereof)

FOR

OBTAINING

Environmental Clearance

Schedule Sl. No. 1 (a) (i): Mining Project

(Category B1-Minor Mineral-Cluster-Non-Forest Land)

Proposed Area –4.90.5 Ha

Cluster Extent: 15.59.5 Ha

PANAMPATTI ROUGH STONE QUARRY CLUSTER

STUDY PERIOD - December 2021 to February 2022

Located at

S. F. NOS.

11/2A, 12/1A & 12/1B (Part) of THIRUVENGAIVASAL VILLAGE & 236/1A, 236/1B, 236/1C,236/1D, 236/1E, 236/2,236/3, 236/4, 236/5,236/6, 236/7,236/9,236/10, 236/11, 236/12,236/13, 236/14, 19/3,235/9B & 235/11 of PANAMPATTI VILLAGE, ILLUPPUR TALUK, PUDUKKOTTAI DISTRICT, TAMIL NADU

PROJECT PROPONENT

Tvl. Om Shri Vari Stones Pvt., Ltd.,
No. 24/2 (11/2), Raja Street Ext.,
Mandaveli, Chennai – 600 028

ENVIRO RESOURCES

(NABET Certificate No: NABET/EIA/1922/SA0133)

Reg. Add. 1904 Roopnagar CHS, S V Road, Kandivali West, Mumbai 400067, Maharashtra

JUNE 2022

UNDERTAKING BY CLIENT

We lessees as Tvl. Om Shri Vari Stones Pvt Ltd., of Panamaptti Village and Thiruvengaivasal, Rough Stone Quarry Cluster, Illupur Taluk, Pudukkottai District, Tamil Nadu having new proposed area of 4.90.5 Ha. while the cluster area is 15.59.5 Ha give this undertaking to the effect that the conditions laid down in Terms of Reference by SEIAA, Tamil Nadu vide Letter no. SEIAA-TN/F.No.8685/SEAC/ToR-1044/2022 respectively for the proposed quarry.

The report has been complied with, and the data submitted and the information presented in the report are factually correct.

Date: 01/06/2022

P. Vadival
Managing Director,
M/s. Om Shri Vari Stones Pvt Ltd,
No.24/2(l1/2), Raja Street Ext.,
Mandaveli, Chennai – 600 028

Declaration by Expert

Declaration by Experts contributing to the EIA, The Proposed Rough Stone Quarry" Cluster at Survey Nos. 11/2A, 12/1A & 12/1B (Part) of Thiruvengaivasal village & 236/1A, 236/1B, 236/1C,236/1D,236/1E,236/2,236/3,236/4,236/5,236/6,236/7,236/9,236/10,236/11,236/12, 236/13,236/14,19/3,235/9B & 235/11 of Panampatti village, Illuppur Taluk, Pudukkottai District, Tamil Nadu, having proposed area of 4.90.5 Ha), while cluster area is 15.59.5 Ha. Project Proponent: **M/s. Om Shri Vari Stones Pvt Ltd. Study Period December 2021 to February 2022 (Pre -monsoon).**

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

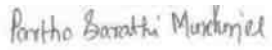
EIA coordinator:
Name: **Dr. Milind P. Kundal**

Signature and Date: ……
Period of involvement: February 2021 to Till Date

Contact information:
Email id.: info@enviroresources.in
Tel. No. +91-9867898844

Functional area experts:

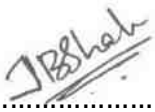
S. No.	Functional areas	Name of the expert/s	Involvement (Period and task**)	Signature and date
1.	AP*	Timir Shah	February 2021 to Till Date (Identification & Assessment of Impact, Suggestion Mitigation Measures)	
2.	WP*	Pritam Kadam	February 2021 to Till Date (Identification & Assessment of Impact, Suggestion Mitigation Measures).	
3.	SE*	Anil Shende	February 2021 to Till Date (Identification & Assessment of Impact, Suggestion Mitigation Measures)	
4.	EB*	Bhaskar Yengal	February 2021 to Till Date (Identification & Assessment of Impact, Suggestion Mitigation Measures)	
5.	HG*	Milind Kundal	February 2021 to Till Date (Identification & Assessment of Impact, Suggestion Mitigation Measures)	
6.	GEO*	Milind Kundal	February 2021 to Till Date (Identification & Assessment of Impact, Suggestion Mitigation Measures)	

S. No.	Functional areas	Name of the expert/s	Involvement (Period and task**)	Signature and date
7.	SC*	Bhaskar Yengal	February 2021 to Till Date (Identification & Assessment of Impact, Suggestion Mitigation Measures)	
8.	AQ*	Pritam Kadam	February 2021 to Till Date (Identification & Assessment of Impact, Suggestion Mitigation Measures)	
9.	NV*	Partho Mukherjee	February 2021 to Till Date (Identification & Assessment of Impact, Suggestion Mitigation Measures)	
10.	LU*	Milind Kundal	February 2021 to Till Date (Identification & Assessment of Impact, Suggestion Mitigation Measures)	
11.	RH*	Santosh Gupta	February 2021 to Till Date (Identification & Assessment of Impact, Suggestion Mitigation Measures)	

Declaration by the Head of the accredited consultant organization/ authorized person

I, Timir Shah, hereby, confirm that the above-mentioned experts prepared the EIA, "The Proposed Rough Stone Quarry" Cluster at Survey Nos. 11/2A, 12/1A & 12/1B (Part) of Thiruvengaivasalvillage&236/1A,236/1B,236/1C,236/1D,236/1E,236/2,236/3,236/4,236/5,236/6,236/7,236/9,236/10,236/11,236/12,236/13,236/14,19/3,235/9B & 235/11 of Panampatti village, Illuppur Taluk, Pudukkottai District, Tamil Nadu, having proposed area of total, 4.90.5 Ha), while cluster area is 15.59.5 Ha. Project Proponent: **M/s. Om Shri Vari Stones Pvt Ltd.** ***Study Period*** **December 2021 to February 2022** ***(Pre -monsoon)***. I also confirm that the consultant organization shall be fully accountable for any misleading information mentioned in this statement.

It is certified that no unethical practices, plagiarism involved in carrying out the work, and external data / text have not been used without proper acknowledgment while preparing this EIA report.



Signature:… ……

Name: Mr. Timir Shah

Designation: Head of ACO & MD

Name of the EIA consultant organization: Enviro Resources, Mumbai .

NABET Certificate No. & Issue Date: **NABET/EIA/1922/SA 0133 and issue date June 12, 2021**

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ANNEXURES

ABBREVIATIONS

AAQ	:	Ambient Air Quality
AAQM	:	Ambient Air Quality Monitoring
AAQS	:	Ambient Air Quality Standards
AIS & LUS	:	All India Soil and Land Use Survey
AMSL	:	Above Mean Sea Level
ANFO	:	Ammonium Nitrate - Fuel Oil
BH	:	Business Head
BHs	:	Bore Holes
BIS	:	Bureau of Indian Standards
bgl	:	Below Ground Level
CC	:	Calcium Carbonate
CFM	:	Cubic Feet per Minute
CWC	:	Central Water Commission
CPCB	:	Central Pollution Control Board
CSR	:	Corporate Social Responsibility
DGMS	:	Directorate General of Mines Safety
DMP	:	Disaster Management Plan
DMG	:	Department of Mines and Geology
DTH	:	Down the Hole
E	:	East
EAC	:	Expert Appraisal Committee
EC	:	Environmental Clearance
EHS	:	Environmental, Health and Safety
EIA	:	Environmental Impact Assessment
EMC	:	Environment Management Cell
EMP	:	Environmental Management Plan
ESE	:	East of South East
ENE	:	East of North East
EPA	:	Environmental Protection Act
ERDAS	:	Earth Resources Data Analysis System
EPO	:	Emergency planning officer
FPS	:	Fine Particulate Sampler
FCC	:	False Color Composite
Govt.	:	Government
GCP	:	Ground Control Points
GLC	:	Ground Level Concentration
GOI	:	Government of India
GPS	:	Global Positioning System
GSI	:	Geological Survey of India
GWEC	:	Ground Water Estimation Committee
Ha	:	Hectare

HIV	:	Human Immunodeficiency Virus
IBM	:	Indian Bureau of Mines
IMD	:	India Meteorological Department
IS	:	Indian Standards
ISO	:	International Organization of Standardization
IUCN	:	International Union for Conservation of Nature
KLD	:	Kilo Litre Per Day
LOI	:	Letter of Intent
LU/LC	:	Land Use / Land Cover
mRL	:	Metre Reduced Level
MC	:	Magnesium Carbonate
ML	:	Mining Lease
MoEF	:	Ministry of Environment & Forests
MSL	:	Mean Sea Level
MT	:	Million Tonnes
MTPA	:	Metric Tonnes Per Annum
MW	:	Mega Watt
N	:	North
NAAQS	:	National Ambient Air Quality Standards
NABET	:	National Accreditation Board for Education & Training
NATMO	:	National Atlas & Thematic Mapping Organization
NABL	:	National Accreditation Board for Testing and Calibration Laboratories
NE	:	North East
NH	:	National Highway
NNE	:	North of North East
NGO	:	Non-Governmental Organization
NNW	:	North of North West
NRSA	:	National Remote Sensing Agency
NRSC	:	National Remote Sensing Centre
NW	:	North West
OB	:	Over Burden
OBC	:	Other Backward Classes
OHS	:	Occupational Health and Safety
OSHA	:	Occupational Safety and Health Administration
PFR	:	Pre-Feasibility Report
pH	:	Potential of Hydrogen
PHCS	:	Public Health Centers
PM	:	Particulate Matter
PPE	:	Personal Protective Equipment
PPV	:	Peak Particle Velocity
QCI	:	Quality Council of India

RSPM	:	Respirable Suspended Particulate Matter
SC	:	Scheduled Caste
SE	:	South East
SEIAA	:	State Environmental Impact Assessment Authority
SH	:	State Highway
SHE	:	Safety, Health & Environment
SI	:	Sustainability initiatives
SIA	:	Social Impact Assessment
SOI	:	Survey of India
TNPCB	:	State Pollution Control Board
SPM	:	Suspended Particulate Matter
SSW	:	South of South West
ST	:	Scheduled Tribe
SW	:	South West
TC	:	Total Carbonate
TDS	:	Total Dissolved Solids
ToR	:	Terms of Reference
TPD	:	Tonnes Per Day
UNFC	:	United Nations Framework Classification
USDA	:	United States Department of Agriculture
USEPA	:	United States Environmental Protection Agency
VT	:	Vocational Training
RF	:	Reserved Forest
PF	:	Protected Forest
W	:	West
WNW	:	West of North West
WSW	:	West of South West
µg/m^3	:	Micro gram per meter cube
µm	:	Micro Meter
cu. m	:	Cubic meter
dB	:	Decibel
gm/sec	:	Gram per second
gm/cc	:	Gram per cubic metre
hr/day	:	Hour per day
kg	:	Kilogram
Kg/hr	:	Kilogram per hour
Kg/ha	:	Kilogram per hectare
km	:	Kilometre
m	:	Metre
mg/l	:	Miligram per Litre
mm	:	Milimetre
Sq.km	:	Square Kilometer

ToR LETTER

SEIAA-TN/F.No. 8685/SEAC/ToR-1044/2021, dated: 31.01.2022

Code	P2
Lessee/ Project Proponent	Tvl. Om Shri Vari Stons Pvt Ltd.,
Proposal Number	SIA/TN/MIN/65957/2021
Survey Numbers	11/2A, 12/1A & 12/1B (Part) & 236/1A,236/1B,236/1C,236/1D,236/1E, 236/2,236/3,236/4,236/5,236/6, 236/7,236/9,236/10, 236/11, 236/12,236/13, 236/14, 19/3,235/9B & 235/11
Extent	4.90.5 Ha
Village	Thiruvengaivasal and Panampatti
Taluk	Illupur
District	Pudukkottai
State	Tamil Nadu

TMT.P.RAJESWARI, I.F.S.,
MEMBER SECRETARY

STATE LEVEL ENVIRONMENT IMPACT ASSESSMENT AUTHORITY – TAMIL NADU
3rd Floor, Panagal Maaligai,
No.1 Jeenis Road, Saidapet,
Chennai-15.
Phone No.044-24359973

TERMS OF REFERENCE (ToR)

Lr No.SEIAA-TN/F.No.8685/SEAC/ToR- 1044/2022 Dated: 31.01.2022

To

M/s.Om Shri Vari Stones Pvt Ltd,
No.24/2(11/2)
Raja Street Ext.,
Mandaveli
Chennai-600028

Sir / Madam,

Sub: SEIAA, Tamil Nadu – Terms of Reference with Public Hearing (ToR) for the proposed Rough Stone quarry lease over an extent of 4.90.5 Ha in S.F.Nos. 11/2A, 12/1A & 12/1B(Part) in Thiruvengaivasal Village and S.F.Nos. 236/1A, 236/1B, 236/1C, 236/1D, 236/1E, 236/2, 236/3, 236/4, 236/5, 236/6, 236/7, 236/9, 236/10, 236/11, 236/12, 236/13, 236/14, 19/3, 235/9B & 235/11of Panampatti Village, Illuppur Taluk, Pudukottai District, Tamil Nadu by M/s. Om Shri Vari Stones Pvt Ltd - under project category – "B1" and Schedule S.No. 1(a) – ToR issued along with Public Hearing- preparation of EIA report for Rough stone quarry lease over an extent of 2.20Ha only S.F.Nos. 236/1A, 236/1B, 236/1C, 236/1D, 236/1E, 236/2, 236/3, 236/4, 236/5, 236/6, 236/7, 236/9, 236/10, 236/11, 236/12, 236/13, 236/14, 19/3, 235/9B & 235/11of Panampatti Village, Illuppur Taluk, Pudukottai District, Tamil Nadu – Regarding.

Ref: 1. Online proposal No.SIA/TN/MIN/ 65957/2021, dated: 24.07.2021
2. Your application submitted for Terms of Reference dated: 02.08.2021
3. Minutes of the 237th meeting of SEAC held on 08.10.2021
4. Minutes of the 481st Authority meeting held on 24.01.2022 & 25.01.2022.

MEMBER SECRETARY
SEIAA-TN

Kindly refer to your proposal submitted to the State Level Impact Assessment Authority for Terms of Reference.

The proponent, M/s. Om Shri Vari stones Pvt Ltd has submitted application for ToR with public Hearing on 24.07.2021, in Form-I, Pre- Feasibility report for the Proposed Rough Stone quarry lease over an extent of 4.90.5 Ha in S.F.Nos. 11/2A, 12/1A & 12/1B(Part) in Thiruvengaivasal Village and S.F.Nos. 236/1A, 236/1B, 236/1C, 236/1D, 236/1E, 236/2, 236/3, 236/4, 236/5, 236/6, 236/7, 236/9, 236/10, 236/11, 236/12, 236/13, 236/14, 19/3, 235/9B & 235/11of Panampatti Village, Illuppur Taluk, Pudukottai District, Tamil Nadu.

Discussion by SEAC and the Remarks:-

The proposal was placed for appraisal in the 237th meeting of SEAC held on 08.10.2021. Based on the presentation and documents furnished by the project proponent, SEAC decided to recommend the proposal for the **grant of Terms of Reference (ToR) with Public Hearing**, subject to the following ToR in addition to the standard terms of reference for EIA study for non-coal mining projects and details issued by the MoEF&CC to be included in EIA/EMP report.

1. If the proponent has already carried out the mining activity in the proposed mining lease area after 15.01.2016, then the proponent shall furnish the following details from AD/DD, mines,
   a) What was the period of the operation and stoppage of the earlier mines with last work permit issued by the AD/DD mines?
   b) Quantity of minerals mined out.
   c) Detail of approved depth of mining.
   d) Actual depth of the mining achieved earlier.
   e) Name of the person already mined in that leases area.
   f) If EC and CTO already obtained, the copy of the same shall be submitted.
   g) Whether the mining was carried out as per the approved mine plan (or EC if issued) with stipulated benches.
2. A detailed Study of the Lithology of the mining lease area shall be furnished.
3. The project proponent shall consider only the large area of 2.2Ha with S.No.236/1A, 236/1B, 236/1C, 236/1D, 236/1E, 236/2, 236/3, 236/4, 236/5, 236/6, 236/7, 236/9, 236/10, 236/11, 236/12, 236/13, 236/14, 19/3, 235/9B & 235/11 and the proponent shall furnish the revised mining plan from AD mines during the final EIA submission.

MEMBER SECRETARY
SEIAA-TN

4. The Project Proponent shall conduct the hydro-geological study considering the contour map of the water table detailing the number of ground water pumping & open wells, and surface water bodies such as rivers, tanks, canals, ponds etc. within 1 km (radius) along with the collected water level data for both monsoon and non-monsoon seasons from the PWD / TWAD so as to assess the impacts on the wells due to mining activity.
5. The proponent shall furnish the baseline data for the environmental and ecological parameters with regard to surface water/ground water quality, air quality, soil quality & flora/fauna including traffic/vehicular movement study.
6. The Proponent shall carry out the Cumulative impact study due to mining from all the mines on the environment in terms of air pollution, water pollution, & health impacts, accordingly the Environment Management plan should be prepared.
7. The Socio-economic studies should be carried out within a 5 km buffer zone from the mining activity.
8. A tree survey study shall be carried out (nos., name of the species, age, diameter etc.,) both within the mining lease applied area & 300m buffer zone and its management during mining activity.
9. A detailed mine closure plan for the proposed project shall be included in EIA/EMP report.
10. All the queries raised during public hearing by the local habitants need to be addressed and the protective measures or management plan may be revised accordingly and to be submitted to SEIAA/SEAC with regard to the Office Memorandum of MoEF& CC accordingly.
11. The recommendation for the issue of "Terms of Reference" is subjected to the outcome of the Hon'ble NGT, Principal Bench, New Delhi in O.A No.186 of 2016 (M.A.No.350/2016) and O.A. No.200/2016 and O.A.No.580/2016 (M.A.No.1182/2016) and O.A.No.102/2017 and O.A.No.404/2016 (M.A.No. 758/2016, M.A.No.920/2016, M.A.No.1122/2016, M.A.No.12/2017 & M.A. No. 843/2017) and O.A.No.405/2016 and O.A.No.520 of 2016 (M.A.No. 981/2016, M.A.No.982/2016 & M.A.No.384/2017).
12. The purpose of Green belt around the project is to capture the fugitive emissions and to attenuate the noise generated, in addition to the improvement in the aesthetics. A wide range of indigenous plants species should be planted in and around the premise in consultation with the DFO, District / State Agriculture University. The plants species

MEMBER SECRETARY
SEIAA-TN

should have thick canopy cover, perennial green nature, native origin and large leaf areas. Medium size trees and small trees alternating with shrubs shall be planted. Miyawaki method of planting i.e. planting different types of trees at very close intervals may be tried which will give a good green cover. Greenbelt needs to be developed in the periphery of the mines area so that at the closure time the trees would have grown well.

13. The project proponent shall furnish the details of the existing/proposed Green belt area earmarked with GPS coordinates and list of trees that are proposed to be planted surrounding the mining area atleast to a width of 3m along with a copy of photos/documents, and the same shall be included in the EIA Report.

Discussion by SEIAA and the Remarks:-

The subject was placed in the 481st Authority meeting held on 24.01.2022 & 25.01.2022. After detailed discussions, the Authority accepted the recommendation of SEAC and decided to grant Terms of Reference (ToR) with Public Hearing under cluster for undertaking the combined Environment Impact Assessment Study and preparation of separate Environment Management Plan subject to the conditions as recommended by SEAC & normal condition in addition to the following conditions:

1. As per the MoEF& CC office memorandum F.No.22-65/2017-IA.III dated: 30.09.2020 and 20.10.2020 the proponent shall address the concerns raised during the public consultation and all the activities proposed shall be part of the Environment Management Plan.
2. The Environmental Impact Assessment shall study in detail the carbon emission and also suggest the measures to mitigate carbon emission including development of carbon sinks and temperature reduction including control of other emission and climate mitigation activities.
3. The Environmental Impact Assessment should study the biodiversity, the natural ecosystem, the soil micro flora, fauna and soil seed banks and suggest measures to maintain the natural Ecosystem.
4. Action should be specifically suggested for sustainable management of the area and restoration of ecosystem for flow of goods and services.

A. STANDARD TERMS OF REFERENCE

1) Year-wise production details since 1994 should be given, clearly stating the highest production achieved in any one year prior to 1994. It may also be categorically informed whether there

MEMBER SECRETARY
SEIAA-TN

had been any increase in production after the EIA Notification 1994 came 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.

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, mining technology etc. and should be in the name of the lessee.

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

5) Information should be provided in Survey of India Topo sheet in 1:50,000 scale indicating geological map of the area, geomorphology of land forms of the area, existing minerals and mining history of the area, important water bodies, streams and rivers and soil characteristics.

6) Details about the land proposed for mining activities should be given with information as to whether mining conforms to the land use policy of the State; land diversion for mining should have approval from State land use board or the concerned authority.

7) It should be clearly stated whether the proponent Company has a well laid down Environment Policy approved by its Board of Directors? If so, it may be spelt out in the EIA Report with description of the prescribed operating process/procedures to bring into focus any infringement/deviation/ violation of the environmental or forest norms/ conditions? The hierarchical system or administrative order of the Company to deal with the environmental issues and for ensuring compliance with the EC conditions may also be given. The system of reporting of non-compliances / violations of environmental norms to the Board of Directors of the Company and/or shareholders or stakeholders at large, may also be detailed in the EIA Report.

8) Issues relating to Mine Safety, including subsidence study in case of underground mining and slope study in case of open cast mining, blasting study etc. should be detailed. The proposed safeguard measures in each case should also be provided.

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.

MEMBER SECRETARY
SEIAA-TN

10) Land use of the study area delineating forest area, agricultural land, grazing land, wildlife sanctuary, national park, migratory routes of fauna, water bodies, human settlements and other ecological features should be indicated. Land use plan of the mine lease area should be prepared to encompass preoperational, operational and post operational phases and submitted. Impact, if any, of change of land use should be given.

11) Details of the land for any Over Burden Dumps outside the mine lease, such as extent of land area, distance from mine lease, its land use, R&R issues, if any, should be given.

12) Certificate from the Competent Authority in the State Forest Department should be provided, confirming the involvement of forest land, if any, in the project area. In the event of any contrary claim by the Project Proponent regarding the status of forests, the site may be inspected by the State Forest Department along with the Regional Office of the Ministry to ascertain the status of forests, based on which, the Certificate in this regard as mentioned above be issued. In all such cases, it would be desirable for representative of the State Forest Department to assist the Expert Appraisal Committees.

13) Status of forestry clearance for the broken up area and virgin forestland involved in the Project including deposition of Net Present Value (NPV) and Compensatory Afforestation (CA) should be indicated. A copy of the forestry clearance should also be furnished.

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.

15) The vegetation in the RF / PF areas in the study area, with necessary details, should be given.

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.

17) Location of National Parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, Ramsar site Tiger/ Elephant Reserves/(existing as well as proposed), if any, within 10 km of the mine lease should be clearly indicated, supported by a location map duly authenticated by Chief Wildlife Warden. Necessary clearance, as may be applicable to such projects due to proximity of the ecologically sensitive areas as mentioned above, should be obtained from the Standing Committee of National Board of Wildlife and copy furnished.

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, endangered,

MEMBER SECRETARY
SEIAA-TN

endemic and RET Species duly authenticated, separately for core and buffer zone should be furnished based on such primary field survey, clearly indicating the Schedule of the fauna present. In case of any scheduled-I fauna found in the study area, the necessary plan along with budgetary provisions for their conservation should be prepared in consultation with State Forest and Wildlife Department and details furnished. Necessary allocation of funds for implementing the same should be made as part of the project cost.

19) Proximity to Areas declared as 'Critically Polluted' or the Project areas likely to come under the 'Aravali Range', (attracting court restrictions for mining operations), should also be indicated and where so required, clearance certifications from the prescribed Authorities, such as the SPCB or State Mining Department should be secured and furnished to the effect that the proposed mining activities could be considered.

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 with respect to CRZ, coastal features such as mangroves, if any, should be furnished. (Note: The Mining Projects falling under CRZ would also need to obtain approval of the concerned Coastal Zone Management Authority).

21) R&R Plan/compensation details for the Project Affected People (PAP) should be furnished. While preparing the R&R Plan, the relevant State/National Rehabilitation & Resettlement Policy should be kept in view. In respect of SCs /STs and other weaker sections of the society in the study area, a need based sample survey, family-wise, should be undertaken to assess their requirements, and action programmes prepared and submitted accordingly, integrating the sectoral programmes of line departments of the State Government. It may be clearly brought out whether the village(s) located in the mine lease area will be shifted or not. The issues relating to shifting of village(s) including their R&R and socio-economic aspects should be discussed in the Report.

22) One season (non-monsoon) [i.e. March-May (Summer Season); October-December (post monsoon season) ; December-February (winter season)]primary baseline data on ambient air quality as per CPCB Notification of 2009, water quality, noise level, soil and flora and fauna shall be collected and the AAQ and other data so compiled presented date-wise in the EIA and EMP Report. Site-specific meteorological data should also be collected. The location of the monitoring stations should be such as to represent whole of the study area and justified keeping in view the pre-dominant downwind direction and location of sensitive receptors.

MEMBER SECRETARY
SEIAA-TN

There should be at least one monitoring station within 500 m of the mine lease in the pre-dominant downwind direction. The mineralogical composition of PM10, particularly for free silica, should be given.

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

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.

25) Necessary clearance from the Competent Authority for drawl of requisite quantity of water for the Project should be provided.

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.

27) Impact of the Project on the water quality, both surface and groundwater, should be assessed and necessary safeguard measures, if any required, should be provided.

28) Based on actual monitored data, it may clearly be shown whether working will intersect groundwater. Necessary data and documentation in this regard may be provided. In case the working will intersect groundwater table, a detailed Hydro Geological Study should be undertaken and Report furnished. The Report inter-alia, shall include details of the aquifers present and impact of mining activities on these aquifers. Necessary permission from Central Ground Water Authority for working below ground water and for pumping of ground water should also be obtained and copy furnished.

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.

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.

31) A time bound Progressive Greenbelt Development Plan shall be prepared in a tabular form (indicating the linear and quantitative coverage, plant species and time frame) and submitted,

MEMBER SECRETARY
SEIAA-TN

keeping in mind, the same will have to be executed up front on commencement of the Project. Phase-wise plan of plantation and compensatory afforestation should be charted clearly indicating the area to be covered under plantation and the species to be planted. The details of plantation already done should be given. The plant species selected for green belt should have greater ecological value and should be of good utility value to the local population with emphasis on local and native species and the species which are tolerant to pollution.

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 Impact of Transportation study as per Indian Road Congress Guidelines.

33) Details of the onsite shelter and facilities to be provided to the mine workers should be included in the EIA Report.

34) Conceptual post mining land use and Reclamation and Restoration of mined out areas (with plans and with adequate number of sections) should be given in the EIA report.

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.

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.

37) Measures of socio economic significance and influence to the local community proposed to be provided by the Project Proponent should be indicated. As far as possible, quantitative dimensions may be given with time frames for implementation.

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.

MEMBER SECRETARY
SEIAA-TN

39) Public Hearing points raised and commitment of the Project Proponent on the same along with time bound Action Plan with budgetary provisions to implement the same should be provided and also incorporated in the final EIA/EMP Report of the Project.

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.

41) The cost of the Project (capital cost and recurring cost) as well as the cost towards implementation of EMP should be clearly spelt out.

42) A Disaster management Plan shall be prepared and included in the EIA/EMP Report.

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.

44) Besides the above, the below mentioned general points are also to be followed:-

a) Executive Summary of the EIA/EMP Report

b) All documents to be properly referenced with index and continuous page numbering.

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.

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.

e) Where the documents provided are in a language other than English, an English translation should be provided.

f) The Questionnaire for environmental appraisal of mining projects as devised earlier by the Ministry shall also be filled and submitted.

g) While preparing the EIA report, the instructions for the Proponents and instructions for the Consultants issued by MoEF&CC vide O.M. No. J-11013/41/2006-IA.II(I) dated 4th August, 2009, which are available on the website of this Ministry, should be followed.

h) Changes, if any made in the basic scope and project parameters (as submitted in Form-I and the PFR for securing the TOR) should be brought to the attention of MoEF&CC with reasons for such changes and permission should be sought, as the ToR may also have to be altered. Post Public Hearing changes in structure and content of the draft EIA/EMP (other than modifications arising out of the P.H. process) will entail conducting the PH again with the revised documentation.

i) As per the circular no. J-11011/618/2010-IA.II(I) dated 30.5.2012, certified report of the

MEMBER SECRETARY
SEIAA-TN

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.

j) The EIA report should also include (i) surface plan of the area indicating contours of main topographic features, drainage and mining area, (ii) geological maps and sections and (iii) sections of the mine pit and external dumps, if any, clearly showing the land features of the adjoining area.

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

The Executive summary of the EIA/EMP report in about 8-10 pages should be prepared incorporating the information on following points:

1. Project name and location (Village, District, State, Industrial Estate (if applicable).
2. Process description in brief, specifically indicating the gaseous emission, liquid effluent and solid and hazardous wastes.
3. Measures for mitigating the impact on the environment and mode of discharge or disposal.
4. Capital cost of the project, estimated time of completion.
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.
6. A detailed study of the lithology of the mining lease area shall be furnished.
7. Details of village map, "A" register and FMB sketch shall be furnished.
8. Detailed mining closure plan for the proposed project approved by the Geology of Mining department shall be shall be submitted along with EIA report.
9. Obtain a letter /certificate from the Assistant Director of Geology and Mining standing that there is no other Minerals/resources like sand in the quarrying area within the approved depth of mining and below depth of mining and the same shall be furnished in the EIA report.
10. EIA report should strictly follow the Environmental Impact Assessment Guidance Manual for Mining of Minerals published February 2010.
11. Detail plan on rehabilitation and reclamation carried out for the stabilization and restoration of the mined areas.
12. The EIA study report shall include the surrounding mining activity, if any.
13. Modeling study for Air, Water and noise shall be carried out in this field and incremental increase in the above study shall be substantiated with mitigation measures.
14. A study on the geological resources available shall be carried out and reported.

MEMBER SECRETARY
SEIAA-TN

15. A specific study on agriculture & livelihood shall be carried out and reported.
16. Impact of soil erosion, soil physical chemical and biological property changes may be assumed.
17. Site selected for the project - Nature of land - Agricultural (single/double crop), barren, Govt./ private land, status of is acquisition, nearby (in 2-3 km.) water body, population, with in 10km other industries, forest , eco-sensitive zones, accessibility, (note - in case of industrial estate this information may not be necessary)
18. Baseline environmental data - air quality, surface and ground water quality, soil characteristic, flora and fauna, socio-economic condition of the nearby population
19. Identification of hazards in handling, processing and storage of hazardous material and safety system provided to mitigate the risk.
20. Likely impact of the project on air, water, land, flora-fauna and nearby population
21. Emergency preparedness plan in case of natural or in plant emergencies
22. Issues raised during public hearing (if applicable) and response given
23. CER plan with proposed expenditure.
24. Occupational Health Measures
25. Post project monitoring plan
26. The project proponent shall carry out detailed hydro geological study through intuitions/NABET Accredited agencies.
27. A detailed report on the green belt development already undertaken is to be furnished and also submit the proposal for green belt activities.
28. The proponent shall propose the suitable control measure to control the fugitive emissions during the operations of the mines.
29. A specific study should include impact on flora & fauna, disturbance to migratory pattern of animals.
30. Reserve funds should be earmarked for proper closure plan.
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 Environment (Protection) Act, 1986. In this connection, the project proponent has to furnish the action plan.

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

MEMBER SECRETARY
SEIAA-TN

a. A note confirming compliance of the TOR, with cross referencing of the relevant sections / pages of the EIA report should be provided.

b. All documents may be properly referenced with index, page numbers and continuous page numbering.

c. Where data are presented in the report especially in tables, the period in which the data were collected and the sources should be indicated.

d. While preparing the EIA report, the instructions for the proponents and instructions for the consultants issued by MoEF & CC vide O.M. No. J-11013/41/2006-IA.II (I) dated 4th August, 2009, which are available on the website of this Ministry should also be followed.

e. The consultants involved in the preparation of EIA/EMP report after accreditation with Quality Council of India (QCI)/National Accreditation Board of Education and Training (NABET) would need to include a certificate in this regard in the EIA/EMP reports prepared by them and data provided by other organization/Laboratories including their status of approvals etc. In this regard circular no F. No.J -11013/77/2004-IA-II(I) dated 2nd December, 2009, 18th March 2010, 28th May 2010, 28th June 2010, 31st December 2010 & 30th September 2011 posted on the Ministry's website http://www.moef.nic.in/ may be referred.

- After preparing the EIA (as per the generic structure prescribed in Appendix-III of the EIA Notification, 2006) covering the above mentioned points, the proponent will take further necessary action for obtaining environmental clearance in accordance with the procedure prescribed under the EIA Notification, 2006.
- The final EIA report shall be submitted to the SEIAA, Tamil Nadu for obtaining Environmental Clearance.
- The TORs with public hearing prescribed shall be **valid for a period of three years** from the date of issue, for submission of the EIA/EMP report as per OMNo.J-11013/41/2006-IA-II(I)(part) dated 29th August, 2017.

MEMBER SECRETARY
SEIAA-TN

Copy to:

1. The Additional Chief Secretary to Government, Environment & Forests Department, Govt. of Tamil Nadu, Fort St. George, Chennai - 9

2. The Chairman, Central Pollution Control Board, Parivesh Bhavan, CBD Cum-Office Complex, East Arjun Nagar, New Delhi 110032.
3. The Member Secretary, Tamil Nadu Pollution Control Board, 76, Mount Salai, Guindy, Chennai-600 032.
4. The APCCF (C), Regional Office, MoEF & CC (SZ), 34, HEPC Building, 1st & 2nd Floor, Cathedral Garden Road, Nungambakkam, Chennai -34.
5. Monitoring Cell, IA Division, Ministry of Environment, Forests & CC, Paryavaran Bhavan, CGO Complex, New Delhi 110003
6. The District Collector, Pudukottai District.
7. The EO/BDO, Panampatti Village, Illuppur Taluk, Pudukottai District
8. Stock File.

TOR COMPLIANCE

The point wise ToR compliance issued by SEIAA,TN for new proposed area of 4.90.5 Ha while cluster area is 15.59.5 Ha, located in Survey No. 11/2A, 12/1A & 12/1B (Part) Thiruvengaivasal village & 236/1A,236/1B,236/1C,236/1D,236/1E,236/2,236/3,236/4,236/5,236/6,236/7,236/9, 236/10, 236/11, 236/12,236/13, 236/14, 19/3,235/9B & 235/11 of Panampatti village Village, Illuppur Taluk, Pudukkottai District, Tamil Nadu. Details of ToR issued by SEIAA is as follows.

LESSEE	PROPOSAL NO	TOR LETTER
Tvl. Om Shri Vari Stones Pvt Ltd.	SIA/TN/MIN/65957/2021	SEIAA-TN/F.No.8685/SEAC/ToR-1044/2021, dated 31.01.2022

TERMS OF REFERENCE (TOR) FOR Tvl. Om Shri Vari Stones Pvt Ltd.(P2)

Sr. No.	Condition	Compliance
SPECIFIC CONDITIONS		
1.	If the proponent has already carried out the mining activity in the proposed mining lease area after 15.01.2016, then the proponent shall furnish the following details from AD/DD mines a) What was the period of operation and stoppage of the earlier mines with last work permit issued by the AD/DD mines? b) Quantity of minerals mined out c) Detail of approved depth of mining d) Actual depth of mining achieved earlier e) Name of the person already mined in the lease area f) If EC and CTO already obtained, the copy of the same shall be submitted Whether the mining was carried out as per the approved mine plan (or EC if used) with	Will be provided in Final EIA.

Sr. No.	**Condition**	**Compliance**
	stipulated benches.	
2	A detailed study of the lithology of the mining lease area shall be furnished	Lithology study map attached in the **Chapter-2, Figure 2.4, Page No. 53.**
3	The Project proponent shall consider only the large area of 2.2 Ha with S.No.236/1A,236/1B,236/1C,236/1D,236/1E,236/2,236/3,236/4,236/5,236/6,236/7,236/9,236/10,236/11,236/12,236/13,236/14,19/3,235/9B & 235/11 and the proponent shall furnish the revised mining plan from AD mines during the final EIA submission	We assure that, will furnish in final EIA submission.
4	The proponent shall conduct the hydro-geological study considering the contour map of the water table detailing the number of ground water pumping and, open wells and surface water such as rivers,tanks,canals, ponds etc within the radius of 1km along with the water levels in both monsoon and Non-monsoon seasons from PWD/TWAD so as to assess the impacts on the wells due to mining acitivity	Hydrogeological study furnished in the **Chapter-3, Section 3.9.3, Page Nos. 101 to 112**
5	The proponent shall furnish the baseline data for the environmental and ecological parameters with regard to surface water/ground water quality, air quality, soil quality and flora/fauna including traffic/vehicular movement study	Environmental and ecological parameters with regard to surface water/ground water quality, air quality, soil quality and flora/fauna including traffic/vehicular movement study to assess the cumulative impact of the proposed project on the environment and in order to propose Environment management plan details furnished in Chapter-3

Sr. No.	Condition	Compliance
6	The Proponent shall carry out the Cumulative impact study due to mining from all the mines on the environment in terms of air pollution, water pollution, health impacts accordingly the Environment Management plan should be prepared	Cluster mining details is tabulated and 500m radius letter is attached as **Annexure II, Page Nos. 264-269.** The cumulative impact study due to mining in all the environment s carried out Cumulative Impact study discussed in **Chapter-7, Section 7.4, Page Nos. 242 to 250.**
7	The Socio Economic studies should be carried out within 10km buffer zone from the mine	Socio-Economic Studies were carried out covering 10km radius from the periphery of the project area and discussed in **Chapter-3, Section 3.11, Page Nos. 129 to 156**
8	A tree survey study shall be carried out (nos. name of the species, age) in the mining lease applied area and 300m buffer and its management during mining activity.	The trees within core and buffer zone are discussed in **Section 3.10, page Nos. 120 to 129.**
9	A detailed mining closure plan for the proposed project shall be included in EIA/EMP report	Mining Plan along with progressive mine closure Plan was approved by Department of Geology and Mining, Pudukottai District attached as **Annexure VI** with a Mining plate **Page Nos. 324-512.**
10	All the queries raised during public hearing by the local habitants need to be addressed and the protective measures or management plan may be revised accordingly and to be submitted to SEIAA/SEAC with regard to the office Memorandum of MoEF & CC accordingly	Will be part of Final EIA.
11	The recommendation for the issue Terms of Reference is subject to the final outcome of the Hon'ble NGT, Principal Bench, New Dehi in O.A. No. 186 of 2016 (M.A.No.350/2016)	Noted.

Sr. No.	Condition	Compliance
	and O.A. No. 200/2016 and O. A. No. 580/2016 (M.A. No.1182/2016) and O.A.No.520 of 2016 (M.A.No.981/2016, M.A.No.982/2016 & M.A.No.384/2017).	
12	The purpose of Green belt around the project is to capture the fugitive emissions and to attenuate the noise generated, in addition to the improvement in the around the premise. A wide range of indigenous plants speices should be planted in and around the premise in consultation with DFO, District/ State Agriculture University. The plant species should have thick canopy cover, prenninal green nature, native origin and large leaf areas. Medium size trees and small trees alternating with shrubs shall be planted. Miyawaki method of planting i.e planting different types of trees at very close intervals may be tried which will give a good green cover. Greenbelt needs to be developed in the periphery of the mines area so that at the closure time the trees would have grown well	Will adhere to the laid down condition and plantation in mining area will be carried out consultation with DFO, District/ State Agriculture University.
13	The project proponent shall furnish the details along with the existing Green belt area earmarked with GPS coordinates and list of trees are planted/ to be planted with a copy of photos/documents of the existing green belt, and included in the EIA Report	The development of greenbelt will be done in the peripheral buffer zone of the mine area. Green belt has been recommended as one of the major components of environmental Management plan, which will improve ecology, environment and quality of the surrounding area. Local trees like, Neem, Pungam etc. will be planted along the safety distance at a rate of 50 trees per annum with interval 5m. The rate of survival expected to be 80% in this area.
14	As per the MoEf & CC office memorandum	Will be part of Final EIA.

Sr. No.	Condition	Compliance
	F.No.22-65/2017-IA.III dated 30.09.2020 and 20.10.2020 the proponent shall address the concerns raised during the public consultation and all the activities proposed shall be part of the Environment Management Plan.	
15	The Environmental Impact Assessment shall study in detail the carbon emission and also suggest the measures to mitigate carbon emission including development of carbon sinks and temperature reduction including control of other emission and climate mitigation activities.	All Mitigation measures will be adhered and mining will be carried out as per prescribed conditions laid down in Environmental Clearance.
16	The Environmental Impact Assessment should study the biodiversity, the natural ecosystem, the soil micro flora, fauna and soil seed banks and suggest measures to maintain the natural Ecosystem.	The EIA Study included Biodiversity Study as the flora fauna observed in 10km study area. **Chapter 3, Section 3.10, Page Nos. 120 to 128.**
17	Action should be specifically suggested for sustainable management of the area and restoration of ecosystem for flow of goods and services.	All precautions will be taken for sustainable management of area and for restoration of ecosystem plantation will be carried in safety zone and upper benches also.
STANDARD TOR		
1)	Year-wise production details since 1994 should be given, clearly stating the highest production achieved in any one year prior to 1994. It may also be categorically informed whether there had been any increase in production after the EIA Notification 1994 came into force, w.r.t. the highest production achieved prior to 1994.	Not applicable. This is not a Violation Category Project. This proposal is for Environmental Clearance for B1 Category Cluster Situation.
2)	A copy of the document in support of the fact that the Proponent is the rightful lessee of the mine should be given.	The copy of LOI i.e. Precise Area Communication Letter in the name of all Lessee is attached as **Annexure I, Page Nos. 254-259.**

Sr. No.	Condition	Compliance
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, mining technology etc. and should be in the name of the lessee	Noted & agreed.
4)	All corner coordinates of the mine lease area, superimposed on a High Resolution Imagery/ toposheet, topographic sheet, geomorphology and geology of the area should be provided. Such an Imagery of the proposed area should clearly show the land use and other ecological features of the study area (core and buffer zone).	All corner coordinates of the mine lease area are superimposed on High Resolution Imagery **Figure 1.4** in **Chapter 1**, **Page No. 27** The topo map showing mine lease area and land use and other ecological features of the study area (core and buffer zone) is also present as **Figure 1.6, Page No. 30 of Chapter 1.**
5)	Information should be provided in Survey of India Toposheet in 1:50,000 scale indicating geological map of the area, geomorphology of land forms of the area, existing minerals and mining history of the area, important water bodies, streams and rivers and soil characteristics.	Geological map of Lease area 10km, 5km radius is given**,** on **Chapter-2 Figure No.2.2, Page No. 51.**
6)	Details about the land proposed for mining activities should be given with information as to whether mining conforms to the land use policy of the State; land diversion for mining should have approval from State land use board or the concerned authority.	The applied area is inspected by the VAO, Revenue Inspector of Mines, Assistant Director and confirmed the land is suitable for Rough stone quarrying operation with the land use policy of the state. VAO Certificate is attached as **Annexure IV, Page Nos 270-273.**
7)	It should be clearly stated whether the proponent Company has a well laid down Environment Policy approved by its Board of Directors? If so, it may be spelt out in the	The proponent has framed its Environmental Policy and the same is Attached as **Annexure VII, page Nos. 513-514.**

Sr. No.	**Condition**	**Compliance**
	EIA Report with description of the prescribed operating process/procedures to bring into focus any infringement/deviation/ violation of the environmental or forest norms/conditions? The hierarchical system or administrative order of the Company to deal with the environmental issues and for ensuring compliance with the EC conditions may also be given. The system of reporting of non-compliances / violations of environmental norms to the Board of Directors of the Company and/or shareholders or stakeholders at large, may also be detailed in the EIA Report.	
8)	Issues relating to Mine Safety, including subsidence study in case of underground mining and slope study in case of open cast mining, blasting study etc. should be detailed. The proposed safeguard measures in each case should also be provided.	It is an open cast mining project. Blasting details are incorporated in **Chapter-2, Section 2.16, Page No. 66.**
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.	The study area comprise of 10 km zone around the mine lease from lease periphery as mentioned and the data contained in the EIA such as waste generation etc. are for the life of the mine. in **Chapter 2, Section. 2.14, Page No. 59.**
10)	Land use of the study area delineating forest area, agricultural land, grazing land, wildlife sanctuary, national park, migratory routes of fauna, water bodies, human settlements and other ecological features should be indicated. Land use plan of the mine lease area should be prepared to encompass preoperational, operational and post	Land use of the study area delineating forest area, agricultural land, grazing land, wildlife sanctuary, national park, migratory routes of fauna, water bodies, human settlements and other ecological features is given in **Chapter 3, Section 3.2, Page No.**

Sr. No.	Condition	Compliance
	operational phases and submitted. Impact, if any, of change of land use should be given.	**80 to 85.** There is no wildlife sanctuary and national park, migratory routes of fauna in the study area
11)	Details of the land for any Over Burden Dumps outside the mine lease, such as extent of land area, distance from mine lease, its land use. R&R issues, if any, should be given.	There is no proposal for use of land outside the mine lease area for OB dumps, etc. There are no R&R issues involved in the project.
12)	A Certificate from the Competent Authority in the State Forest Department should be provided, confirming the involvement of forest land, if any in the project area. In the event of any contrary claim by the Project Proponent regarding the status of forests, the site may be inspected by the State Forest Department along with the Regional Office of the Ministry to ascertain the status of forests, based on which, the Certificate in this regard as mentioned above be issued. In all such cases, it would be desirable for representative of the State Forest Department to assist the Expert Appraisal Committees.	No forest land involved in the project.
13)	Status of forestry clearance for the broken up area and virgin forestland involved in the Project including deposition of net present value (NPV) and compensatory afforestation (CA) should be indicated A copy of the forestry clearance should also be furnished.	Not applicable since no forest land involved within mine lease area.
14)	Implementation status of recognition of forest rights under the Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 should be indicated.	Not applicable since no forest land involved in mine lease area.

Sr. No.	Condition	Compliance
15)	The vegetation in the RF / PF areas in the study area, with necessary details, should be given.	No wildlife sanctuary, national park or biosphere reserve within 10 m radius of mine lease area.
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.	Impact on Biological Environment is given in **Chapter 3, Section 3.10, Page No. 120 to 128.**
17)	Location of National Parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, Ramsar site Tiger/ Elephant Reserves/(existing as well as proposed), if any, within 10 km of the mine lease should be clearly indicated, supported by a location map duly authenticated by Chief Wildlife Warden Necessary clearance, as may be applicable to such projects due to proximity of the ecologically sensitive areas as mentioned above, should be obtained from the Standing Committee of National Board of Wildlife and copy furnished.	Not Applicable since no National Parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, Ramsar site Tiger/ Elephant Reserves/ (existing as well as proposed) within 10 km radius.
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, endangered, endemic and RET Species duly authenticated, separately for core and buffer zone should be furnished based on such primary field survey, clearly indicating the Schedule of the fauna present. In case of any scheduled-l fauna found in the study area, the necessary plan along with budgetary provisions for their conservation	Details biological study (flora & fauna) within 10 km radius of the project site have been incorporated in **Chapter 3, Section 3.10, Page No. 120 to 128.**

Sr. No.	Condition	Compliance
	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.	
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 TNPCB or State Mining Department should be secured and furnished to the effect that the proposed mining activities could be considered.	There is no critically polluted area within 10 km radius of the mining area. Also, the project does not come under the '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).	The project does not fall under CRZ.
21)	R&R Plan/compensation details for the Project Affected People (PAP) should be furnished. While preparing the R&R Plan, the relevant State/National Rehabilitation & Resettlement Policy should be kept in view. In respect of SCs /STs and other weaker sections of the society in the study area, a need based sample survey, family-wise, should be undertaken to assess their requirements, and action programmes prepared and submitted accordingly, integrating the sectoral programmes of line	There is no Rehabilitation and resettlement is involved. Land classified as Patta land

Sr. No.	Condition	Compliance
	departments of the State Government. It may be clearly brought out whether the village(s) located in the mine lease area will be shifted or not. The issues relating to shifting of village(s) including their R&R and socio-economic aspects should be discussed in the Report.	
22)	One season (non-monsoon) [i.e. March-May (Summer Season); October-December (Pre Monsoon season) , December-February (winter season)]primary baseline data on ambient air quality as per CPCB Notification of 2009, water quality, noise level, soil and flora and fauna shall be collected and the AAQ and other data so compiled presented date-wise in the EIA and EMP Report. Site-specific meteorological data should also be collected. The location of the monitoring stations should be such as to represent whole of the study area and justified keeping in view the pre-dominant downwind direction and location of sensitive receptors. There should be at least one monitoring station within 500 m of the mine lease in the pre-dominant downwind direction. The mineralogical composition of PM10, particularly for free silica, should be given.	Baseline environmental monitoring was conducted in the core zone and buffer zone during Summer **December 2021 to February 2022.** Site specific meteorological data was also collected during the study period. The monitoring location details and the monitoring results are discussed in **Chapter 3**.
23)	Air quality modeling should be carried out for prediction of impact of the project on the air quality of the area. It should also consider the impact of movement of vehicles for transportation of mineral. The details of the model used and input parameters used for modeling should be provided. The air quality contours may be	Air quality modeling was carried out for the rough stone mining project using AERMOD as incorporated in **Chapter-4**, **Section 4.3, Page No. 157- 163,** while Incremental due to mining is provided in **Table 4.2, Page No. 162.**

Sr. No.	Condition	Compliance
	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.	
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 requirement for the project and source are given in detail in **Table No. 2.2 in Chapter 2, Page No. 43.**
25)	Necessary clearance from the Competent Authority for drawl of requisite quantity of water for the project should be provided.	Not Applicable Water will be taken from nearby villages
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. Impact of the Project on the water quality, both surface and groundwater, should be assessed and necessary safeguard measures, if any required, should be provided.	Proposed water conservation measures including rainwater harvesting measures are discussed in **Chapter 4.**
27)	Impact of the project on the water quality, both surface and groundwater, should be assessed and necessary safeguard measures, if any required, should be provided.	Impact of the project on the surface and ground water environment and necessary control measures are discussed in **Chapter 4, Section 4.5, Page No. 169 to 171.**
28)	Based on actual monitored data, it may clearly be shown whether working will intersect groundwater. Necessary data and documentation in this regard may be provided. In case the working will intersect groundwater table, a detailed Hydro Geological Study should be undertaken and Report furnished The Report inter-alia. shall include details of the aquifers present	The mining activities will not intersect ground water during life of mine as per plan period and Conceptual Plan. Schematic Diagram Of Mine Workings W.R.T. Ground Water Table is shown in **Chapter 4, Figure 4.6, Page No. 170.**

Sr. No.	Condition	Compliance
	and impact of mining activities on these aquifers. Necessary permission from Central Ground Water Authority for working below ground water and for pumping of ground water should also be obtained and copy furnished.	
29)	Details of any stream, seasonal or otherwise, passing through the lease area and modification / diversion proposed, if any, and the impact of the same on the hydrology should be brought out.	There is no seasonal stream or nallah flowing through the mining 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.	Highest elevation: 117 AMSL Proposed Depth: 45m below ground level Ground water table : 50-65m
31)	A time bound Progressive Greenbelt Development Plan shall be prepared in a tabular form (indicating the linear and quantitative coverage, plant species and time frame) and submitted, keeping in mind, the same will have to be executed up front on commencement of the Project. Phase-wise plan of plantation and compensatory afforestation should be charted clearly indicating the area to be covered under plantation and the species to be planted. The details of plantation already done should be given. The plant species selected for green belt should have greater ecological value and should be of good utility value to the local population with emphasis on local and native species and the species which are tolerant to pollution.	Progressive green belt development plan is prepared and attached mining Plate no. IV. It is shown in **Chapter 2, Figure 2.5, Page No. 63.** While details of Plantation is part of **Chapter 4, Section 4.11 Page No. 182.**
32)	Impact on local transport infrastructure due to the Project should be indicated. Projected	Impact on local transport infrastructure due to the project

Sr. No.	Condition	Compliance
	increase in truck traffic as a result of the Project in the present road network (including those outside the Project area) should be worked out, indicating whether it is capable of handling the incremental load. Arrangement for improving the infrastructure, if contemplated (including action to be taken by other agencies such as State Government) should be covered Project Proponent shall conduct Impact of Transportation study as per Indian Road Congress Guidelines.	has been assessed. There shall not be much impact on local transport. Traffic density from the proposed mining activity has been incorporated in **Chapter-4 section No.4.9, Page No. 177-180.** EIA/EMP report..
33)	Details of the onsite shelter and facilities to be provided to the mine workers should be included in the EIA Report.	Details of onsite facilities to be provided to the mine workers are given in **Section 2.19** in **Chapter 2**, **Page No. 76**
34)	Conceptual post mining land use and Reclamation and Restoration of mined out areas (with plans and with adequate number of sections) should be given in the EIA report.	Conceptual Plan and Section of the mine lease area is given in **Chapter-2, Figure. 2.6, Page No. 69**
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.	Details of anticipated occupational health impacts and proposed preventive measures are discussed in **Section 4.8** in **Chapter 4, Page No. 174**
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	The public health implications due to the project are discussed in **Section 4.8.3 in Chapter 4, Page No. 175**

<table>
<tr><th>Sr. No.</th><th>Condition</th><th>Compliance</th></tr>
<tr><td></td><td>measures should be detailed along with budgetary allocations.</td><td></td></tr>
<tr><td>37)</td><td>Measures of socio economic significance and influence to the local community proposed to be provided by the Project Proponent should be indicated. As far as possible, quantitative dimensions may be given with time frames for implementation.</td><td>CSR Affidavit is attached as Annexure IX, page Nos. 552.</td></tr>
<tr><td>38)</td><td>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.</td><td>Environmental Management Plan for the project is discussed in detail in Chapter 9.</td></tr>
<tr><td>39)</td><td>Public Hearing points raised and commitment of the Project Proponent on the same along with time bound Action Plan with budgetary provisions to implement the same should be provided and also incorporated in the final EIA/EMP Report of the Project.</td><td>The draft EIA/EMP report is submitted for public hearing. Issues raised in the public hearing along with time bound action plan will be incorporated in the final EIA/EMP report.</td></tr>
<tr><td>40)</td><td>Details of litigation pending against the project, if any, with direction /order passed by any Court of Law against the Project should be given.</td><td>There is no litigation pending against the project.</td></tr>
<tr><td>41)</td><td>The cost of the Project (capital cost and recurring cost) as well as the cost towards implementation of EMP should be clearly spelt out.</td><td><table><tr><th>S.No</th><th>Description</th><th>Cost</th></tr><tr><td>1</td><td>Operational cost</td><td>1,00,35,000</td></tr><tr><td>2</td><td>EMP Cost</td><td>3,80,000</td></tr><tr><td></td><td>Total</td><td>1,06,24,000</td></tr></table></td></tr>
<tr><td>42)</td><td>A Disaster management Plan shall be prepared and included in the EIA/EMP Report.</td><td>Disaster Management Plan is included in Section7.3 of Chapter 7, Page No. 196</td></tr>
<tr><td>43)</td><td>Benefits of the Project if the Project is implemented should be spelt out. The</td><td>The Project benefits are clearly spelt out in Chapter 8.</td></tr>
</table>

Sr. No.	Condition	Compliance
	benefits of the Project shall clearly indicate environmental, social, economic, employment potential, etc.	
44)	Besides the above, the below mentioned general points are also to be followed:- Executive Summary of the EIA/EMP Report All documents to be properly referenced with index and continuous page numbering. Where data are presented in the Report especially in Tables, the period in which the data were collected and the sources should be indicated. 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. Where the documents provided are in a language other than English, an English translation should be provided. The Questionnaire for environmental appraisal of mining projects as devised earlier by the Ministry shall also be filled and submitted. While preparing the EIA report, the instructions for the Proponents and instructions for the Consultants issued by MoEF&CC vide O.M. No. J-11013/41/2006-1 A.ll (l)dated 4th August, 2009, which are available on the website of this Ministry, should be followed. 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	All general are followed while preparing EIA/EMP.

Sr. No.	Condition	Compliance
	changes and permission should be sought, as the TOR may also have to be altered. Post Public Hearing changes in structure and content of the draft EIA/EMP (other than modifications arising out of the P.H. process) will entail conducting the PH again with the revised documentation. Changes if any made in the basic scope and project parameters (as submitted in Form-I and 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 to be altered. Post public hearing changes in structure and content of the draft EIA/EMP (Other the modifications arising out of the P.H. Process) will entail conducting the Ph again with the revised documentation. As per the circular no. J-11011/61S/2010-IA.ll(l) 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. . 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.	

CHAPTER 1: INTRODUCTION

1.1 INTRODUCTION

Environmental Impact Assessment (EIA) is the basic management tool to ensure the sustainable development with proposed project implementation. In the process of EIA anticipated environmental impacts due to proposed project identified including social and economic impacts, prior to decision making for the project implementation. EIA is the decision-making tool, which guides the decision maker to take appropriate decisions for proposed project. EIA study systematically examines both beneficial and adverse impact due to proposed project to ensure that anticipated impacts can be mitigating during operational phase of the project with resilience to climate.

The Report is prepared by considering Cumulative load of all proposed & existing quarries of Rough Stone Cluster Quarries consisting of Two Proposed and Four Existing Quarries with total extent of Cluster of 15.59.5 Ha at Panampatti and Thiruvengaivasal Village, Illuppur Taluk, Pudukottai District, Tamil Nadu State, cluster area is calculated as per MoEF & CC Notification S.O. 2269(E) Dated 1st July 2016.

1.2 HISTORY OF THE PROJECT

Lessee Tvl. Om Shri Vari stones (P) Ltd., has applied for TOR in order to prepare EIA report for grant of Environmental Clearance for proposed Rough stone mine having proposed area of 4.90.5 Ha while cluster area is 15.59.5 Ha, located in Melur Village, Kulathur Taluk, Pudukkottai District, Tamil Nadu. The lessee has sought TOR (Terms of Reference) to prepare Draft EIA report for grant of environmental clearance as per EIA notification 2006. As the total cluster comes to 15.59.5 Ha (4 Existing + 2 Proposed) as the cluster area more than 5 Ha but less than 250 Ha project falls in B Category

Details of LOI and ToR of the mine are given in **Table 1.1** below.

TABLE 1.1: LOI & ToR DETAILS

Name of Lessee	LOI Letter No.	LOI Letter Date	Period of lease
Tvl.Om Shri Vari Stones (P) Ltd., **(Project 1)**	Rc.No.32/2021 (G&M)	23.02.2021	5 years
	ToR Letter No.	**Letter Date**	**-**
	SEIAA-TN/F.No.8584/SEAC/ToR-1028/2021	26.08.2021	-
Tvl.Om Shri Vari Stones (P) Ltd., **(Project 2)**	Rc.No.32/2021 (G&M)	23.02.2021	5 years
	ToR Letter No.	**Letter Date**	**-**
	SEIAA-TN/F.No.8685/SEAC/ToR-1044/2022	31.01.2022	-

1.3 PURPOSE OF THE REPORT

The purpose of the EIA process is to inform decision-makers and the public of the environmental consequences of implementing a proposed project. The EIA document itself is a technical tool that identifies, predicts and analyses impacts on the physical environment, as well as social, cultural, and health impacts.

The purpose of this report is to assess the environment impact, suggest the environmental mitigation measures and to assess the technical feasibility, economic viability and sustainable development of the Rough stone Quarry with new proposed area 4.90.5 Ha, while cluster area is 15.59.5 Ha, located in Survey No. 11/2A, 12/1A & 12/1B (Part) Thiruvengaivasal village & 236/1A,236/1B,236/1C,236/1D,236/1E,236/2,236/3,236/4,236/5,236/6,236/7,236/9 ,236/10, 236/11, 236/12,236/13, 236/14, 19/3,235/9B & 235/11 of Panampatti village Village, Illuppur Taluk, Pudukkottai District, Tamil Nadu.

The mined stone will be used for the setting up of the basic infrastructure facilities, roads, housing, ports, railways, irrigation, etc. It will generate employment and the overall development of the state while contributing to the state and central income. The proposed product from the mine will be utilized for private and government projects in and around the surrounding districts in Tamil Nadu. The abundance of rough stone its growing demand in the state has prompted the entrepreneur for the mining quarry in this area.

The EIA/EMP has been prepared in accordance with the Standard ToR. Further to assess the impact on environment, it is necessary to ascertain present status of environment prevailing at the project site and identification and Assessment of impact on the environment. Keeping these points and statutory requirement in view, this Environment Impact Assessment Report (EIA) and Environmental Management Plan (EMP) has been prepared. Environmental Study has been carried out within 10 km radius of proposed mine lease area for one season monitoring data from December 2021 to February 2022.

The application for TOR was submitted in order to prepare EIA report for grant of Environmental Clearance (Form-1, PFR and Approved Mine Plan) for this proposed mine was considered as per the provisions of EIA Notification dated 14th September 2006. The proposals were considered by the State Expert Appraisal SEAC. The proposal was recommended for TOR by SEAC, Tamil Nadu. The proposal was considered by SEIAA, Tamil Nadu in its meeting and granted Terms of Reference (ToR) in order to prepare the Environmental Impact Assessment and Environmental Management Plan. The cluster details are provided in **Table 1.2.**

TABLE 1.2: LIST OF QUARRIES WITHIN THE CLUSTER

PROPOSED QUARRIES				
CODE	**Name of the Owner**	**S.F. Nos & Village**	**Extent**	**Status**
P1	**M/s. Om Shri Vari Stones Pvt Ltd,** No.24/2(l1/2), Raja Street Ext., Mandaveli Chennai – 600 028	20/1, 20/2, 270/2, 270/3, 270/4, 257/9, 257/8A & 257/10A – Panampatti Village	4.77.0 ha	ToR obtained vide Lr. No. SEIAA-TN/F.No.8584/ SEAC/ToR-1028/2021 Dated:26.08.2021
P2	**M/s. Om Shri Vari Stones Pvt Ltd,** No.24/2(l1/2), Raja Street Ext., Mandaveli Chennai – 600 028	1l/2A, 12/1A & 12/1B (Part) of Thiruvengaivasal Village & 236/1A, 236/1B, 236/1C, 236/1D, 236/1E, 236/2, 236/3, 236/4, 236/5, 236/6, 236/7,236/9, 236/10, 236/11, 236/12, 236/13, 236/14, 19/3, 235/9B & 235/11 of Panampatti Village	4.90.5 ha	ToR obtained vide Lr. No. SEIAA-TN/F.No.8685/ SEAC/ToR-1044/2022 Dated:31.01.2022
TOTAL			**9.67.5 ha**	
EXISTING QUARRIES				
CODE	**Name of the Owner**	**S.F. No & Village**	**Extent**	**Lease Period**
E1	**Thiru. S.A. Subbaiah**	42/2 Thiruvengaivasal Village	0.01.5 ha	23.09.2016 – 22.09.2021
E2	**Thiru. S.A. Subbaiah**	42/3 Thiruvengaivasal Village	0.01.5 ha	23.09.2016 – 22.09.2021
E3	**Thiru. M. Ramesh**	11/1 & 11/2B Thiruvengaivasal Village	2.86.0 ha	09.03.2017 – 08.03.2022
E4	**Thiru. R. Chinnathambi**	12/3, etc., Thiruvengaivasal Village	3.03.0 ha	31.07.2019 – 30.07.2024
TOTAL			**5.92.0 ha**	
TOTAL CLUSTER EXTENT			**15.59.5 ha**	

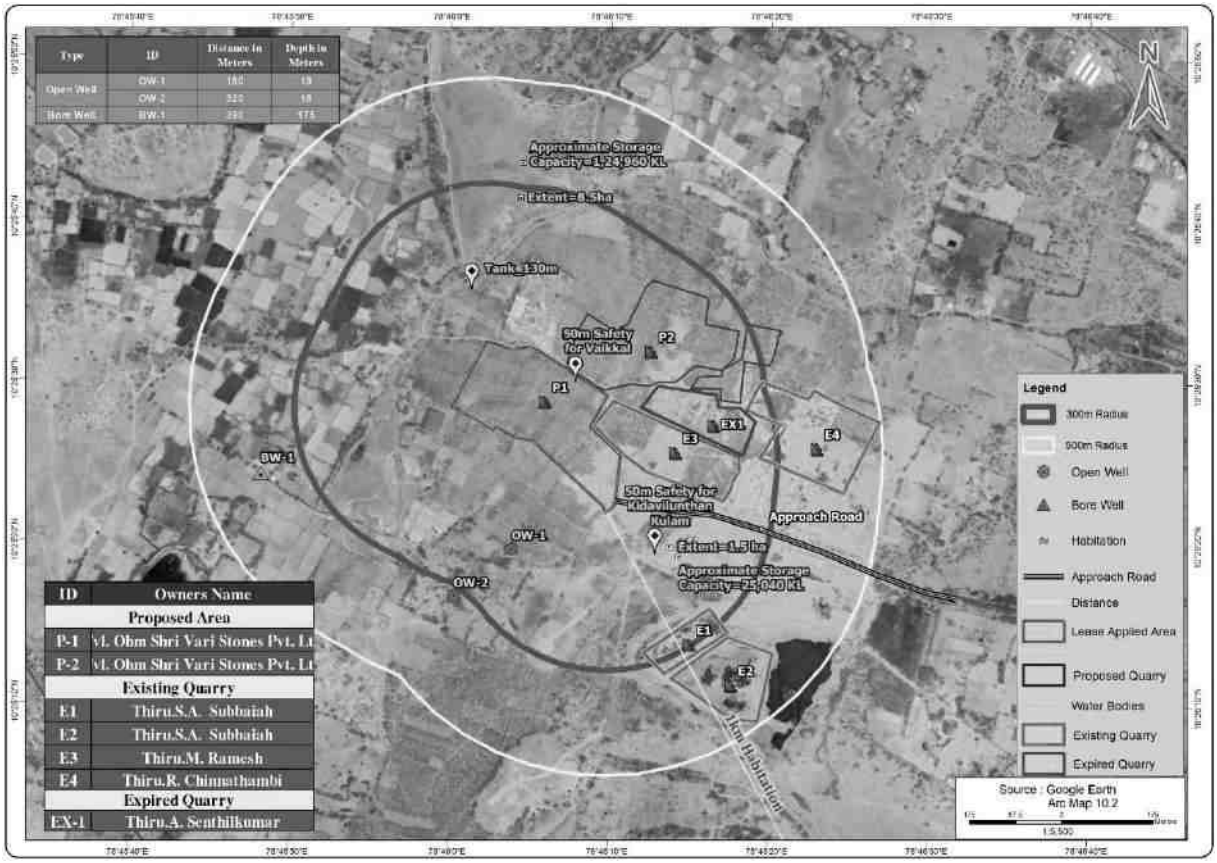


FIGURE 1.1: GOOGLE MAP OF CLUSTER MINES (EXISTING & PROPOSED)

The application for TOR was submitted in order to prepare EIA report for grant of Environmental Clearance (Form-1, PFR and Approved Mine Plan) for the rough stone mine was considered for all the three projects vide Application no. SIA/TN/MIN/63144/2021, SIA/TN/MIN/65957/2021 respectively by SEAC, as per the provisions of EIA Notification dated 14th September 2006. Rough stone mine was considered by the State Expert Appraisal SEAC. The proposal was recommended for TOR by SEAC, Tamil Nadu.

This Environmental Impact Assessment (EIA) report is prepared for obtaining Environmental Clearance (EC) from the State Environmental Impact Assessment Authority, Tamil Nadu for open cast Rough stone mine.

M/s. Enviro Resources, Mumbai has been allocated work to undertake Environmental Impact Assessment (EIA) studies as per the Terms of Reference (ToR) for assessing the impacts due to Minor Mineral cluster project in the districts of Pudukottai. To assess the activities on various environmental parameters and prepare an Environment Management Plan for mitigating the adverse impacts of the project. The public hearing will be conducted in line with the EIA Notification dated 14th September 2006 and its amendments and as prescribed in ToR. The final report will be upgraded after public hearing incorporating

concerns of public raised at the time of public hearing. As per Order Dated: 04.09.2018 & 13.09.2018 passed by Hon'ble National Green Tribunal, New Delhi in O.A. No. 173 of 2018 & O.A. No, 186 of 2016 and MoEF & CC Office Memorandum F. No. L-11011/175/2018-IA-II (M) Dated: 12.12.2018 clarified the requirement for EIA, EMP and therefore, Public Consultation for all areas from 5 to 25 ha falling in Category B - 1 and appraised by SEAC/ SEIAA as well as for cluster situation.

1.4 IDENTIFICATION OF PROJECT & PROJECT PROPONENT

PROPOSAL – P2

- The proponent applied for Rough Stone Quarry Lease Dated: 02.08.2021
- Precise Area Communication Letter was issued by the District Collector, Pudukkottai district, Rc.No.32/2021 (G&M), dated 23.02.2021.
- The Mining Plan was prepared by Recognized Qualified Person and approved by Deputy Director, Department of Geology and Mining, Pudukkottai, vide Rc.No.32/20211 (G&M), dated: 28.04.2021.
- The proposed project falls under "B1" Category as per Order Dated: 04.09.2018 & 13.09.2018 passed by Hon'ble National Green tribunal, New Delhi in O.A. No. 173 of 2018 & O.A. No, 186 of 2016 and MoEF & CC Office Memorandum F. No. L-11011/175/2018-IA-II (M) Dated: 12.12.2018
- Proponent applied for ToR for Environmental Clearance vide. online Proposal No. SIA/TN/MIN/65957/2021 and and ToR was granted by SEAC with letter no. SEIAA-TN/F.No.8685/SEAC/ToR-1044/2022, dated 31.01.2021

A. Project Proposal

TABLE 1.3: PROJECT DETAILS

Proposed Project	4.90.5 Ha
Location of the Project	Panampatti and Thiruvengaivasal Village, Kulathur Taluk, Pudukkottai District, Tamil Nadu.

B. Screening Category

As per EIA Notification dated 14th September 2006 & subsequent amendments on 1st December 2009 and 4th April 2011; the proposed mining project falls under Activity(1a), namely Mining of Minerals. Such activities are further divided into category "A" and "B". The said project is for mining rough stone of area 9.67.5 (i.e. individual lease areas of 4.77.0 Ha, 4.90.5 Ha) such projects are listed as category "B" under the said notification, this project is categorized as 'B' category project as the total cluster area is 20.90.5 Ha. This project comes into B Category due to Cluster situation. As per latest amended EIA Notification, dated 14.08.2018 lease area upto 100 Ha now falls under B category. The

project falls in B1 category vide OM No F. NO. L-11011/175/2018-IA-II (M) dated 12th December 2018 as per order dated 4th September 2018 and 13th September 2018 passed by Ho'ble NGT, New Delhi in O.A. NO. 173 of 2018 and O.A. NO. 186 of 2016.

C. Mining Lease Status

Lessee has obtained Letter of Intent from Deputy Director (Geology & Mining), Pudukkottai district for all the two projects, vide letter no. Rc.No.33/2021 (G&M), dated: 17.03.2021 for project 1, Rc.No.32/20211 (G&M), dated: 28.04.2021 for project 2 for rough stone mine of new proposed mine lease area 9.67.5 (i.e. individual lease areas of 4.77.0 Ha, 4.90.5 Ha) located at Survey No. Draft EIA/EMP for Rough Stone Quarry Cluster with total new proposed area of 9.67.5 Ha (i.e. individual lease areas of 4.77.0 Ha, 4.90.5 Ha), while cluster area is 15.59.5 Ha, located in Survey No.20/1,20/2,270/2,270/3, 270/4, 257/9,257/8A&257/10A of Panampatti village and 11/2A,12/1A & 12/1B(Part) Thiruvengaivasal village & 236/1A, 236/1B, 236/1C, 236/1D, 236/1E, 236/2, 236/3, 236/4,236/5,236/6,236/7,236/9,236/10,236/11,236/12,236/13,236/14, 19/3,235/9B & 235/11 of Panampatti village Village, Illuppur Taluk, Pudukkottai District, Tamil Nadu. for 5 years.

D. Status of approval of Mining Plan

Mining Plan for the proposed project has been approved for plan period 5 years by Deputy Director, Department of Geology and Mining, Pudukottai, Tamil Nadu. Copy of approval letter is enclosed as **Annexure II.**

TABLE 1.4: MINING PLAN DETAILS

Name of the Lessee	S.F.Nos.	Area	Approved Mine Plan Letter No.
Tvl. Om Shri Vari Stones Pvt Ltd,	11/2A, 12/1A & 12/1B (Part) & 236/1A,236/1B,236/1C,236/1D,236/1E, 236/2,236/3,236/4,236/5,236/6, 236/7,236/9,236/10, 236/11, 236/12,236/13, 236/14, 19/3,235/9B & 235/11	4.90.5 Ha	Rc.No.32/20211 (G&M) ,dated: 28.04.2021

1.5 INTRODUCTION OF PROJECT PROPONENT

Details of the lessee is given below.

TABLE 1.5: PROJECT PROPONENT DETAILS

Lessee Name	Tvl. Om Shri Vari Stones Pvt Ltd,
Address	Office at No.24/2 (11/2) Raja Street Extension, Mandaveli, Chennai – 600028 Tamil Nadu State.
Mobile No	9965389445
Email ID	omshrivaristones@gmail.com
Site Address	Survey No. 11/2A, 12/1A & 12/1B (Part) Thiruvengaivasal village &236/1A,236/1B,236/1C,236/1D,236/1E,236/2,236/3,236/4,236/5,236/6,236/7,236/9,236/10,236/11,236/12,236/13, 236/14, 19/3,235/9B & 235/11 of Panampatti village Village, Illuppur Taluk, Pudukkottai District, Tamil Nadu.

1.6 BRIEF DESCRIPTION OF THE PROJECT

This is a case of proposed rough stone mine of area, 4.90.5 Ha located in Survey No. 11/2A, 12/1A & 12/1B (Part) Thiruvengaivasal village&236/1A,236/1B,236/1C,236/1D,236/1E,236/2,236/3,236/4,236/5,236/6,236/7,236/9,236/10,236/11,236/12,236/13, 236/14, 19/3,235/9B & 235/11 of Panampatti village Village, Illuppur Taluk, Pudukkottai District, Tamil Nadu The project proponent has applied for Environmental clearance as per EIA notification dated 14th September 2006 and its amendments. The cost of project **Rs. 1,08,78,000** Crores and **Rs. 1,06,24,000** Crores. Details of mine is presented in **Table 1.6.**

TABLE 1.6: BRIEF DESCRIPTION OF THE PROJECT

Location of Project	Survey No. 11/2A, 12/1A & 12/1B (Part) & 236/1A,236/1B,236/1C,236/1D,236/1E, 236/2,236/3,236/4,236/5,236/6, 236/7,236/9,236/10, 236/11, 236/12,236/13, 236/14, 19/3,235/9B & 235/11 Panampatti Village and Thiruvengaivasal Village Illppur Taluk, Pudukkottai District, Tamil Nadu.
Topo sheet Number	58 -J/10,58J/11,58J,14,58J/15
Type of Mining	Open Cast Mechanized Mining
Seismic Zone	Seismically, this area is categorized under Zone-II as per IS-1893 (Part-1)-2002. Hence, seismically the site is less Damage Risk Zone. With MSK scale of VII.

No of Working Days	300days/ year	
Mine Area	9.67.5 (i.e. individual lease areas of 4.77.0 Ha, 4.90.5 Ha)	
Mine Location on WGS 1984 datum	**Latitude**	**Longitude**
(Project 2)	10°25'28.72"N to 10°25'36.27"N	78°46'07.27"E to 78°46'20.71"E

1.7 LOCATION OF THE PROJECT

The proposed mines are in Panampatti Village and Thiruvengaivasal, Illuppur Taluk, Pudukkottai District, Tamil Nadu. The nearest railway station is Vellanur Railway Station at 6.0 Km, NE Direction. The nearest National Highway is NH 336 - (Pudukkottai – Trichy Road) at 2.0 Km in the direction of NE from the project site and State Highway is SH 71- (Viralimalai – Pudukkottai Road) at 1.0 Km in SW side of the site. The area is included in Survey of India Toposheet No. 58 J/15 on R.F. 1:50,000. The location map of the project site is presented in **Figure:1.2**. Topographical map of study area of the project area (10 km radius) is shown in **Figure:1.6**. The environmental setting and the project details is presented in **Table-1.7.** Photographs of the Rough stone mine are given in **Figure: 1.7**. There is no critically polluted identified cluster by CPCB/MOEF in the vicinity of the project.

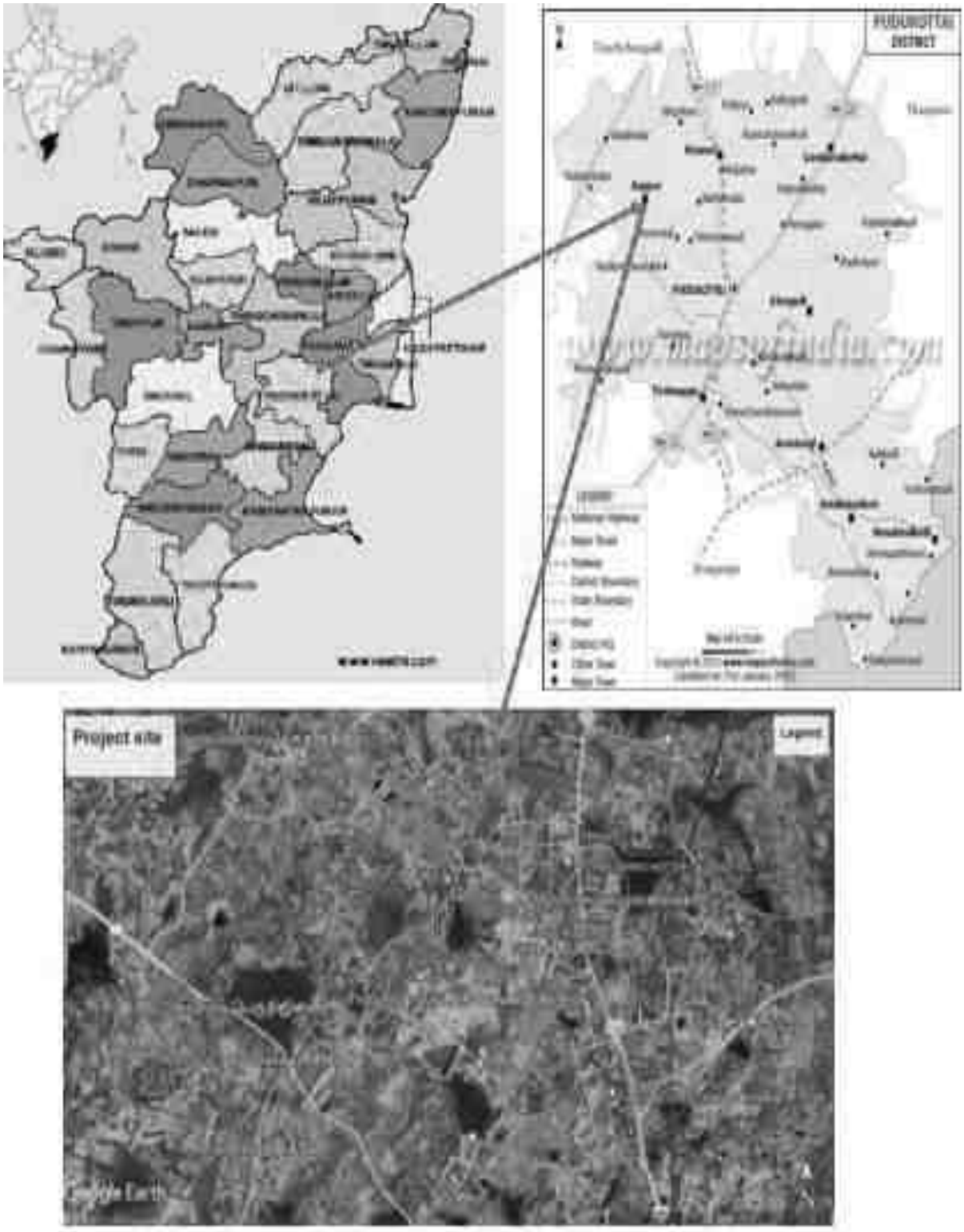


FIGURE 1.2: LOCATION MAP

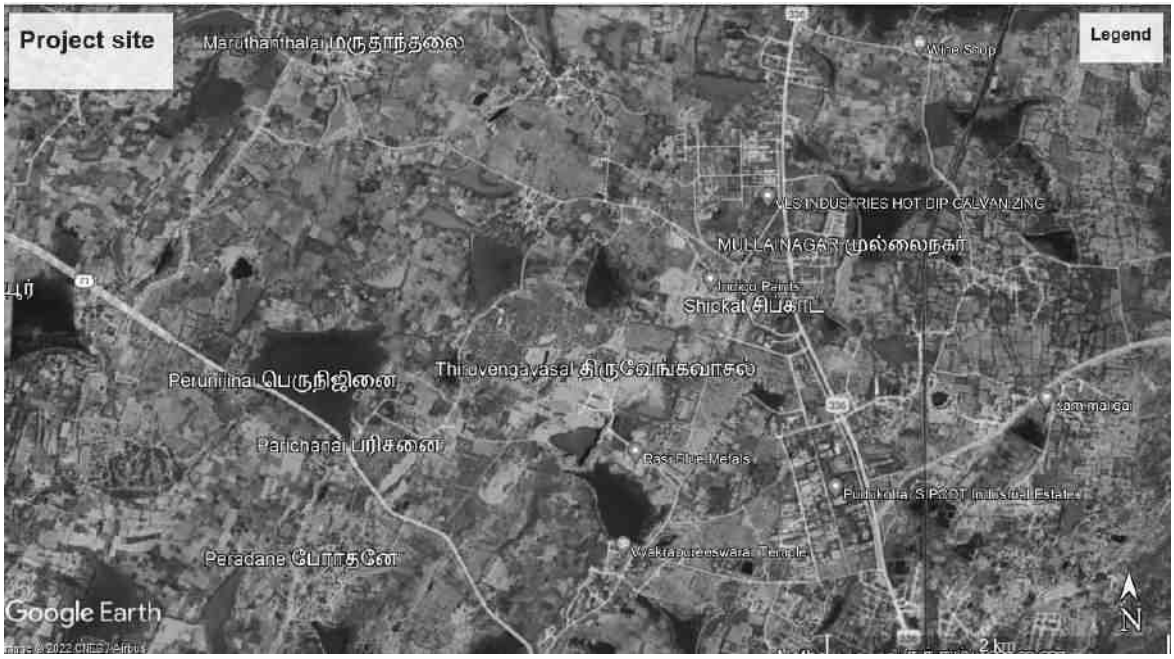


FIGURE 1.3: ROUTE CONNECTIVITY MAP

FIGURE 1.4(a): MINE LOCATION ON WGS 1984 DATUM OF PROJECT 1

FIGURE 1.4(b): MINE LOCATION ON WGS 1984 DATUM OF PROJECT 2

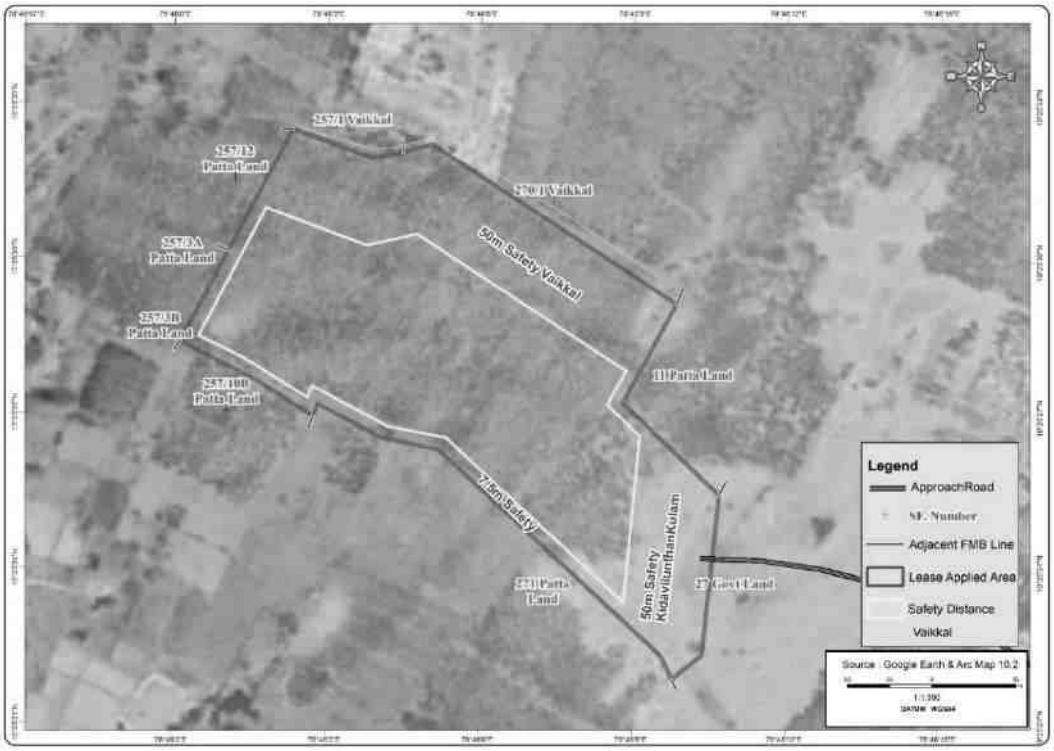


FIGURE 1.5(a): LEASE BOUNDARY OF PROJECT 1

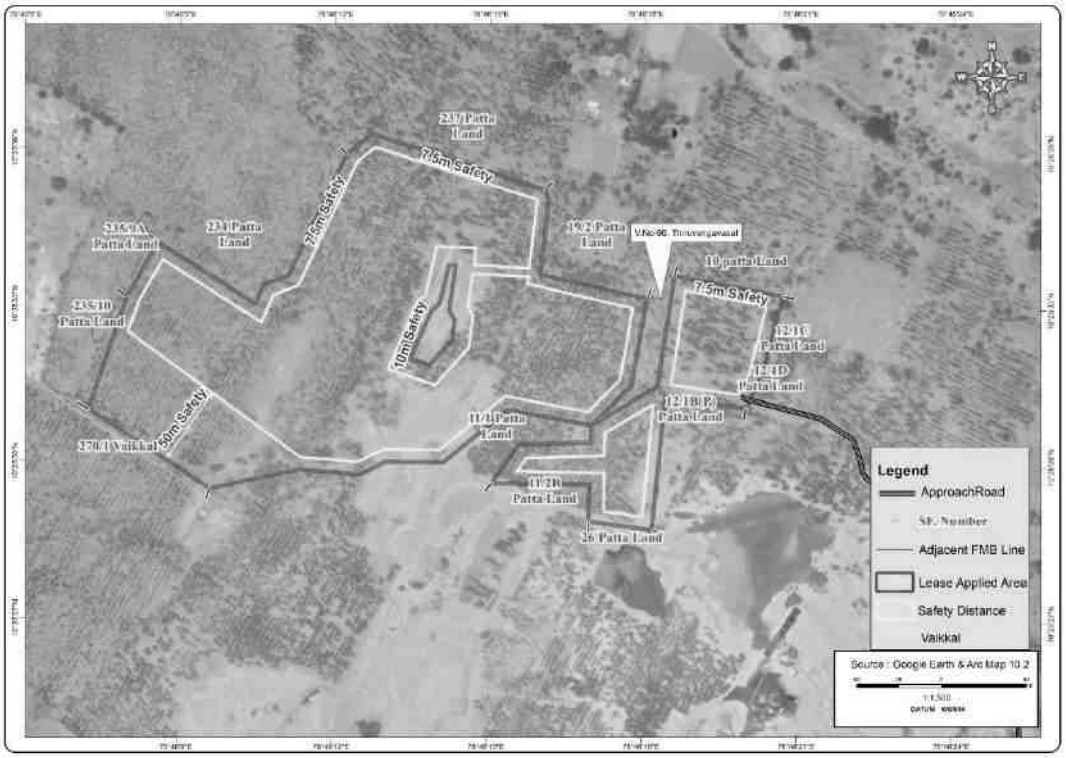


FIGURE 1.5(b): LEASE BOUNDARY OF PROJECT 2

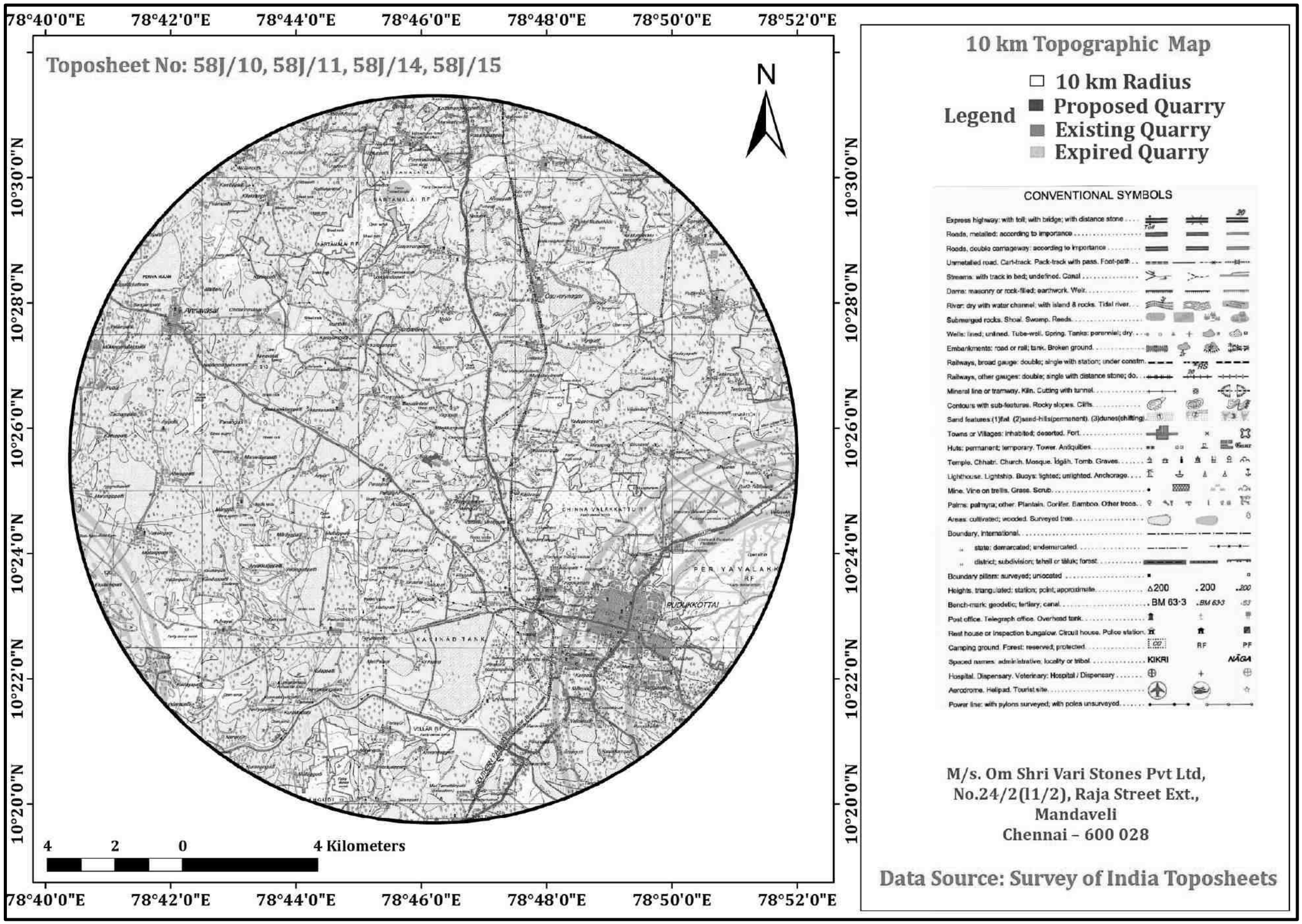


FIGURE 1.6: TOPOGRAPHICAL MAP OF STUDY AREA (10 KM RADIUS)

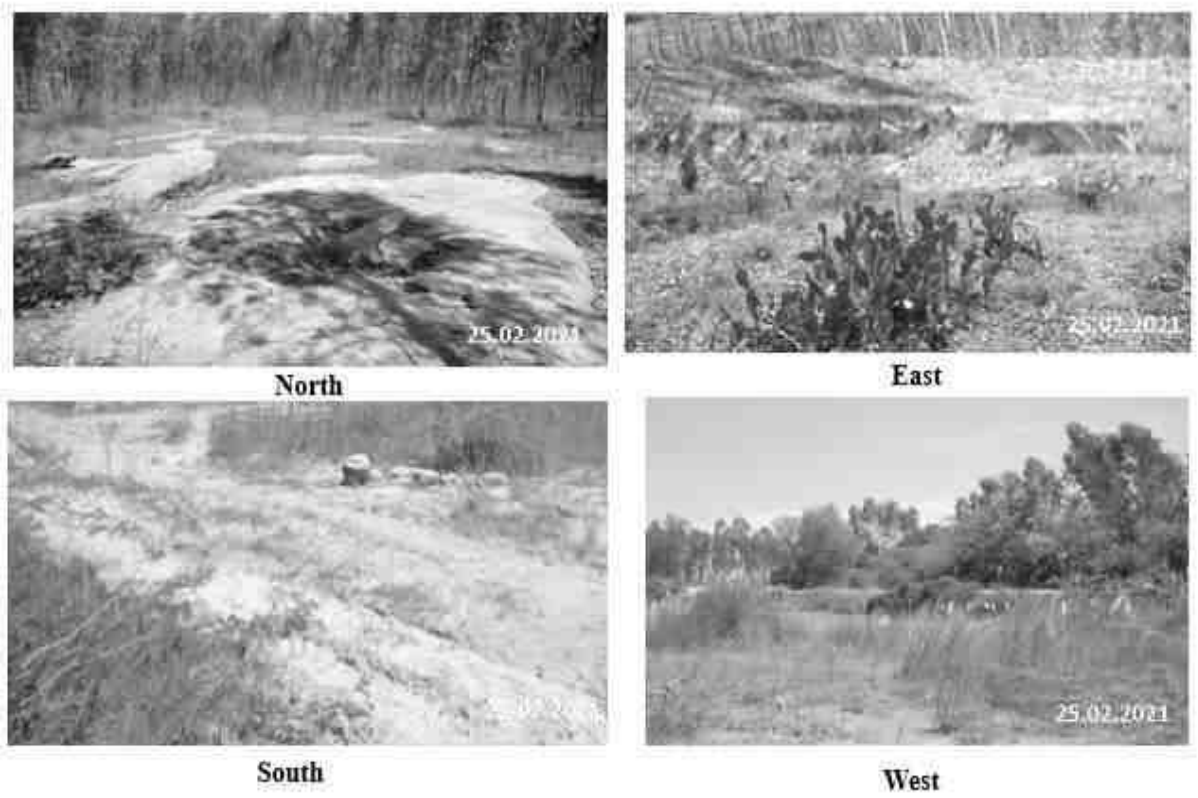


FIGURE 1.7(a): PHOTOGRAPHS OF PROJECT 1

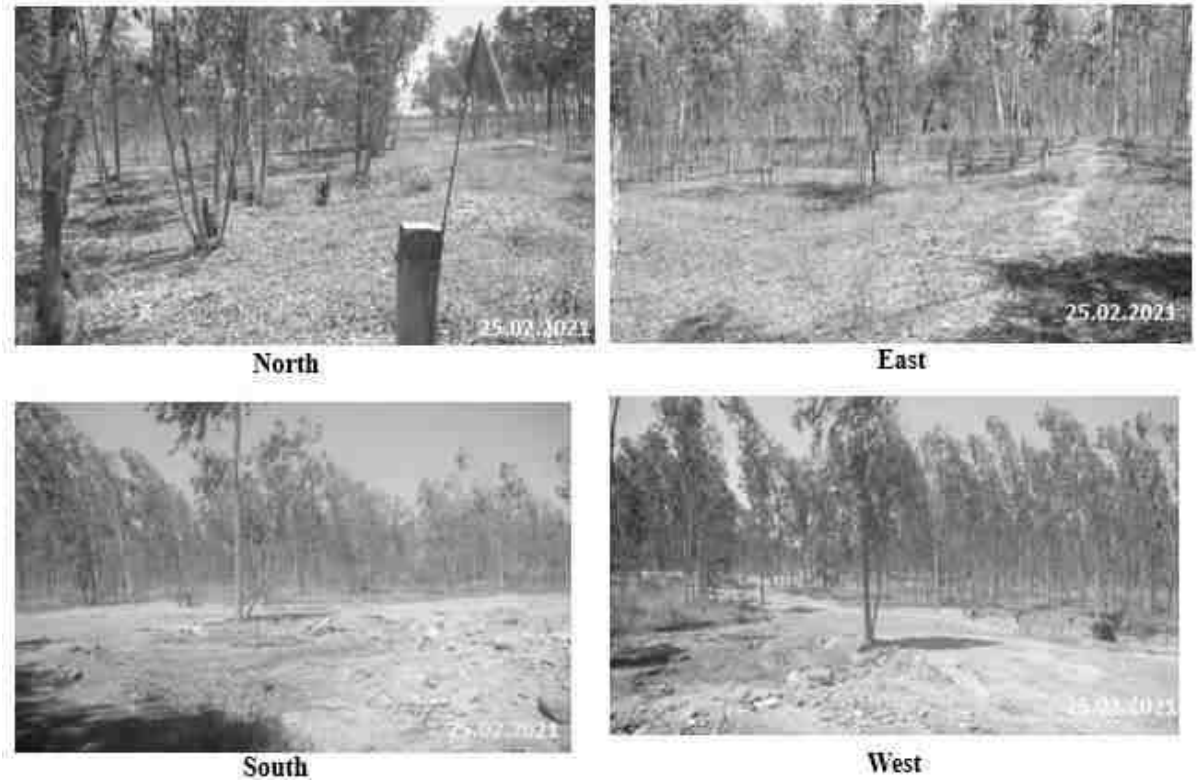


FIGURE 1.7(b): PHOTOGRAPHS OF PROJECT 2

TABLE 1.7 (a): PROJECT DETAILS OF PROJECT 1

S. No.	Particulars	Details		
1	Type of Project	Rough Stone Mine		
2	Mine area applied	4.77.0 Ha		
3	Project Location	Survey No. 20/1, 20/2, 270/2,270/3, 270/4, 257/9,257/8A & 257/10A, Panampatti Village, Illuppur Taluk, Pudukkottai District, Tamil Nadu		
4	Location on WGS 1984 datum	**Latitude**	**Longitude**	
		10°25'21.87"N to 10°25'32.47"N	78°46'00.15"E to 78°46'10.71"E	
5	Topo sheet Number	58 - J/15		
6	Land use at the proposed project site	Non-Forest Land / Patta Land Land Cover: Barren Land which is not fit for vegetation/cultivation		
7	Site Topography	The lease applied area is exhibits plain topography. The area has gentle sloping towards Southern side.		
8	Site elevation	117m (Max) above Mean Sea Level		
9	Reserves	**Top soil**	**Weathered formation**	**Rough stone**
	Geological Reserves	1,43,100 m^3	95,400 m^3	19,08,000 m^3
	Mineable Reserves	83,232 m^3	48,918 m^3	5,04,990 m^3
	Recoverable Reserves	83,232 m^3	48,918 m^3	5,04,990 m^3
10	Lease period	5 years		
11	Proposed depth of Mining	**45m** below ground level (3m Top soil+2m Weathered formation+40m Rough Stone)		
12	Ultimate pit dimension	275m (L) x 105m (W) x 45m (D) BGL		
13	Climatic Conditions	IMD Data, Pudukkottai (1971-2000) • Avg. Ambient air temp – 42 ^{o} C to 20^o C Annual rainfall - 887 mm		
14	Ground water level	The Ground water is about **70m- 65m** depth from ground level.		
15	Seismic zone	Seismically, this area is categorized under Zone-II as per IS-1893 (Part-1)-2002. Hence, seismically the site is Less Damage Risk Zone. With MSK scale of VII.		
16	Land Use Pattern	**Description**	**Percentage**	
		Old Pits/Crusher	11%	

S. No.	Particulars	Details	
		Trees	05%
		Roads	06%
		Habitation	04%
		Seasonal Agricultural Land	25%
		Barren Land	22%
		Waterbodies	27%
17	Nearest State/National Highway	NH - 336 - Pudukkottai- Trichy– 1.27 km - E SH - 71 - Viralimalai - Pudukkottai –1.0km -SW	
18	Nearest Railway Station	Vellanur – 6.0Km – North eastern side.	
19	Nearest Air Port	Trichy Airport – 38.0km – NW	
20	Nearest village/major town	Perunijinai : 1.0Km, SW Pudukkottai : 7.0 Km, SE	
21	Nearest Town, city, District Headquarters along with distance in kms.	Pudukkottai : 7.0 Km, SE	
22	Nearest Hospital	Pudukkottai – 7.0 Km, SE	
23	Ecologically sensitive zone	No wildlife sanctuary, national park or biosphere reserve within 500m radius of mine lease area.	
24	Reserved/Protected forests	No wildlife sanctuary, national park or biosphere reserve within 500m radius of mine lease area.	
25	Historical/tourist places	None within 300m radius of mine lease area	
26	Water bodies within 10 Km Radius	The Government Poramboke Vaikkal is passing in S.F.No. 257/1 & 270/1 on the Northern side and Kidaivilluthan Kulam is located in S.F.No. 27 on the Southeastern side of the applied area ➢ Vellar River – 7.0km – S ➢ Perunjunai Periya Kanmai – 0.60km – W ➢ Thiruvengaianathar tank -0.70 km SE ➢ Mullai nagar lake – 1.97 km NE	
27	Reserve Forest within 10Km Radius	Reserve forest: ➢ Pudukkottai R.F. – 3.9km – SE ➢ Narathamalai R.F. – 7.5km- N	

S. No.	Particulars	Details
		➢ Kudumaiyamalai R.F -8.90 km SW
28	Details of other quarries for a radius of 500m around the quarry site	There are following quarries located within the radius of 500m from the proposed project site. Details: Lease expired quarry– 1 No (0.64.5 Ha) Existing quarry– 4 Nos (5.92 Ha) Proposed quarry– 2 Nos (9.67.5Ha) The total extent of the Existing and proposed quarry within the radius of 500m is **15.59.5 Ha.** The project falls under the cluster situation.
29	Man power	Total Employees proposed for the quarry operation is **55 Nos.**
30	Water requirement & source	Total water requirement for **7.9 KLD** from water vendors & nearby Bore well.
31	Overburden /Waste	The overburden in the form of Topsoil is about 83,232m^3 up to depth for 3m and Weathered Rock is about 48,918m^3 up to depth for 2m for a period of three years.
32	Cost of the project	**The Project Cost:** A. Operational cost = Rs. 1,02,84,000/- B. EMP cost = Rs.3,80,000/- Total Project Cost = Rs. 1,06,64,000/- CER Cost (2.0%) = Rs.2,14,000/- Total cost = Rs. 1,08,78,000/-

TABLE 1.7 (b): PROJECT DETAILS OF PROJECT 2

S. No.	Particulars	Details	
1	Type of Project	Rough Stone Mine	
2	Mine area applied	4.90.5 Ha	
3	Project Location	Survey No. 11/2A, 12/1A & 12/1B (Part) Thiruvengaivasal village and 236/1A, 236/1B, 236/1C, 236/1D, 236/1E, 236/2, 236/3, 236/4, 236/5 ,236/6, 236/7,236/9,236/10 236/11, 236/12, 236/13, 236/14, 19/3,235/9B & 235/11 Panampatti Village, Illuppur Taluk, Pudukkottai District, Tamil Nadu.	
4		**Latitude**	**Longitude**

S. No.	Particulars	Details		
	Location on WGS 1984 datum	10°25'28.72"N to 10°25'36.27"N	78°46'07.27"E to 78°46'20.71"E	
5	Topo sheet Number	58 - J/15		
6	Land use at the proposed project site	Non-Forest Land / Patta Land Land Cover: Barren Land which is not fit for vegetation/cultivation		
7	Site Topography	The lease applied area is exhibits plain topography. The area has gentle sloping towards Southern side.		
8	Site elevation	117 m (Max) above Mean Sea Level		
9	Reserves	**Top soil**	**Weathered formation**	**Rough stone**
	Geological Reserves	1,47,150 m^3	98,100 m^3	19,62,000 m^3
	Mineable Reserves	99,039 m^3	54,824 m^3	4,75,915 m^3
	Recoverable Reserves	99,039 m^3	54,824 m^3	4,75,915 m^3
10	Lease period	5 years		
11	Proposed depth of Mining	**45m** below ground level (3m Top soil + 2m Weathered rock +40m Rough stone)		
12	Ultimate Pit Dimension	Pit -I 185m (L) x 207m (W) x 45m (D) BGL Pit -I 66m (L) x 93m (W) x 30m (D) BGL Pit -I 55m (L) x 46m (W) x 20m (D) BGL Pit -I 58m (L) x 24m (W) x 10m (D) BGL		
13	Climatic Conditions	IMD Data, Pudukkottai (1971-2000) • Avg. Ambient air temp – 42 ^{o} C to 20^{o} C Annual rainfall - 887 mm		
14	Ground water level	The Ground water is about **70 to 65m** depth from ground level.		
15	Seismic zone	Seismically, this area is categorized under Zone-II as per IS-1893 (Part-1)-2002. Hence, seismically the site is Less Damage Risk Zone. With MSK scale of VII.		
16	Land Use Pattern	**Description**	**Percentage**	
		Old Pits/Crusher	11%	
		Trees	05%	
		Roads	06%	
		Habitation	04%	
		Barren Land	22%	
		Seasonal Agri. Land	25%	
		Odai & Private Building	27%	

S. No.	Particulars	Details
17	Nearest State/National Highway	NH - 336 - Pudukkottai- Trichy– 1.27 km - E SH - 71 - Viralimalai - Pudukkottai –1.0km -SW
18	Nearest Railway Station	Vellanur Railway station – 6.0km – NE
19	Nearest Air Port	Trichy Airport – 38.0 Km, NW
20	Nearest village/major town	Perunijinai : 1.0 Km, SW Pudukkottai : 7.0 Km, SE
21	Nearest Town, city, District Headquarters along with distance in kms.	Pudukkottai : 7.0 Km, SE
22	Nearest Hospital	Pudukkottai – 7.0 Km, SE
23	Ecologically sensitive zone	No wildlife sanctuary, national park or biosphere reserve within 10m radius of mine lease area.
24	Reserved/Protected forests	No wildlife sanctuary, national park or biosphere reserve within 10m radius of mine lease area.
25	Historical/tourist places	None within 300m radius of mine lease area
26	Water bodies within 10 Km Radius	The Government Poramboke Vaikkal is passing in S.F.No. 270/1 on the southern side applied area. Hence 50m safety distance has been maintained ➢ Vellar River – 7.0km – S ➢ Perunjunai Periya Kanmai – 0.60km – W ➢ Thiruvengaianathar tank -0.70 km SE ➢ Mullai nagar lake – 1.97 km NE
27	Reserve Forest within 10Km Radius	Reserve forest: ➢ Pudukkottai R.F. – 3.9km – SE ➢ Narathamalai R.F. – 7.5km- N ➢ Kudumaiyamalai R.F -8.90 km SW
28	Details of other quarries for a radius of 500m around the quarry site	There are following quarries located within the radius of 500m from the proposed project site. Details: Existing quarry – 1No (2.86.0Ha) Expired quarry – 1No(0.64.5Ha)

S. No.	Particulars	Details
		Proposed quarries – 2Nos (9.67.5Ha) The total extent of the Existing and proposed quarries within the radius of 500m is **12.53.5Ha**. The project area falls under the Cluster situation
29	Man power	Total Employees proposed for the quarry operation is **53 Nos**.
30	Water requirement & source	Total water requirement for **7.9 KLD** from water vendors & nearby Bore well.
31	Overburden /Waste	The overburden in the form of Top soil and Weathered formation, the top soil and Weathered formation will be directly loaded into tippers for the filling and levelling of low-lying areas.
32	Cost of the project	**The Project Cost:** A. Operational cost = Rs. 1,00,35,000/- B. EMP cost = Rs.3,80,000/- Total Project Cost = Rs. 1,04,15,000/- CER Cost (2.0%) = Rs.2,09,000/- Total cost = Rs. 1,06,24,000/-

1.8 SUPPLY AND DEMAND DETAILS

There is a huge demand of rough stone for State and National Road projects is under massive development for its widening and strengthening operation, apart from this many bridges and fly overs are also being under construction. And, huge requirements of rough stone for Public and Private sector projects to infrastructure development of the state; hence the project is significant to the state.

Railway lines in the country also under progress where huge rough stone is required as Ballast. Other internal Panchayat Roads are also under progress, besides all these public works projects the rough stone is widely used for domestic construction project like Hospital, School, Government Building and Housing construction. It is worth mentioning that the rough stone of Pudukkottai District.

FIGURE 1.8: ENVIRONMENTAL SENSITIVITY MAP

1.9 SCOPE OF THE STUDY

The EIA study includes detailed characterization of various environmental components like Air, Noise, Water, Soil, Land and Socio-economics within 10 km radius around the study area. The SEAC, Tamil Nadu committee suggested us to focus on baseline data which includes Hydrology study, Ground water study, Biodiversity assessment and land use cover within in the 10km radius around the mining lease area. The EIA is done based on collection of one season data (From Dec -2021 to Feb - 2022).

1.10 DATA GENERATION

The data has been generated by Noida Testing Laboratories, Haridwar (Uttarakhand) in accordance with the requirement of statutory agencies from Dec -2021 to Feb - 2022. The monitoring and testing have been done as per the guidelines of MoEF&CC and the IS standards.

1.11 DATA COLLECTION

The EIA study is being done for the Mine Lease (core zone) and area within 10 km radius (buffer zone), both of which comprise the study area. The following data has been collected by Enviro Resources through field survey and other sources for preparing the EIA/EMP for the mining project.

- Details of wild fauna and flora within 10 km from the project site and information about forests, if any.
- Eco-sensitive places, sanctuaries, biosphere reserves within 10 km radius.

- Physical environment (Air, Water, Soil, & noise) baseline data.
- Religious places / historical monuments and tourist places within 10 km radius.
- Land use pattern within core zone and buffer zone (10 km radius around the core zone) based on Survey of India toposheet map and satellite image.
- Demography and Socio-economic based on last available Census data for entire study area.
- Relevant meteorological data, for previous decades from Indian Meteorological Department (IMD) and primary data.
- Study of present environmental protection and mitigation measures in nearby operating similar projects if any.
- Identification of water bodies, hills, roads etc. within 10 km radius.

1.12 GENERIC STRUCTURE OF ENVIRONMENTAL IMPACT ASSESSMENT DOCUMENT

As per EIA notification of the MoEF dated 14th September 2006 as amended Dec 2009, the generic structure of the EIA document will be as under:

1. Introduction
2. Project Description
3. Analysis of Alternatives (Technology and site)
4. Description of the Environment
5. Anticipated Environmental Impact & Mitigation Measures
6. Environmental Monitoring Programme
7. Additional Studies
8. Project Benefits
9. Environmental Cost Benefit Analysis
10. Environmental Management Plan
11. Summary & Conclusion
12. Disclosure of Consultants engaged

1.13 PREPARATION OF EIA/EMP

The EMP will include the following details:

- Present Environmental Setting.
- Identification, prediction and evaluation of anticipated environmental impact due to the proposed mine and related facilities.
- The environmental impacts would be anticipated in core and buffer zone.
- Sensitive Places/Historical Monuments.
- Measures to control the surface and ground water pollution due to various effluents to be discharged, if any.
- Measures to control air pollution due to proposed activities/operation.
- Green belt development plan and reclamation plan of mine.

- Measures to contain noise pollution & mitigate adverse impact on workers and habitat in core and buffer zone.
- Pronounce the improvement in socio-economic conditions & benefits the people will get on implementation of the project.
- Total and specific cost of control measures.
- Environmental monitoring, implementation organization and feedback mechanism to effect mid-course corrections.
- Identification of flora species which can be planted in and around the project.

The field studies for baseline environmental studies were conducted for a period of three months representing to determine existing levels of various environmental attributes as outlined in **Table 1.8**. The scope also includes all the conditions outlined in the ToR's prescribed.

TABLE 1.8: ENVIRONMENTAL ATTRIBUTES AND FREQUENCY OF MONITORING

S. No.	Attributes	Parameters	Frequency
1	Ambient Air Quality	PM_{10}, SO_2, NO_X, & mineralogical composition of PM_{10}, particularly for free silica	24 hourly samples, twice a week for three months at 7 locations.
2	Meteorology	Wind speed, Wind direction, Temperature, Relative humidity and Rainfall	Continuous hourly recording (one season) at project site. Secondary data from the nearest IMD station.
3	Water quality	Physical and Chemical parameters.	Grab samples collected once during study period from 6 ground water locations.
4	Soil Quality	Physical and Chemical parameters.	Grab samples collected once during study period from 6 locations.
5	Ecology	• Existing terrestrial flora and fauna covering Core Zone (5.58.0 (i.e. individual lease areas of 1.68.0 Ha, 0.51.5 Ha, 3.85.5 Ha)) & Buffer Zone (10-Km radius). • Existing aquatic ecological status in Buffer Zone (10-Km radius).	Through field studies once during study period. Secondary data also collected.

S. No.	Attributes	Parameters	Frequency
6	Noise levels	Noise levels in dB (A) Day and Night.	Hourly Noise levels in and around the project area for 24 hours at each location once during study period at 7 locations.
7	Land use	Current land use scenario	Once during study period based on recent satellite imagery and ground-truthing at site.
8	Geology	Geological details	Once during study period. Data collected from secondary sources
9	Hydrogeology	Drainage area and pattern, nature of streams, aquifer characteristics, recharge and discharge areas, etc.	Based on primary and secondary sources, once during study period.
10	Socio-Economic aspects	Socio-economic aspects like demography, population dynamics, infrastructure resources, health status, economic resources, etc.	From primary and secondary sources (like census abstracts of census of India 2011) once during the study period.

1.14 TERMS OF REFERENCE

The EIA/EMP report is prepared for rough stone cluster Mine; which is classified as **"Category B"** by Ministry of Environment, Forest & Climate Change (MoEF & CC), New Delhi, as per the EIA notification dated on 14th September, 2006 and as the lease area is less than 100 Ha vide amended EIA Notification dated 14.08.2018. The project falls in B1 category vide OM No F. NO. L-11011/175/ 2018-IA-II (M) dated 12th December 2018 as per order dated 4th September 2018 and 13th September 2018 passed by Ho'ble NGT, New Delhi in O.A. NO. 173 of 2018 and O.A. NO. 186 of 2016. The draft report is prepared incorporating the Terms of Reference (ToR's) granted by SEIAA, Tamil Nadu to prepare the Environmental Impact Assessment and Environmental Management Plan.

CHAPTER 2: PROJECT DESCRIPTION

2.1 TYPE OF PROJECT

Lessee has applied for TOR to prepare EIA report for grant of Environmental Clearance for Rough Stone Quarry Cluster with total new proposed area of 9.67.5 Ha (i.e. individual lease areas of 4.77.0 Ha, 4.90.5 Ha), while cluster area is 15.59.5 Ha, located in Survey No. 20/1, 20/2, 270/2,270/3, 270/4, 257/9,257/8A & 257/10A of Panampatti village and 11/2A, 12/1A & 12/1B (Part) Thiruvengaivasal village & 236/1A, 236/1B, 236/1C ,236/1D,236/1E,236/2,236/3,236/4,236/5,236/6,236/7,236/9,236/10,236/11,236/12 ,236/13, 236/14, 19/3,235/9B & 235/11 of Panampatti village Village, Illuppur Taluk, Pudukkottai District, Tamil Nadu. Lessee: Tvl. Om Shri Vari Stones Pvt Ltd. (Lease Area in Ha: 4.77.0, 4.90.5) Since the cluster extent is more than 5 ha, the proposal falls under B1 Category as per the Order Dated: 04.09.2018 & 13.09.2018 passed by Hon'ble National Green Tribunal, New Delhi in O.A. No. 173 of 2018 & O.A. No, 186 of 2016 and MoEF & CC Office Memorandum F. No. L-11011/175/2018-IA-II (M) Dated: 12.12.2018, and requirement for EIA, EMP and Public Consultation for obtaining Environmental Clearance. Rough Stone is proposed to be excavated by opencast mechanized method involving splitting of rock mass of considerable volume from the parent rock mass by jackhammer drilling and blasting, hydraulic excavators are used for loading the Rough Stone from pithead to the needy crushers and rock breakers to avoid secondary blasting.

2.2 NEED FOR THE PROJECT

The basic objective of the project is to have effective utilization of rough stone as a building material in this region and state. The spur in infrastructure development and construction industry has enhanced the demand of rough stone in past few years. Building stone, mine not only provides the building material but also employment and economic growth of the region that ultimately enhance the socio-economic status of the people of the region and the state. The mining activities shall provide socio-economic benefits to the local population with direct & indirect employment opportunities. The project also contributes to the regional and financial benefits in the form of Royalty, Cess, Taxes, DMF etc.

2.3 LOCATION

TABLE 2.1: LOCATION DETAILS

Survey No.	Survey No. 20/1, 20/2, 270/2,270/3, 270/4, 257/9,257/8A & 257/10A, 11/2A, 12/1A & 12/1B (Part) & 236/1A,236/1B,236/1C,236/1D,236/1E, 236/2,236/3,236/4,236/5,236/6, 236/7,236/9,236/10, 236/11, 236/12,236/13, 236/14, 19/3,235/9B & 235/11 Panampatti Village and Thiruvengaivasal Village Illppur Taluk, Pudukkottai District, Tamil Nadu.
Village	Panampatti and Thiruvengaivasal Village

Taluka and District	Illuppur Taluk, Pudukkottai District	
State	Tamil Nadu	
Toposheet No.	58 -J/10,58J/11,58J,14,58J/15	
Latitude & Longitude **(Project 1)**	**Latitude**	**Longitude**
	10°25'21.87"N to 10°25'32.47"N	78°46'00.15"E to 78°46'10.71"E
(Project 2)	10°25'28.72"N to 10°25'36.27"N	78°46'07.27"E to 78°46'20.71"

2.4 REQUIREMENTS FOR THE PROJECT

2.4.1 Land Requirement

Lessee has obtained Letter of Intent by District Collector, Pudukkottai district for rough stone mine for a proposed lease area 9.67.5 (i.e. individual lease areas of 4.770 Ha, 4.90.5 Ha) located at Survey Nos.20/1, 20/2, 270/2,270/3, 270/4, 257/9,257/8A & 257/10A, 11/2A,12/1A&12/1B(Part)&236/1A,236/1B,236/1C,236/1D,236/1E,236/2,236/3,236/4,236/5,236/6,236/7,236/9,236/10,236/11,236/12,236/13, 236/14, 19/3,235/9B & 235/11 in Panampatti Village and Thiruvengaivasal Village, Illuppur Taluk, Pudukkottai District, Tamil Nadu. The LOI is provided for lease period of 5 years.

2.4.2 Water Requirement

Total water requirement for the proposed project will be **13.1 KLD**, which will be met from mine pit water (when available) and by tankers from nearby bore wells**.** Water for drinking purposes will be supplied from nearby borewell. Details of water requirement in the project are presented in **Table 2.2**. Water balance diagram for the proposed mine is given in **Figure 2.1**

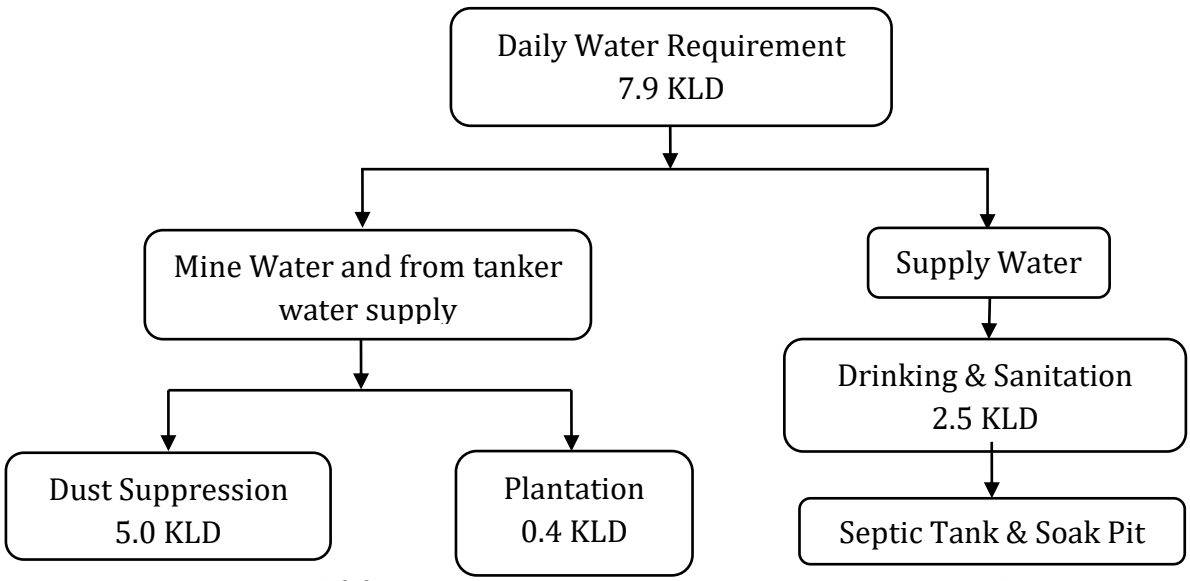


FIGURE 2.1(a): WATER BALANCE DIAGRAM OF PROJECT 1

TABLE 2.2(a): DAILY WATER REQUIREMENT (KLD) OF PROJECT 1

Particular	Calculation description	Qty
Dust Suppression	➢ Water requirement per day for sprinkling of water to curb fugitive emission in KL (0.1 Litre per Sq.m.) (Water required for 47700 Sqm. i.e. 4.77.0 Ha area required =0.1*4770 = 477 liters i.e. 5.0 KLD)	5.0
Green Belt & Plantation	➢ One plant per 4 Sqm of Green area. ➢ One plant requires 4 litre water per day. ➢ Green Belt Area= 0.20 Ha, i.e. 2000 Sqm. 2000/4 = 500 No of trees considering 100 trees per year 100*4 = 400 liters per day i.e. 0.4 KLD	0.4
Domestic Use	➢ 45 liters/day water required by one person. ➢ Total No. of Workers including technical staff = 55 (45 Lpcd*55 = 2.475 KLD) i.e. 2.5 KLD	2.5
Total		**7.9**

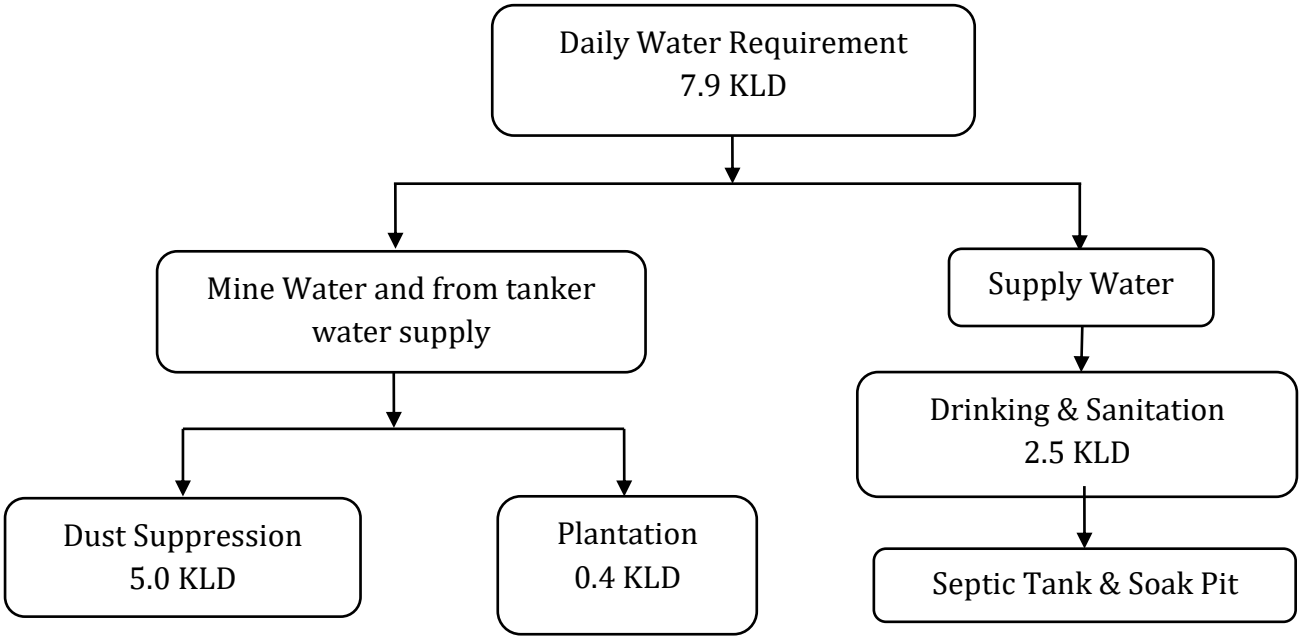


FIGURE 2.1(b) : WATER BALANCE DIAGRAM OF PROJECT 2

TABLE 2.2(b): DAILY WATER REQUIREMENT (KLD) OF PROJECT 2

Particular	Calculation description	Qty
Dust Suppression	➢ Water requirement per day for sprinkling of water to curb fugitive emission in KL (0.1 Litre per Sq.m.) (Water required for 4905 Sqm. i.e. 4.90.5 Ha area required =0.1*4905 = 490.5 liters i.e. 5.0 KLD)	5.0

Particular	Calculation description	Qty
Green Belt & Plantation	➢ One plant per 4 Sqm of Green area. ➢ One plant requires 4 litre water per day. ➢ Green Belt Area= 0.20 Ha, i.e. 2000 Sqm. 2000/4 = 500 No of trees considering 100 trees per year 100*4 = 400 liters per day i.e. 0.4 KLD	0.4
Domestic Use	➢ 45 liters/day water required by one person. ➢ Total No. of Workers including technical staff = 53 (45 Lpcd*53 = 2.385 KLD) i.e. 2.5 KLD	2.5
Total		**7.9**

2.4.3 Man Power Requirement

The mine will provide employment for activities such as excavation, transportation etc. The list of proposed manpower for rough stone mine is shown in **Table-2.3.**

TABLE 2.3: REQUIREMENT OF MANPOWER

S.No	Particulars	Project-1 (Nos)	roject-2 (Nos)
Mine Official & Competent Person			
1.	Mine Foreman/ Manager	1	1
2.	Blaster/mate	1	1
Machinery Operators			
3.	Excavator- Operator	11	10
4.	Jack hammer operator	24	24
Semi- Ordinary Employee			
5.	Watchman/ Security		2
6.	Labour & Helper	5	5
7.	Co- operator/ Cleaner	11	10
	Total	**55**	**53**

(Source: Approved Mining Plan)

2.4.4 Power Requirement

Most of the mine machinery will be operated on diesel and thus, no major electrical power will be required for mining. The proposed rough stone mine does not require any power supply for the Mining operation. Lightings on the Night will be taken from nearby electric poles after obtaining permission from concerned authorities. It is proposed to operate in day time only from 9 Am to 5 PM with 1 Hour lunch interval between 1PM to 2PM.

2.4.5 Diesel Requirement

For Project- 1

Diesel (HSD) used for quarrying machineries will be around **4,95,252 litres** of HSD for the entire project life. Diesel will be brought from nearby diesel pumps.

For top soil:

Per hour Excavator will consume	=	10 liters/hour
Per hour Excavator will excavate	=	60m^3 of Top soil
Top soil quantity	=	83,232/60 = 8323 hours
Diesel consume	=	8323 hours x 10 liters
Total diesel consumption	=	83230 Liters of HSD will be utilized for top soil

For Weathered Rock:

Per hour Excavator will consume	=	10 liters / hour
Per hour Excavator will excavate	=	60$m^3$of
Weathered RockWeathered Rock quantity	=	48,918/60=815 hours
Diesel consume	=	815 hours x 10 liters
Total diesel consumption	=	8150 Liters of HSD will be utilized forWeathered Rock

For Rough stone:

Per hour Excavator will consume	=	16 liters / hour
Per hour Excavator will excavate	=	20$m^3$of Rough stone
Rough stone	=	5,04,840/20 = 25,242 hours
Diesel consume	=	25,242 hours x 16 liters
Total diesel consumption	=	4,95,252 Liters of HSD will be utilized for Roughstone

Total diesel consumption = 4,95,252 litres of HSD will be utilized for entire project.

For Project- 2

Diesel (HSD) used for quarrying machineries will be around **4,06,386 litres** of HSD for the entire project life. Diesel will be brought from nearby diesel pumps.

For top soil:

Per hour Excavator will consume	=	10 liters/hour
Per hour Excavator will excavate	=	60m^3 of Top soil
Top soil quantity	=	99,039/60 = 1651hours
Diesel consume	=	1651 hours x 10 liters
Total diesel consumption	=	16,510 Liters of HSD will be utilized for top soil

For Weathered Rock:

Per hour Excavator will consume	=	10 liters / hour

Per hour Excavator will excavate	=	60m^{3}of
Weathered RockWeathered Rock quantity hours	=	54,824/60 = 914
Diesel consume	=	914 hours x 10 liters
Total diesel consumption	=	9,140 Liters of HSD will be utilized forWeathered Rock

For Rough stone:

Per hour Excavator will consume	=	16 liters / hour
Per hour Excavator will excavate	=	20m^{3}of Rough stone
Rough stone	=	4,75,915/20 = 23,796 hours
Diesel consume	=	23,796 hours x 16 liters
Total diesel consumption	=	3,80,736 Liters of HSD will be utilized for Roughstone

Total diesel consumption = 4,06,386 litres of HSD will be utilized for entire project.

2.4.6 Extent of Mechanization

Since the deposit in this area is massive in nature, it is proposed to carry out opencast mining for this plan period. The lists of machines to be used in the mine are given in **Table 2.4.** Mostly hired equipment's are utilized.

TABLE 2.4: LIST OF MACHINERY

S.No	Particulars	Size capacity	Motive Power	P1	P2
				Numbers	
1.	Jack hammer (30-35mm dia hole)	1.2m -2.0m	Compressed air	12	12
2.	Compressor	400 psi	Diesel drive	3	3
3.	Excavator with Bucket and Rock Breaker	300	Diesel drive	3	3
4.	Tippers	20 tonnes	Diesel drive	7	1

(Source: Approved Mining Plan)

2.4.7 Lorry Load Calculation

For Project- 1

One lorry load	= 6m^3 (approx..)
Total No of working days	= 300 days per year
Total quantity to be removed in this five years plan period	= 5,04,840 m^3
Hence total lorry loads per day	= 5,04,840 m^3 / 6m^3
	= 84,140 Lorry loads
	= 84,140/ 5years
	= 16828/ 300 days

Rough stone **= 56 Lorry loads per day**

Total quantity of weathered to be removed during three years = 48,918 m^3`
Hence total lorry loads per day = 48,918m^3/ 6m^3
= 8153 Lorry loads
= 8153/ 3
= 2718/ 300 days

Weathered Rock load per day **= 9 Lorry loads per day**

Total quantity of top soil to be removed during three years = 83,232 m^3
Hence total lorry loads per day = 83,232 m^3 / 6m^3
= 13,872 Lorry loads
= 13,872/ 3
= 4,624/ 300 days

Top soil load per day **= 15-16 Lorry loads per day**

For Project- 2

One lorry load = 6m^3 (approx..)
Total No of working days = 300 days per year
Total quantity to be removed in this five years plan period = 4,75,915 m^3
Hence total lorry loads per day = 4,75,915 m^3 / 6m^3
= 79,319 Lorry loads
= 79,319/ 5years
= 15,863/ 300 days

Rough stone **= 52-53 Lorry loads per day**

Total quantity of weathered to be removed during three years = 54,824 m^3`
Hence total lorry loads per day = 54,824 m^3/ 6m^3
= 9137 Lorry loads
= 9137/ 3
= 3046/ 300 days

Weathered Rock load per day **= 10 Lorry load per day**

Total quantity of top soil to be removed during three years = 99,039 m^3
Hence total lorry loads per day = 99,039 m^3 / 6m^3
= 16506 Lorry loads
= 16506/ 3
= 55002/ 300 days

Top soil load per day **= 18-19 Lorry loads per day**

2.5 PROJECT COST

The estimated cost of the proposed rough stone quarry is given below in **Table.2.5** with split up. The Total cost of the project including EMP Cost for Project- 1 is **Rs. 1,08,78,000/-** (One crore eight Lakhs and seventy eight thousand only), The Total cost of the project including EMP Cost for Project- 2 is **Rs. 1,06,24,000/-** (One crore six lakhs and twenty four thousand only)

TABLE 2.5: ESTIMATION OF PROJECT COST

Description	Project 1 (Rs)	Project 2 (Rs)
Project cost/ Investment		
Land cost	15,48,000	15,60,000
Machinery cost	70,00,000	65,00,000
Refilling/Fencing cost	3,06,000	4,44,000
Labourers shed	2,00,000	2,00,000
Sanitary facility	1,50,000	1,50,000
Others items (First aid room & accessories)	1,00,000	1,00,000
Drinking water facility	1,50,000	1,50,000
Sanitary arrangement	90,000	1,00,000
Safety kit	1,50,000	1,50,000
Water sprinkling	3,00,000	3,00,000
Garland drain construction	2,28,000	3,09,000
Greenbelt etc.	62,000	72,000
A. Total Project cost	**1,02,84,000**	**1,00,35,000**
EMP cost		
Air Quality Monitoring	52,000	52,000
Water quality sampling	18,000	18,000
Noise Level monitoring	2,000	2,000
Ground vibration test	4,000	4,000
B. Total EMP Cost for the five years period	**3,80,000**	**3,80,000**
A. Project cost	1,02,84,000	1,00,35,000
B. EMP cost	3,80,000	3,80,000
Total Project Cost (A+B)	**1,06,64,000**	**1,04,15,000**
CER Cost (2.0%)	2,14,000	2,09,000
Total cost	**1,08,78,000**	**1,06,24,000**

2.6 MAINTENANCE REQUIREMENT

Regularly maintenance will be carried out of all equipment's at service centers located in nearby Town. The proposed method of mining operation will be Open Pit Mine by using by deploying drilling and blasting method, loader and tipper/dumper combination. The

machineries to be deployed are excavators, Water Tanker loading and transportation from mine head to destination will be done by hired tipper/dumper.

2.7 GEOLOGY OF THE AREA

2.7.1 Regional Geology

Peninsular gneiss forms the oldest rock formations, in which the massive formation of Charnockite lies over with rich accumulation of recent quaternary formation. On regional scale the Charnockite body N45^{0}E – S45^{0}W with dipping towards SE80^0. The general geological sequences of the rocks in this area are given below:

Regional stratigraphic sequence:

AGE		FORMATION
Recent	-	Quaternary formation (Top soil + Weathered Formation)
---------Unconformity----------		
Archaean	-	Charnockite
		Peninsular Gneiss complex

The geological formation of Pudukkottai District comprises of the hard rocks formed in the Archean age to the sedimentary deposits of the Quaternary period. Geologically the entire study area can be divided into hard rock and sedimentary rock regions. The hard rocks are found on the western side and sedimentary formation towards the eastern direction of the study area. About 45 per cent of the study area is under hard massive formation of Archean age and the rest 55 per cent comprises of the sedimentary formation ranging from Pre-Cambrian to Quaternary period. The various types of hard rocks found here are Charnockites, Hornblende Gneiss, Biotite Gneiss, Granite and Quartzite's. Various types of Gneiss rocks are found in the western part of Pudukkottai District. Charnockites and granites rocks are mostly found in the central part including the blocks of Kunnandavarkoil, Thirumayam and the southern parts of Pudukkottai Block. The various types of Gneiss rocks are found in the western part of the study area, consisting the blocks of Viralimalai, Annavasal and Ponamaravathy. Quartzite deposits are found in small quantity in some parts of Annavasal and Thirumayam Blocks. In the Blocks of Kulathur, Thirumayam and parts of Pudukkottai crystalline rocks are found.

The sedimentary deposits found in this region consist of shaly sandstone, sand, clay and gravels. The sedimentary deposits formed during the Tertiary period consist of laterite, arenaceous and argillaceous sandstone clay. These deposits are found in the Blocks of Arantangi, Gandarvakottai, Alangudi and Thiruvarankulam. Crecateous deposits consisting of clay, limestone, sand stone and clayey sand stone are found in some parts of Gandarvakottai, Thirumayam and Pudukkottai. Unconsolidated coastal alluvial deposits consisting of sand gravel and silt are found along the river bed. Silt and clay deposits of

Quaternary period are found in the blocks of Avudaiyarkoil and Manalmelkudi. Sand deposits with beach ridges and dunes are identified near the coastal boundary of Pudukkottai District.

(Source: Microsoft Word - DSR -MCG 03.09.2019 (s3waas.gov.in)*)*

2.7.2 Local Geology

The study area follows the regional trend and mainly comprises of Hard Rock Formation as a homogeneous formation / Batholith formation of Charnockite.

Project 1: The lease applied area is exhibits plain topography. The area has gentle sloping towards Southern side. The maximum altitude of the area is 117 m (max) above Mean Sea level. The area is covered by 3m thickness of Top soil and 2m of Weathered formation. Massive Charnockite is found after 6m which is clearly inferred from the existing quarry pits in the cluster.

Project 2: The lease applied area is exhibits plain topography. The area has gentle sloping towards Southern side. The maximum altitude of the area is 117 m (max) above Mean Sea level. The area is covered by 3m thickness of Top soil and 2m of Weathered rock. Massive Charnockite is found after 5m which is clearly inferred from the existing quarry pits in the cluster.

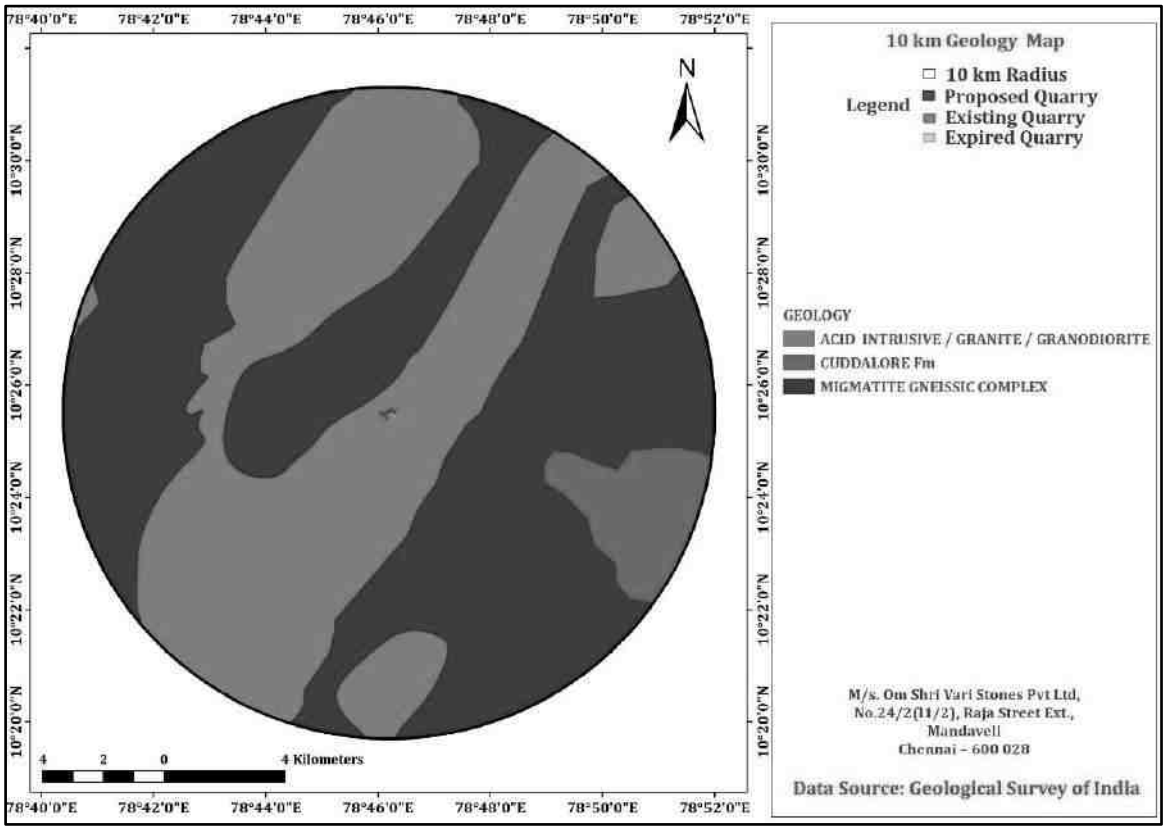


FIGURE 2.2: GEOLOGY OF STUDY AREA

2.8 GEOMORPHOLOGY

The district is characterized by an undulating topography with residual hills in the northern, western and southern parts of the district, where as in the eastern part of the district is a flat terrain consisting of alluvial plains. The elevation of the terrain of the western part of the area is about 125 m above MSL, whereas towards coast it is about 1m above msl. The geomorphic evolution of the area is mainly controlled by denudational, structural and fluvial processes. The evolution of various landforms has been governed mainly by the varying resistance of geological formations to these processes. Various landforms are occurring in the area, such as erosional plains, residual hills, pediments, buried pediments and deltaic plain. The shallow pediments possess poor to moderate yields with in soil cover. The buried pediments and deltaic plain possess good ground water potential. *(Source:* Microsoft Word - DSR -MCG 03.09.2019 (s3waas.gov.in)*)*

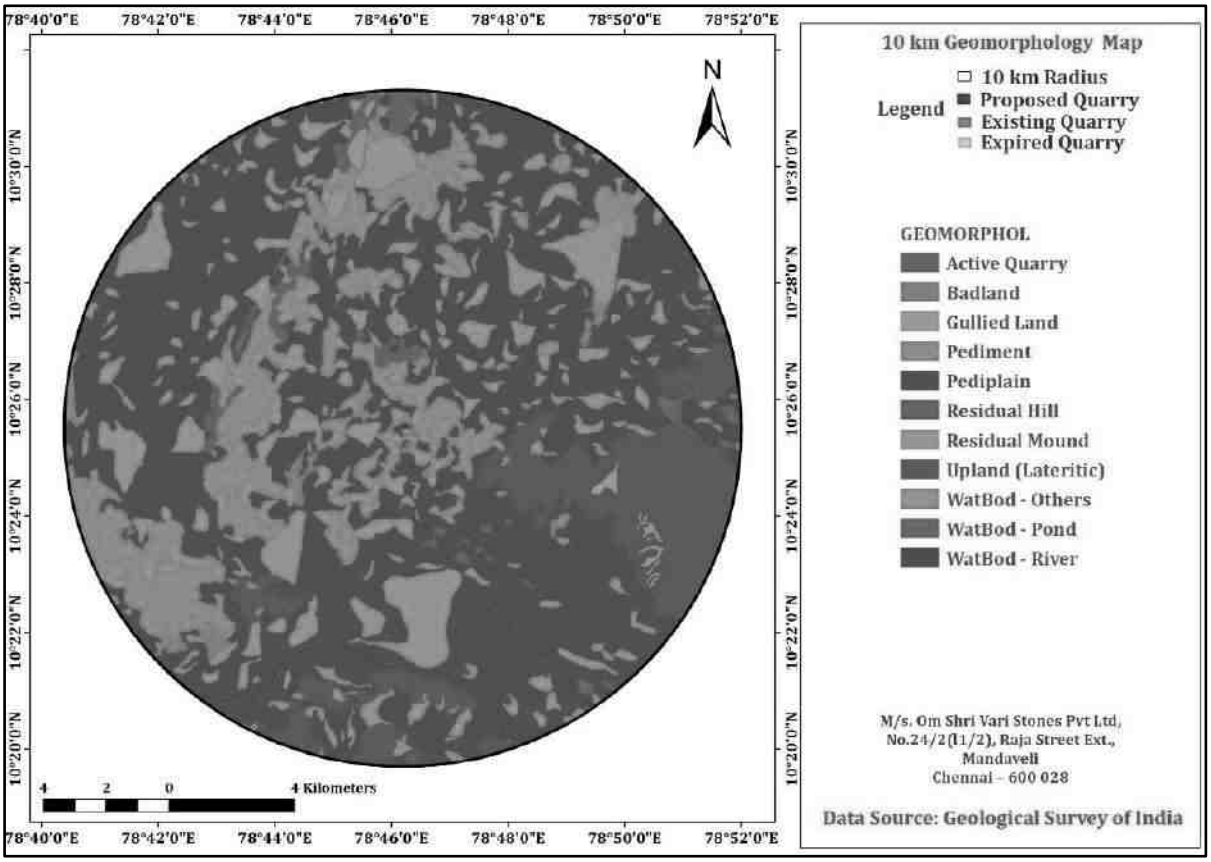


FIGURE 2.3: GEOMORPHOLOGY OF STUDY AREA

2.9 LITHOLOGY

The subsurface order of existence of different geological stratum in a particular locality is described with the term called as lithology. The study area consists of top soil, weathered and fresh stratums of geneiss, charnockite, pyroxenite. The lithological details of the study area are known from the selected bore logs across the study area.

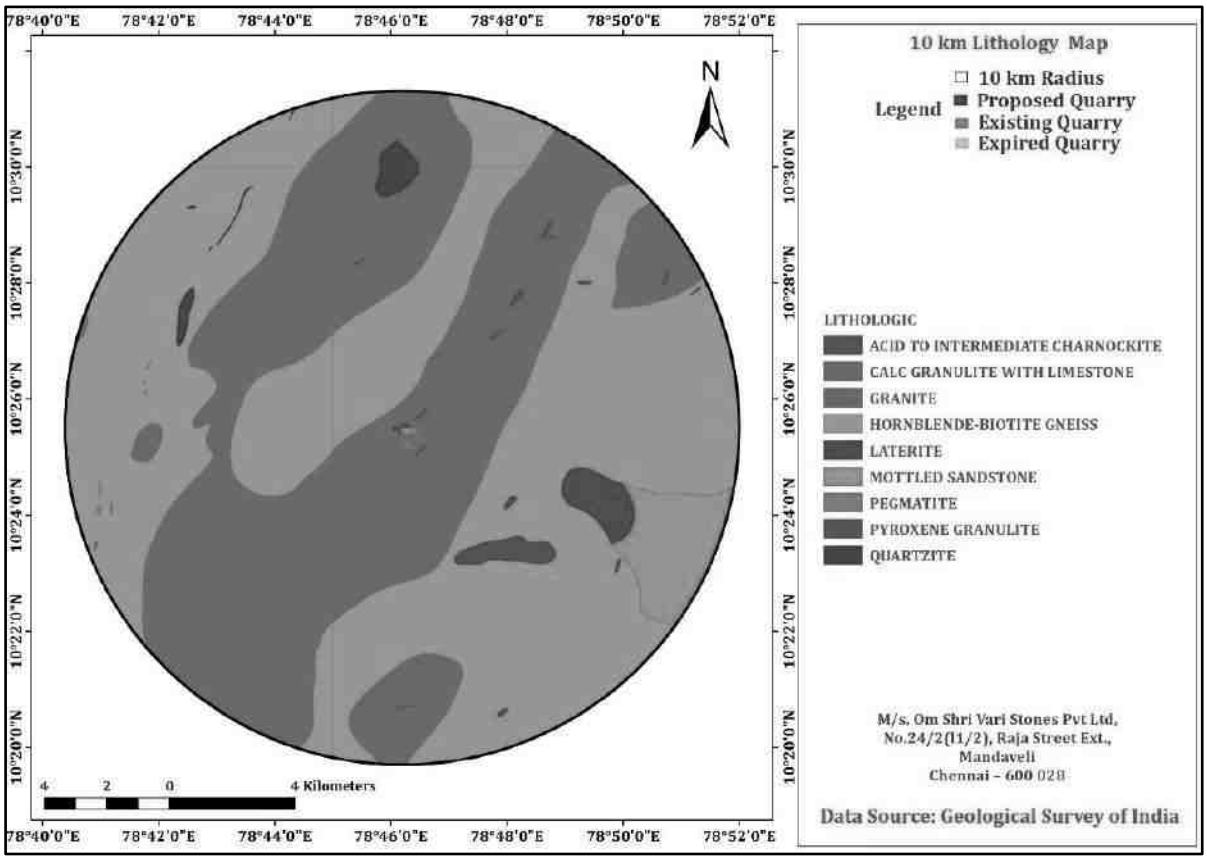


FIGURE 2.4: LITHOLOGY OF STUDY AREA

2.10 PHYSIOGRAPHY AND DRAINAGE PATTERN

Fundamental characteristic of the terrain of Pudukkottai District is the general flatness, inter spread with small rocky hills which are numerous in the south western parts of the district. Within this general flat terrain, depressions and slopes have created seasonal rivers and jungle streams, and have made it possible to construct tanks across slopes and irrigate lands under these tanks for many centuries. There are rivers like Vellar, Agniar that drain the district. The climate of the district is hot and dry during most parts of the year. In coastal areas of the district the intensity of the heat is mitigated to some extent by sea breeze.

Pudukkottai is a part of Cauvery Basin and parts of Vellar, Agniyar, Ambuliyar, Koraiyar, Gundar and Pambar sub basins. Vellar is the major river, which flows in an East- south easterly direction and confluences with the Bay of Bengal near Manamelkudi. Agniyar, Ambuliyar, Koraiyar, Gundar and Pambar are the other important rivers draining the District. All most all the rivers are ephemeral in nature.

This is a case of proposed mine change in topography which will be there with formation of mining pits. Mining of Rough stone by opencast method will change the existing topography within the mine lease area. The district profile is as follows.

- Pudukottai district has an undulating topography with a gentle slope towards East-North East along the coast.
- There are no major hill ranges in this district, except some detached patches of residual hills at Thirumayam, Kudimiyanmalai, Sithannavasal, Viralimalai and Narthamalai.
- There is no perennial river, however, Agniar, Vellar, Koraiyar, Gundar, etc are some of the seasonal rivers that drain the district.
- The rivers Vellar and pambar flow in the N.W.S.E direction. Apart from these rivers, there are approximately 5451 shallows interconnected tanks which are mainly rainfed.

Source: Pudukottai | TWAD (tn.gov.in)

Project 1: The lease applied area is exhibits plain topography. The area has gentle sloping towards Southern side. The maximum altitude of the area is 117 m (max) above Mean Sea level. The area is covered by 3m thickness of Top soil and 2m of Weathered formation. Massive Charnockite is found after 6m which is clearly inferred from the existing quarry pits in the cluster. The water table is found at a depth of 68m in summer and at 63m in rainy seasons. Average rainfall is about 887mm

Project 2: The lease applied area is exhibits plain topography. The area has gentle sloping towards Southern side. The maximum altitude of the area is 117 m (max) above Mean Sea level. The area is covered by 3m thickness of Top soil and 2m of Weathered rock. Massive Charnockite is found after 5m which is clearly inferred from the existing quarry pits in the cluster. The water table is found at a depth of 68m in summer and at 63m in rainy seasons. Average rainfall is about 887mm

2.11 DETAILS OF MINING

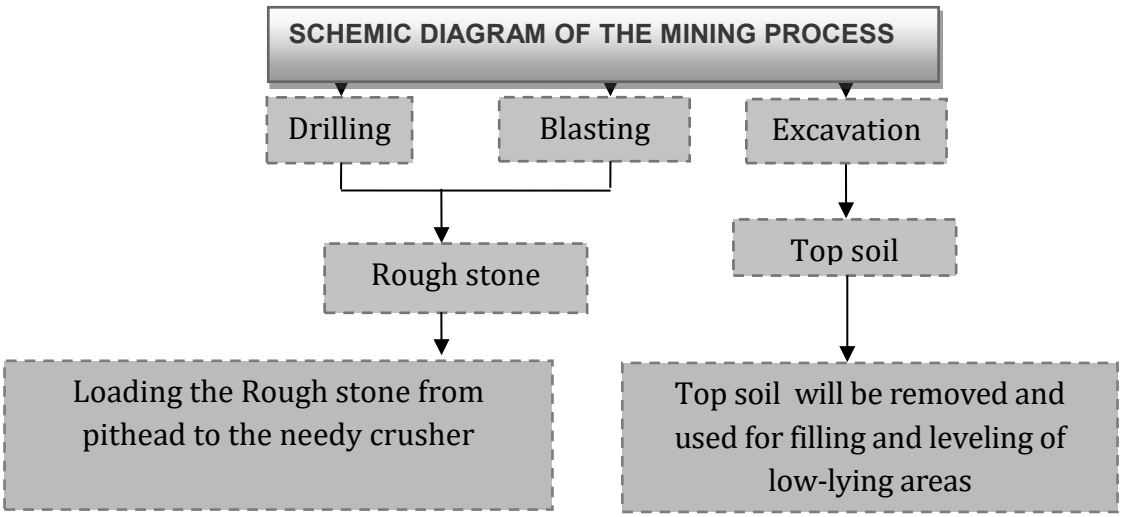
The mine will be designed in such a way that the height of the bench is kept around 5m max and the width of benches will more than height, maintain a slope of 45° from the horizontal. Mining will be done with the help of drilling and blasting technique.

2.12 RESERVE ESTIMATION & LIFE OF THE MINE

2.12.1 Reserve Estimation

The estimation of ore reserves is made by conventional parallel cross section method using geological cross section. The geological cross sections are prepared across the strike of the ore body. The area of individual litho units in each cross section is calculated separately. The volume between the cross section is arrived based on the average area of

parallel cross section i.e. ((S1+S2)/2) and multiplying sectional interval. And tonnage is arrived at by multiplying by bulk density.



2.12.2 Geological Reserves

The geological cross sections are prepared across the strike of the ore body. The area of individual litho units in each cross section is calculated separately. Section wise sectional area is measured and multiplied by the influence to obtain the volume in m^3. The volume is multiplied by 2.5MT/m^3 (bulk density) to calculate the resource of Rough stone in MT. The total Geological resources are calculated after depletion of existing quarry pits. The total Geological reserves available in the mine lease area are given below.

Project 1

Total Extent of the area	: 4.77.0 Ha
Area in square meter	: 4.77.0 x 10,000 = 47,000 sq.m
Top soil	: 3m below ground level
	: 47,700 sq.m x 3m Depth
	: 1,43,100 m^3 of Top soil
Weathered Rock	: 2m below ground level
	: 47,700 sq.m x 2m Depth
	: 95,400 m^3 of Weathered Rock
Rough stone	: 40m below ground level
	: 47,700 sq.m x 40m Depth
	: 19,08,000 m^3 of Rough stone
Available Geological Resources of Top soil	: 1,43,100 m^3
Available Geological Resources of Weathered rock	: 95,400 m^3
Available Geological Resources of Rough stone	: 19,08,000 m^3

(Source: Approved Mining Plan)

Project 2

Total Extent of the area : 4.90.5 Ha
Area in square meter : 4.90.5 x 10,000 = 49,050 sq.m
Top soil : 3m below ground level
: 49050 sq.m x 3m Depth
: 1,47,150 m^3 of Top soil
Weathered Rock : 2m below ground level
: 49,050 sq.m x 2m Depth
: 98,100 m^3 of Weathered Rock
Rough stone : 40m below ground level
: 49,050 sq.m x 40m Depth
: 19,62,000 m^3 of Rough stone

Available Geological Resources of Top soil : 1,47,150 m^3
Available Geological Resources of Weathered rock : 98,100 m^3
Available Geological Resources of Rough stone : 19,62,000 m^3
(Source: Approved Mining Plan)

2.12.3 Mineable Reserves

Mineable reserve is getting restricted due to the formation of benches, leaving the statutory safety distance in the inner boundary, mineral lock up in the benches itself, ultimate depth of mining, bench slope adopted etc. So, the mineable reserve is estimated after reducing the rough stone blocked in the safety distance, benches and existing pit. The Rough stone reserves are given below.

TABLE 2.6(a): SUMMARY OF MINEABLE RESERVE OF PROJECT- 1

Section	Bench (m)	Length (m)	Width (m)	Depth (m)	Mineable Resources of Rough stone at 100% (m^3)	Weathered Formation (m^3)	Top soil (m^3)
XY-AB	I	272	102	3	-	-	83232
	II	263	93	2	-	48918	-
	III	259	89	5	115255	-	-
	IV	249	79	5	98355	-	-
	V	239	69	5	82455	-	-
	VI	229	59	5	67555	-	-
	VII	219	49	5	53655	-	-
	VIII	209	39	5	40755	-	-
	IX	199	29	5	28855	-	-
	X	189	19	5	17955	-	-

Section	Bench (m)	Length (m)	Width (m)	Depth (m)	Mineable Resources of Rough stone at 100% (m^3)	Weathered Formation (m^3)	Top soil (m^3)
				Total	**117760**	**48918**	**83232**

(Source: Approved Mining Plan)

Total Mineable Recoverable Reserves of Top soil : 83232 m^3
Total Mineable Recoverable Reserves of Weathered formation : 48918 m^3
Total Mineable Recoverable Reserves of Rough stone : 504840 m^3

The mineable reserves have been computed as **5,04,840m^3** of rough stone, **48,918 m^3** of Weathered formation and **83,232 m^3** of top soil at the rate of 100% recovery upto a maximum depth of 46m below the ground profile for a period of five years.

TABLE 2.6(b): SUMMARY OF MINEABLE RESERVE OF PROJECT- 2

Section	Bench	Length in (m)	Width in (m)	Depth in (m)	Mineable Reserves of Rough Stone (m^3)	Rock (m^3)	Top soil (m^3)
XY-AB	I	52	111	3	-	-	17316
	II	47	102	2	-	9588	-
	III	45	98	5	22050	-	-
	IV	40	88	5	17600	-	-
	V	35	78	5	13650	-	-
	VI	30	68	5	10200	-	-
	VII	25	58	5	7250	-	-
	VIII	20	48	5	4800	-	-
	IX	10	38	5	1900	-	-
	Total				**77450**	**9588**	**17316**
XY-CD	I	60	65	3	-	-	11700
	II	60	56	2	-	6720	-
	III	60	52	5	15600	-	-
	IV	60	42	5	12600	-	-
	V	60	32	5	9600	-	-
	VI	60	22	5	6600	-	-
	VII	60	12	5	3600	-	-
	Total				**48000**	**6720**	**11700**
XY-EF	I	70	204	3	-	-	42840
	II	66	195	2	-	25740	-
	III	64	191	5	61120	-	-
	IV	59	181	5	53395	-	-
	V	54	171	5	46170	-	-
	VI	49	161	5	39445	-	-
	VII	44	151	5	33220	-	-

Section	Bench	Length in (m)	Width in (m)	Depth in (m)	Mineable Reserves of Rough Stone (m^3)	Rock (m^3)	Top soil (m^3)
	VIII	39	141	5	27495	-	-
	IX	29	131	5	18995	-	-
	X	19	121	5	11495	-	-
	Total				**291335**	**25740**	**42840**
X1Y1-GH	I	63	90	3	-	-	17010
	II	54	81	2	-	8748	
	III	50	77	5	19250	-	-
	IV	40	67	5	13400	-	-
	V	30	57	5	8550	-	-
	VI	20	47	5	4700	-	-
	VII	10	37	5	1850	-	-
	Total				**47750**	**8748**	**17010**
X2Y2-IJ	I	52	43	3	-	-	6708
	II	43	34	2	-	2924	-
	III	39	30	5	5850	-	-
	IV	29	20	5	2900	-	-
	V	19	10	5	950	-	-
	Total				**9700**	**2924**	**6708**
X3Y3-KL	I	55	21	3	-	-	3465
	II	46	12	2	-	1104	-
	III	42	8	5	1680	-	-
	Total				**1680**	**1104**	**3465**
Grand Total					**475915**	**54824**	**99039**

Total Mineable Recoverable Reserves of Top soil : 99,039 m^3
Total Mineable Recoverable Reserves of Weathered formation : 54,824 m^3
Total Mineable Recoverable Reserves of Rough stone : 4,75,915 m^3

(Source: Approved Mining Plan)

2.12.4 Anticipated Life of The Mine

The estimated life of the proposed quarry is 5 years.

2.13 METHOD OF MINING

The method of mining is common for all the Cluster quarries, Opencast Mechanized Mining Method is being proposed by formation of 5 m height bench with a bench width not less than the bench height. However, as far as the quarrying of Rough Stone is concerned, observance of the provisions of Regulation 106 (2) (b) as above is seldom possible due to various inherent petro genetic factors coupled with mining difficulties. Hence it is proposed to obtain relaxation to the provisions of the above regulation from the Director of Mines Safety for which necessary provision is available with the Regulation 106 (2) (b) of MMR-1961, under Mine Act – 1952.

Rough stone will be directly excavated by Hydraulic Excavators and loaded into tippers directly and sold to needy customers. The Rough Stone is a batholith formation and the splitting of rock mass of considerable volume from the parent rock mass will be carried out by deploying jackhammer drilling and Slurry Explosives will be used for blasting. Hydraulic Excavators attached with Rock Breakers unit will be deployed for breaking large boulders to required fragmented sizes to avoid secondary blasting and hydraulic excavators attached with bucket unit will be deployed for loading the Rough Stone into the tippers and then the stone is transported from pithead to the nearby crushers.

2.14 TOPSOIL, OVERBURDEN REMOVAL AND WASTEWATE

Project- 1

- **Overburden / Waste**

The overburden in the form of Top soil and Weathered formation, the top soil and Weathered formation will be directly loaded into tippers for the filling and levelling of low-lying areas. The excavated Rough stone (100%) will be directly loaded into tippers to the needy customers. There is no Waste anticipated during this plan period hence, disposal of waste does not arise.

- **Wastewater**

There will not be any process effluent generation from the quarry lease area. Domestic effluent from the mine office is discharged in septic tank and soak pit. There is no toxic effluent expected to generate in the form of solid liquid and gases and the no requirement of treatment of waste.

Project- 2

- **Overburden / Waste**

The overburden in the form of Top soil and Weathered formation, the top soil and Weathered formation will be directly loaded into tippers for the filling and levelling of low-lying areas. The excavated Rough stone (100%) will be directly loaded into tippers to the needy customers. There is no Waste anticipated during this plan period hence, disposal of waste does not arise

- **Wastewater**

There will not be any process effluent generation from the quarry lease area. Domestic effluent from the mine office is discharged in septic tank and soak pit. There is no toxic effluent expected to generate in the form of solid liquid and gases and the no requirement of treatment of waste.

2.15 PRODUCTION DETAILS

Year wise Production of Rough stone from the area will be upto maximum capacity. The recovery factor is up to 100% hence no waste expected to be generated. All excavated quantity is saleable. The summary of proposed development and production during the mine plan period is given in **Table 2.7**. The Plan showing mine development during the plan period is given in **Figure 2.5.**

TABLE 2.7(a): YEAR- WISE DEVELOPMENT & PRODUCTION OF PROJECT-1

Year	Section	Bench (m)	Length (m)	Width (m)	Depth (m)	Recoverable Reserves Rough stone at 100% (m^3)	Weathered Formation (m^3)	Top soil (m^3)
I		I	101	102	3	-	-	30906
		II	92	93	2	-	17112	-
		III	88	89	5	39160	-	-
		IV	78	79	5	30810	-	-
		V	68	69	5	23460		
					Total	**93430**		**30906**
II		I	86	102	3	-	-	26316
		II	86	93	2	-	15996	-
		III	86	89	5	38270	-	-
		IV	86	79	5	33970	-	-
		V	86	69	5	29670		
					Total	**101910**	**15996**	**26316**
III	**XY-AB**	I	85	102	3	-	-	26010
		II	85	93	2	-	15810	-
		III	85	89	5	37825	-	-
		IV	85	79	5	33575	-	-
		V	85	69	5	29325		
					Total	**100725**	**15810**	**26010**
IV		VI	229	59	5	67555	-	-
		VII	219	49	5	53655	-	-
					Total		**-**	**-**
V		VIII	209	39	5	40755	-	-
		IX	199	29	5	28855	-	-
		X	189	19	5	17955	-	-
					Total	**87565**	**-**	**-**
					Grand Total	**504840**	**48918**	**83232**

(Source: Approved Mining Plan)

Total Recoverable Reserves of Top soil @ 100% : 83232 m^3
Total Recoverable Reserves of Weathered formation @ 100% : 48918 m^3
Total Recoverable Reserves of Rough stone @ 100% : 504840 m^3

TABLE 2.7(b): YEAR- WISE DEVELOPMENT & PRODUCTION OF PROJECT-2

Section	Year	Bench	Length in (m)	Width in (m)	Depth in (in)	Recoverable Reserves Rough stone at 100% (m^3)	Weathered Formation (m^3)	Top soil (m^3)
XY-EF	I	I	70	204	3			42840
		II	66	195	2		25740	
		III	64	191	5	61120		
		IV	22	181	5	19910		
		Total				**8103**	**25740**	**42840**
	II	IV	37	181	5	33485		
XY-CD		I	60	65	3			11700
		II	60	56	2		6720	
		III	60	52	5	15600		
		IV	60	42	5	12600		
XY-AB		I	52	111	3			17316
		II	47	102	2		9588	
		III	45	98	5	22050		
		Total				**83735**	**16308**	**29016**
	III	IV	40	88	5	17600		
		V	35	78	5	13650		
		VI	30	68	5	10200		
		VI	25	58	5	7250		
XY-CD		V	60	32	5	9600		
		VI	60	22	5	6600		
		VII	60	12	5	3600		
X1Y1-GH		I	63	90	3			17010
		II	54	81	2		8748	
		III	50	77	5	19250		
X3Y3-KL		I	55	21	3			3465
		II	46	12	2		1104	
		III	42	8	5	1680		
X2Y2-IJ		I	52	43	3			6708
		II	43	34	2		2924	
		Total				**89430**	**12776**	**27183**
XY-AB	IV	VIII	20	48	5	4800		
		IX	10	38	5	1900		
XY-EF		V	54	171	5	46170		
		VI	49	161	5	39445		
		VII	22	151	5	16610		
		Total				**108925**		

Section	Year	Bench	Length in (m)	Width in (m)	Depth in (in)	Recoverable Reserves Rough stone at 100% (m^3)	Weathered Formation (m^3)	Top soil (m^3)
	V	VII	22	151	5	16610		
		VIII	39	141	5	27495		
		IX	29	131	5	18995		
		X	19	121	5	11495		
X1Y1-GH		rv	40	67	5	1 3400		
		V	30	57	5	8550		
		VI	20	47	5	4700		
		VII	10	37	5	1850		
X2Y2-IJ		III	39	30	5	5850		
		IV	29	20	5	2900		
		V	19	10	5	950		
		Total				**112795**		
Grand Total						**475915**	**54824**	**99039**

(Source: Approved Mining Plan)

Total Recoverable Reserves of Top soil @ 100% : 99039 m^3
Total Recoverable Reserves of Weathered rock @ 100% : 54824 m^3
Total Recoverable Reserves of Rough stone @ 100% : 475915 m^3

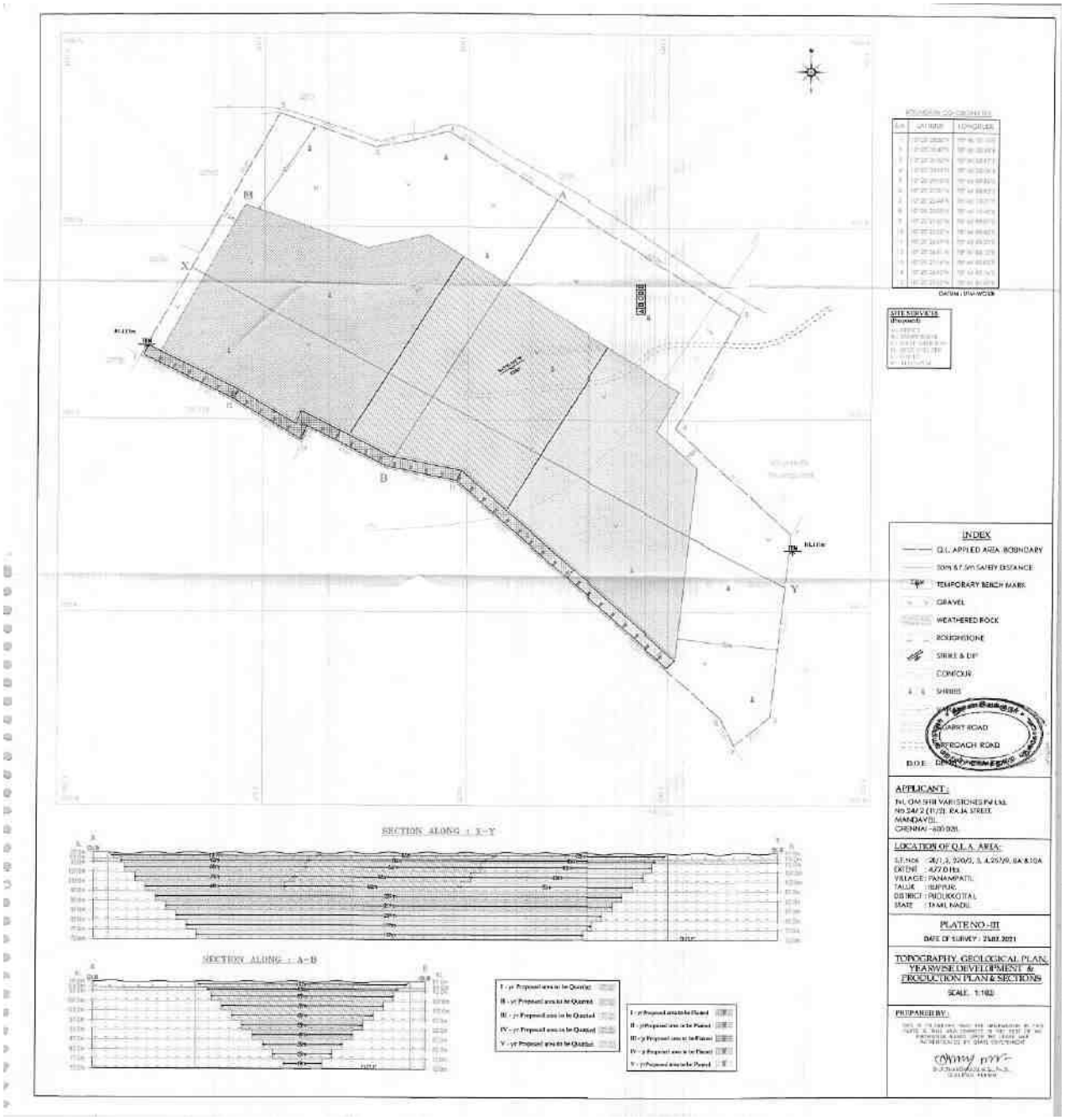


FIGURE 2.5(a): PRODUCTION AND DEVELOPMENT PLAN AND SECTION OF PROJECT- 1

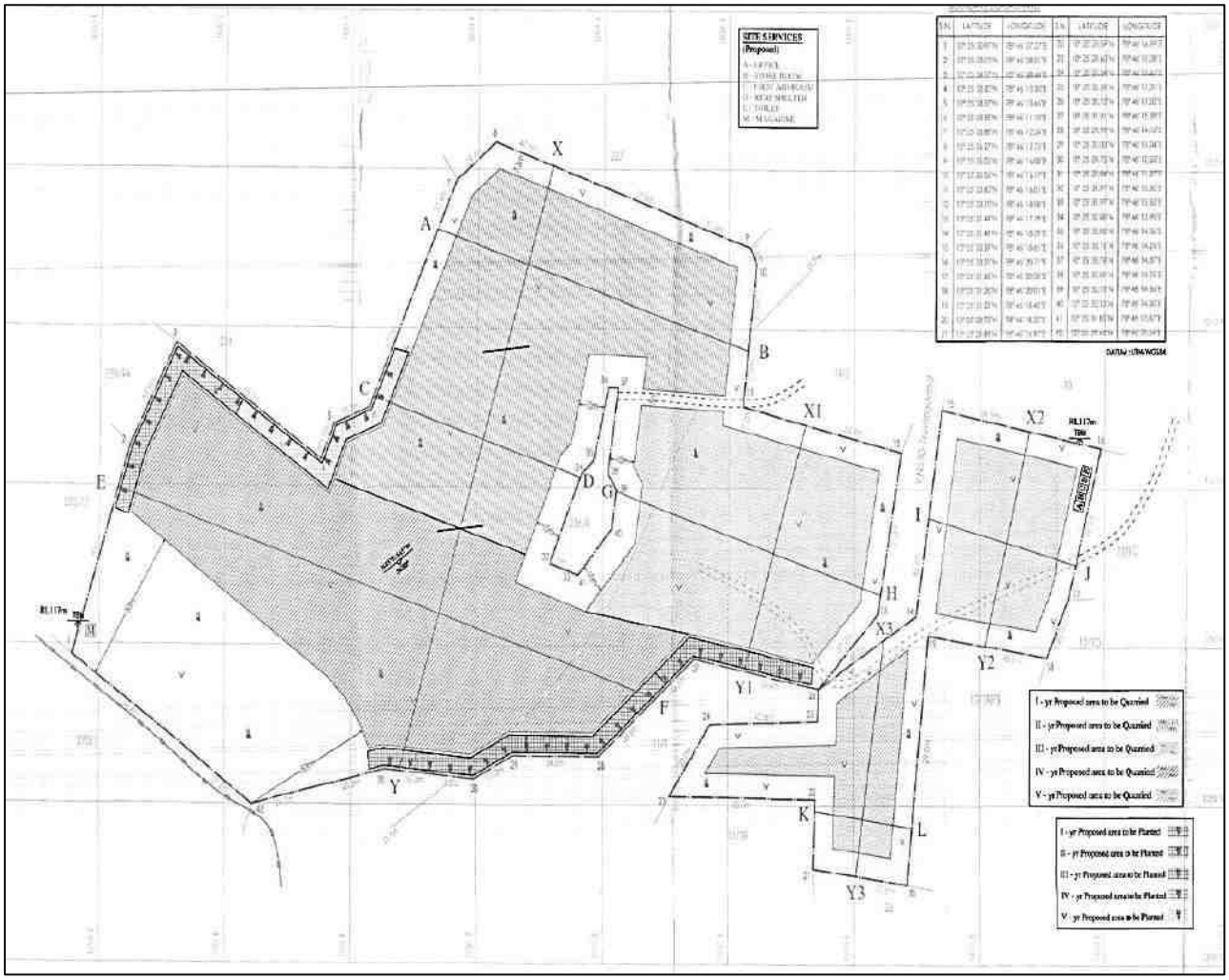


FIGURE 2.5(b): PRODUCTION AND DEVELOPMENT PLAN AND SECTION OF PROJECT- 2

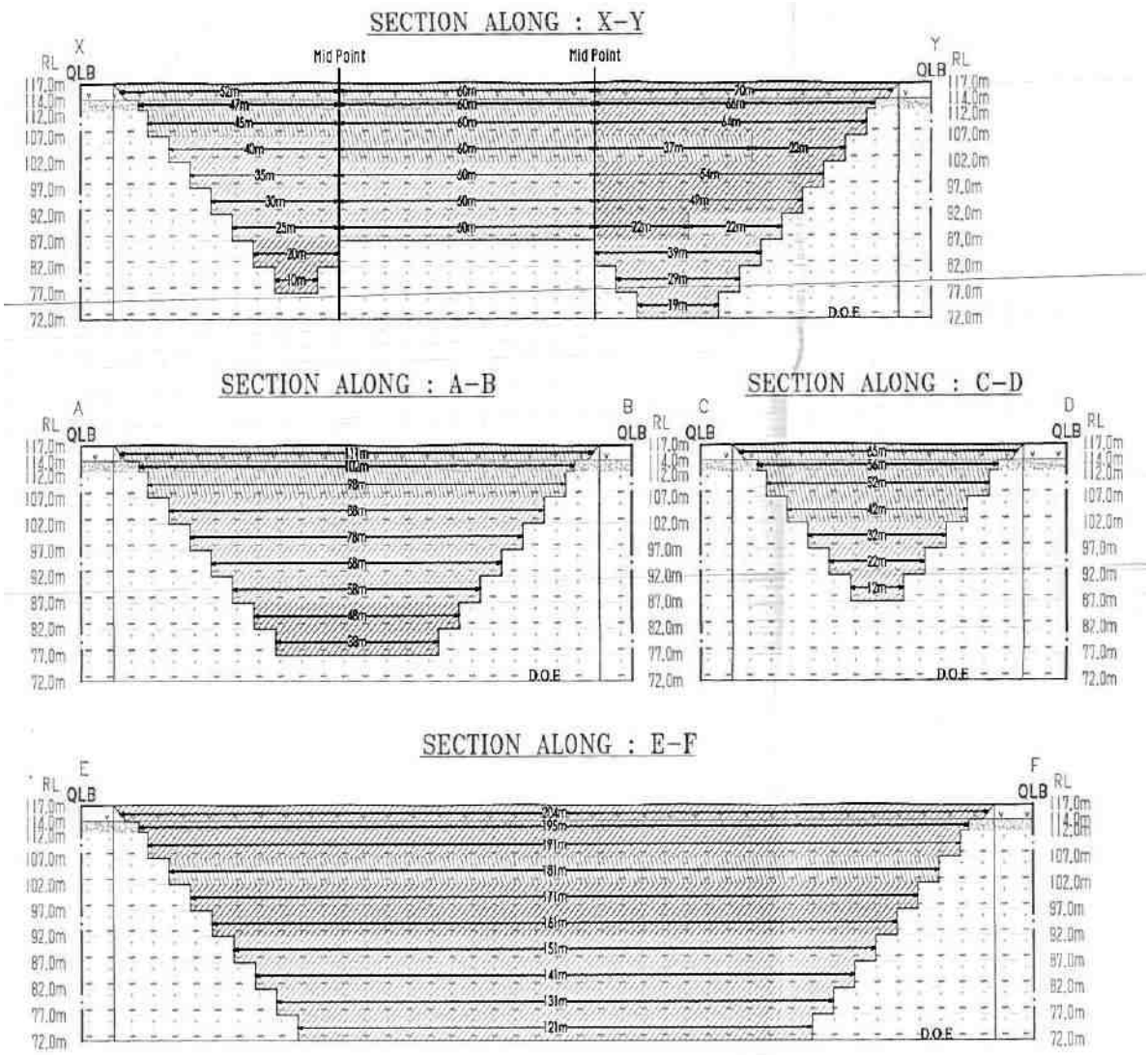


FIGURE 2.5(c): PRODUCTION AND DEVELOPMENT SECTION OF PROJECT- 2

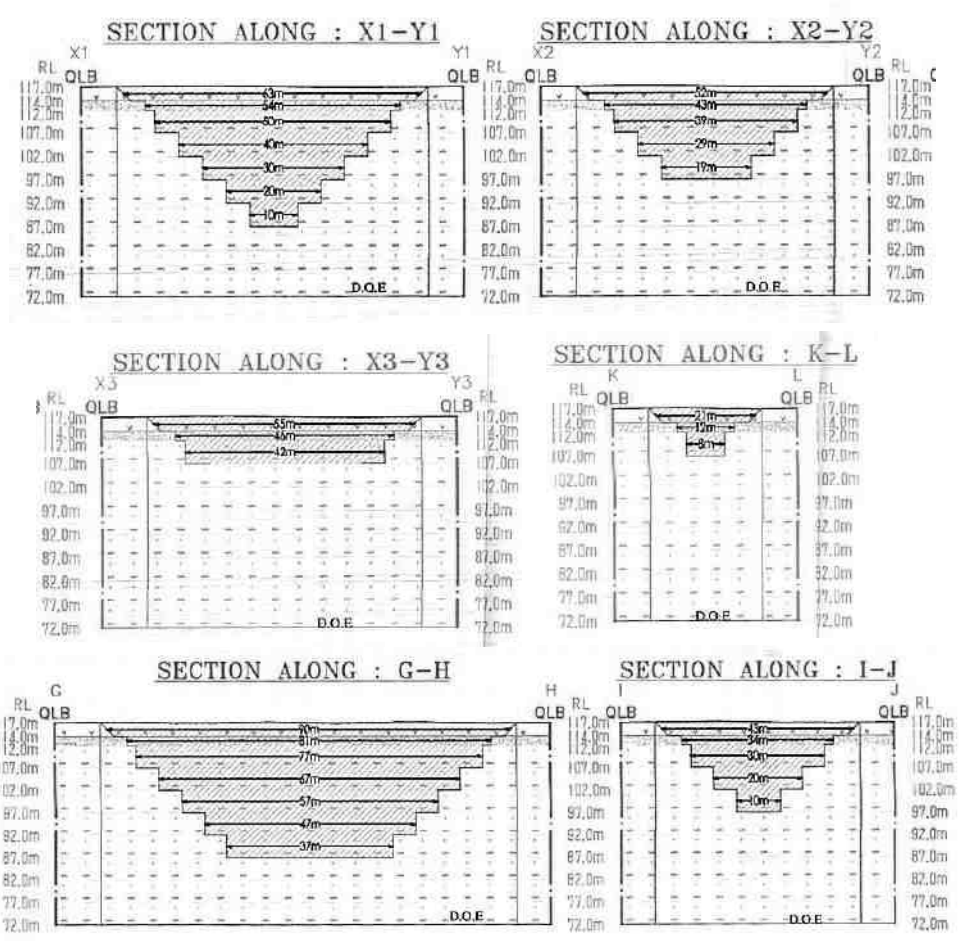


FIGURE 2.5(e): PRODUCTION AND DEVELOPMENT SECTION OF PROJECT- 2

2.16 DRILLING AND BLASTING PARAMETERS

Production from the fractured zone will be obtained with the help of excavator, whereas from compact zone the production will be obtained by drilling and blasting. Drilling will be done by jack hammer with the help of air compressor.

- Hole location will be properly dressed by excavator to remove the loose boulders for efficient drilling and for avoiding jamming of drilling hammer and bits.
- Drill holes of 32mm diameter and 1.5 m in depth will be made.
- To reduce the noise level the holes will be blasted by using nitrate mixture and Millisecond delay detonators.
- To maintain the bench height of 5m, sub bench of 2.5 m will be formed first, later Two benches will be merged and one bench of 5m will be formed and maintained.
- The spacing and burden will be kept at 1.2 m and 1m respectively.
- About 30 to 50 holes will be blasted in one blast.
- Yield per hole will be 1.5 x 1 x 1=1.5m^3.

2.16.1 Blasting Pattern

The blasting pattern entirely depends about the joints present in the rocks. The drilling is done as per the requirement of the rock fragmentation with desired production of mineral.

TABLE 2.8: BLASTING PROGRAM FOR THE PRODUCTION PER DAY

Particulars	Project-1 (Qty)	Project-2 (Qty)
No. of holes	292	357
Pattern of hole	Zigzag Multi-rows	Zigzag Multi-rows
Inclination of holes (From horizontal)	80^0	80^0
Yield (Tons)	875	825
Powder factor (Tons/Kg of explosives)	6	6
Total explosive required (Kg-Slurry explosives)	146	137
Charge/hole (Kg)	0.5	0.5
Use of detonators	25ms relays	25ms relays
Detonating fuse	Detonating Cord	Detonating Cord

2.16.2 Frequency of Blasting

Blasting will be carried out only in Day time between 12.00 – 12.30P.M. whenever required.

2.16.3 Storages of Explosives

Licensed Portable explosive magazines will be utilized for storage of explosives. Blasting will be performed as per requirement on the face. The explosive will be handled by authorized blasting party himself and the blasting will be carried out by registered blasting contractor as per present practices. The controlled blasting is proposed by adopting all the safety measures as per "MMR 1961" and with the permission of DGMS.

2.16.4 Precautions

- ✓ Proper and safe storage of explosives in approved and Licensed Magazine.
- ✓ Proper, safe and careful handling and use of explosives by competent Blasters having Blaster's Certificate of Competency issued by DGMS.
- ✓ Proper security system to prevent theft/ pilferage, unauthorized entry into Magazine area and checking authorized persons to prevent carrying of match box, lights, mobile phones etc.

- ✓ The explosives of class 2 will be used in their original cartridge packing and such cartridge shall not be cut to remove explosive for making cartridge of different size.
- ✓ Detonators will be conveyed in special containers. These will not be carried with other explosives.
- ✓ The holes which have been charged with explosives will not be left unattended till blasting is completed.
- ✓ Before starting charging, clear audible warning signals by Sirens will be given so that people nearby can take shelter.
- ✓ Blasting operations will be carried out in day times only. Also, in this project, the mining operations are proposed to be carried out in day times.

2.16.5 Types of Explosives Used

Slurry explosives (An explosive material containing substantial portions of a liquid, oxidizers, and fuel, plus a thickener), NONEL / Electric Detonator &Detonating Fuse.

2.17 CONCEPTUAL MINE PLAN

During conceptual stage the mined-out area will be converted into water reservoir and safety zone as well as upper benches will be used for plantation at the conceptual period. It will also serve the purpose as socio economic and corporate social responsibility of the lessee by way of supplying water for irrigation purpose or at will of the local people. This will help in ground water recharging as well. The conceptual plan and section of mine lease area is given in **Figure 2.6.**

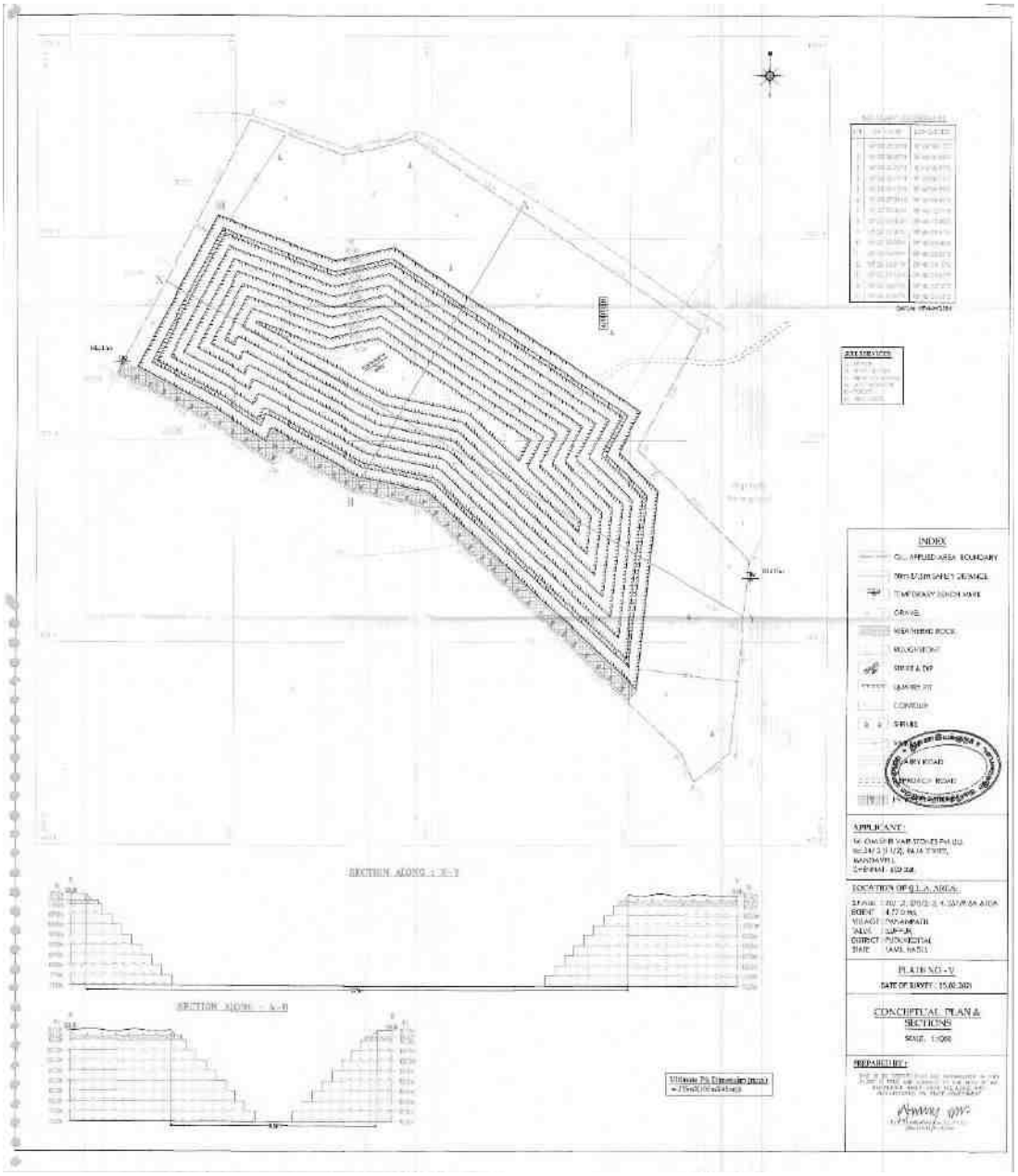


FIGURE 2.6(a): CONCEPTUAL PLAN OF PROJECT- 1

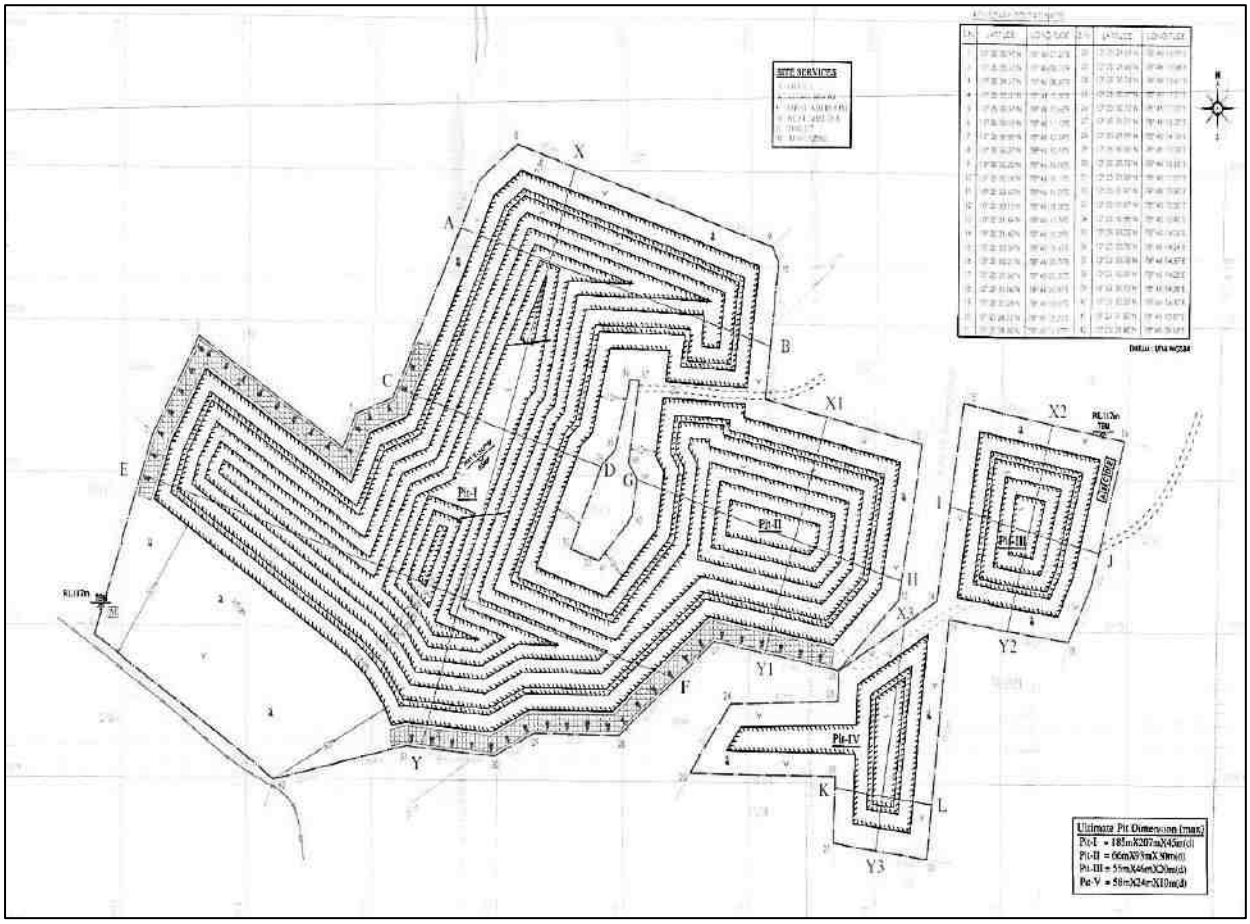


FIGURE 2.6(b): CONCEPTUAL PLAN OF PROJECT- 2

2.18 LAND USE PATTERN OF MINE LEASE AREA

Project- 1

- **Land form**

The lease applied area is exhibits slightly plain topography. Lease area is dry land. The area does not fall in forest land.

- **Land use**

The area is a dry barren land devoid of Agriculture and Habitations. The land is not used for any specific vegetation. Some thorny bushes and shrubs are observed.

- **Land Ownership**

It is a Patta land. Registered in the name of applicant (Om Shri Vari Stones (P) Ltd chennai) vide Patta No.1524.

Project- 2

- **Land form**

The lease applied area is exhibits flat terrain. Lease area is dry land. The area does not fall in forest land.

- **Land use**

The area is a dry barren land devoid of Agriculture and Habitations. The land is not used for any specific vegetation. Some thorny bushes and shrubs are observed.

- **Land Ownership**

It is a Patta land. Registered in the name of applicant (Om Shri Vari Stones (P) Ltd chennai) vide Patta No.1524.

The existing and proposed land use pattern of the mine lease area upto conceptual stage is given in **Table 2.9.**

TABLE 2.9(a): EXISTING AND PROPOSED LAND USE PATTERN OF MINE LEASE AREA OF PROJECT- 1

S. No.	Description	Present area (Ha)	Area at the end of this quarrying period (Ha)
1.	Area under quarry	Nil	2.65.8
2.	Infrastructure	Nil	0.01.0
3.	Roads	Nil	0.02.0
4.	Green Belt	Nil	0.20.0
5.	Unutilized Land	4.77.0	0.88.2
Total		**4.77.0**	**4.77.0**

TABLE 2.9(b): EXISTING AND PROPOSED LAND USE PATTERN OF MINE LEASE AREA OF PROJECT- 2

S. No.	Description	Present area (Ha)	Area at the end of this quarrying period (Ha)
1.	Area under quarry	Nil	3.41.0
2.	Infrastructure	Nil	0.01.0
3.	Roads	Nil	0.02.0
4.	Green Belt	Nil	0.20.0
5.	Unutilized Land	4.90.5	1.26.5
Total		**4.90.5**	**4.90.5**

Plantation with suitable native species will be taken up along the safety zone and upper benches within mining lease area progressively with mine operation till mine closure.

2.19 SITE SERVICES

A centralized office cum store with minor maintenance shed is available near mine site outside lease area. A first aid box with necessary medical facility is available and maintained at the mine office.

- **Power supply:** The mine will work in one shift only in day time, so no electric power supply is required for mining operations. However eclectic connection and required transformer unit has been installed in the lease to support the crushing and screening unit.
- **Water supply:** There is no source of drinking water within the applied area. Drinking water & water for other purpose is brought from tube well situated outside the lease area. Drinking water stored in clean covered earthen pots and kept near working faces.
- **Latrine and Urinal**: latrine and urinal will be provided separately for male and female worker as per rule.
- **First-Aid Room**: A first-aid room with all necessary medical facilities will be provided as per mines act and mines rules.

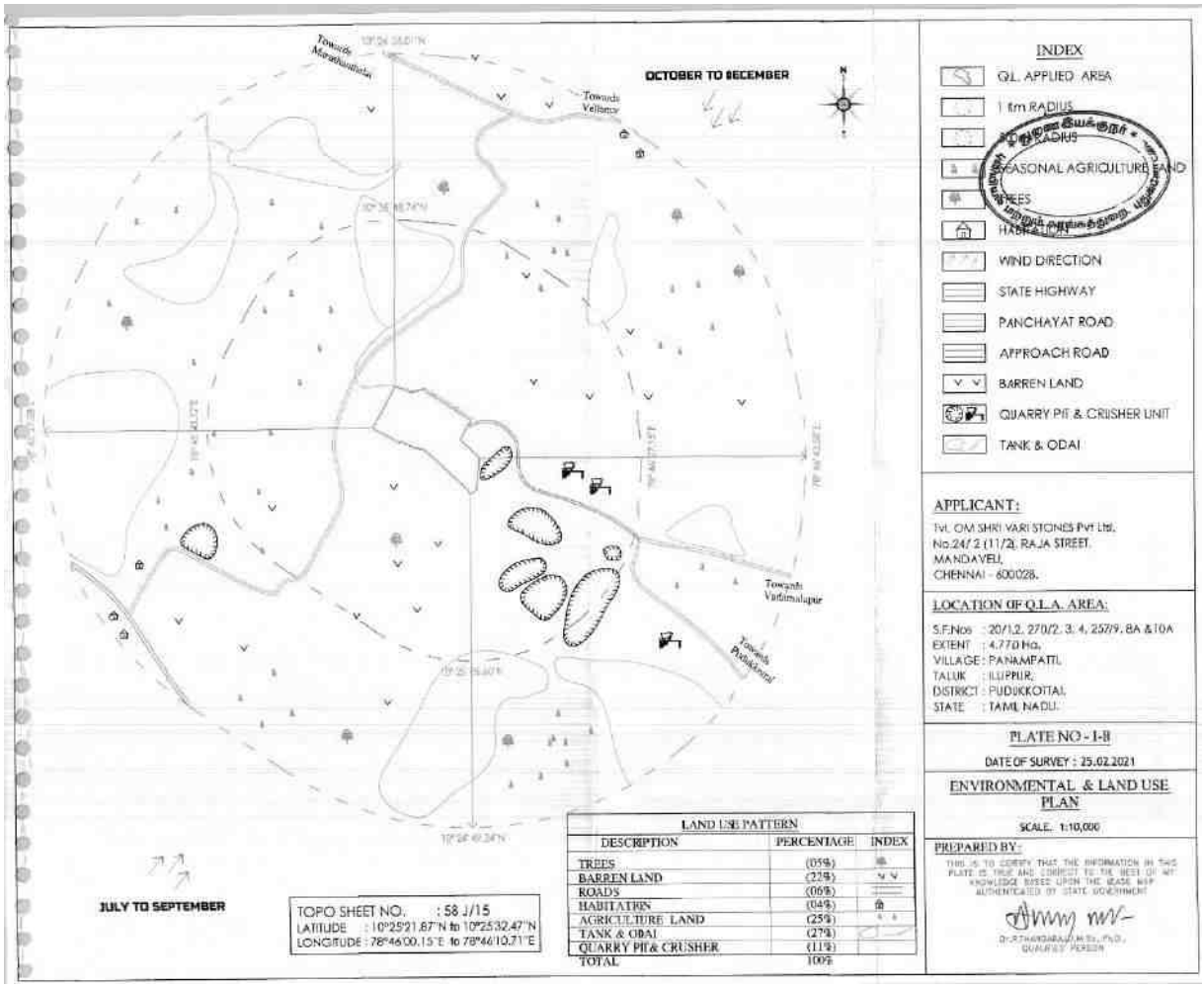


FIGURE 2.7(a): ENVIRONMENTAL & LAND USE PLAN OF PROJECT- 1

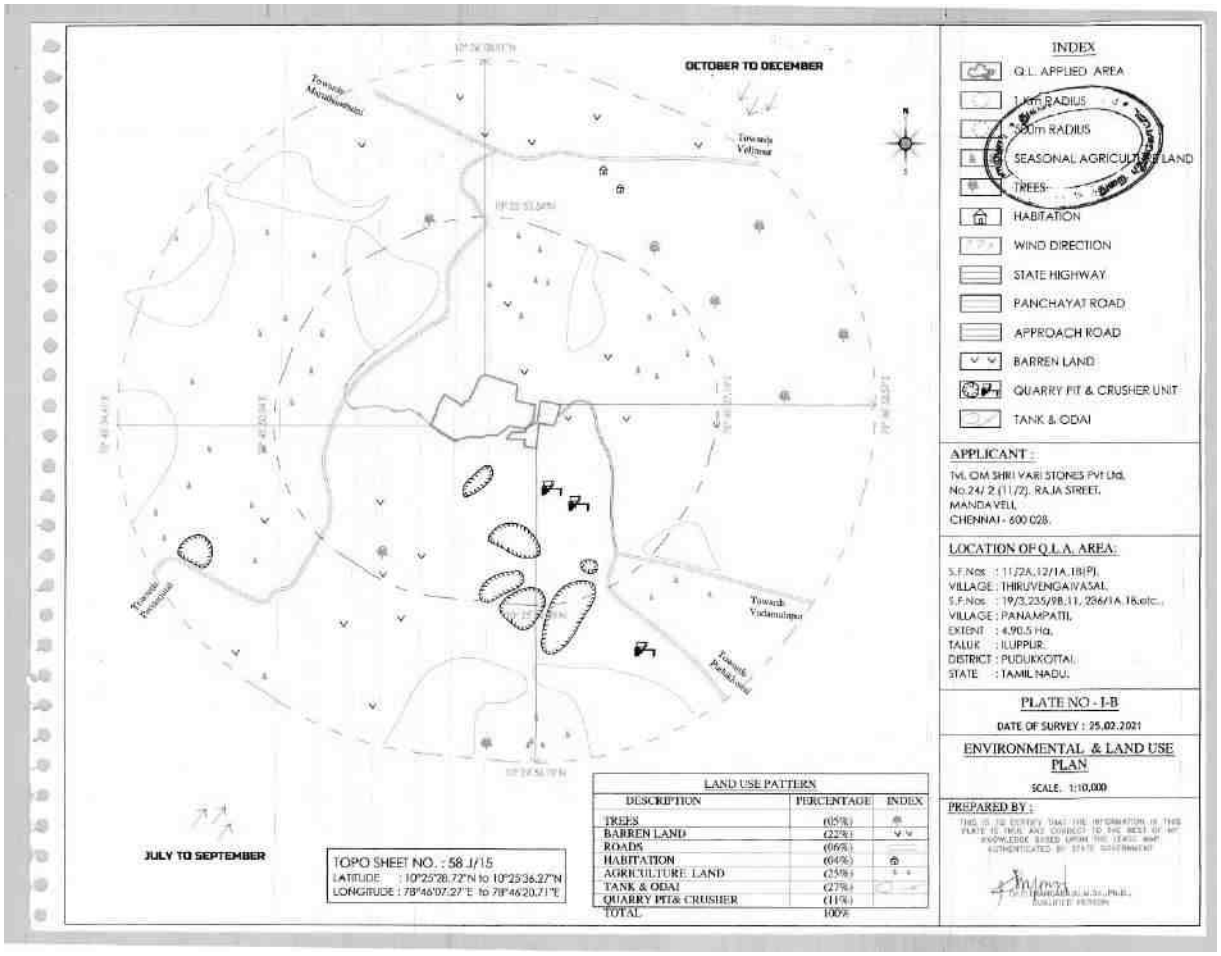


FIGURE 2.7(b): ENVIRONMENTAL & LAND USE PLAN OF PROJECT- 2

2.20 POTENTIAL IMPACTS & MITIGATION MEASURES

The expected anticipated adverse environmental impacts and mitigation measures are summarized in **Table-2.10**.

TABLE 2.10: ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES PROPOSED

Environmental Component	Project Activities	Impacts	Mitigation Measures
Air Quality	Drilling and Blasting	Dust is generated during drilling and blasting operations	• Use of dust aprons on drilling equipment and adopting wet drilling methods. • Avoiding blasting during adverse weather conditions. • Use of controlled blasting practice • Development of greenbelt.

Environmental Component	Project Activities	Impacts	Mitigation Measures
	Extraction of Mineral, Loading / unloading activities	Increase in SPM/RPM levels in ambient air and SO_2/NOx concentration levels in ambient air due to vehicular emissions.	• Exposed area will be limited to the minimum required for mining operations. • Periodic sprinkling of water on working faces, • Regular preventive maintenance of mine machinery
	Transportation of Mineral	Increase in SPM/RPM level due to dust generation and SO_2/NOx concentration levels in ambient air due to vehicular emissions.	• Regular sprinkling of water on haul and access roads. • Periodic maintenance of transport vehicles. • Periodic maintenance of haul roads • All tippers would be covered by tarpaulin sheets at top and avoid spillage.
	General equipment operations	Increased SPM/RPM and SO_2/NOx concentrations in ambient air.	• Regular maintenance of all equipment to minimize particulate matter and gaseous emissions from diesel engines.
	All activities	Excessive occupational exposures to airborne particulate matter.	• Provision of dust masks to workers exposed to dusty operations / areas.

Environmental Component	Project Activities	Impacts	Mitigation Measures
Noise Levels and Ground Vibrations	Blasting	High impulsive noise levels, overpressure and ground vibrations impacts and noise related community annoyance	• Small scale blasting will be carried out. • Controlled blasting using delay detonators will be carried out to minimize ground vibrations. • Charge per delay will be kept optimum. • Muffle blasting will be carried out in area facing habitation. • Blasting will be conducted during lunch (noon) time when no employees are present in mine working area.
	General activities including machine/ operations and transportation of Mineral.	Increase in noise levels occupational hazard due to noise exposures and increase in ambient noise levels.	• Periodic maintenance of all mining machinery and transport vehicles • Provision of effective silencers to all mine machinery • Provision of ear plugs/ear muffs to workers exposed to high noise generating operations • Development of thick plantation around mine lease boundary to act as a noise screen. • Regular noise monitoring will be carried-out.
Water Resources and Quality	Dewatering	Reduction in groundwater availability Deterioration in surface/ground water quality of receiving body.	• Surface run-off from mining area will be collected in settling tank / mine sump and will be used for dust suppression and plantation. • There may be impact of groundwater availability since the proposed working may intersect water table. • There will not be any process effluent discharge from the mine. • Domestic effluent will be discharged in septic tank and soak pit system. • At conceptual stage, mined out pit will

Environmental Component	Project Activities	Impacts	Mitigation Measures
			be converted into water reservoir, which will help in recharging ground water table and will be available to nearby villagers as an additional surface water body.
	Water required in mine for dust suppression, plantation and domestic use.	Reduction in groundwater availability for domestic and for irrigation purposes.	• Surface run-off from mining area will be collected in settling tank / mine sump and will be used for dust suppression and plantation. • There may be impact of groundwater availability since the proposed working may intersect water table. • Water for drinking and domestic use will be supplied by tanker from nearby village. • At conceptual stage, mined out pit will be converted into water reservoir, which will help in recharging ground water table and will be available to nearby villagers as an additional surface water body.
	Waste water generated from domestic usage at mine.	Deterioration in ground water and soil quality when discharged untreated for greenbelt development	• There will not be any process effluent discharge from the mine. • Rain water accumulated in mine pit will be discharged in nearby drainage after passing through settling pond. • Domestic effluent will be discharged in septic tank and soak pit system.
Geology	Mining activities	Change in Geomorphology of the area with disturbance of stratigraphic sequence.	• The impact will be confined to lease area. • Mining will be carried out as per guidelines with formation of proper benches and presence of non-disturbed safety zone of 10m from lease boundary. • No active faults present in the area hence the change in geomorphology

Environmental Component	Project Activities	Impacts	Mitigation Measures
			will be limited to lease area.
Hydrogeology and Drainage pattern	Mining activities	May impact regional hydrology and drainage pattern of the area.	• There may be impact of groundwater availability since the proposed working may intersect water table. However, at conceptual stage, mined out pit will be converted into water reservoir, which will help in recharging ground water table and will be available to nearby villagers as an additional surface water body. • Rainwater harvesting structures will be constructed in nearby villages.
Land use and Soil Characteristics	Mining operations.	Land use of the mine lease area will degrade. Impact due to settling of air borne dust on soil outside ML area. Land degradation due to disposal of solid wastes.	• Development of thick plantation around mine lease area, waste dump area and on undisturbed area. • Adoption of adequate air pollution control measures to control dust emissions. • At conceptual stage, mined out pit will be converted into water reservoir. Plantation will be developed on top benches of mined out pit. This will improve aesthetic view of the ML area.
Biological environment	Dust emission due to Rough stone mining activity.	Dust deposition on vegetation & agriculture paddy crop around periphery of ML area may reduce the crop productivity specifically within 500m from mine lease	• Development of thick green belt around mine lease boundary and plantation on undisturbed area, top benches of mined out area, waste dump area etc. using native flora species. • Transport through covered trucks. Sprinkler will be installed at loading & unloading point; regular water sprinkling within the mining area and also on haulage road will be carried out.

Environmental Component	Project Activities	Impacts	Mitigation Measures
		area.	• The waste material/OB dumps will be covered with shrubs and grasses plantation.
Environmental Pollution, Health, Safety	Overall Mining operation	Occupational health issues, Community disturbance, risk of accidents, etc	• Adoption of suitable pollution control measures in the mines • Provision of pre-employment and periodic training on health and safety to all the workers in the mine • Adoption of safe working practices • Maintaining proper housekeeping at working places. • Provision of necessary personal protective equipment's to all mine workers • Periodic maintenance of mine machinery and transport vehicles • Display of warning signals at strategic locations.
Socio-economic Aspects	Mining operations	Increase in employment opportunities both direct and indirect thereby increasing economic status of people of the region.	• Will generate direct employment for persons. While secondary employment will be generated by other ancillary activities. • Mostly local people will be employed in the mine. • Mine management will carry out CER activities in the nearby villages to improve conditions of the villages. • The Mine management will improve the basic facilities. in the nearby villages under CER.

CHAPTER 3: DESCRIPTION OF ENVIRONMENT

3.1 BASELINE ENVIRONMENTAL STUDIES

Baseline environmental studies were carried out within 10 km radius of the rough stone mine cluster area to assess the existing environmental scenario in the area. For the purpose of EIA studies, Mine lease area of rough stone mine was considered as the core zone and area outside the mine upto 10 km radius was considered as buffer zone. The baseline environmental monitoring was conducted by **Noida Testing Laboratories, Haridwar (Uttarakhand)** it is an NABL and MOEF recognized laboratory for various components of environment, viz. Air, Noise, Water, Land was carried out during Summer Season i.e. **December 2021 to February 2022** in the study area covering 10 km radial distance from the rough stone mine. Other environmental data on flora and fauna, land-use pattern, forest etc. were also generated through field surveys and secondary information collected from different State Govt. departments. Sampling methods and analysis. Socio-economic survey was conducted, through interaction with the people, sarpanch and medical officers by floating questionnaires and collection of information are supported by census data for demographic structures, amenities, and infrastructure availability within the study area.

3.1.1 Methodology

Appropriate methodologies are followed in developing the EIA-EMP report. The methodology adopted for the study is outlined below:

- Conducting reconnaissance of the study area;
- Selecting sampling locations for conducting various environment baseline studies;

The sampling locations were selected on basis of the following:

- Predominant wind directions recorded by the nearest Indian Meteorological Department (IMD) observatory;
- Existing topography;
- Drainage pattern and location of existing surface water bodies like lakes, rivers and streams;
- Location of villages/towns/ sensitive areas, and;
- Areas, which represent baseline conditions;

The field observations were made to:

- Assess the positive and negative impacts due to the proposed project;
- Suggest appropriate mitigation measures for negating the adverse environmental impacts, if any, and;
- Suggest post-project monitoring;

3.2 LAND ENVIRONMENT

3.2.1 LAND USE OF STUDY AREA

The land-use & land cover map of the 10 km radial study area from the periphery of project site has been prepared using Resource Sentinel-2A having 10 m spatial resolution and date of pass 14th March 2022 satellite image with reference to Google Earth data and the IRS Cartosat having 2.45 m spatial resolution and date of pass September 2014. In order to strengthen the baseline information on existing land use pattern, the following data covering approx. the proposed project site as well as the 10 km radius from the periphery of the project site i.e. 10°24'40.24"N to 10°25'10.68"N latitude and 78°40'34.41"E to 78°51'54.74"E longitude and elevation -23 to 121 meter are observed. The project is in Survey of India topo sheet no 58J/15 while 10 km radius study area covers four topo sheets 58J/10, 58J/11, 58J/14 & 58J/15 as Figure 1: 10 Km radius topo map of study area.

The digital image processing was performed on ERDAS Imagine 2014 and ArcGIS 10.8 software system on high-configured computer. This software package is a collection of image processing functions necessary for pre-processing, rectification, band combination, filtering, statistics, classification, etc. Apart from contrast stretching, there are large numbers of image processing functions that can be performed on this station. Arc GIS map 10.8 is used for final layout presentation.

Creating a GIS spatial database is a complex operation and is the heart of the entire work; it involves data capture, verification and structuring processes. Raw geographical data are available in many different analogue and digital form such as toposheets, aerial photographs, satellite imageries and tables. Out of all these sources, the source of toposheets is of much concern to natural resource scientist and an environmentalist.
In the present study, the essential maps generated from SOI topographical maps. Using the topographical maps, the drainage map and contour Map were also developed. The maps are prepared to a certain scale and with attributes complying with the requirement of terms of reference (ToR). The location of entities on the earth's surface is then specified by means of an agreed co-ordinate system. For most GIS, the common frame of co-ordinate system used for the study is UTM co-ordinates system. All the maps are first Geo-referenced. The same procedure is also applied on remote sensing data before it is used to prepare the Essential maps.

TABLE 3.1: DATA SPECIFICATION USED FOR PRESENTS STUDY

Satellite/ Image	Sensor	Spatial resolution	Date of Acquisition
Sentinel-2A	Sentinel-2	10 m	14th March 2022
SRTM	IRS Cartosat I	2.45m	2014

Since, a major part of 10km study area comprises of Forest Area, Agricultural Area, Waste Land thus study on land environment of ecosystem play an imperative role in identifying susceptible issues and taking appropriate action to uphold ecological equilibrium in the region. The main objective of this section is to provide a baseline status of the study area covering 10 km radius around the project site so that temporal changes due to the industrial activities on the surroundings can be assessed in future.

3.2.2 Methodology

The land use pattern of the study area was studied by analysing the available secondary data published in the District Primary Census abstract of the year 2001 & 2011.

Salient features of the adopted methodology are given below:

- Acquisition of satellite data
- Preparation of base map from Survey of India topo sheets
- Data analysis using visual interpretation techniques
- Ground truth studies or field checks using GPS
- Finalization of the map
- Digitization using head up vectorisation method
- Topology construction in GIS
- Area calculation for statistics generation
- Masking

Four spectral bands provide high degree of measurability through band combination including FCC generation, bands rationing, classification etc. These features of the IRS data are particularity important for better comprehension and delineation of the land use classes. Hence, Sentinental 2A data and Cartosat Data 2.45m spatial resolution having pan chromatic imagery has been used for land use mapping.

The satellite data from the compact disc is loaded on the hard disk and by studying quick look (the sampled image of the appropriate area ;) the sub-scene of the study area is extracted.

Supervised classification using all the spectral bands can separate fairly accurately, the different land use classes at level II on the basis of the spectral responses, which involve the following three steps:

1. Acquisition of ground truth.
2. Calculation of the statistics of training area.
3. Classification using maximum likelihood algorithm.

The training areas for classification were homogeneous, well spread throughout the scene with bordering pixels excluded in processing. Several training sets have been used through the scene for similar land use classes. After evaluating the statistical parameters of training sets,

the training areas were rectified by deleting no congruous training sets and creating new ones.

3.3 PRE-FIELD INTERPRETATION OF SATELLITE DATA

The False Color Composite (FCC) of Sentinel-2A satellite imagery having 10 m spatial resolution satellite data at 1:50,000 scale was used for pre-field interpretation work. Taking the help of topo sheets, geology, geo-morphology and by using the image elements, the features were identified and delineated the boundaries roughly. Each feature was identified on image by their image elements like tone, texture, color, shape, size, pattern and association. A tentative legend in terms of land cover and land use was formulated. The sample area for field check is selected covering all the physiographic, land use/land cover feature cum image characteristics. **Figure 3.1** shows the FCC of 10 KM radius of Sentinental imagery.

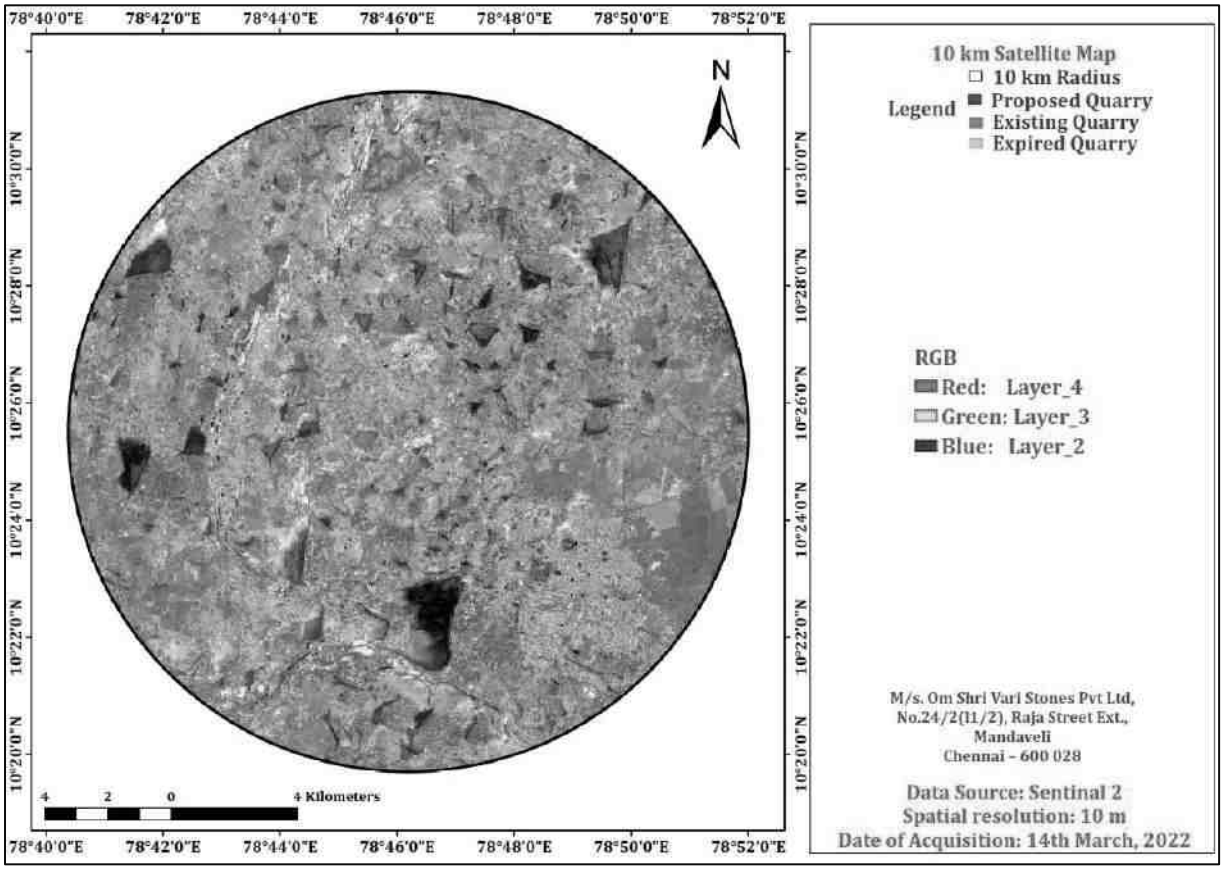


FIGURE 3.1: FCC OF THE 00-10 KM RADIUS WITH PROJECT LOCATION

3.4 TOPOGRAPHY

The physical setting of study area shows a contrast of immense dimensions and reveals a variety of landscapes influenced by relief, climate, vegetation, and economic use by man. But even then, regionally, there is considerable local variation. The area is sloping from

south west to north east. The Surface elevation map of the study area is shown in **Figure 3.2** to **Figure 3.4**. The Elevation from 23 to 121m MSL are observed in the study area.

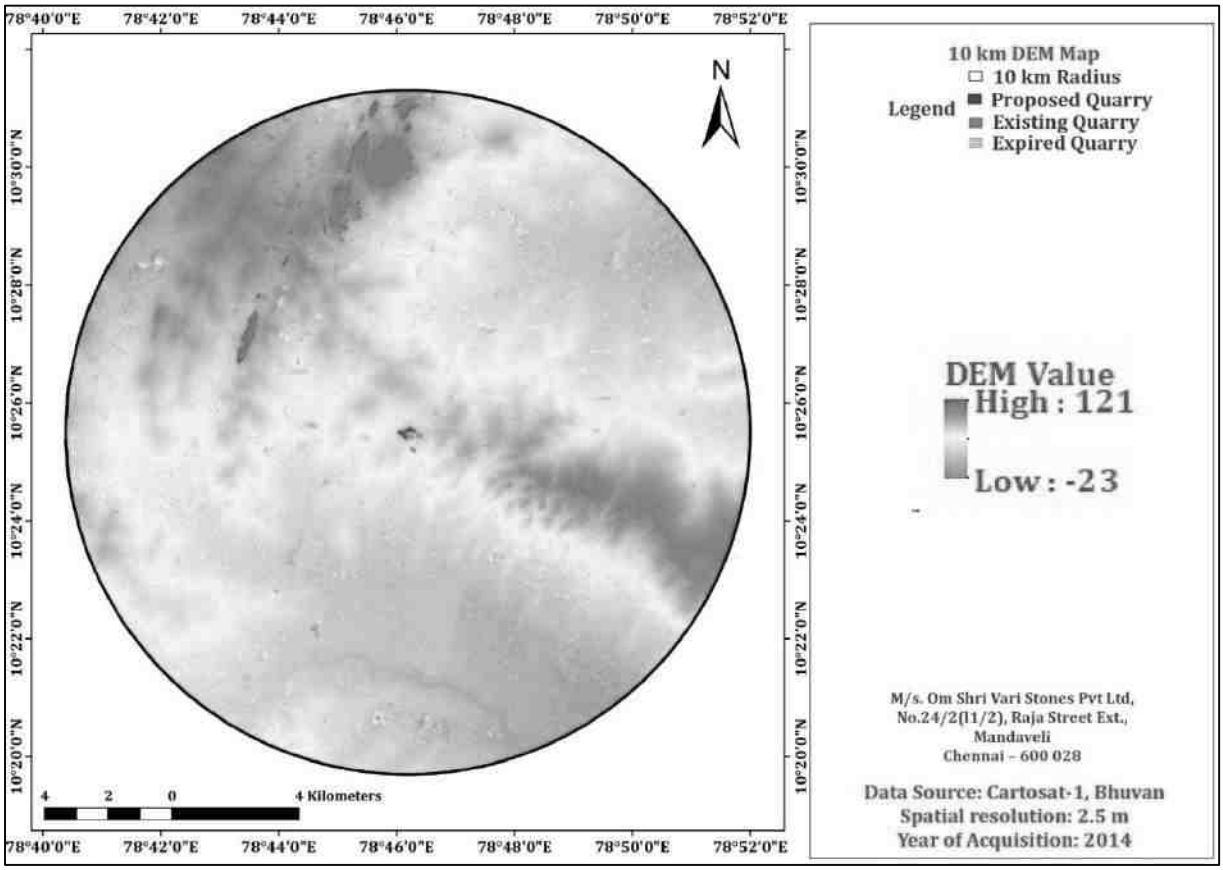


FIGURE 3.2: DIGITAL ELEVATION MODEL WITH IN 10 KM RADIUS

FIGURE 3.3: ELEVATION PROFILE OF NW-SE DIRECTION WITH IN 10 KM RADIUS

FIGURE 3.4: ELEVATION PROFILE OF SW-NE DIRECTION WITH IN 10 KM RADIUS

3.5 LAND USE/LAND COVER CLASSIFICATION

Total three major land use/land cover classes were demarcated in the study area following Level I classification furthermore a level II classification also adopted as per the requirement of **MoEF & CC** in which total 10 classifications has been classified in the study area. A thematic map of 1:50,000 scale was generated incorporating these classified categories considering the area of the project

Of the 6 LU/LC classes as per NRSA-TR-LU & CD-01-90 the 10 Km radius study area has presence of all 6 LU/LC classes are shown in **Table 3.2** of which the agricultural crops has the highest category of land of 42.11 % (143.8 Km^2), followed by waste land i.e. plantation 14.62 % (49.92 km^2), bare land 18.5 % (63.24 Km^2) and scrub/shrub 5.48 % (18.71 km^2), followed by forest of 7.72 % (26.35 Km^2), followed by water body 6.10 % (20.81 km^2), followed by built-up land 5.15 % (17.57 $Km^{2)}$ and the last one is mining land 0.32 % (1.1 km^2) and the last one is. Terrain presumably makes it difficult to visualize some of the other features of the total project area. It is also observed that the study area is well connected NH - 336 which is passing under the 10 km radius of the study area. The presence of different land use is shown in **Figure 3.5** of the pie chart distribution.

TABLE 3.2: LU/LC AND ITS COVERAGE WITHIN 10 KM RADIUS

S.No	Level I	Level -II	Area (Km^2)	Percentage (%)
1	Built-up Land	Built-up Land	17.57	5.15
2	Forest	Dense jungle	26.35	7.72
3	Agricultural Land	Crops	143.8	42.11
4	Waste Land	Plantation	49.92	14.62
		Scrub/shrub	18.71	5.48
		Bare Land	63.24	18.5
5	Water Body	Water Body	20.81	6.10
6	Other	Mining land	1.1	0.32
		Total	**341.5**	**100**

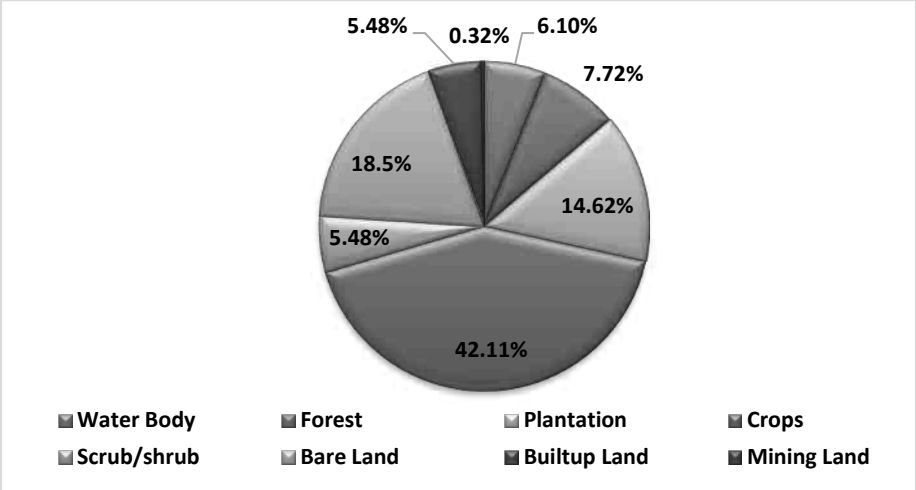


FIGURE 3.5: PIE CHART OF THE LU/LC CLASSIFICATION WITHIN 10 KM RADIUS

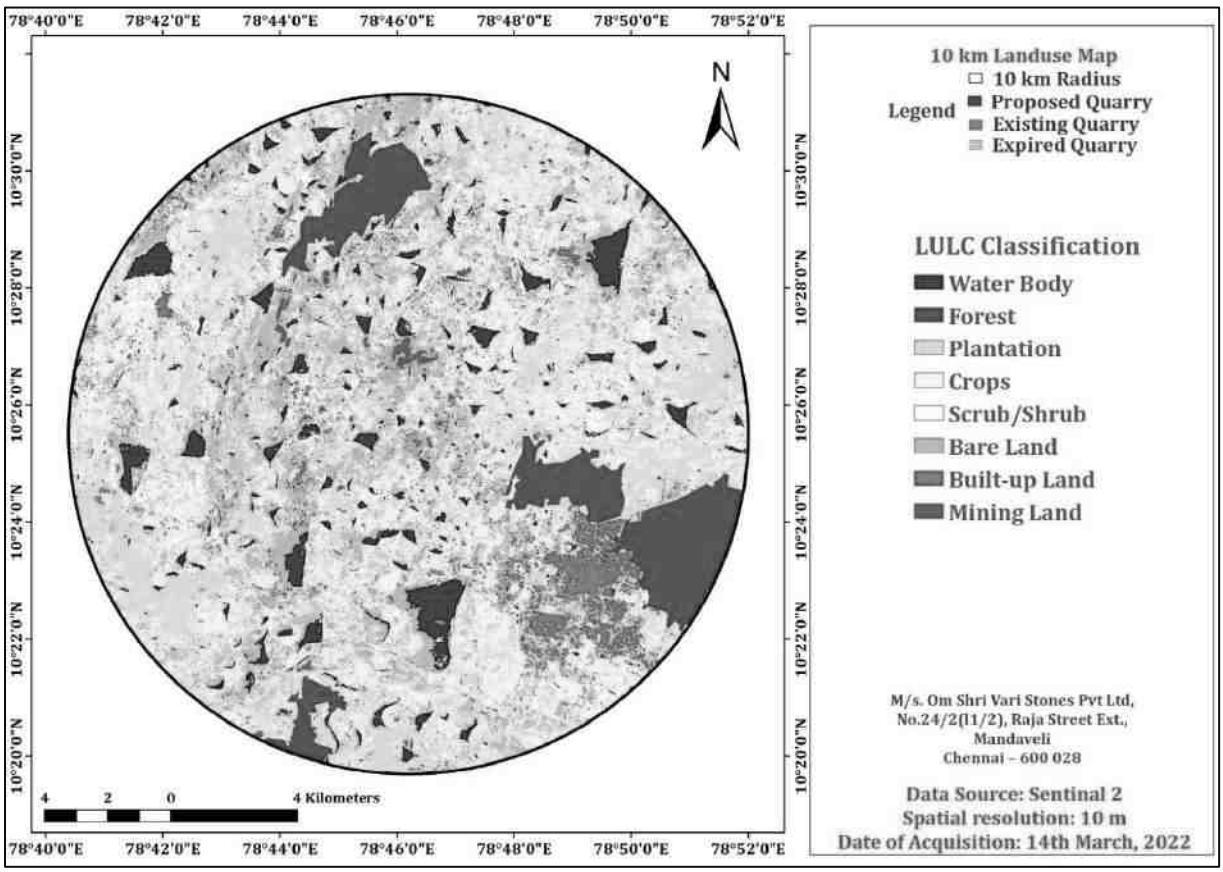


FIGURE 3.6: LU/LC DETAILS OF 10 KM RADIUS

From the above table and pie diagram it is inferred that most of the land in the study area is Agriculture land (includes crop land) 44.1 % and by water bodies (Rivers Stream Canals) 0.44 %. The total mining area within the study area is 0.53 %. The new proposed area of 5.58.0 (i.e. individual lease areas of 1.68.0 Ha, 0.51.5 Ha, 3.85.5 Ha) contributes about 0.32% of the total mining area within the study area. This small percentage of Mining Activities shall not have any significant impact on the environment.

3.6 SOIL CHARACTERISTICS

The soils of the district can be classified into black, red, ferruginous, lateritic, alluvial and beach soils. Black soils are formed in the western part of the district. Red ferruginous lateritic soils are formed on the high grounds, south of Annavasal, west of Illupur, north of Malaipatti around Kulakurichchi near Gandarvakottai, east of Arantangi around Arimalam and Alangudi. Alluvial soils consisting of blackish and brownish sandy and silty soils are observed along the course of the Vellar, Agniyar and Ambuliyar rivers, whereas the beach sands are noticed along the coast of the district.

Black soil, Red loamy, Sandy coastal Alluvium, Red sandy soil is found to be popular in this district. The entire soils of the district are classified into 17 soil series. Out of them 8 series alone occupy about 90 % of the total area. In this sandy clay loam soil in 2687 Sq km, river alluvial soil 1536 Sq km and saline coastal 440 Sq km contributes 57.62%, 32.94%, 9.44% respectively. Soils are shallow to moderately deep, medium textured, acidic to neutral, non–calcareous, moderately well drained. ***Source:*** *District Profile – KVK Pudukkottai (tnau.ac.in)*

For studying soil profile of the region, sampling locations were selected to assess the existing soil conditions in and around the stone mining area representing various land use conditions. The samples were collected by ramming a core-cutter into the soil up to a depth of 15-20 cm. Total 7 samples within the study area were collected and analyzed. The details of the soil sampling locations are given in **Table 3.4** and shown in **Figure-3.8**. The sampling was carried out once in the study period during winter season. Detailed Baseline report is attached as **Annexure VII.**

TABLE 3.3: DETAILS OF SOIL SAMPLING LOCATIONS

S. No	Location Code	Location	Distance & Direction	Co- ordinates
			w.r.t Project Site	
1.	S1	Mullai nagar	1.42 km NE	10°25'47.11"N to 78°47'0.67"E
2.	S2	Vellanur Ration shop	4.37 km NE	10°27'16.90"N to 78°47'45.60"E
3.	S3	Jesus Chruch perunjunai	1.30 km SW	10°25'8.45"N to 78°45'32.65"E
4.	S4	Palani temple Mettupatti	3.71 km SW	10°24'10.26"N to 78°44'36.10"E
5.	S5	Little Angles Nursery school	4.57 km SE	10°23'54.37"N to 78°48'12.52"E
6.	S6	Mathiyanallur village	4.13 km NE	10°26'59.29"N to 78°44'39.39"E
7.	S7	Sellukudi village	3.50 km S	10°23'21.94"N to 78°46'20.66"E

The collected soil samples were analyzed in the NABL/MOEF approved laboratory for physio-chemical and nutrition parameters. The physical, chemical properties and heavy metals concentrations were determined, and the results are given in **Table 3.5**.

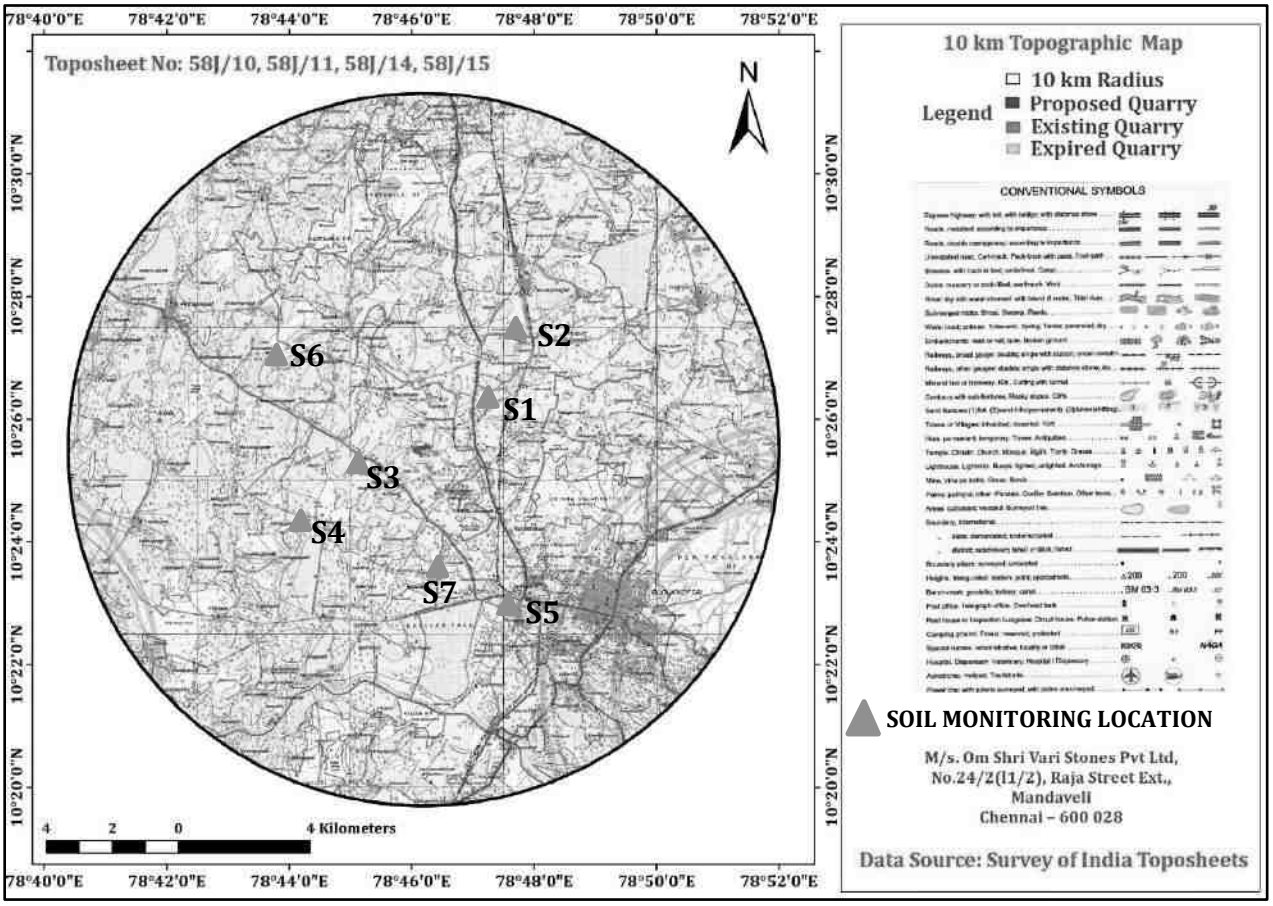


FIGURE 3.7: STUDY AREA MAP WITH SOIL SAMPLING LOCATIONS

TABLE 3.4: TEST RESULTS OF SOIL

Date of Sampling	20.02.2022	**Sampling Method**	ETS/STP/SOIL-01
Analysis Start Date	25.02.2022	**Sample Quantity**	2.0 Kg.
Analysis End Date	28.02.2022	**Packing Condition**	SEALED
Sampling Done By	ETS Lab STAFF	**Packed In**	POLY BAG

S. No.	Test Parameter	Unit	S1 (Mullai nagar) Results	S2 (Vellanur Ration shop) Results	S3 (Jesus (Chruch perunjunai) Results	S4 (Palani temple mettupatti) Results	S5 (Little angle nursery school) Results	S6 (Mathiya nallur village) Result	S7 (Sellukudi village) Result	Test Method
1	pH	…	7.93	8.22	7.66	7.93	7.33	7.96	7.96	IS 2720 (Part-26)
2	Electrical Conductivity (EC)	µs/cm	363	454	466	465	355	335	337	IS 14767
3	Texture	…	Clay Loam	Clay Loam	Clay Loam	Clay Loam	Clay Loam	Sandy Clay Loam	Sandy Clay Loam	IS 2720 (Part-4)
4	Sand	%	33.6	35.1	34.3	33.5	35.2	52.6	52.2	IS 2720 (Part-4)
5	Silt	%	35.2	35.5	31.6	35.3	32.6	18.1	18.7	IS 2720 (Part-4)
6	Clay	%	31.2	29.4	34.1	31.2	32.2	29.3	29.1	IS 2720 (Part-4)
7	Water Holding Capacity (WHC)	%	41.0	44.3	35.0	27.4	23	40.5	40.5	IS 2720 (Part-2)
8	Bulk Density	g/cm^3	1.26	1.07	0.95	1.06	1.18	0.56	0.47	IS 2386 (Part-4)
9	Porosity	%	33.4	25.8	23.7	35.1	16	35.3	35.6	IS 13030
10	Calcium,(Ca)	mg/kg	153	155	171.3	157.1	153	136	145	IS 2720 (Part-23)
11	Magnesium,(Mg)	mg/kg	26.7	22.5	24.5	33	33	23.7	23.8	ETS/STP/SOIL-08
12	Manganese,(Mn)	mg/kg	30.5	31.7	26.4	23.1	25.8	18	18	ETS/STP/SOIL-18
13	Zinc,(Zn)	mg/kg	0.54	0.73	1.16	1.16	1.06	0.57	0.57	ETS/STP/SOIL-18
14	Boron (as B)	mg/kg	0.44	0.83	0.68	0.75	1.43	0.43	0.46	ETS/STP/SOIL-18

S. No.	Test Parameter	Unit	**S1** (Mullai nagar) **Results**	**S2** (Vellanur Ration shop) **Results**	**S3** (Jesus (Chruch perunjunai) **Results**	**S4** (Palani temple mettupatti) **Results**	**S5** (Little angle nursery school) **Results**	**S6** (Mathiya nallur village) **Result**	**S7** (Sellukudi village) **Result**	Test Method
15	Chloride,(Cl)	mg/kg	126	144	133.7	152	164	178	179	BS 1377 -3
16	Soluble Sulphate (SO_4)	%	129	143	142.1	143.5	146	166	163	IS 2720 (Part-27)
17	Potassium (K)	mg/kg	42.8	45.5	45.4	46	38.7	25.5	25.5	ETS/STP/SOIL-18
18	Phosphorus (P)	mg/kg	0.82	1.57	0.58	1.13	1.18	0.78	0.78	ETS/STP/SOIL-19
19	Nitrogen (N)	mg/kg	158	163.8	149	199	165.7	266	263	ETS/STP/SOIL-15
20	Cadmium,(Cd)	mg/kg	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	ETS/STP/SOIL-18
21	Chromium,(Cr)	mg/kg	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	ETS/STP/SOIL-18
22	Copper,(Cu)	mg/kg	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	ETS/STP/SOIL-18
23	Lead,(Pb)	mg/kg	0.72	0.75	0.82	1.56	1.35	0.46	0.42	ETS/STP/SOIL-18
24	Iron,(Fe)	mg/kg	2.66	2.36	2.57	2.77	2.06	2.76	2.76	ETS/STP/SOIL-18
25	Organic Matter,(OM)	%	1.34	1.50	2.00	1.83	1.53	1.63	1.66	IS 2720 (Part-22)
26	Organic Carbon,(OC)	%	0.54	1.07	1.50	1.15	0.97	1.12	1.21	BS 1377 -3
27	Cation Exchange Capacity (CEC)	meq/100g	36.4	35.6	36	32.9	35	38	46	IS 2720 (Part-24)

3.6.1 Observations:

- pH of the soil samples varied from 7.33 to 8.22 indicating slightly alkaline soil
- Bulk density of the soil samples varied from 0.95 to 1.26 g/cm^3
- Organic matter in the soil samples varied from 1.34 to 2.00 %
- Total Nitrogen in the soil samples varied from 149 to 266 mg/kg
- Water Holding Capacity (WHC) in the soil samples varied from 23 to 44.3%.

From the analysis results of the soil samples, it was observed that the soil was low to medium fertile and having low productivity. The soil in the study area needs additional fertilizers for improving the fertility status and increase in crop productivity. This also indicates the poor level of micro-nutrient. The organic matter was found in the range of 1.34to 2.00 % indicating moderate organic content in the soil. Overall, the soil quality in the area was found to medium to fair fertile with moderate productivity.

3.7 AIR ENVIRONMENT

3.7.1 Meteorology

The district enjoys a tropical climate. The weather is pleasant during the period from November to January. The normal rain fall occurs during North East monsoon and moderate rainfall is received during South West monsoon.

Meteorology is the key to understand the Air quality. The essential relationship between meteorological condition and atmospheric dispersion involves the wind in the broadest sense. Wind fluctuations over a very wide range of time, accomplish dispersion and strongly influence other processes associated with them.

A temporary meteorological station was installed at project site by covering cluster quarries. The station was installed at a height of 3m above the ground level in such a way that there are no obstructions facilitating flow of wind, wind speed, wind direction, humidity and temperature are recorded on hourly basis.

The district enjoys a tropical climate. The weather is pleasant during the period from November to January. Mornings in general are more humid than the afternoons, with the humidity exceeding 70% on an average. In the period June to November the afternoon humidity exceeds 60% on an average. In the rest of the year the afternoons are drier, the summer afternoons being the driest

- **Temperature**

Temperature is an important parameter in determining the climatic condition of any region. The climatic condition determines the agricultural pattern, life style of people and the socio economic conditions of any region. Pudukkottai District falls under the tropical

region so the temperature here is normally high. For the study area, the monthly mean temperature is calculated from the daily temperature data available for the period from 1976 to 2010. From the table 3, it is observed that the temperature varies according to the seasonal changes. It is inferred from the table, that the temperature is very high during summer season, low during the winter season and moderate during other months. During the summer season, the highest temperature, in the day time was recorded in the months of May (38^{o}C) and April (37.4 ^{o}C). The highest temperature received during winter was 33.3 ^{o}C in the month of February and minimum temperature was found to be 19.8 oC in the month of January. (Source: (Pdf) A Study On The Temperature And Rainfall Conditions Of Pudukkottai District, Tamil Nadu, India (Researchgate.Net))

- **Rainfall**

The average rainfall in Pudukkottai is 821 mm. During northeast monsoon this district receives the highest rainfall of 397 mm followed by, South west monsoon with 303 mm of rainfall. The summer and winter rainfalls are 81 mm and 40 mm respectively. Average rainfall shows that the rainfall is highest in the south eastern part of the district, which includes the coastal blocks of Manalmelkudi and Avudayarkoil. It gradually decreases towards the northeast where the average annual rainfall is found to be the lowest in Malaiyur. The temperature is very high during summer season, low during the winter season and moderate during other months.

(Source: Microsoft Word - PUDUKOTTAI .doc (tnenvis.nic.in))

TABLE 3.5: RAINFALL DATA

Actual Rainfall (mm)						Normal Rainfall (mm)
2013	**2014**	**2015**	**2016**	**2017**	**2018**	
613.70	794.9	1096.5	470.8	724.4	692.1	887.4

(Source: https://www.twadboard.tn.gov.in/content/Pudukkottai)

TABLE 3.6: METEOROLOGICAL DATA RECORDED AT SITE

S. No	Parameters		Dec 2021	Jan 2022	Feb 2022
1	Temperature (^{0}C)	Max	32	32	31.1
		Min	23.8	22	22.2
		Avg	27.9	27	26.6
2	Relative Humidity (%)	Avg	94	94	88
3	Wind Speed (m/s)	Max	16	7	12
		Min	2	3	1
		Avg	6.2	6.4	6.9
4	Cloud Cover (OKTAS)		NE	NE	NE
5	Wind Direction		32	32	31.1

Source: On-site monitoring/sampling

3.7.2 Analysis of Meteorological Data, Pudukottai

The Indian Meteorological Department records the data at two times a day viz. 08:30 hr and 17:30 hr. The meteorological data recorded during the monitoring period is very useful for proper interpretation of the baseline information as well as input for air quality prediction. Historical data on meteorological parameters also plays an important role in identifying the general meteorological regime of the region. The year may broadly be divided into four seasons based on meteorological variations:

Winter	:	December to February
Pre-Monsoon/Summer	:	March to May
Monsoon	:	June to September
Post-Monsoon	:	October to November

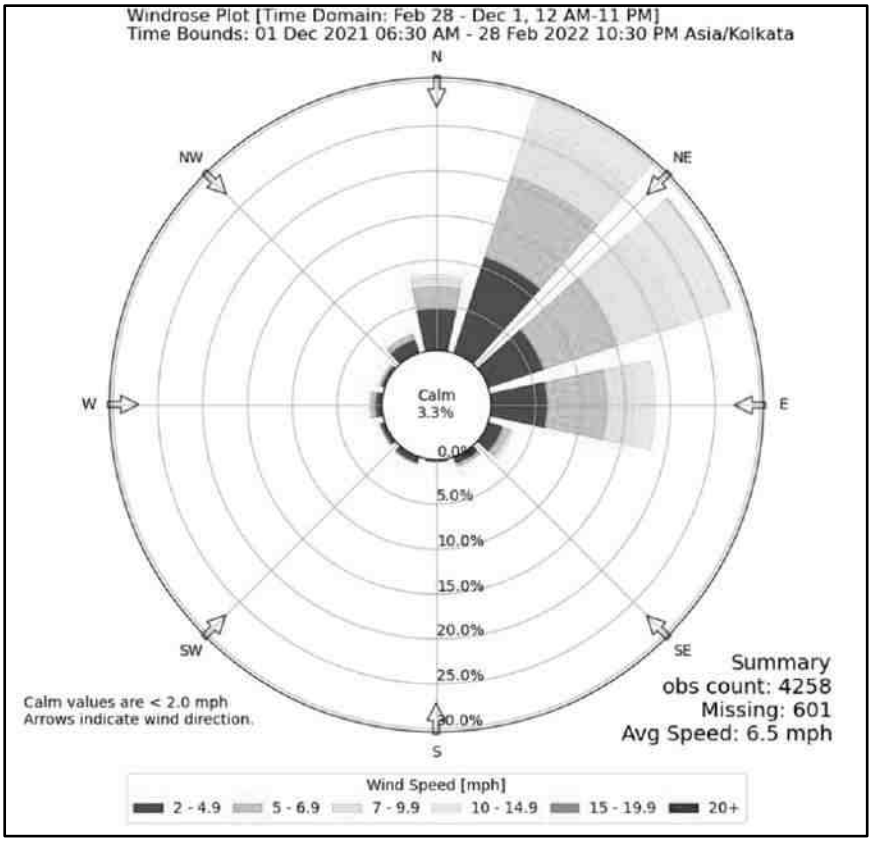


FIGURE 3.8: SITE SPECIFIC WINDROSE DECEMBER 2021 TO FEBRUARY 2022

TABLE 3.7: WIND DIRECTION AND WIND SPEED

Wind Direction	**Frequency %**
Upwind Direction	NE (30 %)
Downwind Direction	SW (10%)
Calm conditions (%)	<2mph
Average Speed	6.5 mph

3.7.3 Baseline Ambient Air Quality

The status of ambient air quality within the study area was monitored during December 2021 to February 2022 at 8 locations including the Rough stone mine lease area and in nearby villages. The monitoring locations are given in **Table 3.8** and are shown in **Figure 3.11**.

The various sources of air pollution in the region are stone mining, crushing activities and vehicular traffic. The prime objective of the baseline air quality study (10-km radius) was to assess the existing air quality of the area to form baseline information. The study area represents mostly rural environment with stone mining quarries & crushers.

The regional climatologically data, was used as a guideline to know the predominant wind direction during study period. The locations were identified keeping in view predominant wind directions prevailing during study period, sensitive receptors, human settlements, and mining activities around.

The levels of Respirable Particulate Matter (PM_{10}), Fine Particulates ($PM_{2.5}$), Sulphur Dioxide (SO_2) and Oxides of Nitrogen (NO_x) were monitored for establishing the baseline status. PM10 were sampled with the help of Respirable Dust Samplers on filter papers and SO_2& NOx were absorbed in the respective absorption media in the impingers attached to RD samplers and analyzed Spectro-photometrically. $PM_{2.5}$ was monitored with the help of Fine Particulate Samplers. The minimum, maximum, average and 98th percentile values have been computed from the observed raw data for all the AAQ monitoring stations and the results are summarized in **Table 3.9.** Detailed Baseline report is attached as **Annexure VII.**

TABLE 3.8: DETAILS OF AMBIENT AIR QUALITY MONITORING LOCATIONS

S. No.	Station Code	Locations	Distance & Direction	Coordinates	Selection Criteria
			w.r.t Project Site		
1	AAQ1	Core Zone	Project Area	10°25'29.77"N 78°46'9.84"E	Core Zone
2	AAQ 2	Mullai nagar	1.42 km NE	10°27'50.65"N 78°46'30.40"E	Nearest Habitation Upwind
3	AAQ 3	Vellanur Ration shop	4.37 km NE	10°24'39.34"N 78°47'32.03"E	Upwind
4	AAQ 4	Jesus Chruch perunjunai	1.30 km SW	10°27'14.68"N 78°48'28.92"E	Downwind

S. No.	Station Code	Locations	Distance & Direction	Coordinates	Selection Criteria
			w.r.t Project Site		
5	AAQ 5	Palani temple Mettupatti	3.71 km SW	10°25'36.35"N 78°44'14.66"E	Downwind
6	AAQ 6	Little Angles Nursery school	4.57 km SE	10°28'15.96"N 78°43'47.37"E	Crosswind
7	AAQ 7	Mathiyanallur village	4.13 km NE	10°30'27.03"N 78°44'59.69"E	Crosswind
8	AAQ 8	Sellukudi village	3.50 km S	10°30'6.44"N 78°47'53.40"E	Crosswind

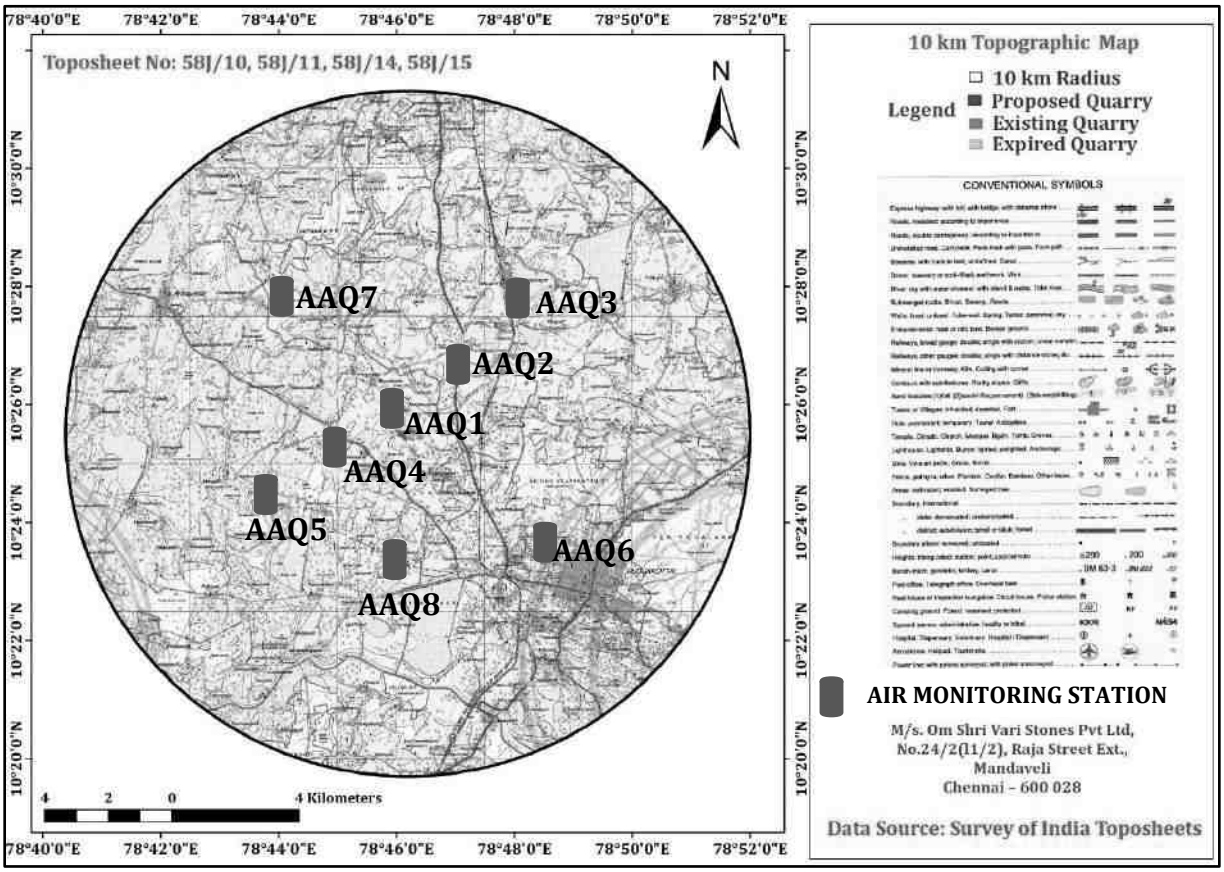


FIGURE 3.9: STUDY AREA MAP WITH MONITORING LOCATIONS

TABLE 3.9: SUMMARY OF AMBIENT AIR QUALITY RESULTS

Date of Sampling	-	**Sampling Method**	ETS/STP/AIR-01
Analysis Start Date	05.12.2021	**Sample Quantity**	-
Analysis End Date	01.03.2022	**Packing Condition**	-
Sampling Done By	ETS STAFF	**Weather Condition**	**Clear**

Particulate matter PM-2.5					
Station ID	**Max**	**Min**	**Mean**	**98 Percentile**	**STDEV**
AAQ-1	30.4	24.5	27.9	30.2	1.43
AAQ-2	28.4	22.5	25.9	28.2	1.43
AAQ-3	29	23.1	26.5	28.8	1.43
AAQ-4	28.5	22.6	26.0	28.3	1.43
AAQ-5	27.9	22	25.4	27.7	1.43
AAQ-6	28.9	23	26.4	28.7	1.43
AAQ-7	27.8	21.9	25.3	27.6	1.43
AAQ-8	28.2	22.3	25.7	28	1.43
Particulate matter PM-10					
Station ID	**Max**	**Min**	**Mean**	**98 Percentile**	**STDEV**
AAQ-1	52.6	47.4	50.14231	52.6	1.44
AAQ-2	51.4	46.2	48.94231	51.4	1.44
AAQ-3	52.3	47.1	49.84231	52.3	1.44
AAQ-4	51.6	46.4	49.14231	51.6	1.44
AAQ-5	51.1	45.9	48.64231	51.1	1.44
AAQ-6	53.1	47.9	50.64231	53.1	1.44
AAQ-7	51.9	46.7	49.44231	51.9	1.44
AAQ-8	51.4	46.2	48.94231	51.4	1.44
Sulphur Di-oxide as SO_2					
Station ID	**Max**	**Min**	**Mean**	**98 Percentile**	**STDEV**
AAQ-1	10.9	9.3	10.2	10.85	0.48
AAQ-2	10.6	9	9.9	10.55	0.48
AAQ-3	10.9	9.3	10.2	10.85	0.48
AAQ-4	10.5	8.9	9.8	10.45	0.48
AAQ-5	10.6	9	9.9	10.55	0.48
AAQ-6	11	9.4	10.3	10.95	0.48
AAQ-7	9.7	8.1	9.01	9.65	0.48
AAQ-8	9.4	7.8	8.7	9.35	0.48
Oxide of Nitrogen as NO_2					
Station ID	**Max**	**Min**	**Mean**	**98 Percentile**	**STDEV**
AAQ-1	25.9	21.6	23.5	25.85	1.26
AAQ-2	25.7	21.4	23.3	25.65	1.26
AAQ-3	26	21.7	23.6	25.95	1.26
AAQ-4	25.7	21.4	23.3	25.65	1.26
AAQ-5	25.5	21.2	23.10	25.45	1.26
AAQ-6	26.1	21.8	23.7	26.05	1.26
AAQ-7	25	20.7	22.6	24.95	1.26
AAQ-8	26.1	21.8	23.7	26.05	1.26

3.7.4 Observations of Primary Data:

- $PM_{2.5}$ concentration in the study area varied from 21.9 to 30.4 µg/m^3 during the study period.
- PM_{10} concentration in the study area varied from 46.2 to 53.1 µg/m^3 during the study period.

- SO_2 concentration in the study area varied from 7.8 to 11 µg/m^3 during the study period.
- NO_2 concentration in the study area varied from 21.4 to 25.9 µg/m^3 during the study period.

From the above results, it is observed that the ambient air quality with respect to PM_{10}, $PM_{2.5}$, SO_2, and NO_2 at all the monitoring locations was within the permissible limits specified by CPCB.

3.8 NOISE ENVIRONMENT

3.8.1 Baseline Status

Ambient noise level monitoring was carried out at the 8 monitoring locations; those were selected for ambient air quality monitoring. The details of noise monitoring locations are given in **Table 3.10** and are shown in **Figure-3.10**. Monitoring stations and the results are summarized in **Table 3.11**. Detailed Baseline report is attached as **Annexure VII.**

TABLE 3.10: NOISE SAMPLING LOCATIONS IN THE STUDY AREA

S. No.	Station Code	Locations	Distance & Direction	Coordinates
			w.r.t Project Site	
1	N 1	Core Zone	Project Area	10°25'29.77"N to 78°46'9.84"E
2	N 2	Mullai nagar	1.42 km NE	10°25'47.11"N to 78°47'0.67"E
3	N 3	Vellanur Ration shop	4.37 km NE	10°27'16.90"N to 78°47'45.60"E
4	N 4	Jesus Chruch perunjunai	1.30 km SW	10°25'8.45"N to 78°45'32.65"E
5	N 5	Palani temple Mettupatti	3.71 km SW	10°24'10.26"N to 78°44'36.10"E
6	N 6	Little Angles Nursery school	4.57 km SE	10°23'54.37"N to 78°48'12.52"E
7	N 7	Mathiyanallur village	4.13 km NE	10°26'59.29"N to 78°44'39.39"E
8	N 8	Sellukudi village	3.50 km S	10°23'21.94"N to 78°46'20.66"E

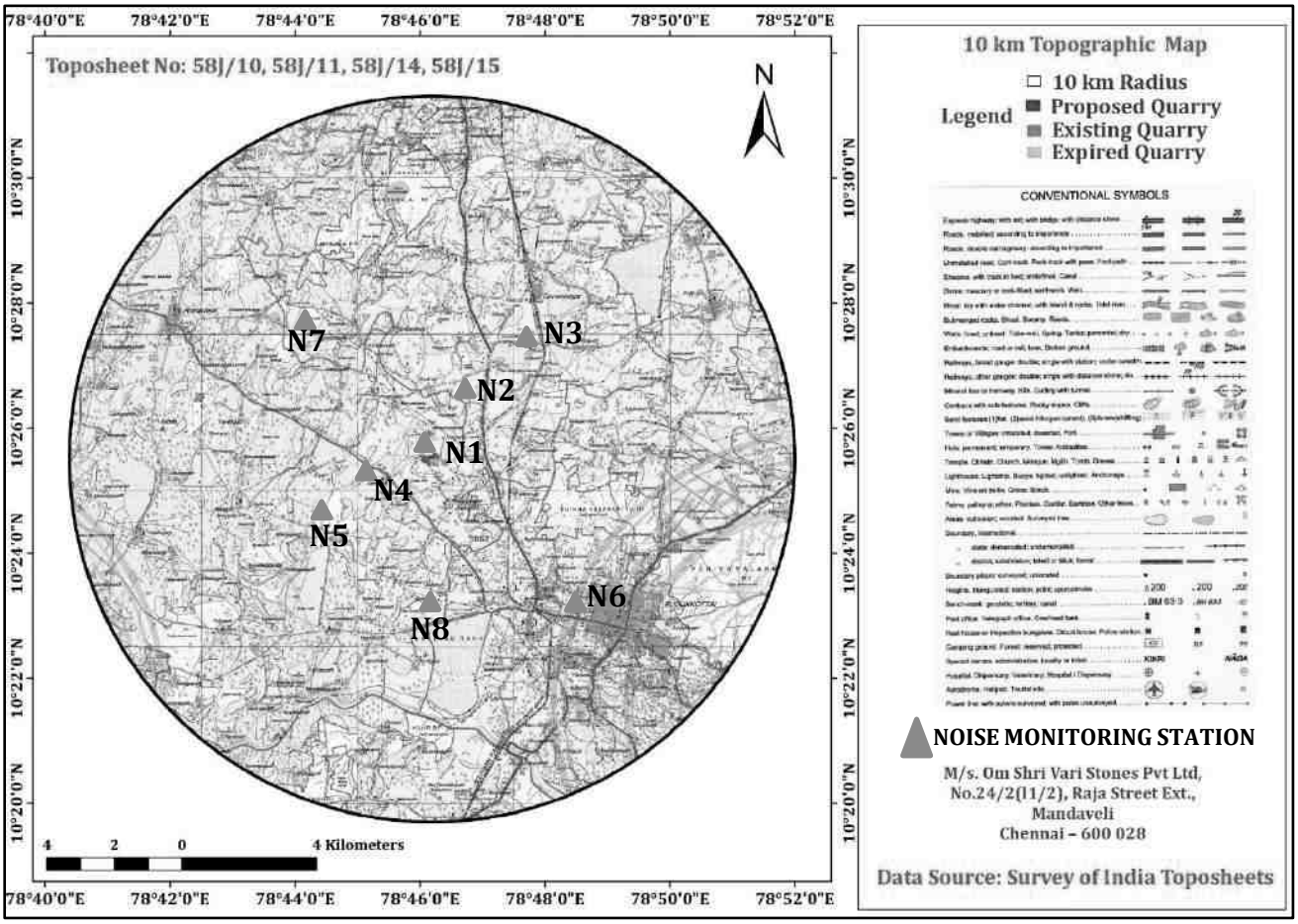


FIGURE 3. 10: STUDY AREA MAP WITH NOISE MONITORING LOCATIONS

TABLE 3.11: AMBIENT NOISE LEVEL MONITORING RESULTS, [dB(A)]

Date of Sampling	-	**Sampling Method**	STP/NOISE-01
Analysis Start Date	22.02.2022	**Sample Quantity**	-
Analysis End Date	23.02.2022	**Packing Condition**	**-**
Sampling Done By	ETS STAFF	**Category of Area**	**Industrial Area**

Location		**N1 (Project Site)**			**N2 (Mullai nagar)**			**N3 (Vellanur Ration shop)**			**N4 (Jesus Chruch perunjunai)**		
S.No	**Time (Hrs)**	**Min dB(A)**	**Max dB(A)**	**dB(A)**	**Min dB(A)**	**Max dB(A)**	**dB(A)**	**Min dB(A)**	**Max dB(A)**	**dB(A)**	**Min dB(A)**	**Max dB(A)**	**dB(A)**
1	0600	41.1	48.5	**46.0**	43.6	46.6	**45.4**	47.3	50.1	**46.9**	32.4	36.2	36.0
2	0700	41.5	51.2	**47.6**	41.6	44.1	**45.0**	46.3	50.2	**47.5**	34.5	40.4	37.2
3	0800	43.6	53.6	**49.0**	42.2	45.5	**46.3**	46.1	48.6	**47.5**	35.2	39.5	37.9
4	0900	42.6	53.1	**51.5**	44.9	49.8	**48.0**	47.4	46.2	**48.3**	36.8	38.5	37.7
5	1000	43.1	45.8	**46.7**	41.9	50.6	**49.1**	46.2	49.1	**49.9**	36.5	37.6	38.3
6	1100	44.5	46.6	**45.7**	42.5	52.6	**50.0**	45.1	47.3	**50.4**	38.1	45.3	40.2
7	1200	45.6	47.8	**46.8**	44.2	54.2	**51.6**	46.9	49.5	**50.2**	34.7	40.5	42.5
8	1300	46.9	49.6	**42.5**	41.6	51.6	**52.0**	46.2	48.8	**50.7**	37.2	41.3	46.7
9	1400	47.1	50.2	**48.9**	42.2	53.5	**50.8**	45.7	46.7	**51.5**	36.2	43.5	48.3
10	1500	45.4	51.8	**46.7**	42.6	54.5	**52.8**	46.3	48.7	**51.4**	35.9	44.8	50.3
11	1600	43.6	52.8	**51.3**	43.2	46.5	**52.2**	48.1	50.2	**52.3**	36.6	38.7	51.6
12	1700	44.8	52.6	**51.3**	43.5	48.3	**50.5**	46.3	51.5	**51.8**	32.5	40.9	50.5
13	1800	46.2	55.3	**52.8**	42.5	47.6	**51.8**	47.3	53.5	**50.4**	34.4	43.4	49.9
14	1900	43.5	52.1	**49.7**	40.9	49.6	**48.1**	48.9	50.5	**49.7**	31.5	39.6	48.3
15	2000	40.9	50.1	**47.7**	43.5	47.6	**47.0**	42.6	55.5	**49.5**	36.9	46.5	47.9
16	2100	40.5	49.8	**46.3**	41.5	47.1	**45.1**	40.9	51.9	**48.2**	32.5	40.8	38.4

Location		N1 (Project Site)			N2 (Mullai nagar)			N3 (Vellanur Ration shop)			N4 (Jesus Chruch perunjunai)		
S.No	**Time (Hrs)**	**Min dB(A)**	**Max dB(A)**	**dB(A)**	**Min dB(A)**	**Max dB(A)**	**dB(A)**	**Min dB(A)**	**Max dB(A)**	**dB(A)**	**Min dB(A)**	**Max dB(A)**	**dB(A)**
17	2200	38.6	46.9	**44.5**	38.2	45.6	**43.3**	41.2	53.2	**47.6**	36.1	44.3	46.9
18	2300	37.5	38.1	**37.8**	39.8	43.5	**42.0**	35.1	43.6	**44.2**	34.1	39.9	44.9
19	0000	36.1	40.5	**38.8**	37.6	43.7	**41.6**	36.4	47.2	**44.7**	32.9	37.8	42.0
20	0100	35.3	39.7	**38.0**	36.8	42.5	**40.5**	32.9	37.5	**40.8**	33.5	36.9	40.5
21	0200	36.1	38.6	**37.5**	37.3	44.1	**40.9**	31.8	39.8	**37.4**	33.7	35.8	38.9
22	0300	33.1	35.8	**34.8**	37.1	39.1	**38.2**	32.7	37.5	**36.7**	32.5	34.5	36.6
23	0400	34.1	37.8	**36.3**	35.9	39.8	**37.3**	32.5	36.2	**35.2**	33.4	36.6	35.3
24	0500	34.6	36.9	**34.9**	36.5	38.2	**37.4**	31.4	35.5	**33.9**	33.4	36.5	35.6
Day Mean dB(A)				**48.4**	**Day Mean dB(A)**		**47.1**	**Day Mean dB(A)**		**48.7**	**Day Mean dB(A)**		**39.4**
Night Mean dB(A)				**37.0**	**Night Mean dB(A)**		**40.0**	**Night Mean dB(A)**		**37.7**	**Night Mean dB(A)**		**35.4**

Location		N5 (Palani temple Mettupatti)			N6 (Little Angles nursery school)			N7 (Mathivanallur)			N8 (Sellukudi)		
S. No	**Time (Hrs)**	**Min dB(A)**	**Max dB(A)**	**dB(A)**	**Min dB(A)**	**Max dB(A)**	**dB(A)**	**Min dB(A)**	**Max dB(A)**	**dB(A)**	**Min dB(A)**	**Max dB(A)**	**dB(A)**
1	0600	40.5	45.3	**43.4**	46.7	48.5	**47.4**	41.2	43.5	**41.3**	41.2	43.8	41.2
2	0700	41.6	46.6	**44.4**	49.5	50.4	**49.8**	41.5	42.3	**42.1**	43.5	42.3	42.1
3	0800	41.6	45.5	**44.7**	47.5	52.1	**50.7**	41.4	44.9	**43.2**	41.4	44.9	43.2
4	0900	42.4	50.4	**47.3**	45.5	47.2	**47.5**	42.8	45.5	**44.6**	42.8	45.5	45.6
5	1000	45.5	48.8	**47.5**	48.3	52.3	**50.7**	43.8	47.6	**46.4**	42.8	48.6	45.4
6	1100	46.7	51.3	**49.6**	45.9	48.3	**47.1**	44.7	45.5	**45.1**	44.5	45.5	45.1

Location		**N5 (Palani temple Mettupatti)**			**N6 (Little Angles nursery school)**			**N7 (Mathivanallur)**			**N8 (Sellukudi)**		
S. No	**Time (Hrs)**	**Min dB(A)**	**Max dB(A)**	**dB(A)**	**Min dB(A)**	**Max dB(A)**	**dB(A)**	**Min dB(A)**	**Max dB(A)**	**dB(A)**	**Min dB(A)**	**Max dB(A)**	**dB(A)**
7	1200	47.7	50.3	**49.5**	47.2	49.5	**48.5**	44.6	49.9	**48.3**	44.6	49.9	48.3
8	1300	48.1	50.3	**49.3**	45.8	51.2	**49.3**	46.5	49.2	**50.4**	46.5	50.2	48.6
9	1400	47.2	51.2	**50.7**	46.1	55.6	**54.7**	46.4	52.5	**51.8**	46.4	52.5	51.4
10	1500	48.5	51.3	**50.1**	47.3	54.5	**52.2**	45.8	54.2	**52.1**	43.2	54.2	51.8
11	1600	47.6	51.7	**50.6**	45.8	52.2	**51.6**	44.2	54.7	**51.7**	44.2	54.8	52.1
12	1700	46.1	50.4	**48.8**	47.1	53.5	**51.4**	42.8	53.9	**51.5**	42.7	53.9	51.7
13	1800	45.5	50	**48.2**	47.2	54.3	**51.9**	42.7	53.2	**51.5**	42.7	53.2	51.8
14	1900	46.1	49.5	**47.7**	48.5	51.3	**50.5**	42.8	51.8	**49.3**	42.8	52.8	49.3
15	2000	44.4	45.5	**48.1**	35.1	46.3	**43.6**	41.9	50.5	**48.5**	41.9	50.5	48.7
16	2100	43.2	45.6	**44.6**	36.4	45.7	**43.2**	41.5	49.7	**47.2**	41.6	49.7	47.2
17	2200	31.5	38.9	**44.0**	34.7	44.4	**41.9**	41.5	46.9	**47.1**	41.5	45.9	45.3
18	2300	36.7	38.2	**36.6**	36.1	40.2	**38.7**	38.8	40.2	**45**	41.5	40.2	40.8
19	0000	36.7	45.6	**37.5**	34.2	38.4	**37.0**	38.9	42.8	**40.8**	38.8	42.8	40.9
20	0100	35.8	38.2	**36.4**	34.9	39.9	**37.8**	38.4	40.5	**40.9**	37.9	42.5	39.7
21	0200	31.2	37.9	**33.2**	32.8	34.2	**34.0**	36.5	38.9	**39.4**	36.5	38.9	36.9
22	0300	34.2	34.6	**35.7**	33.1	36.6	**35.2**	35.5	37.7	**37.9**	35.5	37.7	35.6
23	0400	33.6	35.9	**34.5**	36.2	38.8	**36.7**	34.8	36.6	**36.6**	34.8	36.8	35.7
24	0500	32.2	35.5	**34.6**	34.4	38.2	**35.4**	34.4	35.6	**35.6**	34.4	35.6	35.7
Day Mean dB(A)				**47.5**	**Day Mean dB(A)**		**48.9**	**Day Mean dB(A)**		**47.5**	**Day Mean dB(A)**		**47.6**
Night Mean dB(A)				**35.5**	**Night Mean dB(A)**		**36.7**	**Night Mean dB(A)**		**38.2**	**Night Mean dB(A)**		**38.3**

3.8.2 Observations

From the above table, it is observed that the ambient noise levels at all the monitoring locations and villages, recorded in core zone during daytime were from 39.4 to 48.4 dB (A) Leq and during nighttime were from 35.4 to 40.0 dB (A) Leq. it is observed that the ambient noise levels at all the monitoring locations and villages as the permissible limits of 55 dB(A) for daytime and 45 dB(A) for night time observed within permissible limit.

3.9 WATER ENVIRONMENT

3.9.1 Topography & Drainage Pattern

Topography

Project 1

The lease applied area is exhibits plain topography. The area has gentle sloping towards Southern side. The maximum altitude of the area is 117m (max) above Mean Sea level.

Project 2

The lease applied area is exhibits plain topography. The area has gentle sloping towards Southern side. The maximum altitude of the area is 117 m (max) above Mean Sea level.

Drainage Pattern of the area

Pudukkottai is a part of Cauvery Basin and parts of Vellar, Agniyar, Ambuliyar, Koraiyar, Gundar and Pambar sub basins. Vellar is the major river, which flows in an East- south easterly direction and confluences with the Bay of Bengal near Manamelkudi. Agniyar, Ambuliyar, Koraiyar, Gundar and Pambar are the other important rivers draining the district. All most all the rivers are ephemeral in nature.

The general drainage pattern of the area is of sub dendritic and dendritic pattern. During rainy season the surface runoff flows in E to W direction. The quarrying activity will not hinder the natural flow of rainwater.

3.9.2 Rainfall

The normal rainfall for the district has been 827.18 mm (Per Year). However, during the two decades the district has experienced rainfall only below normal. Most of the rains occur during north east monsoon. The heaviest rainfall in the district used to be received in the month of October was 153.99 mm (Average). The average humidity is 74.2%.
(Source-
https://cdn.s3waas.gov.in/s342e7aaa88b48137a16a1acd04ed91125/uploads/20\19/06/2019060866.pdf)

3.9.3 HYDROLOGY

The major aquifer systems in the district are constituted by weathered and fractured crystalline rocks consisting mainly hornblende gneisses, granitic gneisses and pink

granites, sedimentary formations ranging in age from Cretaceous to Recent, consisting of sand stones, lime stones, shales and unconsolidated alluvium. In the former, ground water occurs under phreatic conditions in the weathered mantle at shallow depths and semi-confined conditions in the fractured systems at deeper levels, whereas in the latter, it occurs under phreatic to confined conditions depending upon the storage and conduit characterization of the confining layers.

The thickness of weathering in crystalline rock in the district ranges from less than a meter to maximum of 15.0 m bgl depending on the topography, lithology and structural features. The results of groundwater exploration indicate that there is a possibility of encountering 2 fracture zones within 50 m bgl, 2 zones in between 50 – 100 m depth and 1 fracture zone between 100 - 150 m and 150-200m depth ranges. However, all the zones may not be encountered at all places.

In case of porous formations, aquifers can be grouped into shallow aquifers with zones within the depth of 100 m bgl and deeper aquifers between the depth range of 100 – 450 m bgl. In the shallow aquifer zones, area south of Vellar has quality problem and groundwater extraction is only from beyond 100 m depth. In other places, the granular zones are present between 60 – 100 m depth. In case of deeper aquifers, the exploration has revealed that the presence of 2 to 22 aquifer zone with a total thickness varying between 21.43 and 314.5 m. The isopach contour showed an increase in thickness from less than 50 m in the northwestern part to more than 250 m in the southeastern part.

The dug wells tapping weathered formation are 12-15 m deep and can sustain a yield up to 5 lps for a pumping 2-4 hours, while the dug wells tapping the shallow aquifers in porous formations are 12 m deep and can sustain a yield of 5 lps for a pumping of 4-6 hrs.

The shallow aquifer down to 100 m bgl are tapped with shallow tube wells with a diameter of 150 mm with depth varying between 60 – 100m and slotted pipe of length of 10 to 20 m. The wells can yield between 2 to 8 lps and can sustain a pumping of 8 – 10 hrs.

The deeper aquifers are yet to be tapped for irrigation purposes and only tube wells are constructed for providing drinking water supply. The depth of the wells vary between 350 – 450 m bgl with a housing diameter of 20 – 30 cm and assembly diameter of 15 – 20 cm. The wells may yield between 19 – 56 lps.

The depth to water level in the phreatic aquifer varied from 0.85 to 9.50 m bgl during pre-monsoon (May 2006) and from 0.58 to 6.88 m bgl during post monsoon (Jan 2007). The depth to piezometric surface varied from 1.90 to 6.60 m bgl during pre-monsoon (May 2006) and from 1.70 to 7.60 m bgl during post monsoon (Jan 2007).

(Source: Microsoft Word - Pudukkotai-Dt-GW-Br-Final.doc (cgwb.gov.in))

TABLE 3.12: DISTANCE & DIRECTION OF RIVER/STREAM/NALLA WITHIN 10 KM RADIUS

Name of the River/Stream/Nala	Distance from Project Site (Km)	Direction from Project Site
Vellar River	7.3 km	S
Kondar River	5.27 km	SE

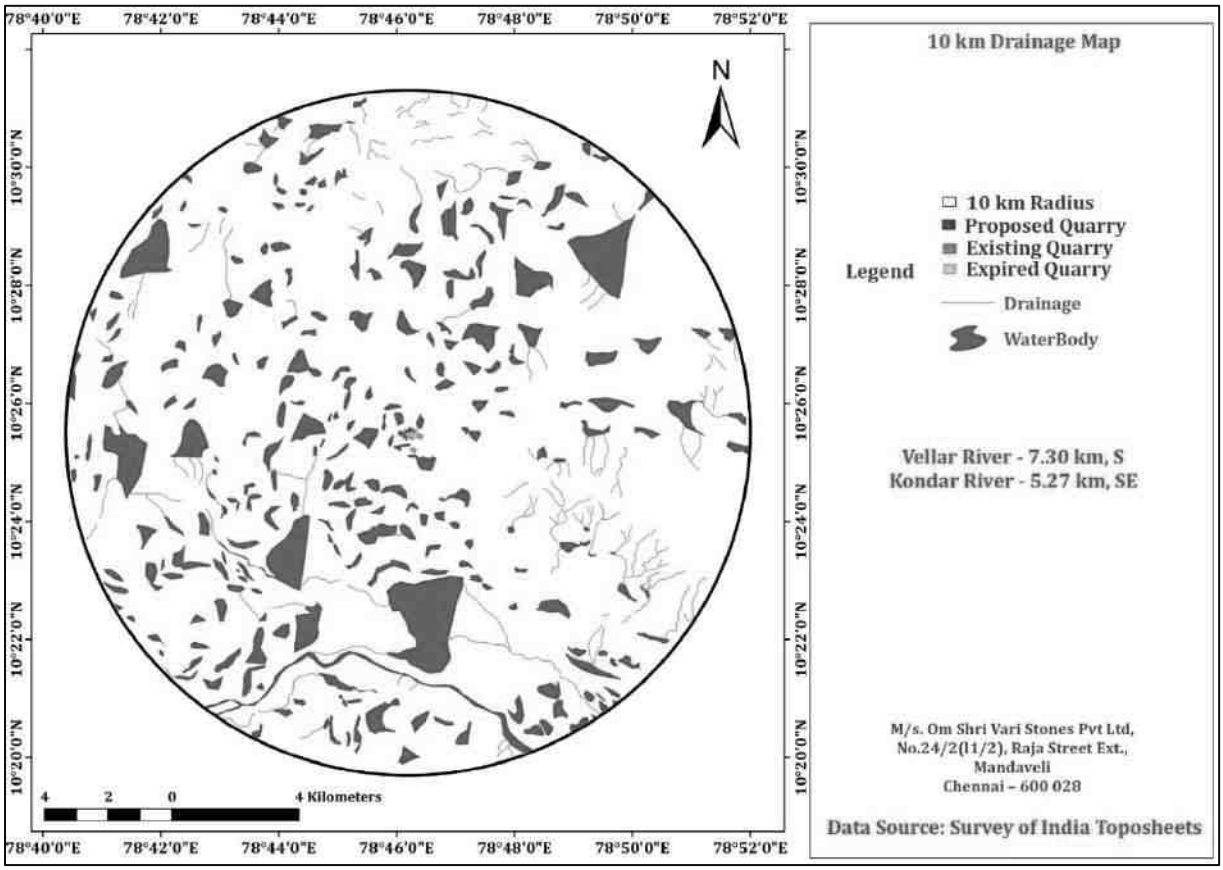


FIGURE 3.11: DRAINAGE PATTERN 10 KM RADIUS

TABLE 3.13: WATER LEVEL OBSERVED WITHIN STUDY AREA

Particulars	Project 1
Water Table Level	
During summer	65-70 m
Rainy Season	50-65 m

TABLE 3.14(a): NEARBY WATER BODIES WITHIN 1KM OF PROJECT-1

PARTICULARS	DETAILS
Open well	180 m – South Depth of Open Well = 19 m Water Level – 14.4 m
	320 m – South West Depth of Open Well = 18 m Water Level – 15.2 m
Bore well	390 m – South Depth of Open Well = 175 m Water Level – 55.9 m
Tank	130 m North East Extent – 8.5 ha with App Storage 1,24,960 KL
Kulam	50 m Safety Provided Kidavilunthan Kulam – Extent 1.5 ha – App Storage 25,040 KL
Vaikkal	North Side 50 m Safety Provided

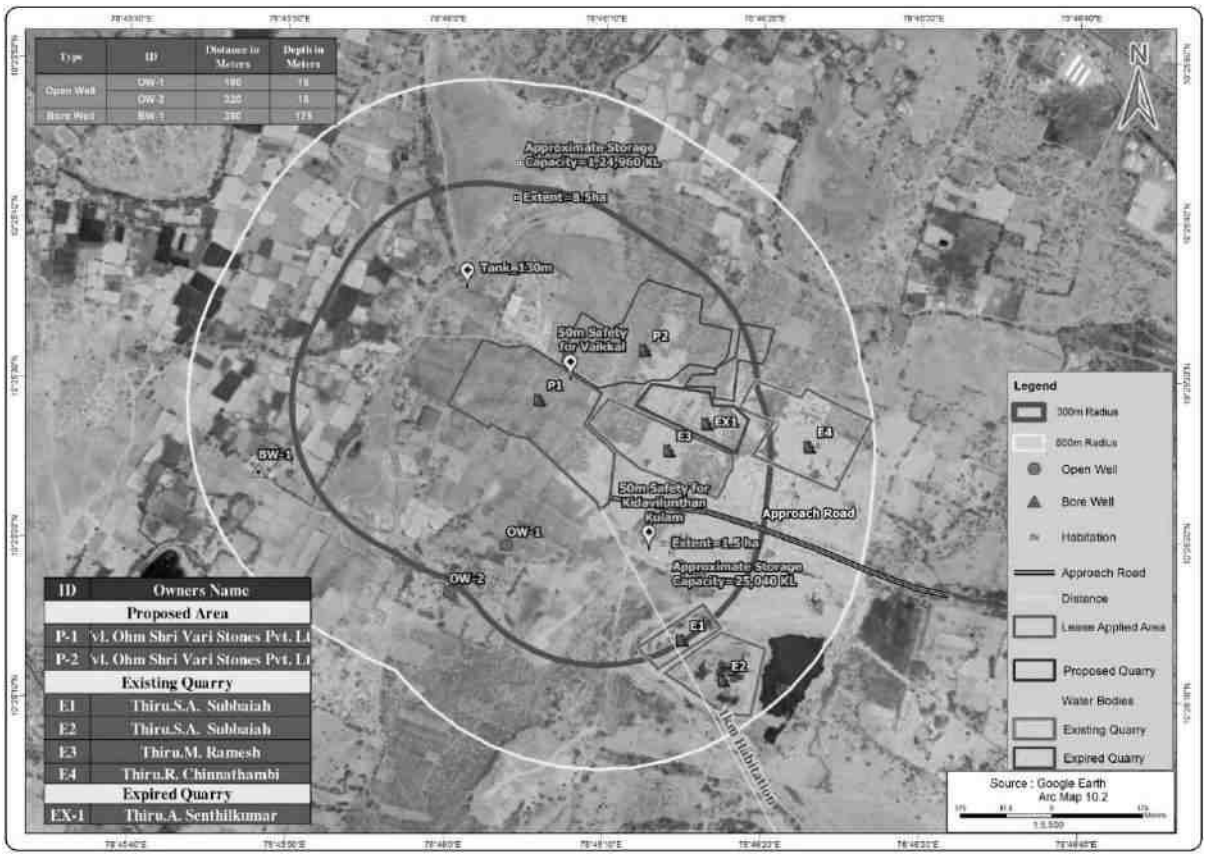


FIGURE 3.12(a): OPEN WELL & BORE WELL LOCATIONS OF PROJECT-1

TABLE 3.14(b): NEARBY WATER BODIES WITHIN 1KM OF PROJECT-2

(Measured from Water Level Meter)

PARTICULARS	DETAILS
Open well	80m – Northeast & Depth of Open Well = 18m Water Level – 14.2m
	310m –Northeast & Depth of Open Well = 17m Water Level – 13.4m
	360m –Northwest & Depth of Open Well = 21m Water Level – 14.4m
Bore well	250m– Southeast & Depth of Bore Well = 158m Water Level – 67.5m
	360m– Southwest & Depth of Bore Well = 161m Water Level – 66.1m
Vaikkal	50m Southwest
Tank	1. 180m – Northeast, Extent – 1.0ha Appx. St. Capacity – 12,550 KL 2. 240m – Northwest, Extent – 3.0ha Appx. St. Capacity – 45,720 KL

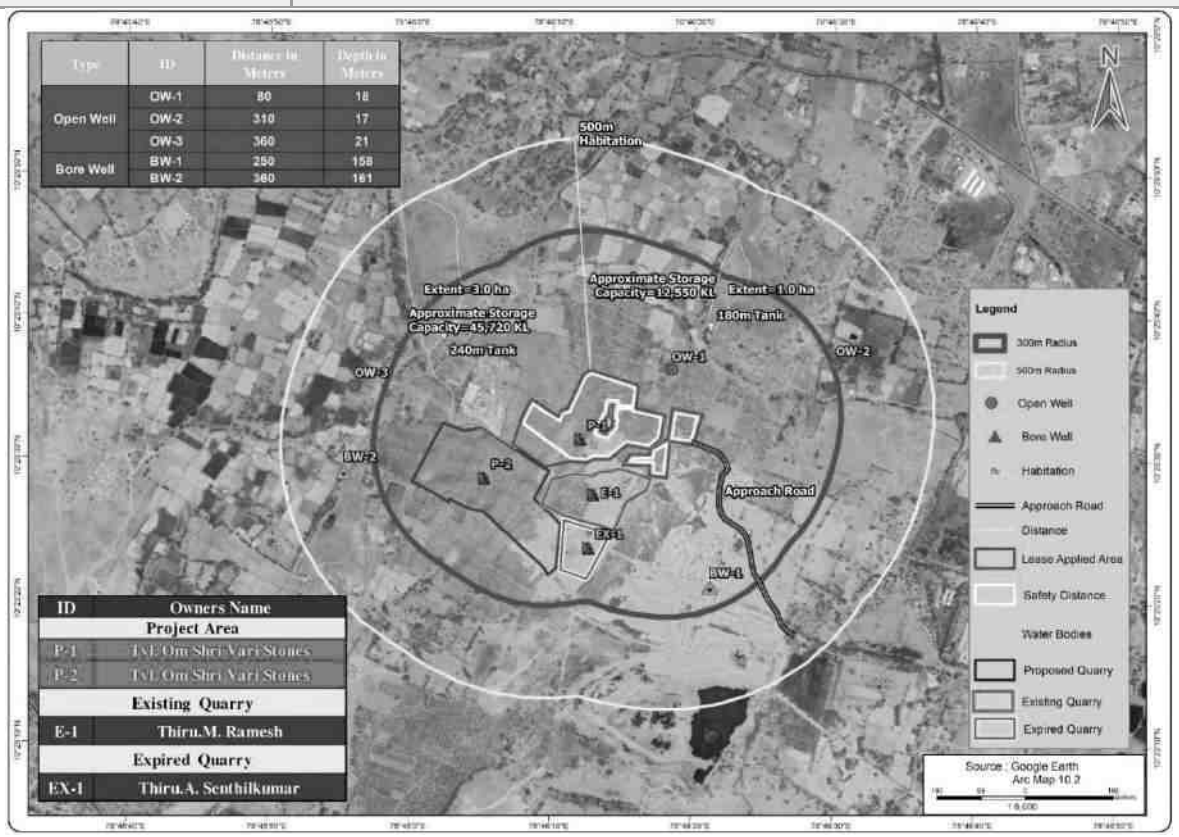


FIGURE 3.12(b): OPEN WELL & BORE WELL LOCATIONS OF PROJECT-2

TABLE 3.15WATER LEVEL OBSERVED IN BOREWELLS WITH 1KM RADIUS

Station Code	Latitude Northing	Longitude Easting	December	January	February	Average
			Water Level bgl in m			
A.	10°25'9.50"N	78°46'10.33"E	56	58	57	57
B.	10°25'21.72"N	78°46'20.70"E	61	62	61	61
C.	10°24'50.44"N	78°46'29.99"E	51	52	52	52
D.	10°24'38.10"N	78°46'18.83"E	46	48	50	48
E.	10°25'0.09"N	78°45'42.74"E	40	42	44	42
F.	10°25'8.93"N	78°45'35.19"E	52	53	53	53
G.	10°25'59.01"N	78°46'12.39"E	50	52	52	51
H.	10°25'56.93"N	78°46'27.74"E	53	54	55	54
I.	10°25'46.25"N	78°46'51.73"E	51	51	51	51
J.	10°25'26.68"N	78°46'47.39"E	53	53	54	53
K.	10°24'43.02"N	78°46'24.26"E	40	41	44	42

Source: Field Monitoring Data

3.9.6 GEOPHYSICAL SURVEY

Geophysical survey was carried out in that area by SSRMP-ATS Instrument with the help of IGIS software. Low resistance encountered at the depth between 90-95m bgl. There is no possibilities of water table intersection during the entire mine life period besides it is also inferred topographically that there are no major water bodies intersecting the project area. There is no necessity of stream, channel diversion due to this proposed project. During rainy season there is a possibility of collection of seepage water from the subsurface levels this is due to the fracture and fissures. Productive aquifers are expected within weathered/fractured sedimentary terrain. Shallow aquifers are expected average depth is above 90-95m BGL. The water seepage from the fractured zone is not anticipated.

3.9.6.1 Methodology and Data Acquisition

VES Resistivity Method for delineating lateral as well vertical discontinuities in the resistive structure of the Earth's subsurface is well established. Schlumberger electrode set up was employed for making sounding measurements. Since it is least influenced by lateral in homogeneities and can provide higher depth of investigation. The four electrodes collinear set up where in the outer electrodes send current into the ground and the inner electrodes measure the potential difference.

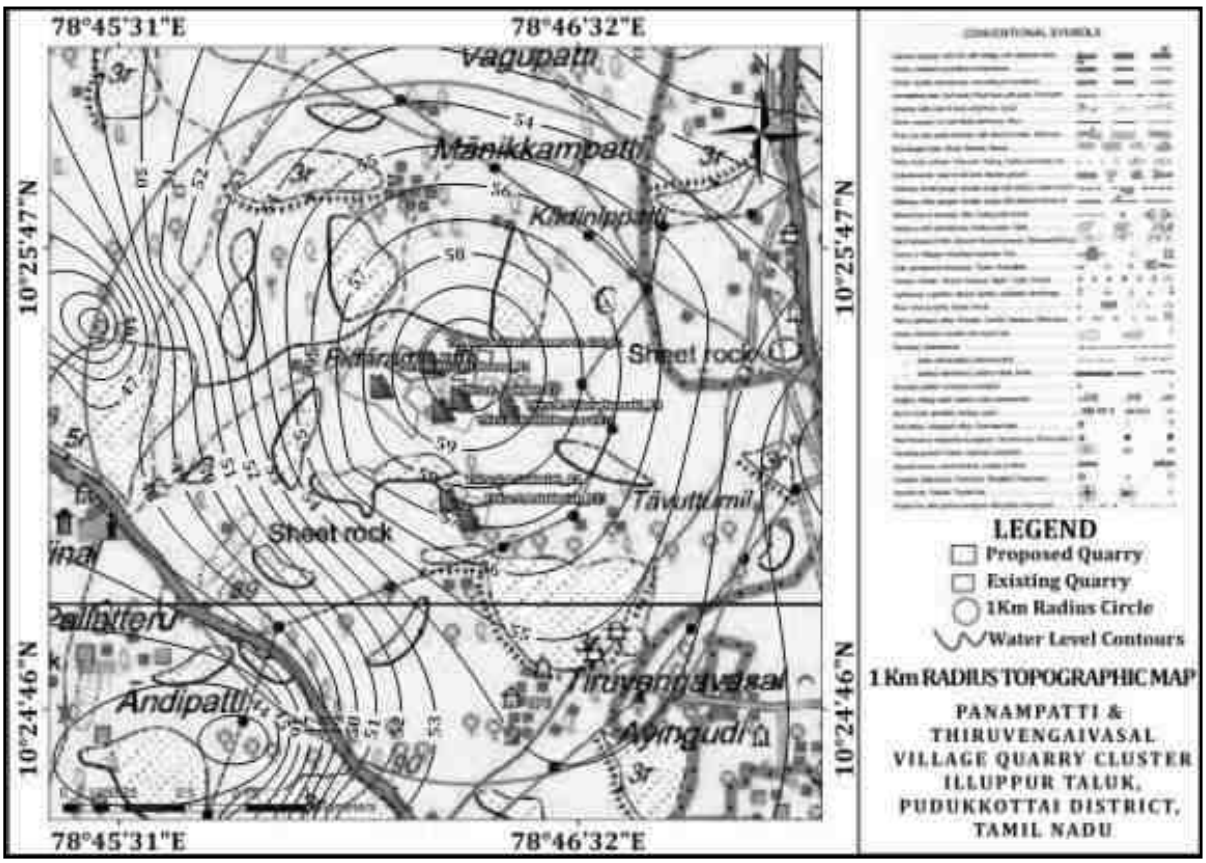


FIGURE 3.13: WATER LEVEL CONTOURS OBSERVED WITHIN 1KM RADIUS

The present study utilizes maximum current electrode separation AB/2. The data from this survey are commonly arranged and contoured in the farm of Pseudo-section that gives an approximate of the subsurface resistivity. This technique is used for the inversion of Schlumberger VES data to predict the layer parameter namely layer resistivity and Geo electric layer thickness. The main goal of the present study is to search the vertical in homogeneities that is consistent with the measured data.

For a Schlumberger among the Apparent resistivity can be calculated as follows

$$\rho_a = \frac{G\Delta V}{I}$$

ΔV = potential difference between receiving electrodes

G = Geometric Factor.

Rocks show wide variation in resistivity ranging from 10-8 more than 10+14 ohmmeter. On a broad classification, one can group the rocks falling in the range of 10-8 to 1 ohmmeter as good conductors. 1 to 106 ohmmeter as intermediate conductors and 106 to 1012 ohmmeter as more as poor conductor. The resistivity of rocks and subsurface lithology, which is mostly dependent on its porosity and the pore fluid resistivity is defined by Archie's Law,

$$\rho_r = F\rho_w = a\,\emptyset^m\rho_w$$

ρr= Resistivity of Rocks
ρw= Resistivity of water in pores of rock
F= Formation Factor
Ø= Fractional pore volume
A= Constants with values ranging from 0.5 to 2.5

3.9.6.2 Survey Layout

Here the present study is considered with Schlumberger array. The layout for a resistivity survey depends on the choice of the current and potential electrode arrangement, which is called electrode array. In which the distance may be used for current electrode separation while potential electrode separation is kept on third to one fifth of the same. One interesting aspect in VES is the principle of reciprocity, which permits interchange of the potential and current electrode without any effect on the measured apparent resistivity. The field equipment deployed for the study is in a deep resistivity meter with a model of SSR – MP – ATS. This Signal stacking Resistivity meter is a high quality data acquisition system incorporating several innovation features for Earth resistivity. In the presence of random earth Noises the signal to nose ration can be enhanced by √N where N is the number of stacked readings. This SSR meter in which running averages of measurements [1, (1+2)/2, (1+2+3)/3 … (1+2...+16/16)] up to the chosen stacks are displayed and the final average is stored automatically, in memory utilizing the principles of stacking to achieve the benefit of high signals to noise ratio. Based on these above significations the signal stacking resistivity meter was used for (VES) Vertical Electric Resistivity Sounding.

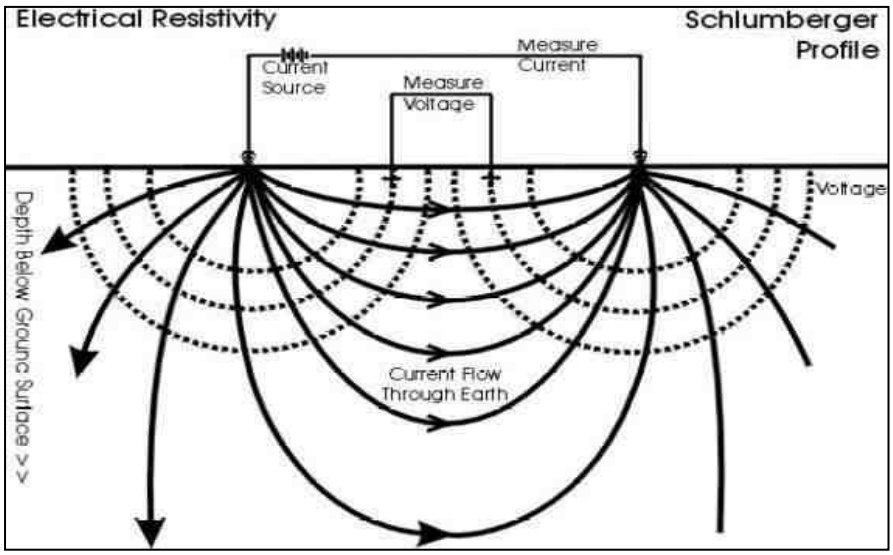


FIGURE 3.14: RESISTIVITY SURVEY PROFILE

Measurements of ground Resistivity is essentially done by sending a current through two electrodes called current electrodes (C_1& C_2) and measuring the resulting potential by two

other electrodes called potential electrode (P_1& P_2). The amount of current required to be sent into the ground depends on the contact resistance at the current electrode, the ground resistivity, and the depth of interest.

TABLE 3.16: GPS CO-ORDINATES OF VES LOCATION

No of station	Co-ordinates	Vertical Electrical Sounding depth in (m)
Satation-1	10°25'29.75"N 78°46'2.54"E	100m
Satation-2	10°25'27.82"N 78°46'5.88"E	100m
Satation-3	10°25'24.29"N 78°46'9.33"E	100m

Source: Field Data

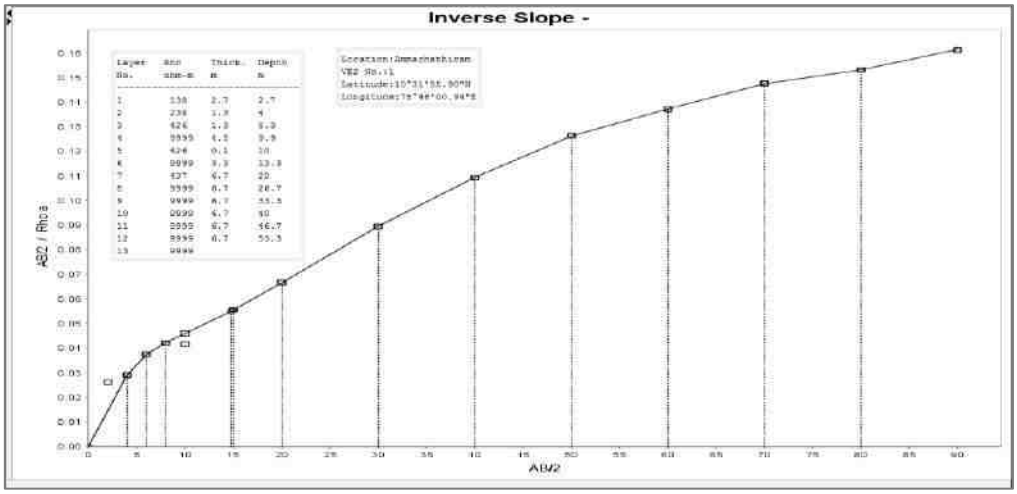
3.9.6.3 Data Presentation

TABLE 3.17 VES RESULTS

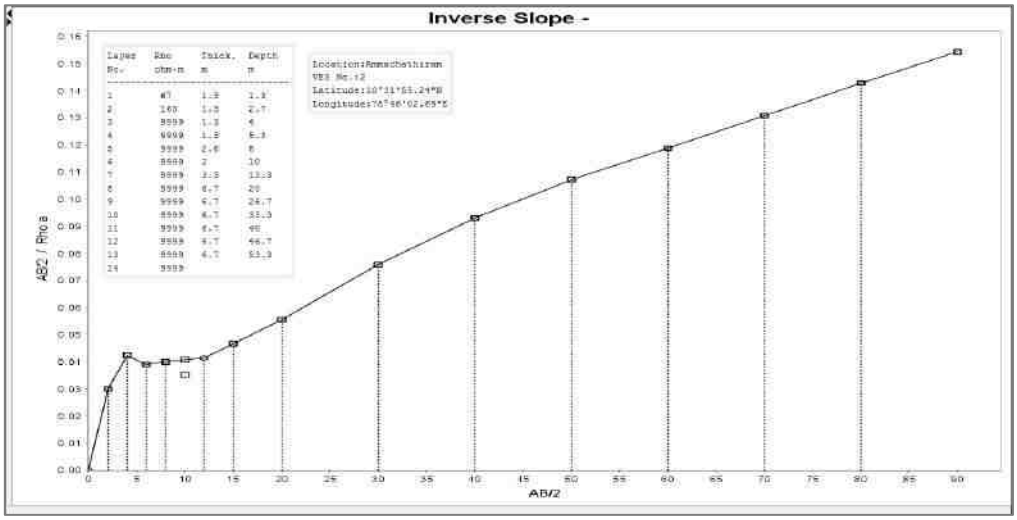
S.No	Ab/2	Mn/2	K	R	Rho
Station 1					
1	2	1	4.71	16.20	76.30
2	4	1	23.55	5.85	138.00
3	6	1	54.95	2.92	160.45
4	8	1	98.91	1.91	189.91
5	10	1	155.45	1.41	217.63
6	10	5	23.55	10.21	240.21
7	15	5	62.80	4.30	270.04
8	20	5	117.75	2.55	300.26
9	30	5	274.75	1.22	335.20
10	40	5	494.55	0.73	365.97
11	50	5	777.15	0.51	396.35
12	60	5	1122.55	0.40	437.79
13	70	5	1530.75	0.31	474.53
14	80	5	2001.75	0.24	522.46
15	90	5	2535.55	0.22	557.82
16	100	5	3132.15	0.19	595.11
Station 2					
1	2	1	4.71	14.14	66.69
2	4	1	23.55	4.02	94.67
3	6	1	54.95	2.81	153.86
4	8	1	98.91	2.02	199.80
5	10	1	155.45	1.58	245.61
6	10	5	23.55	12.04	284.01
7	15	5	62.80	5.12	321.54

S.No	Ab/2	Mn/2	K	R	Rho
8	20	5	117.75	3.06	360.32
9	30	5	274.75	1.44	395.64
10	40	5	494.55	0.86	430.26
11	50	5	777.15	0.60	466.29
12	60	5	1122.55	0.46	505.15
13	70	5	1530.75	0.35	535.76
14	80	5	2001.75	0.27	560.49
15	90	5	2535.55	0.22	583.18
16	100	5	3132.15	0.20	626.43
Station 3					
1	2	1	4.71	14.60	68.77
2	4	1	23.55	4.98	117.28
3	6	1	54.95	3.01	165.95
4	8	1	98.91	2.11	207.71
5	10	1	155.45	1.48	230.07
6	10	5	23.55	11.20	263.76
7	15	5	62.80	4.61	288.88
8	20	5	117.75	2.70	317.93
9	30	5	274.75	1.26	346.19
10	40	5	494.55	0.75	375.86
11	50	5	777.15	0.53	411.89
12	60	5	1122.55	0.41	449.02
13	70	5	1530.75	0.32	489.84
14	80	5	2001.75	0.28	520.46
15	90	5	2535.55	0.22	557.82
16	100	5	3132.15	0.18	563.79

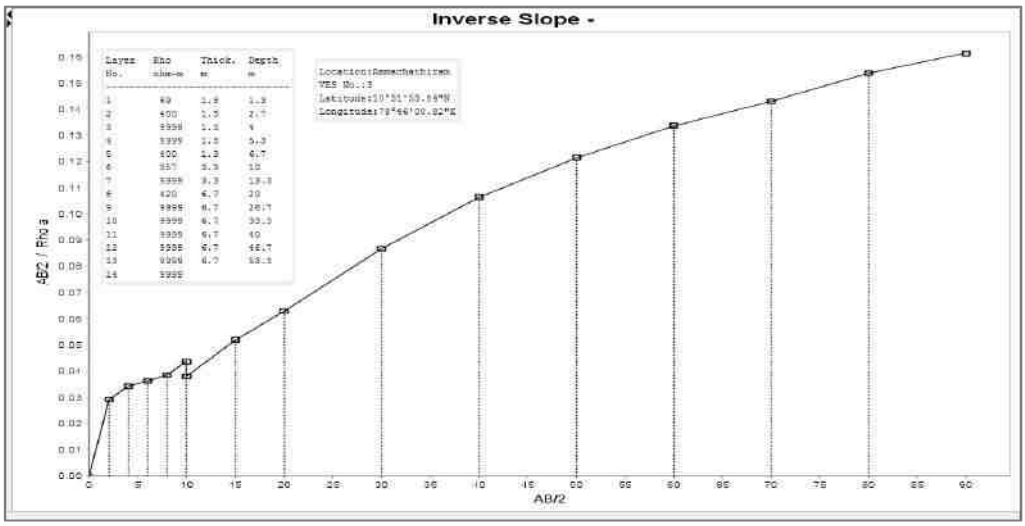
Source: Field Data



STATION 1



STATION 2



STATION 3

FIGURE 3.15: VES SOUNDING INVERSE CURVE

3.9.6.4 Geophysical Data Interpretation

From the interpreted data, it has inferred that the area has moderate groundwater potential in the investigated area. This small quarrying operation is above ground level and topography is hilly and will not have any significant impact on the Ground Water. The geophysical data's was obtained to study the lateral variations, vertical in homogeneities in the sub-surface with respect to the availability of groundwater.

3.9.7 Water requirement

Total water requirement in the rough stone mine for the total proposed project is estimated to be 7.9 KLD. Water will be supplied from mostly rainwater accumulated in mine pit (when available) for dust suppression and plantation and by tanker from nearby villages. Drinking water will be supplied from nearby villages.

3.9.8 Baseline Status

The existing status of groundwater and surface water quality were assessed by identifying 8 ground water (Bore wells/dug wells) samples and 4 surface water samples. The physico-chemical characteristics of ground are given in the **Tables 3.19** respectively**.** Detailed Baseline report is attached as **Annexure VII.**

TABLE-3.18: DETAILS OF WATER SAMPLING LOCATIONS

S. No.	Location Code	Location	Distance & Direction	Co- ordinates
			w.r.t Project Site	
SURFACE WATER				
1.	SW-1	Perunjunai Lake	0.75 km, W	10°25'24.97"N 78°45'39.30"E
2.	SW-2	Thiruvengainathar tank	0.79 km SE	10°24'59.78"N 78°46'24.10"E
3.	SW-3	Mullai nagar lake	1.79 km NE	10°25'57.84"N 78°47'19.66"E
4.	SW-4	Sellukudi lake	1.73 km S	10°24'24.86"N 78°46'1.54"E
GROUND WATER				
1.	BW-1	Pannapatti village	0.68 km N	10°25'57.06"N 78°46'11.43"E
2.	BW-2	Mullai nagar	1.42 km NE	10°25'47.11"N to 78°47'0.67"E
3.	BW-3	Vellanur Ration shop	4.37 km NE	10°27'16.90"N to 78°47'45.60"E
4.	BW-4	Jesus Chruch perunjunai	1.30 km SW	10°25'8.45"N to 78°45'32.65"E
5.	BW-5	Palani temple Mettupatti	3.71 km SW	10°24'10.26"N to 78°44'36.10"E
6.	BW-6	Little Angles Nursery school	4.57 km SE	10°23'54.37"N to 78°48'12.52"E
7.	BW-7	Mathiyanallur village	4.13 km NW	10°26'59.29"N to 78°44'39.39"E
8.	BW-8	Sellukudi village	3.50 km S	10°23'21.94"N to 78°46'20.66"E

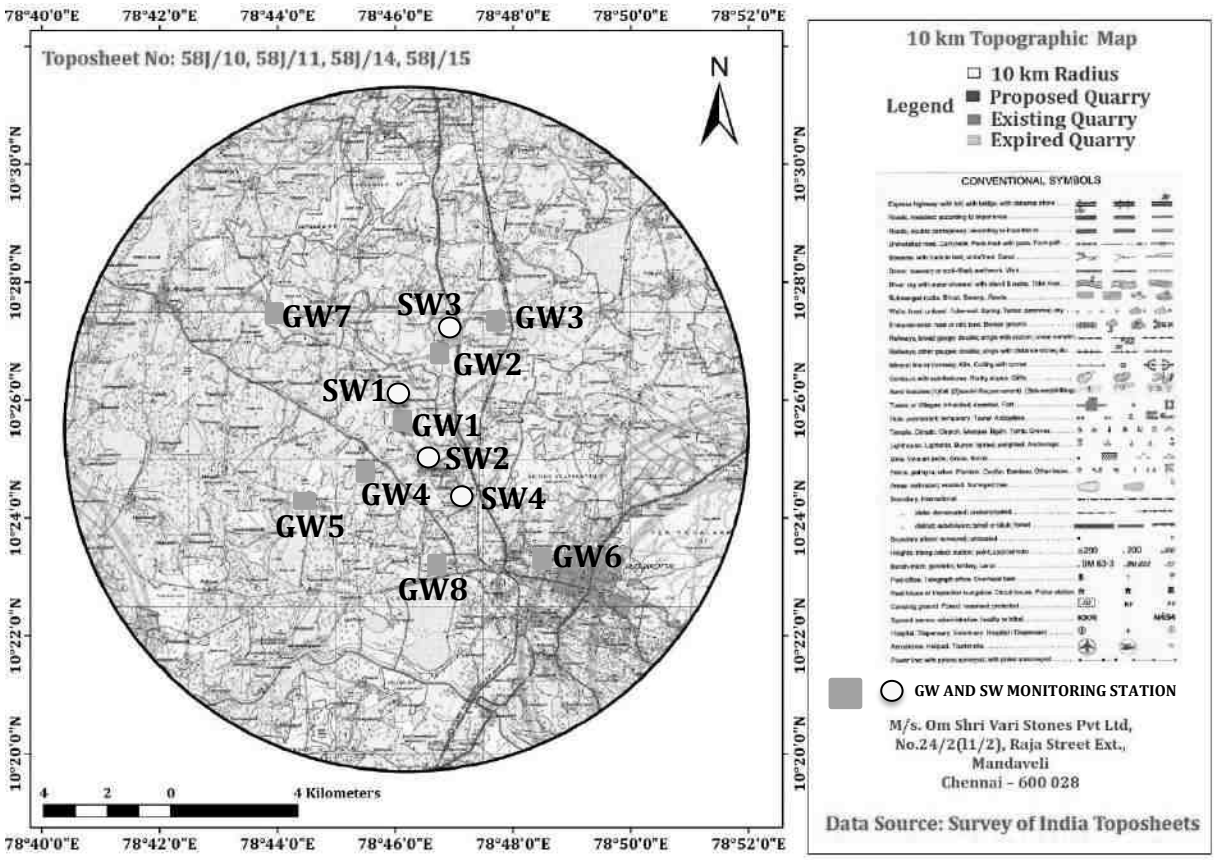


FIGURE 3.16: WATER MONITORING LOCATIONS

TABLE 3.19(a): PHYSICO-CHEMICAL CHARACTERISTICS OF SURFACE WATER

Date of Sampling	20.02.2022	**Sampling Method**	STP/WATER-01
Analysis Start Date	25.02.2022	**Sample Quantity**	2.0+ 0.5 Litre
Analysis End Date	28.02.2022	**Packing Condition**	Sealed
Sampling Done By	ETS lab staff	**Packed IN**	PVC and Glass Bottle

S. No.	Test Parameter	Unit	SW1 Perunjunai lake	SW2 Thiruvengainathar tank	SW3 Mullai nagar lake	SW4 Sellukudi lake	Specification/Limit (As per IS:10500: 2012)		Test Method
							Desirable	Permissible	
1	Colour	Hazen	5	10	10	10	5	15	APHA 2120-B
2	Odour	...	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	APHA 2150-B
3	pH	...	7.66	7.36	7.16	7.25	6.5 - 8.5	No Relaxation	APHA 4500-H+
4	Conductivity	µs/cm	683	858	852	855	Not Specified	Not Specified	APHA 2510-B
5	Turbidity	NTU	455	14.0	14.0	14.0	1	5	APHA 2130-B
6	Total Dissolved Solids,(TDS)	mg/L	236.0	528	533	530	500	2000	APHA 2540-C
7	Total Hardness, ($CaCO_3$)	mg/L	37.9	192.5	175.8	180	200	600	APHA 2340-C
8	Calcium, (Ca)	mg/L	31.3	23	22	23	75	200	APHA 3500:(Ca)-B
9	Magnesium (Mg)	mg/L	148	29.6	24.6	22.8	30	100	APHA 3500:(Mg)-B
10	Total Alkalinity (CaCO3)	mg/L	65.6	263	242	232	200	600	APHA 2320-B
11	Chloride, (Cl)	mg/L	23	91	93	95	250	1000	APHA 4500:(Cl-)-B
12	Sulphate, (SO_4)	mg/L	0.19	20	17	14	200	400	APHA 4500:(SO_4)-E

S. No.	Test Parameter	Unit	SW1 Perunjunai lake	SW2 Thiruvengainathar tank	SW3 Mullai nagar lake	SW4 Sellukudi lake	Specification/Limit (As per IS:10500: 2012)		Test Method
							Desirable	Permissible	
13	Iron,(Fe)	mg/L	<0.02	0.13	0.13	0.19	0.3	No Relaxation	APHA-3120B
14	Chlorine (Residual)	mg/L	0.28	<0.02	<0.02	<0.02	0.2	1	APHA 4500:(Cl)-B
15	Fluoride, (F)	mg/L	15.5	0.18	0.13	0.17	1	1.5	APHA 4500:(F-)-D
16	Nitrate, (NO_3)	mg/L	<0.1	23	22	23	45	No Relaxation	APHA 4500:(NO_3-)-B
17	Copper, (Cu)	mg/L	<0.01	<0.1	<0.1	<0.1	0.05	1.5	APHA 3120B
18	Manganese, (Mn)	mg/L	<0.001	<0.01	<0.01	<0.01	0.1	0.3	APHA-3120B
19	Mercury, (Hg)	ug/L	<0.001	<0.001	<0.001	<0.001	0.001	No Relaxation	APHA-3114C
20	Cadmium, (Cd)	mg/L	<0.01	<0.001	<0.001	<0.001	0.003	No Relaxation	APHA 3120B
21	Selenium, (Se)	mg/L	<0.01	<0.01	<0.01	<0.01	0.01	No Relaxation	APHA-3120B
22	Aluminium, (Al)	mg/L	<0.001	<0.01	<0.01	<0.01	0.03	0.2	APHA-3120B
23	Lead,(Pb)	mg/L	<0.01	<0.001	<0.001	<0.001	0.01	No Relaxation	APHA-3120B
24	Zinc,(Zn)	mg/L	<0.01	<0.01	<0.01	<0.01	5	15	APHA-3120B
25	Total Chromium, (Cr)	mg/L	<0.01	<0.01	<0.01	<0.01	Not Specified	Not Specified	APHA-3120B
26	Boron,(B)	mg/L	<0.01	<0.01	<0.01	<0.01	0.5	1	APHA 4500: (B)-C
27	Mineral Oil	mg/L	<0.001	<0.001	<0.001	<0.01	0.5	No Relaxation	IS 3025 (Part-39)
28	Phenolic Compound, (C_6H_5OH)	mg/L	<0.001	<0.001	<0.001	<0.001	0.001	0.002	APHA 5530-C

S. No.	Test Parameter	Unit	SW1 Perunjunai lake	SW2 Thiruvengainathar tank	SW3 Mullai nagar lake	SW4 Sellukudi lake	Specification/Limit (As per IS:10500: 2012)		Test Method
							Desirable	Permissible	
29	Anionic Detergent (MBAS)	mg/L	<0.01	<0.01	<0.01	<0.01	0.2	1	APHA 5540-C
30	Cyanide, (CN)*	mg/L	<0.05	<0.05	<0.05	<0.05	0.05	No Relaxation	APHA 4500: (CN-)-D
31	Biological Oxygen	mg/L	9.2	6.8	6.4	6.3	-	-	-
32	Chemical O_2	mg/L	13	31	28	30	-	-	-
33	Dissolved O_2	mg/L	5.2	4.8	4.3	4.5	-	-	-
34	Total Coliform	MPN/100mL	150	90	110	140	Shall Not Be Detectable		IS 1622
35	Escherichia coli	MPN/100mL	80	80	80	110	Shall Not Be Detectable		IS 1622
36	Barium, (Ba)	mg/L	<0.01	<0.01	<0.01	<0.01	0.7	No Relaxation	APHA 3120B
37	Ammonia (as Total NH_3-N)*	mg/L	0.86	2.6	2.5	2.6	0.5	No Relaxation	APHA 4500:(NH3)-C
38	Sulphide, (H_2S)	mg/L	<0.5	<0.5	<0.5	<0.5	0.05	No Relaxation	APHA 4500: (S_2-)-D
39	Molybdenum,(Mo)	mg/L	<0.01	<0.01	<0.01	<0.01	0.07	No Relaxation	APHA-3120B
40	Arsenic, (As)	mg/L	<0.01	<0.01	<0.01	<0.01	0.01	0.05	APHA 3120B
41	(TSS)	mg/L	16.2	18.3	17.6	16.8	Not Specified	Not Specified	APHA 2540-D

TABLE 3.19(b): PHYSICO-CHEMICAL CHARACTERISTICS OF GROUND WATER

S. No.	Test Parameter	Unit	GW1 Panampatti	GW2 Mullainagar	GW3 Vellanur Ration shop	GW4 Jesus church perunjunai	GW5 Palani temple Mettupatti	GW6 Little angle nursery school	GW7 Mathiyanallur village	GW8 Sellukudi village	Specification/Limit (As per IS:10500: 2012)		Test Method
											Desirable	Permissible	
1	Colour	Hazen	<5	<5	< 5	< 5	< 5	< 5	< 5	< 5	5	15	APHA 2120-B
2	Odour	…	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	APHA 2150-B
3	pH	…	7.83	7.36	6.46	7.56	7.23	7.55	7.39	6.46	6.5 - 8.5	No Relaxation	APHA 4500-H+
4	Conductivity	µs/cm	600	759	693	663	692	626	736	675	Not Specified	Not Specified	APHA 2510-B
5	Turbidity	NTU	<1	<1	<1	<1	<1	<1	<1	<1	1	5	APHA 2130-B
6	Total Dissolved Solids,(TDS)	mg/L	412	529	483	464	478	412	512	463	500	2000	APHA 2540-C
7	Total Hardness, ($CaCO_3$)	mg/L	136	190.0	192	185.5	186	136	196.0	185	200	600	APHA 2340-C
8	Calcium, (Ca)	mg/L	24.3	41.6	36.6	31.9	23	24.5	41.6	36.8	75	200	APHA 3500:(Ca)-B
9	Magnesium (Mg)	mg/L	19	23.4	21.4	21	18.5	17	23.7	21.6	30	100	APHA 3500:(Mg)-B
10	Total Alkalinity (CaCO3)	mg/L	171	159	133	148	188	176	196	135	200	600	APHA 2320-B
11	Chloride, (Cl)	mg/L	76	102.6	81.8	86	90.5	72	102.2	81.4	250	1000	APHA 4500:(Cl-)-B
12	Sulphate, (SO_4)	mg/L	17.5	34	23.1	24	27	17.6	37	23.6	200	400	APHA 4500:(SO_4)-E
13	Iron,(Fe)	mg/L	0.15	0.16	0.16	0.18	0.16	0.17	0.16	0.19	0.3	No Relaxation	APHA-3120B
14	Chlorine (Residual)	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	1	APHA 4500:(Cl)-B
15	Fluoride, (F)	mg/L	0.16	0.17	0.18	0.2623	0.26	0.19	0.19	0.14	1	1.5	APHA 4500:(F-)-D
16	Nitrate, (NO_3)	mg/L	18	26	16.6	19	13	15	23	15.6	45	No Relaxation	APHA 4500:(NO_3-)-B
17	Copper,	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.05	1.5	APHA 3120B

S. No.	Test Parameter	Unit	GW1 Panampatti	GW2 Mullai nagar	GW3 Vellanur Ration shop	GW4 Jesus church perunjunai	GW5 Palani temple Mettupatti	GW6 Little angle nursery school	GW7 Mathiyanallur village	GW8 Sellukudi village	Specification/Limit (As per IS:10500: 2012)		Test Method
											Desirable	Permissible	
	(Cu)												
18	Manganese, (Mn)	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.1	0.3	APHA-3120B
19	Mercury, (Hg)	ug/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	No Relaxation	APHA-3114C
20	Cadmium, (Cd)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.003	No Relaxation	APHA 3120B
21	Selenium, (Se)	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.01	No Relaxation	APHA-3120B
22	Aluminium, (Al)	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	0.2	APHA-3120B
23	Lead,(Pb)	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.01	No Relaxation	APHA-3120B
24	Zinc,(Zn)	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	5	15	APHA-3120B
25	Total Chromium, (Cr)	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	Not Specified	Not Specified	APHA-3120B
26	Boron,(B)	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.5	1	APHA 4500: (B)-C
27	Mineral Oil	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.5	No Relaxation	IS 3025 (Part-39)
28	Phenolic Compound, (C_6H_5OH)	mg/L	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	0.001	0.002	APHA 5530-C
29	Anionic Detergent (MBAS)	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.2	1	APHA 5540-C
30	Cyanide, (CN)*	mg/L	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	0.05	No Relaxation	APHA 4500: (CN-)-D
31	Total Coliform	MPN/100mL	<2	<2	<2	<2	<2	<2	<2	<2	-	-	-
32	Escherichia coli	MPN/100mL	<2	<2	<2	<2	<2	<2	<2	<2	-	-	-

S. No.	Test Parameter	Unit	GW1 Panampatti	GW2 Mullai nagar	GW3 Vellanur Ration shop	GW4 Jesus church perunjunai	GW5 Palani temple Mettupatti	GW6 Little angle nursery school	GW7 Mathiyanallur village	GW8 Sellukudi village	Specification/Limit (As per IS:10500: 2012)		Test Method
											Desirable	Permissible	
33	Barium, (Ba)	mg/L	<0.005	<0.005	<0.005	<0.005	<2	<0.005	<0.005	<0.005	-	-	-
34	Ammonia (as Total NH_3-N)*	mg/L	<0.05	<0.05	<0.05	<0.05	<0.005	<0.05	<0.05	<0.05	Shall Not Be Detectable		IS 1622
35	Sulphide, (H_2S)	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	Shall Not Be Detectable		IS 1622
36	Molybdenum,(Mo)	mg/L	<0.005	<0.005	<0.005	<0.005	<0.05	<0.005	<0.005	<0.005	0.7	No Relaxation	APHA 3120B
37	Arsenic, (As)	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.5	No Relaxation	APHA 4500:(NH3)-C
38	(TSS)	mg/L	<2.0	<2.0	<2.0	<0.005	<0.005	<2.0	<2.0	<2.0	0.05	No Relaxation	APHA 4500: (S_2-)-D

3.9.9 Result Discussion

3.9.9.1 Ground Water Quality

The physico-chemical characteristics of groundwater are presented in Table above and are compared with the standards. The pH of the water samples collected ranged from 6.46 to 7.83 and within the acceptable limit of 6.5 to 8.5. The total dissolved solids were found in the range of 412 to 529 mg/L in all samples. The total hardness varied between 136 to 196 mg/L for all samples collected at 8 locations.

In all samples, iron content is 0.15 to 0.19 mg/L, Nitrate in between 13 to 26 mg/l, fluoride varied between 0.16 to 0.19 mg/L, chloride <0.1 to ,0.1 mg/L, Sulphate 17.4 to 34 mg/L, alkalinity 133 to 196 mg/L, calcium 23 to 41.6 mg/L and magnesium in between 17 to 23.7 mg/L. The overall ground water quality was found to be good. The levels of heavy metals content were found to be within permissible limits.

3.9.9.2 Surface Water Quality

The physico-chemical characteristics of surface water are presented in Table above and are compared with the standards. The pH of the water samples collected was 7.16 and 7.66 and within the acceptable limit of 6.5 to 8.5. The total dissolved solids were found in the range of 263 and 533 mg/L in all samples. The total hardness was 39.9 and 192.5 mg/L for all samples collected at 4 locations.

In all samples, iron content was between <0.02 and 0.19 mg/L, Nitrate was between <0.1 and 23 mg/l, fluoride was 0.13 and 15.5 mg/L, chloride was <0.02 and 0.28 mg/L, Sulphate was 0.19 and 20 mg/L, alkalinity was 65.6 and 263 mg/L, calcium was 22 and 31.3 mg/L and magnesium was 22.8and 148 mg/L. The overall surface water quality was found to be good in most. The levels of heavy metals content were found to be within permissible limits.

3.10 BIOLOGICAL ENVIRONMENT

3.10.1 Introduction

Biological environment of any area constitutes all living beings of that area. It is an integral part of the environment. Biodiversity is often considered synonymous with species richness of the area. Identifying, measuring, and monitoring biodiversity is a complex exercise. The biodiversity assessment generally concerns with, conducting biodiversity inventories, inventories for assessing existing biodiversity. This provides the information on the biodiversity richness of the area under consideration. The selection of indicators differs for each biodiversity monitoring and is entirely based on the output required from such biodiversity inventory. Any change in the surrounding environment could cause loss of species or decrease in biodiversity of the area. Therefore, the present study is proposed to assess the impact of the rough stone mining project on biological environment of the project site and surrounding area within 10 km radius. Accordingly, mitigation measures are planned to sustain the biological diversity.

3.10.2 Ecological Impact Assessment

Ecological Impact Assessment is used to predict and evaluate the impacts of development activities on ecosystems and their components, thereby providing the information needed to ensure that ecological issues are given full and proper consideration in development planning. Environmental Impact Assessment (EIA) has emerged as a key to sustainable development by integrating social, economic and environmental issues. EIA has a major part to play as a component of EIA but also has other potential applications in environmental planning and management. Ecological Impact Assessment provides a comprehensive review of the EIA process and summarizes the ecological theories and

tools that can be used to understand, explain and evaluate the ecological consequences of development proposals.

Environmental Impact Assessments have become an integral part of development projects in India ever since 1994, to formulate policies and guidelines for environmentally sound economic development. Proper assessment of biological environment and compilation of its taxonomical data is essential for the impact predictions.

Consistent and regularly updated data on regional and local taxonomy and floristic and faunal diversity of the areas are almost non-existent in country as diverse as India. Instant information on biodiversity profiles of the area, where the proposed project is setting up, is an essential part of the baseline studies of EIA. In such a situation, good primary baseline biodiversity survey is a pre-requisite for the collection of reliable data. These contributions towards biodiversity surveys may sometimes recognized as the actual value additions in terms of new records or a new data base but are more often recognized in the validation and updating of the existing information base.

There is no National Parks, Eco sensitive areas, Wild life sanctuaries, Reserve Forest within the radius of 10km. An ecological survey of the study area was conducted particularly with reference to the listing of species and assessment of the existing baseline ecological (terrestrial) condition in the study area.

3.10.3 Objectives of the study

The ecological study of the area was conducted in order to understand the existing status of the flora and fauna to generate baseline information and evaluate the possible impacts on biological environment. The present study highlights the various issues pertaining to floristic diversity and faunal wealth in the surrounding area up to 10 km radius of the proposed project site.

3.10.4 Methodology Adopted & Objective

To achieve the above objective, a detailed study of the area was undertaken in 10 km radius from the proposed project area. The different methods adopted were as follows:

- Primary field surveys to establish primary baseline of the study area;
- Compilation of information available in published literatures and as obtained from Forest survey of India,Environmental Information Centre, Botanical Survey of India and Zoological Survey of India.
- The present report gives the review of published secondary data and the results of field sampling conductedand there are no forest blocks in study area. The detailed

ecological assessment of the study a rea has been carried out with the following objectives:

- Identification of flora and fauna within the study area;
- Preparation of checklist of species which also include endangered, endemic and protected (both floral andfaunal categories); and
- Evaluation of impact of proposed expansion on flora and fauna of the area.

The present study was carried out in given steps

- Field survey was conducted by visual encounter survey for flora present within the 10 km radius study areaof all the proposed mine site.
- After surveying the core and buffer areas, a detailed floral inventory has been compiled. List of all plantsof the study area was prepared and their habitats were recorded.
- Verification of Rare, Endangered and Threatened Flora species from IUCN Red Data Book.
- Plants and Animals communities were noted.

3.10.5 Site selection criteria

The core study area is located at Panampatti and Thiruvengaivasal Village, Illuppur Taluk, Pudukkottai District, Tamil Nadu. The buffer study area comprises of 10 km radius from all the proposed rough stone quarry area.

Selection of sampling locations was made with reference to topography, land use, vegetation pattern, etc. The observations were taken on natural vegetation, roadside plantation and non-forest area (agricultural field, in plain areas, village wasteland, etc.) for quantitative representation of different species.

A methodology of Sampling Flora and fauna studies were carried out to assess the list of terrestrial plant and animal species that occur in the core area and the buffer area up to 10 km radius from the project site. No damage was created to flora and fauna during the sampling.

3.10.6 Flora Methodology

To provide representative ecological status for the study area, the 10-km buffer zone has been divided into four quartiles for biodiversity sampling, i.e., NE (Quartile-1), NW (Quartile-2) SW (Quartile-3) and SE (Quartile-4). Each of the quartiles have been examined for representative flora on randomly sampled quadrats for trees (25x25-m), shrubs (10x10-m) and herbs (2x2-m) depending upon prevailing geographical conditions and bio-diversity aspects of study area.

3.10.7 Fauna Methodology

The assessment of fauna was done collecting the primary data from the project sites. The presence was also confirmed from the local inhabitants depending on the animal sightings and the frequency of their visits inthe project area. In addition, officials, local people were another source of information for studying the fauna of the area. Field activities were physical search, hollow inspection, covering rocks, location of nesting sites and habitat assessment etc. Taxonomical identification was done by the field guide book and wildlife envis data base (wiienvis.nic.in/Database/Schedule Species Database) and Zoological Survey of India (ZSI).

3.10.7.1 Survey and Monitoring of Mammals

Intensive survey was done by line transect method (Walking and in vehicle) for all major habitats forsurveying of mammals by direct and indirect evidence. Indirect methods such as scat (i.e. faecal matter,) and pug mark by establishing 10 × 100-m linear transects depending on the habitat (i.e., existing wildlife game routes/foresttrails used).
Direct observation technique was used for surveying large and medium sized mammals but this technique was perfectly suitable for surveying of diurnal mammals.

3.10.7.2 Survey and Monitoring of Birds

Birds are sampled by using point count methods, and opportunistic bird sightings. By this bird vocal sounds, the species were identified in consultation with village local people.
Point count: In this method, the observer will stand in a randomly chosen point and birds seen or heard in 50m radius will be recorded for 5-min, this observation will be repeated in another point at least 30m from the first point. We have enumerated 20 point – counts in each quartile, which constitute a total of 80 points-count (20 x 4) within 10 km radius area.

Opportunistic bird sightings: While traveling in study area, many bird species will be detected in survey time. Such species will be recorded by their appearance or by their call.

3.10.7.3 Survey and Monitoring of reptiles

Several survey techniques such as standard walk transect visual encounter survey methods were used to sampling reptiles in each and every habitat of the study area. Species identification was done by using standard field guides in consultation with village people expert. The butterfly was enumerated by 2 linear transects of 10 × 100 m, laid within each quartile at minimum interval of 1 km. Further, amphibians and fishes documented in existing literature and secondary information in consultation with local people and wildlife experts.

3.10.8 Flora in Core Zone

Taxonomically a total of 15 species belonging to 16 families have been recorded from the core mining lease area. It is very dry and exhibit plain topography. Based on habitat classification of the enumerated plants the majority of species were Tree (6), Shrubs (4), Herbs (3) and Climber (2). The result of core zone of flora studies shows that Fabaceae and Arecaceae are the main dominating species.

3.10.9 Flora in Buffer Zone

Similar type of environment also in buffer area but with more flora diversity compare than core zone areabecause nearby some agriculture land. The agriculture land was found to dominate mostly in North, and East directions. Majority of the flat landscape around project unit is occupied by agriculture fields. It contains a total of 52 species belonging to 39 families have been recorded from the buffer zone. Floral (52) varieties among them trees (24), shrubs (8) and herbs (13) and climbers (7) were identified. The resultof buffer zone of flora studies shows that Fabaceae and Lamiaceae, Moraceae are the main dominating species in the study area. There is no Rare, Endangered and Threatened Flora species in mining area and their surrounding area.

The Agricultural Crops produced in study area are as Maize *Zea mays,* Paddy *Oryza sativa,* Cholam *Sorghum controversum,* Cumbu *Pennisetum glaucum,* Ragi *Eleusine coracana,* Green Gram *Vigna radiata,* Black Gram *Vigna mungo,* Horse gram *Macrotyloma uniflorum* while In Small Portions Bengal Gram *Cicer arietinum* and Red gram *Cajanus cajan* while commercial crops are as Sugar Cane *Saccharum officinarum,* Cotton *Gossypium arboreum L.* Groundnut *Apios americana,* Gingelly *Sesamum indicum,* Castor *Ricinus communis L*

TABLE 3.20: FLORA IN CORE ZONE

S. No	*Scientific Name*	*Family*	Local Name
TREES			
1	*Vachellia nilotica*	Fabaceae	Karuvelam maram
2	*Cocos nucifera*	Arecaceae	Thennai maram
3	*Borassus flabellifer*	Arecaceae	Panai maram
4	*Azadirachta indica*	Meliaceae	Vembu
5	*Mangifera indica*	Anacardiaceae	Manga maram
6	*Morinda citrifolia*	Rubiaceae	Nuna maram
HERB			
7	*Leucas aspera*	Lamiaceae	Thumbai
8	*Tribulus terrestris*	Zygophyllales	Nerunji
9	*Cynodon dactylon*	Poaceae	Arugampul
SHRUB			
10	*Calotropis gigantea*	Apocynaceae	Erukku
11	*Mimosa pudica*	Mimosaceae	Thottalchinungi

12	*Senna auriculata*	Fabaceae	Avarai
13	*Abutilon indicum*	Malvaceae	Thuththi
CLIMBER			
14	*Cissus quadrangularis*	Vitaceae	Perandai
15	*Passiflora foetida*	Passifloraceae	Sirupunaikkali

TABLE 3.21: FLORA IN BUFFER ZONE

S.No	Scientific Name	Family	Local Name	Resource use type
TREE				
1.	*Tamarindus indica*	Legumes	Puliyamaram	EM
2.	*Azadirachta indica*	Meliaceae	Vembu	M
3.	*Cocos nucifera*	Arecaceae	Thennai maram	EM
4.	*Ficus religiosa*	Moraceae	Arasanmaram	M
5.	*Psidium guajava*	Myrtaceae	Koyya	EM
6.	*Emblica officinalis*	Phyllanthaceae	Nelli	EM
7.	*Borassus flabellifer*	Arecaceae	Panai maram	E
8.	*Ficus recemosa*	Moraceae.	Athi	EM
9.	*Musa*	Musaceae	Vazhaimaram	EM
10.	*Mangifera indica*	Anacardiaceae	Manga	E
11.	*Ficus benghalensis*	Moraceae	Alamaram	E
12.	*Bambusa bambo*	Poaceae	Moonghil	E
13.	*Carica papaya L*	Caricaceae	Pappali maram	EM
14.	*Lawsonia inermis*	Lythraceae	Marudaani	EM
15.	*Tectona grandis*	Verbenaceae	Thekku	E
16.	*Citrus lemon*	Rutaceae	Ezhumuchaipalam	EM
17.	*Eucalyptus globules*	Myrtaceae	Eucalyptus	EM
18.	*Morinda citrifolia*	Rubiaceae	Nuna maram	M
19.	*Sygygium cumini*	Myrtaceae	Navalmaram	EM
20.	*Manilkara zapota*	Sapotaceae	Sapota	E
21.	*Murraya koenigii*	Asclepiadaceae	Velipparuthi	EM
22.	*Vachellia nilotica*	Fabaceae	Karuvelam maram	M
23.	*Calophyllu inophyllum*	Calophyllaceae	Punnai	M
24.	*Annona reticulata*	Annonaceae	Seethapazham	E
HERB				
25.	*Boerhavia diffusa*	Nyctaginaceae	Mukurattai	M
26.	*Phyllanthus amarus*	Phyllanthaceae	Kilanelli	M
27.	*Acalypha indica*	Euphorbiaceae	Kuppaimeni	M
28.	*Cynodon dactylon*	Poaceae	Arugampul	E
29.	*Eclipta prostata*	Asteraceae	Karisilanganni	EM
30.	*Cyperus compressus*	Cyperaceae	Kunnakora	NE
31.	*Centella asiatica*	Apiaceae	Vallarai	EM
32.	*Cyperus rotundus*	Cyperaceae	Korai	NE

S.No	Scientific Name	Family	Local Name	Resource use type
33.	*Leucas aspera*	Lamiaceae	Thumbai	M
34.	*Achyranthes aspera*	Amaranthaceae	Nayuruv	M
35.	*Ocimum tenuiflorum*	Lamiaceae	Thulasi	M
36.	*Solanumnigrum*	Solanaceae	Manathakkali	EM
37.	*Tridax procumbens*	Asteraceae	Veetukaayapoondu	M
		SHRUB		
38.	*Abrus precatorius*	Fabaceae	Kundumani	M
39.	*Solanum torvum*	Solanaceae	Sundaika	EM
40.	*Ixora cinea*	Rubiaceae	Idlipoo	M
41.	*Senna auriculata*	Fabaceae	Avarai	M
42.	*Nerium indicum*	Apocynaceae	Arali	M
43.	*Hibiscu rosa-sinensis*	Malvaceae	Chemparuthi	EM
44.	*Mimosa pudica*	Mimosaceae	Thottalchinungi	M
45.	*Calotropis gigantea*	Apocynaceae	Erukku	M
		CLIMBER		
46.	*Jasminum augustifolium*	Oleaceae	Malli	EM
47.	*Cissus quadrangularis*	Vitaceae	Perandai	M
48.	*Lagenaria siceraria*	Cucurbitaceae	Sorakkai	EM
49.	*Coccinia grandis*	Cucurbitaceae	Kovai	M
50.	*Solanum trilobatum*	Solanaceae	Thuthuvelai	EM
51.	*Passiflora foetida*	Passifloraceae	Sirupunaikkali	M
52.	*Trichosanthes dioica*	Cucurbitaceae	Kovakkai	EM

*E- Economical, M- Medicinal, EM- Both Economical and Medicinal, NE- Not evaluated

3.10.10 FAUNA

The faunal survey has been carried out as per the methodology cited and listed out Mammals, birds, Reptiles, Amphibians and Butterflies. All the listed species were compared with Red Data Book and Indian WildlifeProtection Act, 1972. There are no rare, endangered, threatened (RET) and endemic species present in core area.

3.10.11 FAUNA IN CORE ZONE

A total of 22 varieties of species observed in the Core zone of Panampatti village, rough stone quarry. Among them numbers of Insects 8 (37.5%), Reptiles 3 (20.83%), Mammals 2 (12.5%)and Avian 6 (29.16%). A total of 22 species belonging to 19 families have been recorded from the core mining leasearea. None of these species are threatened or endemic in the study area and surroundings. There is no Schedule I species and six species are under schedule IV according to Indian wild life Act 1972. A total seven species of bird were sighted in the mining lease area.

Dominant species are mostly birds and insects and three amphibians were observed during the extensive field visit (Hoplobatrachus tigerinus), (Rana hexadactyla), (Bufo melonosticatus). There are no critically endangered, endangered, vulnerable and endemic species were observed. Details of fauna in core zone with the scientific name were mentioned in **Table 3.22**.

TABLE 3.22: LIST OF FAUNA IN CORE ZONE

S. No	*Scientific Name*	*Family Name*	*WPA Schedule*	*IUCN List*
INSECTS				
1	*Hamitermes silvestri*	Blattodea	NL	LC
2	*Danaus plexippus*	Nymphalidae	Schedule IV	LC
3	*Catopsilia pyranthe*	Peridae	NL	LC
4	*Acraea violae*	Nymphalidae	NL	LC
5	*Danaus genutia*	Nymphalidae	NL	NL
6	*Hieroglyphus sp*	Acrididae	NL	LC
7	*Mantis religiosa*	Mantidae	NL	NL
8	*Crausius morosus*	Lonchodidae	NL	LC
REPTILES				
10	*Calotes versicolor*	Agamidae	NL	LC
11	*Hemidactylus frenatus*	Gekkonidae	NL	LC
12	*Eutropis carinata*	Scincidae	NL	LC
MAMMALS				
14	*Rattus rattus*	Muridae	Schedule IV	LC
15	*Herpestes javanicus*	Herpestidae	Schedule II	LC
AVES				
17	*Corvussplendens*	Corvidae	NL	LC
18	*Meropsorientalis*	Meropidae	NL	LC
19	*Bubulcus ibis*	Ardeidae	NL	LC
20	*Acridotheres tristis*	Sturnidae	NL	LC
21	*Dicrurus macrocercus*	Dicruridae	Schedule IV	LC
22	*Coturnix coturnix*	Phasianidae	Schedule IV	LC

*NE- Not evaluated; LC- Least Concern, NT –Near Threatened, T-Threatened

3.10.10.1 FAUNA IN BUFFER ZONE

Taxonomically a total of 32 species belonging to 29 families have been recorded from the buffer zone area. Based on habitat classification the majority of species were Insects 12 (35%), followed by Reptiles4 (12.5%), Mammals 2 (7.5%) and Avian 14 (7.5%). There are one Schedule II species and twenty-two speciesare under schedule IV according to Indian wild life Act 1972. A total 12 species of bird were sighted in the study area. There are no critically endangered, endangered, vulnerable and endemic species were observed.

The result of core & Buffer zone of fauna studies shows that Nymphalidae and *Scincidae, Agamidae* are the main dominating species in the study area; it is mentioned in Table No.3.5. There is no schedule I Species in study area. There are no critically endangered, endangered, vulnerable and endemic species were observed. Details of faunal diversity in buffer zone are given in **Table 3.23**.

TABLE 3.23: FAUNA IN BUFFER ZONE

S.No	Scientific Name	Family Name	WPA Schedule	IUCN List
INSECTS				
1	*Apis cerana*	Apidae	Schedule IV	LC
2	*Camponotus Vicinus*	Formicidae	NL	NL
3	*Danaus plexippus*	Nymphalidae	Schedule IV	LC
4	*Danaus chrysippus*	Nymphalidae	Schedule IV	LC
5	*Ceratogomphus pictus*	Gomphidae	Schedule IV	
6	*Danaus genutia*	Nymphalidae	Schedule IV	LC
7	*Eurythyrea austriaca*	Buprestidae	Schedule IV	NA
8	*Tirumala limniace*	Nymphalidae	Schedule IV	LC
9	*Mantis religiosa*	Mantidae	NL	NL
10	*Danainae*	Nymphalidae	NL	LC
11	*Euploea core*	Nymphalidae	Schedule IV	LC
12	*Hieroglyphus sp*	Acrididae	NL	LC
REPTILES				
13	*Calotes versicolor*	Agamidae	NL	LC
14	*Eutropis carinata*	Scincidae	NL	LC
15	*Mabuya carinatus*	Scincidae	NL	LC
16	*Sitanaponticeriana*	Agamidae	NL	LC
MAMMALS				
17	*Funambulus palmarum*	Sciuridae	Schedule IV	LC
18	*Herpestes javanicus*	Herpestidae	Schedule II	LC
AVES				
19	*Fulica atra*	Rallidae	Schedule IV	LC
20	*Sphaerotheca breviceps*	Dicroglossidae	Schedule IV	LC
21	*Eudynamys*	Cucalidae	Schedule IV	LC
22	*Bubulcus ibis*	Ardeidae	NL	LC
23	*Acridotheres tristis*	Sturnidae	NL	LC
24	*Corvussplendens*	Corvidae	NL	LC
25	*Meropsorientalis*	Meropidae	NL	LC
26	*Pycnonotuscafer*	Pycnonotidae	Schedule IV	LC

S.No	Scientific Name	Family Name	WPA Schedule	IUCN List
27	*Coturnix coturnix*	Phasianidae	Schedule IV	LC
28	*Dicrurus macrocercus*	Dicruridae	Schedule IV	LC
29	*Psittacula krameri*	Psittaculidae	NL	LC
30	*Amaurornis phoenicurus*	Rallidae	NL	LC
31	*Dicrurus macrocercus*	Dicruridae	Schedule IV	LC
32	*Francolinus pondicerianus*	Phasianidae	Schedule IV	LC

*NL- Not listed, LC- Least concern, NT- Near threatened

3.10.11 Interpretation& Conclusion

There is no schedule I species of animals observed within study area as per Wildlife Protection Act 1972 aswell as no species is in vulnerable, endangered or threatened category as per IUCN. There is no endangered red list species found in the study area. Hence this small mining operation over short period of time will not have any significant impact on the surrounding flora and fauna.

3.11 SOCIO ECONOMIC ENVIRONMENT

A prosperous nation needs well-developed industries to provide the amenities of life to its citizens. Industrial development has had an important role in the socio -economic growth of countries. Rapid economic growth is often essential for achieving a reduction in absolute poverty. Industrialization is often essential for economic and social growth.

Poverty reduction the pattern of industrialization, however, impacts remarkably on how the poor benefit from growth. Pro-poor economic and industrial policies focus on increasing the economic returns to the productive factors that the poor possess, e.g. raising returns to unskilled labour, whereas policies promoting higher returns to capital and land tend to increase inequality, unless they also include changes in existing patterns of concentration of physical and human capital and of land ownership. Use of capital-intensive methods instead of labor-intensive ones tends to increase employment, labour regulation, social protection, health, education, etc.

Where the level of education is low and human capital concentrated. Income disparities, as does the employment of skill-based technologies, especially Also, the location of industrial facilities has an impact on overall poverty reduction and inequality. As enterprises are often concentrated in urban areas. The industrial revolutions led to the development of factories for large-scale production, with consequent changes in society like Growth and structure of employment, impact of Socio-economic reforms and globalization trade and employment, labour regulation, social protection, health, education, etc. In this manner all developmental projects have direct as well as indirect

relationship with socio-economic aspect, which also include public acceptability for new developmental projects. Thus the study of socio-economic component incorporating various facets related to prevailing social & cultural conditions and economic status of the project region is an important part of EIA study.

There is no habitation/ village within the radius of 1km from the cluster area. Socio-economic study is an essential part of environmental study. It includes demographic structure of the area, provision of basic amenities viz., housing, education, health and medical services, occupation, water supply, sanitation, communication, transportation, prevailing diseases pattern as well as feature like temples, historical monuments etc., at the baseline level. This will help in visualizing and predicting the possible impact depending upon the nature and magnitude of theproject.

It is expected that the Socio- Economic Status of the area will substantially improve because of this proposedproject. As the proposed project will provide direct and indirect employment and improve the infrastructural facilitiesin that area and, thus, improve their standard of living.

3.11.1 Objectives of the Study

The objectives of the socio-economic study are as follows:

- To examine, current status of developmental parameter in identified study area.
- To identify the direct and indirect impact on the social environment as a result of development project.
- To evaluate the nature and magnitude of these impacts.
- To provide probable mitigating measures on identified negative impacts due to proposed development activity on socio economic environment.

3.11.2 Scope of Work

To study the Socio-economic Environment of the area from the secondary sources;

- Data Collection & Analysis
- Prediction of project impact
- Mitigation Measures

3.12 ADMINISTRATIVE SETUP OF PUDUKOTTAI DISTRICT

An official Census 2011 detail of Pudukkottai, a district of Tamil Nadu has been released by Directorate of Census Operations in Tamil Nadu. Enumeration of key persons was also done by census officials in Pudukkottai District of Tamil Nadu.

According to the 2011 census places total population of this districts 16,18,345 females being numerically superior with 8,15,157 as against 8,03,188 males. The rural population is about 13,01,991 and the urban population is about 3,16,354. The total literate's number 11,10,545 with 6,08,776 males and 5,01,769 females.

3.13 STUDY AREA

The 10km radius village map is shown in **Figure 3.17.**

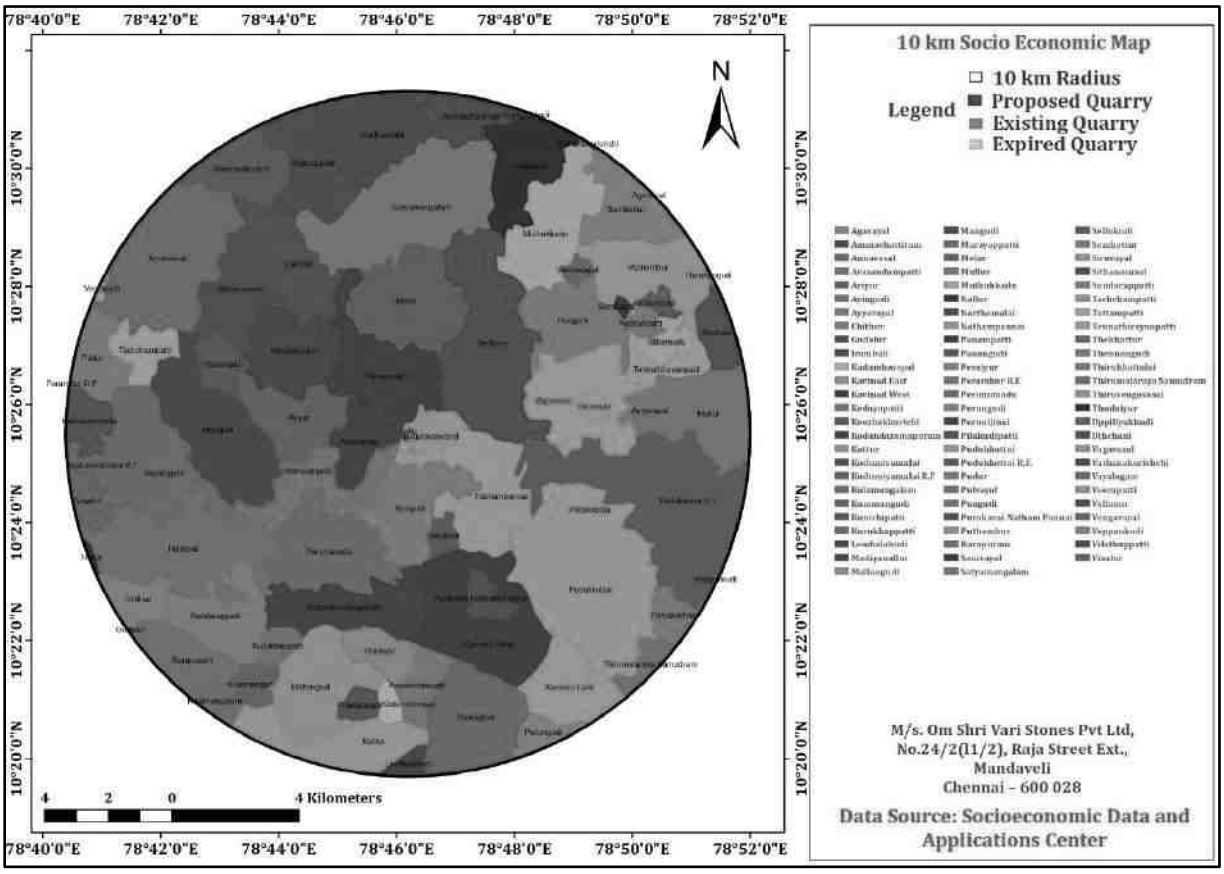


FIGURE 3.17: VILLAGE MAP OF THE STUDY AREA

3.13.1 Reconnaissance

EIA study for Rough Stone Quarry Cluster with total new proposed area of 9.67.5 (i.e. individual lease areas of 4.77.0 Ha, 4.90.5Ha), while cluster area is 15.59.5 Ha, located in Panampatti and Thiruvengaivasal VillageTehsil- Illuppur, District- Pudukkottai, Tamil Nadu, India. The 10km study area comprises of Padukkottai and Nagapattinam District. The talukas part of 10km study areas of Padukkottai district are as Kulathur, Iluppur, Pudukkottai, Thirumayam. Only Sirkali taluka is part of 10km study area of Nagapattinam District.

Objectives of Socio-Economic Assessment

- To examine, current status of developmental parameter in identified study area.
- To identify the direct and indirect impact on the social environment as a result of development project.
- To evaluate the nature and magnitude of these impacts.
- To provide probable mitigating measures on identified negative impacts due to proposed development activity on socio economic environment.

The details of information on demographic structure of the villages in the study area are presented in in **Table 3.24**.

TABLE 3.24: LIST OF VILLAGES IN THE STUDY AREA

SN No.	District	Tehsil	Villages
1.	Pudukkottai	Kulathur	Kolathur
2.			Narthamalai
3.			Uppiliyakkudi
4.			Ammachattiram
5.			Seemanur
6.			Vaithur
7.			Uchani
8.			Thennangudi
9.			Vathanakurichi
10.			Thudaiyur
11.			Melur
12.			Irumbali
13.			Muthukkadu
14.			Vellanur
15.			Vengavayal
16.		Iluppur	Vellanjar
17.			Rapoosal
18.			Keezhakkurichi
19.			Perungudipatti
20.			Tayinipatti
21.			Vilathuppatti
22.			Sithanavasal
23.			Veerapatti
24.			Tachchampatti
25.			Panangudi
26.			Madiyanallur

SN No.	District	Tehsil	Villages
27.			Panampatti
28.			Thiruvengavasal
29.			Perunijinai
30.			Ariyur
31.			Mangudi
32.			Vayalogam
33.			Kudumiyamalai
34.			Pulvayal
35.			Marayappatti
36.			Ayingudi
37.			Perumanadu
38.			Sundarappatti
39.			Kudumiyamalai R.F
40.			Annavasal (TP)
41.		Pudukkottai	Sembattur
42.			Sanivayal
43.			Kunichipatti
44.			Mullur
45.			Kedayapatti
46.			Tattampatti
47.			Tennathirayanpatti
48.			Vagavasal
49.			Ayyavayal
50.			Mullur
51.			Sellukudi
52.			Purakarai Natham Pannai
53.			Kavinad West
54.			Kavinad East
55.			Pudukkottai R.F.
56.			Pudukkottai (M)
57.			Nathampannai (CT)
58.		Thirumayam	Mallangudi
59.			Arasandampatti
60.			Thekkattur
61.			Peraiyur
62.	Nagapattinam	Sirkali	Pannangudy

Source*: Primary Census Abstract 2011, Pudukkottai and Nagapattinam District, State Tamil Nadu*

3.13.2 Baseline Status

Baseline information is collected after delineation of the baseline study area in order to study the socio-economic profile of the project affected area. The process related to baseline database analysis includes:

- Demographic Structure
- Infrastructure Base
- Economic Structure
- Health Status
- Cultural Attributes
- Salient Observation

3.13.3 Demographic Structure

The demographic structure of the study area was derived primarily from data of Census record of two district covering five tehsil and 78 villages. Summary of demographic structure is presented in **Table 3.25.** The demographic structures of each village in the study area as per Census 2011 are presented in **Table 3.26**.

TABLE 3.25: SUMMARY OF DEMOGRAPHIC STRUCTURE IN STUDY AREA

Demographic Parameters	Details
No. of States	1
No. of District	1
No. of Tehsil	6
No. of Villages	78
Total Area of surveyed village (Ha)	52799.16
Total no. of Households	67881
Total Population	281002
Density of Population (per km^2)	533
Sex Ratio (No. of female\ 1000 males)	1004
Child Population	30,558 (10.87%)
Scheduled Castes	51,234 (18.23%)
Scheduled Tribes	425 (0.15%)
Literacy Male Female	2,03,862 (72.55%) 1,10,203 (39.22%) 93,659 (33.33%)

Source: *Primary Census Abstract 2011, Pudukkottai District, State Tamil Nadu*

TABLE 3.26: DEMOGRAPHIC STRUCTURE OF VILLAGE IN THE STUDY AREA

SN	Villages	Area (ha.)	No. of Household	Total Population			0-6 Child Population			Scheduled Cast			Scheduled Tribes		
				Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
District: Pudukkottai Tehsil: Iluppur															
1.	Keezhakkurichi	1092.47	495	2107	1051	1056	235	111	124	246	131	115	1	1	0
2.	Vilathuppatti	1567.25	1165	4528	2209	2319	485	254	231	1021	516	505	0	0	0
3.	Sithanavasal	635.81	410	1935	964	971	261	138	123	644	311	333	0	0	0
4.	Veerapatti	1765.27	1432	6400	3100	3300	885	433	452	530	244	286	0	0	0
5.	Pudur	579.28	670	2937	1453	1484	377	195	182	503	254	249	0	0	0
6.	Tachchampatti	264.18	213	909	447	462	132	65	67	128	65	63	0	0	0
7.	Panangudi	208.51	569	2335	1178	1157	281	150	131	49	23	26	0	0	0
8.	Madiyanallur	664.76	353	1552	766	786	161	80	81	349	173	176	0	0	0
9.	Panampatti	796.74	516	2292	1167	1125	275	154	121	657	335	322	0	0	0
10.	Thiruvengavasal	294.69	142	615	314	301	68	34	34	86	44	42	0	0	0
11.	Perunijinai	354.29	223	919	448	471	110	61	49	416	194	222	0	0	0
12.	Ariyur	528.06	261	1194	645	549	97	53	44	294	148	146	3	0	3
13.	Mangudi	1026.11	453	1963	976	987	272	139	133	589	306	283	0	0	0
14.	Vayalogam	723.33	727	2809	1349	1460	324	158	166	821	409	412	0	0	0
15.	Kudumiyamalai	618.56	614	2643	1314	1329	272	119	153	337	170	167	0	0	0
16.	Visalur	347.96	180	697	334	363	87	46	41	377	177	200	1	1	0
17.	Pulvayal	1304.29	535	2216	1069	1147	273	141	132	1040	520	520	0	0	0
18.	Marayappatti	584.41	389	1757	891	866	198	119	79	743	402	341	0	0	0
19.	Ayingudi	719.64	600	2582	1328	1254	299	145	154	1143	593	550	0	0	0
20.	Perumanadu	807.67	574	2415	1202	1213	294	162	132	395	199	196	0	0	0
21.	Sundarappatti	643.41	301	1287	644	643	165	81	84	387	198	189	0	0	0

22.	Kurukkappatti	121.54	46	199	104	95	23	10	13	64	29	35	0	0	0
23.	Perambur R.F	605.8071	0	0	0	0	0	0	0	0	0	0	0	0	0
24.	Kudumiyamalai R.F	377.6446	0	0	0	0	0	0	0	0	0	0	0	0	0
25.	Kodandaramapuram	802.63	430	1863	936	927	253	130	123	0	0	0	0	0	0
26.	Annavasal (City)	1051	2050	8906	4429	4477	1143	557	586	2450	1218	1232	5	4	1
27.	Kudumiyamalai R.F	377.6446	75	294	154	140	28	11	17	147	79	68	0	0	0
Sub Total		**18862.96**	**13423**	**57354**	**28472**	**28882**	**6998**	**3546**	**3452**	**13416**	**6738**	**6678**	**10**	**6**	**4**
District: Pudukkottai Tehsil: Kulathur															
28.	Narthamalai	660.45	513	2189	1133	1056	260	150	110	679	348	331	0	0	0
29.	Ammachattiram	916	658	2786	1402	1384	303	164	139	418	203	215	0	0	0
30.	Uppiliyakkudi	816.97	553	2295	1161	1134	258	144	114	150	75	75	1	0	1
31.	Uchani	664.28	155	713	360	353	66	37	29	180	83	97	0	0	0
32.	Thennangudi	258.76	123	517	260	257	50	23	27	179	90	89	3	1	2
33.	Vathanakurichi	661.4	520	2310	1128	1182	286	133	153	547	267	280	0	0	0
34.	Thudaiyur	629.39	436	1859	949	910	215	110	105	566	288	278	0	0	0
35.	Sathyamangalam	1390.42	963	4051	2055	1996	430	226	204	1160	596	564	2	0	2
36.	Irumbali	532.99	283	1311	684	627	171	94	77	0	0	0	0	0	0
37.	Melur	855.7	602	2534	1230	1304	324	172	152	512	246	266	1	0	1
38	Vellanur	1438.82	1454	6014	3061	2953	691	340	351	1365	697	668	217	103	114
39.	Muthukkadu	821.39	780	3176	1606	1570	295	146	149	590	281	309	3	3	0
40.	Vengavayal	54.04	201	854	434	420	92	53	39	95	46	49	0	0	0
41.	Poongudi	665.01	403	1564	738	826	181	85	96	657	321	336	2	1	1
Sub Total		**10365.62**	**7644**	**32173**	**16201**	**15972**	**3622**	**1877**	**1745**	**7098**	**3541**	**3557**	**229**	**108**	**121**
District: Pudukkottai Tehsil: Pudukkottai															
42.	Agavayal	71.41	6	30	15	15	3	2	1	0	0	0	0	0	0

43.	Sembattur	849.02	640	2630	1290	1340	273	136	137	623	291	332	38	21	17
44.	Puthambur	1039.96	716	3032	1580	1452	371	188	183	937	477	460	1	1	0
45.	Sanivayal	27.63	39	180	86	94	23	14	9	148	71	77	0	0	0
46.	Kunichipatti	54.02	71	369	190	179	50	32	18	369	190	179	0	0	0
47.	Kedayapatti	78.55	100	405	205	200	41	20	21	214	111	103	0	0	0
48.	Tattampatti	137.4	58	281	147	134	28	14	14	0	0	0	0	0	0
49.	Tennathirayanpatti	84.6	136	541	259	282	60	33	27	86	40	46	0	0	0
50.	Vagavasal	793.58	686	3060	1550	1510	315	170	145	576	289	287	4	2	2
51.	Siruvayal	60.04	7	29	16	13	3	2	1	0	0	0	0	0	0
52.	Ayyavayal	35.94	17	77	38	39	13	5	8	0	0	0	0	0	0
53.	Mullur	2097.57	1274	5451	2720	2731	637	325	312	1212	599	613	0	0	0
54.	Sellukudi	109.63	111	470	239	231	54	23	31	232	118	114	0	0	0
55.	Purakarai Natham Pannai	145.59	130	559	272	287	64	36	28	433	210	223	0	0	0
56.	Kavinad West	1179.18	1014	4227	2106	2121	473	236	237	2131	1066	1065	29	12	17
57.	Kavinad East	758.01	707	2853	1417	1436	353	173	180	1129	547	582	0	0	0
58.	Thirumalaraya Samudram	402.56	799	3288	1600	1688	379	187	192	984	473	511	0	0	0
59.	Nathampannai (City)	350	2261	8915	4454	4461	978	518	460	1535	790	745	9	4	5
60.	Pudukkottai R.F.	2710.69653254	8	26	12	14	4	1	3	0	0	0	0	0	0
61.	Pudukkottai (City)	2183	28838	117630	58737	58893	11762	6028	5734	13964	7023	6941	73	41	32
62.	Agavayal	71.41	6	30	15	15	3	2	1	0	0	0	0	0	0
Sub Total		**10457.69**	**37618**	**154053**	**76933**	**77120**	**15884**	**8143**	**7741**	**24573**	**12295**	**12278**	**154**	**81**	**73**
District: Pudukkottai Tehsil: Thirumayam															
63.	Rarapuram	373.29	148	579	274	305	68	31	37	286	134	152	1	0	1
64.	Kummangudi	128.96	145	590	306	284	57	34	23	143	78	65	0	0	0

65.	Mallangudi	703.59	76	324	154	170	26	13	13	24	8	16	0	0	0
66.	Peraiyur	206.8	206	805	397	408	78	45	33	201	104	97	0	0	0
67.	Arasandampatti	287.76	106	466	226	240	46	18	28	134	64	70	0	0	0
68.	Kadambavayal	81.3	15	58	32	26	6	5	1	49	28	21	0	0	0
69.	Pilakudipatti	109.81	90	383	194	189	43	24	19	110	58	52	0	0	0
70.	Kottur	904.22	1097	4269	2134	2135	452	222	230	626	316	310	3	2	1
71.	Kulamangalam	1125.2	553	2305	1124	1181	217	103	114	633	311	322	8	1	7
72.	Lembalakudi	2112.3	1090	4539	2257	2282	518	268	250	678	335	343	15	8	7
73.	Thekkattur	2653.03	1932	7632	3845	3787	823	417	406	867	463	404	1	0	1
74.	Perungudi	2164.78	1503	6076	3014	3062	628	313	315	1617	796	821	4	2	2
76	Kummangudi	941.34	1080	4518	2213	2305	563	287	276	236	119	117	0	0	0
Sub Total		**11792.38**	**8041**	**32544**	**16170**	**16374**	**3525**	**1780**	**1745**	**5604**	**2814**	**2790**	**32**	**13**	**19**
District: Pudukkottai Tehsil: Ponnamaravathi															
77.	Chithur	255.39	144	641	325	316	71	33	38	77	40	37	0	0	0
District: Pudukkottai Tehsil: Alangudi															
78.	Veppankudi	1065.12	1011	4237	2090	2147	458	230	228	466	225	241	0	0	0
Total		**52799.16**	**67881**	**281002**	**140191**	**140811**	**30558**	**15609**	**14949**	**51234**	**25653**	**25581**	**425**	**208**	**217**

Source: *Primary Census Abstract 2011, Pudukkottai & Nagapattinam District, Tamil Nadu State*

3.13.4 Salient Features of Demographic Structure

In the study area, Pudukkottai city town is likely to have high Population density. The reason for this could be equipped facilities like education, health, sanitization, banking, and transportation

In the study area, Pudukkottai village is likely to have very low population density. The reason for this could be lack of facilities like education, health, sanitization, communication, transportation, and banking.

3.13.5 Infrastructure Resources

The infrastructure resources base of the eleven study areas with reference to education, medical facility, water supply, post and telegraph, transportation, communication facility, power supply, sanitation, road, bank etc. according to the Village Directory Census CD 2011 supply is given in **Table 3.27**.

TABLE 3.27: INFRASTRUCTURE RESOURCE BASE OF THE STUDY AREA

SN	Villages	Education	Medical	Water	Sanitation	Communication	Transportation	Road	Bank	Power	SHG
1.	Keezhakkurichi	GPPS(2),PPPS,GPS(4),PPS,GMS,GSS,GSSS	NA	TWT,TWU,HP,TW/B	ND	SPO,TP,PCO,MPC	GBS,PBS,A.MA	BTPR,GKR,WBM,AWR,F	NA	PSDU,PSAU,PSCU,PSAU	SHG
2.	Vilathuppatti	GPS(8),GMS	PHSC	TWT,TWU,UW,HP,TW/B,S,T/P/L	CD,OD,OKD	SPO,TP,PCO,MPC	GBS,PBS	BTPR,GKR,WBM,AWR,F	NA	PSDU,PSAU	SHG
3.	Sithanavasal	GPPS,GPS(2),GMS	NA	TWT,TWU,HP,TW/B,S,T/P/L	CD,OD,OKD	SPO,TP,MPC	NA	BTPR,GKR,WBM,AWR,F	NA	PSDU,PSAU	SHG
4.	Veerapatti	GPPS(10),PPPS,GPS(6),PPS,GMS(2),PMS,GSS,PSS	PHSC(3)	TWT,TWU,UW,HP,TW/B.T/P/L	CD,OD,OKD	SPO,TP,PCO,MPC	GBS,PBS,T,SH	BTPR,GKR,WBM,AWR,F	NA	PSDU,PSAU	SHG
5.	Pudur	GPPS(2)GPS(3),GMS	NA	TWT,TWU,HP,UW,TW/B	CD,OD,OKD	SPO,TP,PCO,MPC	GBS,PBS	BTPR,GKR,WBM,AWR,F	NA	PSDU,PSAU,PSCU,PSAU	SHG
6.	Tachchampatti	GPPS,GPS	NA	TWT,TWU,CW,UW,HP,TW/B,T/P/L	CD,OD	SPO,TP,PCO,MPC	GBS,PBS	BTPR,GKR,WBM,AWR,F	NA	PSDU,PSAU,PSCU,PSAU	SHG

SN	Villages	Education	Medical	Water	Sanitation	Communication	Transportation	Road	Bank	Power	SHG
7.	Panangudi	GPPS,GPS(2),GMS,GSS	NA	TWT,TWU,CW,UW,TW/B,T/P/L	CD,OD	SPO,TP,MPC	GBS,PBS,SH	BTPR,GKR,WBM,AWR,F	NA	PSDU,PSAU,PSCU,PSAU	SHG
8.	Madiyanallur	GPPS(3),GPS(3),GMS	NA	TWT	CD,OD,OKD	SPO,TP,MPC	GBS,PBS	BTPR,GKR,WBM,AWR,F	NA	PSDU,PSAU	SHG
9.	Panampatti	GPPS(3),GPS(3),GMS,GSS	NA	TWT,TWU,HP,TW/B,S,T/P/L	CD,OD,OKD	SPO,TP,MPC	GBS,PBS	BTPR,GKR,WBM,AWR,F	NA	PSDU,PSAU	SHG
10.	Thiruvengavasal	GPPS(8),GPS(8),GMS,GSS	NA	TWT,HP,TW/B,T/P/L	CD,OD,OKD	TP,PCO,MPC	GBS,PBS	BTPR,GKR,WBM,AWR,F	ACS	PSDU,PSAU,PSCU,PSAU	SHG
11.	Perunijinai	GPPS(1),GPS(1),PPS,GMS,GSS	NA	TWT,TWU,CW,UW,HP,TW/B,T/P/L	CD,OD	SPO,TP,MPC	GBS,PBS,SH	BTPR,GKR,WBM,AWR,F	NA	PSDU,PSAU,PSCU,PSAU	SHG
12.	Ariyur	GPPS(1),GPS(1),GMS,GSS,DC,EC,POLY	NA	TWT,TWU,CW,UW,HP,TW/B,S	CD,OD	TP,MPC	GBS,PBS,SH	BTPR,GKR,WBM,AWR,F	NA	PSDU,PSAU	SHG
13.	Mangudi	GPPS(1),GPS(2),GMS	PHSC	TWT,TWU,CW,UW,HP,TW/B,T/P/L	CD,OD	PO,TP,MPC	GBS,PBS	BTPR,GKR,WBM,AWR,F	NA	PSDU,PSAU,PSCU,PSAU	SHG
14.	Vayalogam	GPPS(2),GPS(3),GMS(3),GSS,GSSS	PHSC,M&CWC,VH	TWT,TWU,CW,UW,HP,TW/B,T/P/L	CD,OD	SPO,TP,MPC	GBS,PBS	BTPR,GKR,WBM,AWR,F	CB	PSDU,PSAU,PSCU,PSAU	SHG

SN	Villages	Education	Medical	Water	Sanitation	Communication	Transportation	Road	Bank	Power	SHG
15.	Kudumiyamalai	GPPS(3),GPS, GMS	VH	TWT,TWU,CW,UW,HP	CD,OD	SPO,TP,MPC	GBS,PBS,A/MA,V	BTPR,GKR, WBM,AWR, F	ACS	PSDU,PSAU,PSCU,PSAU	SHG
16.	Visalur	GPPS(2),GPS	NA	TWT,TWU,CW,UW,HP	CD,OD,OKD	SPO,TP,MPC	GBS,PBS	BTPR,GKR, WBM,AWR, F	NA	PSDU,PSAU,PSCU,PSAU	SHG
17.	Pulvayal	GPPS(3),GPS(4),GMS	NA	TWT,TWU,CW,UW,HP	CD,OD,OKD	SPO,TP,MPC	GBS,PBS,V	BTPR,GKR, WBM,AWR, F	NA	PSDU,PSAU,PSCU,PSAU	SHG
18.	Marayappatti	GPPS(1),GPS(2)	NA	TWT,TWU,CW,UW,HP	CD,OD,OKD	SPO,TP,MPC	GBS,PBS	BTPR,GKR, WBM,AWR, F	ACS	PSDU,PSAU,PSCU,PSAU	SHG
19.	Ayingudi	GPPS(3),GPS(3)	NA	TWT,TWU,CW,UW,HP	CD,OD,OKD	SPO,TP,MPC	GBS,PBS	BTPR,GKR, WBM,AWR, F	NA	PSDU,PSAU,PSCU,PSAU	SHG
20.	Perumanadu	GPPS(2),GPS(2),PPS(2),GMS,)GSS,DC	PHSC,VH	TWT,TWU,CW,UW,HP	CD,OD,OKD	SPO,TP,MPC	GBS,PBS,V	BTPR,GKR, WBM,AWR, F	ACS	PSDU,PSAU,PSCU,PSAU	SHG
21.	Sundarappatti	GPPS(1),GPS, PPS	NA	TWT,TWU,CW,UW,HP	CD,OD	SPO,TP,MPC	GBS,PBS	BTPR,GKR, WBM,AWR, F	NA	PSDU,PSAU,PSCU,PSAU	SHG
22.	Kurukkappatti	NA	NA	TWT,TWU,CW,UW,HP	CD,OD	SPO,TP,MPC	GBS,PBS	BTPR,GKR, WBM,AWR, F	ACS	PSDU,PSAU,PSCU,PSAU	SHG
23.	Kodandaramapuram	GPPS(3),GPS(4),GMS	NA	TWT,TWU,CW,UW,HP,TW/B,T/P/L	CD,OD	SPO,TP,MPC	GBS,PBS	BTPR,GKR, WBM,AWR, F	NA	PSDU,PSAU,PSCU,PSAU	SHG
24.	Perambur R.F	NA	NA	NA	ND	NA	NA	NA	NA	NA	NA

SN	Villages	Education	Medical	Water	Sanitation	Communication	Transportation	Road	Bank	Power	SHG
25.	Kudumiyamalai R.F	NA	NA	TWT	CD,OD,OKD	TP,MPC	T	GKR,F	NA	PSDU	NA
26.	Kadambavayal	NA	NA	NA	CD,OD	SPO,TP,MPC	GBS,PBS	BTPR,GKR,WBM,AWR,F	NA	PSDU,PSAU,PSCU,PSAU	SHG
27.	Narthamalai	GPPS(1),GPS(1),GMS,PMS,GSS,PSS,PSSS	PHSC,VH	TWT,TWU,CW,UW,HP,TW/B	CD,OD	SPO,TP,MPC	GBS,PBS	BTPR,GKR,WBM,AWR,F	CB,COB,ACS	PSDU,PSAU,PSCU,PSAU	SHG
28.	Ammachattiram	GPPS,GPS(4),GMS,PMS,POLY	NA	TWT,TWU,CW,UW,HP,TW/B	CD,OD	SPO,TP,MPC	GBS,PBS,NH	BTPR,GKR,WBM,AWR,F	NA	PSDU,PSAU,PSCU,PSAU	SHG
29.	Uppiliyakkudi	GPPS(4),GPS(4),GMS,GSS	PHC,PHSC,M&CWC,TBC,VH,FWC	TWT,TWU,CW,UW,HP,TW/B	CD,OD	SPO,TP,MPC	GBS,PBS	BTPR,GKR,WBM,AWR,F	NA	PSDU,PSAU,PSAU	SHG
30.	Uchani	GPPS,GPS	NA	TWT,TWU,CW,UW,HP,TW/B	CD,OD	SPO,TP,MPC	GBS,PBS	BTPR,GKR,WBM,AWR,F	NA	PSDU,PSAU,PSAU	SHG
31.	Thennangudi	GPPS,GPS	NA	TWT,TWU,CW,UW,HP,TW/B	CD,OD,OKD	SPO,TP,PCO,MPC	GBS,PBS	BTPR,GKR,WBM,AWR,F	NA	PSDU,PSAU,PSCU,PSAU	SHG
32.	Vathanakurichi	GPPS(2),GPS,PPS,GMS,PMS,PSS	PHSC,PHSC,M&CWC,,TBC,D,VH,FWC	TWT,TWU,CW,UW,HP,TW/B	CD,OD,OKD	SPO,TP,PCO,MPC	GBS,PBS	BTPR,GKR,WBM,AWR,F	NA	PSDU,PSAU,PSAU	SHG

SN	Villages	Education	Medical	Water	Sanitation	Communication	Transportation	Road	Bank	Power	SHG
33.	Thudaiyur	GPPS,GPS,PPS	NA	TWT,TWU,CW,UW,HP,TW/B	CD,OD,OKD	SPO,TP,MPC	GBS,PBS	BTPR,GKR,WBM,AWR,F	COB	PSDU,PSAU,PSCU,PSAU	SHG
34.	Sathyamangalam	GPPS(4),GPS(3),GMS,GSS,EC,POLY	PHSC	TWT,TWU,CW,UW,HP,TW/B,T/P/L	CD,OD,OKD	SPO,TP,PCO,MPC	GBS,PBS,A/MA,T,V,NH	BTPR,GKR,WBM,AWR,F	CB,COB,ACS,ATM	PSDU,PSAU,PSCU,PSAU	SHG
35.	Irumbali	GPPS,GPS(2)	NA	TWT,TWU,CW,UW,HP,TW/B,T/P/L	CD,OD	SPO,TP,MPC	GBS,PBS	GKR,F	NA	PSDU,PSAU,PSCU,PSAU	SHG
36.	Melur	GPPS,GPS,PPS,GMS,PMS,GSS	PHSC	TWT,TWU,CW,UW,HP,TW/B	CD,OD	SPO,TP,MPC	GBS,PBS,NH	GKR,WBM,AWR,F	NA	PSDU,PSAU,PSCU,PSAU	SHG
37.	Vellanur	GPPS(7),GPS(7),PPS,GMS,PMS,GSS,PSS,	PHSC(3)	TWT,TWU,CW,UW,HP,TW/B,T/P/L	CD,OD,OKD	SPO,TP,MPC	GBS,PBS,NH	BTPR,GKR,WBM,AWR,F	COB,ACS	PSDU,PSAU,PSCU,PSAU	SHG
38.	Muthukkadu	GPPS(3),GPS(4),PPS,GMS,PMS,GSS,PSS,GSSS,PSSS	PHSC,PHSC,M&CWC,,TBC,D,VH,FWC	TWT,TWU,CW,UW,HP,TW/B	CD,OD	SPO,TP,MPC	GBS,PBS	BTPR,GKR,WBM,AWR,F	NA	PSDU,PSAU,PSCU,PSAU	SHG
39.	Vengavayal	GPPS(2),GPS,PPS,GMS,GSS,GSSS	NA	TWT,TWU,CW,UW,HP,TW/B	CD,OD	SPO,TP,MPC	GBS,PBS	WBM,AWR,F	NA	PSDU,PSAU,PSCU,PSAU	SHG

SN	Villages	Education	Medical	Water	Sanitation	Communication	Transportation	Road	Bank	Power	SHG
40.	Poongudi	GPPS,GPS,GMS,	NA	TWT,TWU,CW,UW,HP,TW/B	CD,OD,OKD	SPO,TP,MPC	GBS,PBS,T,V	BTPR,GKR,WBM,AWR,F	NA	PSDU,PSAU,PSCU,PSAU	SHG
41.	Agavayal	NA	NA	TWT,TWU,CW,UW,HP,TW/B	ND	TP,MPC	GBS,PBS	BTPR,GKR,WBM,AWR,F	NA	PSDU,PSAU,PSCU,PSAU	NA
42.	Sembattur	GPPS(4),GPS(2),PPS,GMS(2),PMS,GSS	PHSC,M&CWC	TWT,TWU,CW,UW,HP,TW/B	CD,OD	SPO,TP,PCO,MPC	GBS,PBS	BTPR,GKR,WBM,AWR,F	ACS	PSDU,PSAU,PSCU,PSAU	SHG
43.	Puthambur	GPPS(3),PPPS,GPS(4),PPS,GMS,GSS	PHSC,VH	TWT,TWU,CW,UW,HP,TW/B,T/P/L	CD,OD,OKD	SPO,TP,PCO,MPC	GBS,PBS	BTPR,GKR,WBM,AWR,F	ACS	PSDU,PSAU,PSCU,PSAU	SHG
44.	Sanivayal	GPPS(3)	NA	TWT,TWU,CW,UW,HP,TW/B,T/P/L	CD,OD	SPO,TP,MPC	NA	GKR,WBM,AWR,F	NA	PSDU,PSAU,PSCU,PSAU	NA
45.	Kunichipatti	GPPS	NA	TWT,TWU,CW,UW,HP,TW/B	CD,OD	SPO,TP,PCO,MPC	GBS,PBS	BTPR,GKR,WBM,AWR,F	NA	PSDU,PSAU,PSCU,PSAU	SHG
46.	Kedayapatti	GPPS,GPS,GMS	NA	TWT,TWU,CW,UW,HP,TW/B	CD,OD	SPO,TP,MPC	NA	BTPR,GKR,WBM,AWR,F	NA	PSDU,PSAU	SHG

SN	Villages	Education	Medical	Water	Sanitation	Communication	Transportation	Road	Bank	Power	SHG
47.	Tattampatti	NA	NA	TWT,TWU,CW	CD,OD	TP,MPC	NA	BTPR,GKR,WBM,AWR,F	NA	PSDU,PSAU	SHG
48.	Tennathirayanpatti	GPPS,GPS	NA	TWT,TWU,CW,UW,HP,TW/B,T/P/L	CD,OD	SPO,TP,PCO,MPC	GBS,PBS	BTPR,GKR,WBM,AWR,F	NA	PSDU,PSAU,PSCU,PSAU	SHG
49.	Vagavasal	GPPS,GPS,GMS	PHSC	TWT,TWU,CW,UW,HP,TW/B,T/P/L	CD,OD,OKD	TP,MPC	NA	BTPR,GKR,WBM,AWR,F	NA	PSDU	SHG
50.	Siruvayal	NA	NA	TWT,TWU,CW,UW,HP,TW/B,T/P/L	CD,OD	SPO,TP,MPC	NA	GKR,F	NA	PSDU,PSAU,PSCU,PSAU	NA
51.	Ayyavayal	NA	NA	TWT,TW/B	ND	TP,MPC	GBS,PBS	GKR,AWR,F	NA	PSDU,PSAU,PSCU,PSAU	NA
52.	Mullur	GPPS(4),GPS(4),PPS,GMS(2),PMS,GSS	PHSC(3)M&CWC	TWT,TWU,CW,UW,HP,TW/B,T/P/L	CD,OD,OKD	SPO,TP,MPC	GBS	BTPR,GKR,WBM,AWR,F	NA	PSDU,PSAU,PSCU,PSAU	SHG
53.	Sellukudi	GPPS	NA	TWT,TWU,CW,UW,HP,TW/B,T/P/L	CD,OD	MPC	PBS	BTPR,GKR,WBM,AWR,F	NA	PSDU,PSAU	SHG
54.	Purakarai Natham Pannai	GPPS,GPS	NA	TWT,TWU,CW,UW,HP,TW/B,T/P/L	CD,OD,OKD	SPO,TP,PCO,MPC	GBS,PBS	BTPR,GKR,WBM,AWR,F	NA	PSDU,PSAU	SHG

SN	Villages	Education	Medical	Water	Sanitation	Communication	Transportation	Road	Bank	Power	SHG
55.	Kavinad West	GPPS,PPPS,GPS(2),GMS	PHSC	TWT,TWU,CW,UW,HP,TW/B,T/P/L	CD,OD,OKD	SPO,TP,PCO,MPC	GBS,PBS,RS,A/MAT,V,SH	BTPR,GKR,WBM,AWR,F	NA	PSDU,PSAU	SHG
56.	Kavinad East	GPPS(3),GPS(2),PPS,GMS	NA	TWT,TWU,CW,UW,HP,TW/B	CD,OD,OKD	SPO,TP,PCO,MPC	GBS,PBS	BTPR,GKR,WBM,AWR,F	NA	PSDU,PSAU,PSCU,PSAU	NA
57.	Thirumalaraya Samudram	GPPS(2),GPS,PPS,GMS	PHSC	TWT,TWU,CW,UW,HP,TW/B,T/P/L	CD,OD,OKD	SPO,TP,PCO,MPC	GBS,PBSV,SH	BTPR,GKR,WBM,AWR,F	ACS	PSDU,PSAU	SHG
58.	Pudukkottai R.F.	NA	NA	NA	ND	NA	NA	GKR,F	NA	NA	NA
59.	Rarapuram	GPPS,GPS	NA	TWT,TWU,CW,UW,HP,TW/B	CD,OD	SPO,TP,MPC	NA	BTPR,GKR,WBM,AWR,F	NA	PSDU,PSAU,PSCU,PSAU	SHG
60.	Kummangudi	GPPS,GPS(6),GMS	NA	TWT,TWU,CW,UW,HP,TW/B	CD,OD	SPO,TP,MPC	GBS,PBS	BTPR,GKR,WBM,AWR,F	NA	PSDU,PSAU	SHG
61.	Mallangudi	GPPS,GPS	NA	TWT,TWU,CW,UW,HP,TW/B	CD,OD	SPO,TP,MPC	GBS,PBS	BTPR,GKR,WBM,AWR,F	NA	PSDU,PSAU,PSCU,PSAU	SHG
62.	Peraiyur	GPPS(2),GPS(2),GMS	NA	TWT,TWU,CW,UW,HP,TW/B,T/P/L	CD,OD	SPO,TP,MPC	NA	BTPR,GKR,WBM,AWR,F	NA	PSDU,PSAU,PSCU,PSAU	SHG

SN	Villages	Education	Medical	Water	Sanitation	Communication	Transportation	Road	Bank	Power	SHG
63.	Arasandampatti	GPPS,GPS(2)	NA	TWT,TWU,CW,UW,HP,TW/B	CD,OD	SPO,TP,MPC	GBS,PBS	BTPR,GKR,WBM,AWR,F	NA	PSDU,PSAU,PSCU,PSAU	SHG
64.	Kadambavayal	NA	NA	CW	ND	TP,MPC	GBS,PBS	GKR,WBM,AWR,F	NA	PSDU,PSAU,PSCU,PSAU	SHG
65.	Pilakudipatti	GPPS,GPS,GMS	NA	TWT,TWU,CW,UW,HP,TW/B,T/P/L	CD,OD,OKD	SPO,TP,MPC	GBS,PBS	BTPR,GKR,WBM,AWR,F	NA	PSDU,PSAU,PSCU,PSAU	SHG
66.	Kottur	GPPS(4),GPS(5),PMS,PSS,PSS,	PHSC,PHSC,M&CWC,,TBC,D,VH,FWC	TWT,TWU,CW,UW,HP,TW/B	CD,OD,OKD	SPO,TP,PCO,MPC	GBS,PBS,A.MA,T,V	BTPR,GKR,WBM,AWR,F	CB,COB,ACS,ATM	PSDU,PSAU,PSCU,PSAU	SHG
67.	Kulamangalam	GPPS(2),GPS(3)	NA	TWT,TWU,CW,UW,HP,TW/B,T/P/L	CD,OD,OKD	SPO,TP,MPC	GBS,PBS	BTPR,GKR,WBM,AWR,F	NA	PSDU,PSAU,PSCU,PSAU	SHG
68.	Lembalakudi	GPPS(5),GPS(5),PPS,GMS,PMS,GSS	PHSC	TWT,TWU,CW,UW,HP,TW/B,T/P/L	CD,OD,OKD	SPO,TP,MPC	GBS,PBS,NH	BTPR,GKR,WBM,AWR,F	NA	PSDU,PSAU,PSCU,PSAU	SHG
69.	Perungudi	GPPS(8),PPPS,GPS(4),PPS,GMS(3),GSS	PHSC	TWT,TWU,CW,UW,HP,TW/B,T/P/L	CD,OD,OKD	SPO,TP,PCO,MPC	GBS,PBS	BTPR,GKR,WBM,AWR,F	ACS	PSDU,PSAU,PSCU,PSAU	SHG

SN	Villages	Education	Medical	Water	Sanitation	Communication	Transportation	Road	Bank	Power	SHG
70.	Thekkattur	GPPS(7),PPPS(2)GPS(7),PPS,GMS(3),PMS,GSS,PSS,PSSS,DC	PHSC(3)	TWT,TWU,CW,UW,HP,TW/B,T/P/L	CD,OD,OKD	SPO,TP,MPC	GBS,PBS	BTPR,GKR,WBM,AWR,F	NA	PSDU,PSAU,PSCU,PSAU	SHG
71.	Agavayal	GPPS	NA	TWT	CD,OD	SPO,TP,PCO,MPC	GBS,PBS	BTPR,GKR,WBM,AWR,F	NA	PSDU,PSAU,PSCU,PSAU	SHG
72.	Kummangudi	GPPS(7),GPS(6),PPS,GMS	PHSC	TWT,TWU,CW,UW,HP,TW/B	CD,OD,OKD	SPO,TP,MPC	GBS,PBS	BTPR,GKR,WBM,AWR,F	NA	PSDU,PSAU,PSCU,PSAU	NA
73.	Agavayal	GPPS,GPS(2)	NA	TWT,TWU,CW,UW,HP,TW/B,T/P/L	CD,OD	SPO,TP,PCO,MPC	GBS,PBS,T,V	BTPR,GKR,WBM,AWR,F	CB,COB,ACS	PSDU,PSAU,PSCU,PSAU	SHG
74.	Chithur	GPPS,GPS	NA	TWT,TWU,CW,UW,HP,TW/B	CD,OD	SPO,TP,MPC	GBS,PBS	BTPR,GKR,WBM,AWR,F	NA	PSDU,PSAU,PSCU,PSAU	SHG
75.	Veppankudi	GPPS(3),GPS(5),PPS,GMS,GSS,GSSS	PHSC	TWT,TWU,CW,UW,HP,TW/B	CD,OD,OKD	SPO,TP,PCO,MPC	PBS	BTPR,GKR,WBM,AWR,F	CB	PSDU,PSAU,PSCU,PSAU	SHG
76	Annavasal	GPS(3),PPS(2),GMS,PMS(7),GSS,PSS,GSSS,PSSS	D,FWC,M&CWC,TBC,VH	TT,OHT	OD,CD	DNA	DNA	BTPR,GKR	NB(2),ACS	PSDU,PSIU,PSCU,PSAU	NA

SN	Villages	Education	Medical	Water	Sanitation	Communication	Transportation	Road	Bank	Power	SHG
77.	Nathampannai	GPS(6),GMS(2),GSS(2)	VH	TT,OHT	OD,CD	DNA	DNA	BTPR,GKR	NB,CB,COB,ACS	PSDU,PSIU,PSCU,PSAU	NA
78.	Pudukkottai	GPS(15),PPS(22),GMS(9),PMS(7),GSS(3),PSS(5),GSSS(2),PSSS(3),DC(2),POLY	D,FWC,M&CWC,TBC,VH,MHC	TT,OHT	OD,CD	DNA	DNA	BTPR,GKR	NB(5),CB(4),COB(3),ACS	PSDU,PSIU,PSCU,PSAU	NA

Abbreviations:

EDUCATION	MEDICAL FACILITY	WATER	TRANSPORTATION	SANITATION	COMMUNICATION
AC: Anganwadi Center	AH: Allopathic Hospital	TWT: Tap Water Treated	GBS: Govt. Bus Service PBS: Private Bus Service	OD: Open Drainage	PO: Post Office
GPS: Govt. Primary School	PHC: Primary Health Centre	TWU; Tap Water Untreated	A/MA: Auto/Modified Autos	OPDC: Open Pucca Drainage Covered	SPO: Sub Post Office
PPS: Private Primary School	PHSC: Primary Health Sub Centre	CW; Covered Well	V:Van CPR: Cycle-pulled Rickshaws	OPDU: Open Pucca Drainage Uncovered	P&TO: Post &Telegraph office
GMS: Govt. Middle School	M&CWC: Maternity And Child Welfare Centre	UW: Uncovered Well	T:Taxi Trc: Tractor	ND: No Drainage	TP: Telephone
PMS: Private Middle School	FWC: Family Welfare Centre	HP; Hand Pump	SH: State Highway	OKD: Open Kuccha Drainage	PCO: Public Call Office
		SR: Service Reservoir	NH: National Highway	PL: Public Latrine	DNA: Data Not Available

EDUCATION	**MEDICAL FACILITY**	**WATER**	**TRANSPORTATION**	**SANITATION**	**COMMUNICATION**
GSS: Govt. Secondary School	D: Dispensary	R/C: River/Canal	**ROAD**	**BANK**	**POWER**
GSS: Govt. Secondary School	VH: Veterinary Hospital	T/P/L: Tank/Pond/Lake	BTPR: Black Topped pakka Road	CB: Commercial Bank	PSDU: Power Supply for Domestic use
PEC: Private Engineering College	MHC: Mobile Health clinic		PR: Pakka Road	NB: Nationalize Bank	
GSSS: Govt. Senior Secondary School	NA: Not Applicable	TWB: Tube Wells/Borehole	GKR: Gravel (kuchha) Road	COB: Co Operative Bank	PSAU: Power Supply Agriculture use
PSSS: Private Senior Secondary School	**SHG: SELF HELP GROUP**	OHT: Over Head Tank	AWR: All Weather Road	ACS: Agriculture Credit Society	PSCU: Power Supply For Commercial Use
DC: Degree College			F:Foothpath	PCB: Private Commercial Bank	PSIU: Power Supply For Industrial Users

3.13.6 Socio-Economic Survey - Sampling Methodology

To assess and evaluate the likely impacts arising out of any developmental projects on socio-economic environment, it is necessary to gauge the apprehensions of the people in the project area. Socio-economic survey serves as an effective tool for fulfilling this requirement. Sarpanch, ward members, school teachers, medical practitioners, self-help group members and village youth and other respondents (adult's male-female) are involved for awareness and opinion, by using judgmental or purposive sampling methods representing different socioeconomic sections of the community. The respondents were asked for their awareness/opinion about the project, job opportunities, drinking water, road and drainage construction, education, health care, housing, transportation facility and economic status.

Data Collection Method

To assess and evaluate the likely impacts arising out of any developmental projects on socio-economic environment, it is necessary to gauge the apprehensions of the people in project area. For the process of data collection through primary and secondary sources certain methods are used as given below:

Field Survey and Observation

Field survey and observations is made at each sampling villages and the quality of life of that region is studied. Visits are made to hospitals, primary health centres to know the health status of the region. Various governmental organizations such as statistical department, department of census operations are visited to collect the population details of that region.

Interview Method

Structured interview method is used to collect data regarding the awareness and opinion of sample selected from various socio-economic sections of the community. Structured interviews involve the use of predetermined set of questions that includes fixed and alternative questions. The questionnaire mainly highlights the parameters such as income, employment and working conditions, housing, food, clothing, water supply, sanitation, health, energy, transportation, communication, education, environment and pollution to assess the quality of life of that particular region, general awareness and opinion of the respondents about the project. Interview method helps to collect error free and accurate information to the interviewer during the field survey. The respondents were asked for their awareness / opinion about the project and also the impacts of the project which is an important aspect of socio-economic environment, viz. job opportunities, education, health care, transportation facility and economic status.

Focus Group Discussion

A focus group discussion is a small, but demographically diverse group of people It is a form of qualitative research consisting of interviews in which a group of people are asked about their perceptions, opinions, beliefs, and attitudes towards an employment, income, transport, education, Medical facilities, Sanitation, housing, health, agriculture, pollution etc. Questions are asked in an interactive group setting where participants are free to talk with other group members. During this process, the researcher takes notes.

Through the focus group discussion of all these factors, the proposed project helps in evaluating socio-economic conditions in the study area.

The study was carried out with a participatory approach by involving the stakeholders, particularly the project beneficiaries and probable affected persons through a series of consultative process. The population groups consulted include beneficiary group of people shopkeepers, farmers, schoolteachers, gram panchayat sarpanch/members, village leaders, etc.

Observations on Infrastructure Resources:

The significant features of these important parameters for each study area are discussed as follows:

(a) **Education Facilities**: In the study area, education is available from Primary School to Degree collage. Higher education facilities including colleges and other diploma courses are available at Pudukkottai at 5 km respectively from the project site.

(b) **Medical Facilities**: There are Twenty-six (26) government healthcare facilities available within the study area. However; fifty two (52) villages in the study areas were lacking in medical facilities Table 3.23 is given in. Hospitals and other better medical facilities were available at Pudukkottai

(c) **Drinking Water**: The main water supply in the surveyed villages is through tap water, hand pump, well and tube well is the main sources of drinking water in the region.

(d) **Power Supply**: All villages are accessed with electricity supply.

(e) **Transportation**: For transportation purpose Government bus Auto and Taxi Service are available in the study area. Transportation facilities were not frequently available in the region. Private vehicles like Bicycles and Motor Cycles were mostly used by villagers for transportation purpose.

(f) **Communication Facilities**: For communication purpose mainly Sub Post Office, Telephone, Mobile phones and newspaper are available in most of the villages.

(g) **Agriculture**: Most of the respondents are engaged in labor work, agriculture, and livestock activities. Farming is the main occupation; a few respondents service in government sectors. Most of the respondents are labors and others are trying to migrate towards other city places.

(h) **Houses**: Most of the houses are pakka and Semi pakka with good construction in the study area.

(i) **Employment**: **:** main occupations of the people in the study area are agriculture and labor work. The labors were getting daily wage in the range of Rs. 500-600, depending on the type of work involved

(j) **Fuel**: The primary source of cooking fuel is LPG and wood. Kerosene is also been as per the requirement.

(k) **Main Crops**: The principal crops grown in agricultural farm are paddy, groundnut, sugarcane, maize, Coconut, banana, turmeric and onion.

(l) **Language**: The official language of Tamil Nadu is Tamil. The most widely spoken language within the study area is Tamil.

(m) **Migration**: During survey it was found that local population were migrating maximum towards the Pudukkottai city as a purpose of employment and some to other states.

(n) **Sanitation**: Systems of individual and combined septic tanks are in use at some places of this Study area. Toilet facility is one of the most basic facilities required in a house. Most of the households were having toilet facilities in their houses. There was no proper drainage line in the villages

(o) **Road Connectivity**: Most of the roads are tar and connects to the villages. Both tar and gravel roads were commonly seen in the villages.

(p) **Market Facility**: Study area was predominantly semi urban type. In villages, small shops were available for daily needs. Weekly market facility was available in some villages. Wholesale markets were available at town place. Salem is major hub for all type of facilities in the area.

(q) **Recreation**: Temples, Samajbhawan, Television and Radio are the main recreation facilities in the study area. Newspaper/Magazine is also used by the villagers.

3.13.7 Employment Pattern

Economic resource base of any region mainly depends upon its economically active group i.e. the working population involved in productive work. Work may be defined as participation in any economically productive activity. Such participation may be physical or mental in nature. Work not only involves actual work but also effective supervision and direction of work. It also includes unpaid work on farm or in family enterprise.

There are different types of workers that may be classified as - those persons who had worked for at least six months or 180 days are treated to be Main Workers, on the other hand if person categorized as worker has participated in any economic or productive activity for less than six months or 180 days during the last one year is treated as Marginal Worker. Non–workers are those who have not worked any time at all in the year preceding the enumeration.

The workers coming under the main and marginal workers category are those involved in activities such as cultivation, agriculture, livestock, forestry, fishing, hunting, plantations, orchards and allied activities, mining and quarrying, manufacturing, processing, servicing and repairs in household industry, construction, trade and commerce, transport, storage and communication and other services. **Table 3.28.**

Table 3.28: SUMMARY OF ECONOMIC ATTRIBUTES IN STUDY AREA

Demographic Parameters	Details
Total Worker	1,18,989 (42.34%)
Marginal Worker	19,321 (6.88%)
Non Worker	1,62,013(57.66%)
Main Worker	99,668 (35.47%)
Cultivators	16,583 (16.64%)
Agriculture	23,537 (23.62%)
Household	2,234 (2.24%)
Others	57,314 (57.50%)

Source: Source: Primary Census Abstract 2011, Pudukkottai District, State Tamil Nadu

3.13.8 Health Status

Diarrhea / Cholera, Malaria, Could, Cough; viral fever, eye disease, skin disease and Unhygienic are the general health problems which are attributed due to improper sanitation, mosquito nuisance and water logging. Malaria is one of the most frequently occurring diseases and also respiratory infection in the region.

3.13.9 Cultural and Aesthetic Environment

There is no, culturally, and aesthetically important of tourist places in the study area. Hence, there shall be no impact on places of interest.

3.13.10 Quality of Life

The average Quality of life for the study area is leading to satisfactory level due to satisfactory status like, educational facilities, also availability of basic needs viz., food, clothing & housing. Medical, Sanitation, and Bank facilities were not adequate in the study area; Improvement in these fields will help to increase quality of life of the study area.

3.13.11 Rehabilitation and Resettlement Plan (R & R Plan)

As there is no existing settlement on the proposed project area, there are no issues of resettlement or rehabilitation.

3.13.12 Socio Economic Environment

Critical analysis of socio economic profile of the area vis-à-vis its scenario with expansion

project activities indicate that the impacts of the project are expected to be of varying nature.

The following are the impacts predicted:

Positive Impact

1) Total manpower recruited will be P1-55 and P2-53) which included skilled and unskilled.

2) Due to the upcoming of the expansion project there will be ample opportunities for the local literate people to explore job opportunities based on the merits. Others can take the job of unskilled laborers and even few of them can explore business opportunities like traders, suppliers, canteen, grocery, tea stalls etc.

3) The proposed project site is at a Approximate distance of 1.20 km from Highway; hence for transportation of construction/raw material/processed goods the existing road infrastructure is adequate. The impact would be temporary

Negative Impact

1) There will be a slight dust build up during mineral transportation, which can cause health problems in nearby areas.

2) Noise will be produced at mine site during transportation of minerals.

3) The discharge of waste material/defecation from the project site can have some adverse impacts on public health in the surrounding area, if appropriate treatment procedure is not followed.

4) Impact during preparation of site, like Risk of occupational injuries.

Mitigation Measures

1) Regular sprinkling of water will be done at transport routes of mines.

2) Noise will be produced at mine site during transportation of minerals; Necessary steps will be taken as per the guidelines given by MoEF.

3) Vehicle and equipment used for mining will be maintained properly and will not be overloaded so as to keep vehicular emission in control.

4) Ambient air quality will be maintained at site and nearest human habitation.

5) Trucks and mining machinery will be kept in good condition and will not be run over capacity to avoid fugitive emission of noxious gases.

6) By using PPEs during process impacts on occupational health and safety shall be overcome.

7) Occupational health and Safety surveillance program will be carried out.

8) Continuous CSR activities shall be there by proponent such as construction of approach roads, various awareness programs

3.13.13 Recommendation and Suggestion

- Awareness program should be conducted to make the population aware to get

education and a betterlivelihood.

- Health care centre and ambulance facility can be provided to the population to get easy and accessiblemedical facilities.
- Vocational training programme can be organized to make the people self - employed, particularly forwomen and unemployed youth.
- On the basis of qualification and skills local youths may be employed.
- Long term and short-term employments can be generated.
- Maternity facility should be made available at the place to avoid going too far off places for treatment which involves risks. Apart from that as these areas are prone to various diseases a hospital with modern facilities should be opened on a priority basis in a central place to provide better health facilities to the villagers around the project.
- While developing an Action Plan, it is very important to identify the population who falls under the marginalized and vulnerable groups. So that special attention can be given to these groups with special provisions while making action plans.

3.13.4 CONCLUSION

The socio-economic study of surveyed villages gives a clear picture of its population, average household size, literacy rate and sex ratio etc. It is also found that a part of population is suffering from lack of permanent job to run their day-to-day life. Their expectation is to earn some income for their sustainability on a long-term basis. The proposed project will aim to provide preferential employment to the local people there by improving the employment opportunity in the area and in turn the social standards will improve. The nearby villages within 5kms radius have PHC, Anganwadi school, post office, telegram, Government and Private school, bus connectivity besides. To achieve the above objective, a detailed study of the area was undertaken in 10 km radius from the proposed project area.

CHAPTER 4: ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

4.1 INTRODUCTION

This chapter provides a brief overview of the potential impacts on various environmental components due to the Rough stone mining project which will be operated by mechanized method with controlled blasting. The opencast mining operations involve development of benches, approach roads, haul roads, excavation and loading and unloading, manual sorting and transportation of materials. If adequate control measures are not taken to prevent/mitigate the adverse environmental impacts, these operations may cause environmental degradation and ultimately lead to irreversible damage to the ecosystem. Various environmental impacts, which are identified due to mining project, are discussed in the following sections:

4.2 ENVIRONMENTAL IMPACT ASSESSMENT & MITIGATION MEASURES

Mining activities causes environmental problems such as degradation of land, deteriorating air, water and soil quality, affecting the biological and socio-economic environment of the area. The impacts of mining on various environmental parameters were assessed and are given below.

4.3 IMPACT ON AIR QUALITY

To assess the impact of the Rough stone mining, crushing and transportation operations from the Rough stone Mine, air quality modeling was carried out for the mining operations and the mineral transportation activities. The modeling was carried out using MoEF/CPCB approved Lakes AERMOD model. The incremental ground level concentration of PM_{10} due to mining and allied activities was predicted using the above-mentioned models and the resultant concentration of PM_{10} were compared with the National Air Quality Standards.

4.3.1 Ground Level Concentration Increment

4.3.1.1 Air Environment

Base line ambient air monitoring report reveals air pollutant concentrations of SPM, SO2 and NOx are well within the permissible limits as prescribed by National Ambient Air Quality Standards (NAAQS). The major air pollutant from the mining activity will be suspended particulate matter. SPM will be emitted during various stages of the mining activity like excavation, drilling, blasting, loading, Haulage, etc. The pollutants released into the atmosphere will disperse in the down wind direction and finally reach the ground at farther distance from the source. The concentration of ground level concentrations mainly depends upon the strength of the emission source and micrometeorology of the study area.

4.3.1.2 Meteorological data

The meteorological data for the monitoring date, i.e., 01/12/2021 to 28/02/2022 was considered for the study. Data included for the AERMET processing were daily wind speed, wind direction, temperature, relative humidity, station pressure, precipitation, solar radiation, and cloud cover recorded during the period. AERMET reformats raw meteorological data as to be availed as input for AERMOD model.

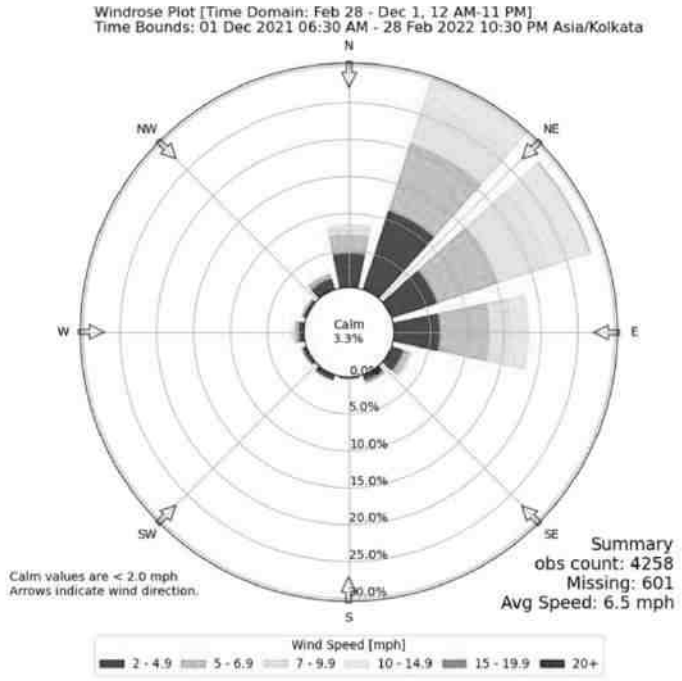


FIGURE 4.1: WINDROSE DIAGRAM OF THE PROJECT SITE DECEMBER 2021 TO FEBRUARY 2022

Site weather summary for DECEMBER 2021 TO FEBRUARY 2022	
Average Temperature (°C)	22.8
Predominant Wind direction from	NE
Relative Humidity (%)	72.4
Average Wind speed (m/h)	6.5

4.3.1 EMISSION CALCULATIONS FROM MINING AREA

Excavation by various activities in project area is construed as an area source which includes excavation pit(s) and activities happening in the excavation area like digging, dozing, hauling and loading/unloading. The dust emission from these areas will be fugitive in nature. The excavator operations, loading/unloading operations will also cause dust emission though it will be confined to the area of operation of the machinery. The gaseous emission from their operation shall be minimal and limited within the project. Transportation of excavated material from the project site to dumping sites are

categorized as line source. Since the dumper movement on haul road will be within the project area, no adverse impact shall be felt in the settlement area.

Dust Dispersion Modeling for Excavation Operation

In the present study, United States Environmental Protection Agency (USEPA–42 series) approved mathematical equations have been used to predict concentrations for different operations in project including the material transportation. To predict the particulate emissions, Envitrans AERMOD Cloud. (Air Dispersion Modeling Software) an interface based on ISCST3 – was used to predict changes in air quality i.e., maximum ground level concentration (GLC's) of Particulate Matter. Short term model options were opted for uniform emissions rates. The air modeling was restricted to determination of PM10, PM2.5, SO2 and NO2 in the present case. The emission factors adopted for various project operations are mentioned below:

Emission Factor for Excavation and Material Loading/unloading

For excavation and material handling the emission factor has been adopted as per USEPA – 42 series.

For Dozing Operation:

EFPM10 (kg/hr) = 0.34 X s1.5(%) / M1.4(%)

Where,

EFPM10 (kg/hr) = emission factor in kg/hr

S = silt contents in percentage by weight

M = moisture content in percentage by weight

For Material Loading/unloading:

EFPM10 (kg/hr) = 0.34 [0.119 / M0.9]

Where,

EFPM10 (kg/hr) = emission factor in kg/ton

M = moisture content in percentage by weight.

Emission Factor for Material Haulage within Project:

The emission rate is dependent on several factors which include soil properties, climatic conditions, vehicular traffic, wind forces and machinery operation. The Empirical equation for calculation of emission rate is as under.

E= k*(1.7) *(s/12) *(S/48) *(W/2.7)0.7*(W/2.7)0.7 (w/4)0.5 * (365-p/365) g/VKT

Where,

E=Emission Rate

K = Particle size multiplier

s=Silt Content of the Road surface material

S= Mean Vehicle Speed (km/hr)

W=Mean Vehicle Weight (tons)

w=Mean number of wheels

p= Number of days with at least 0.254mm of precipitation per year

The Isopleths developed are shown in **Figure 4.2 to 4.5** for PM10, PM2.5, SO2 and NO2 respectively. The maximum GLC due to excavation, loading & unloading activities for PM10, PM2.5, SO2 and NO2 was found to be 11.3 µg/m^3, 6.6 µg/m^3, 5.3 µg/m^3 and 5.8 µg/m^3 respectively and has been shown in Table 4.1

TABLE 4.1: MAXIMUM GROUND LEVEL CONCENTRATION

S.No.	Pollutants	Max. GLC observed, (µg/m3)	Distance and Direction
1	PM_{10}	11.3	1000 m, SW
2	$PM_{2.5}$	6.6	1000 m, SW
3	SO_2	5.3	1000 m, SW
4	NO_2	5.8	1000 m, SW

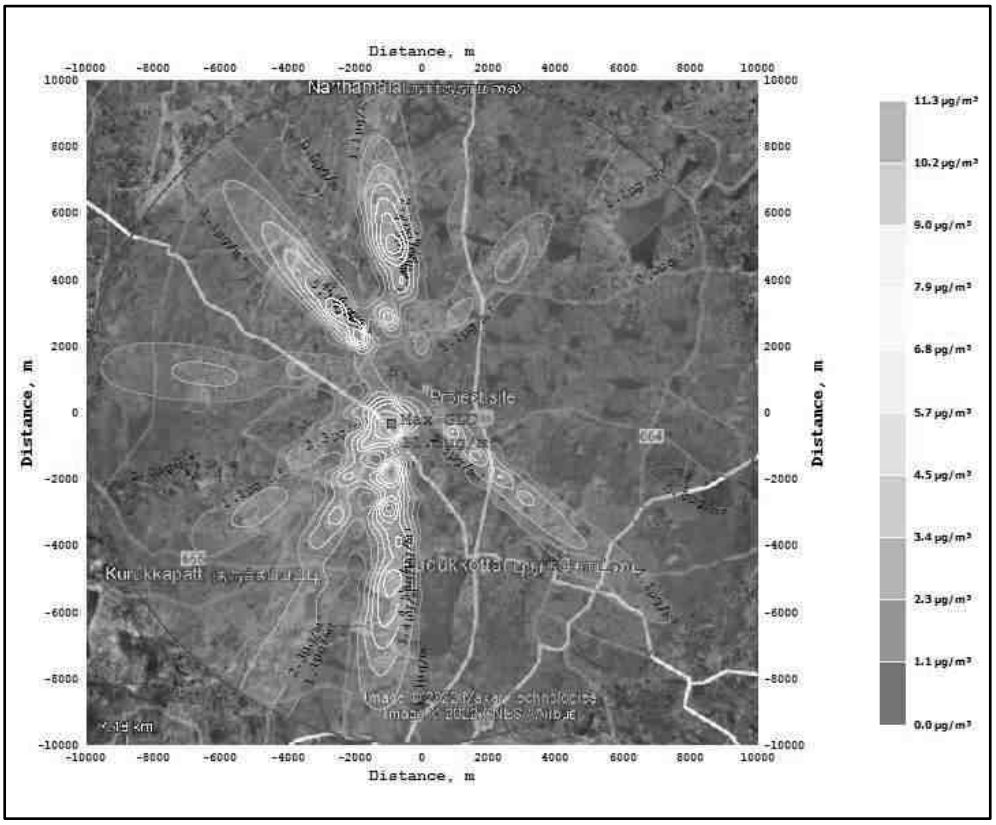


FIGURE 4.2: ISOPLETH OF MAXIMUM PREDICTED 24 HOURLY GROUND – LEVEL CONCENTRATIONS FOR PM10

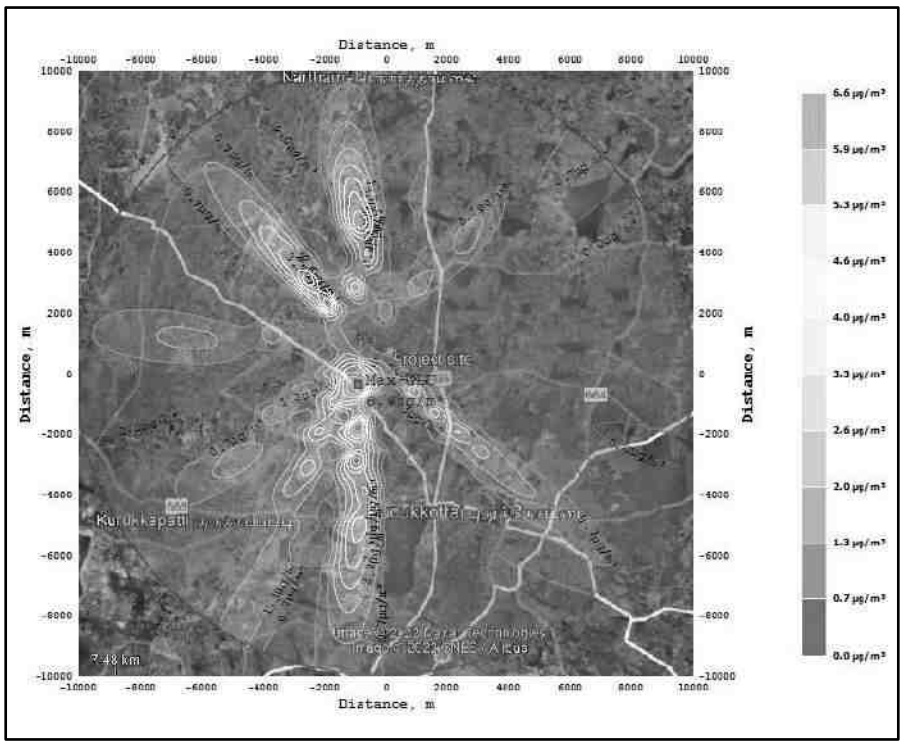


FIGURE 4.3: ISOPLETH OF MAXIMUM PREDICTED 24 HOURLY GROUND – LEVEL CONCENTRATIONS FOR PM 2.5

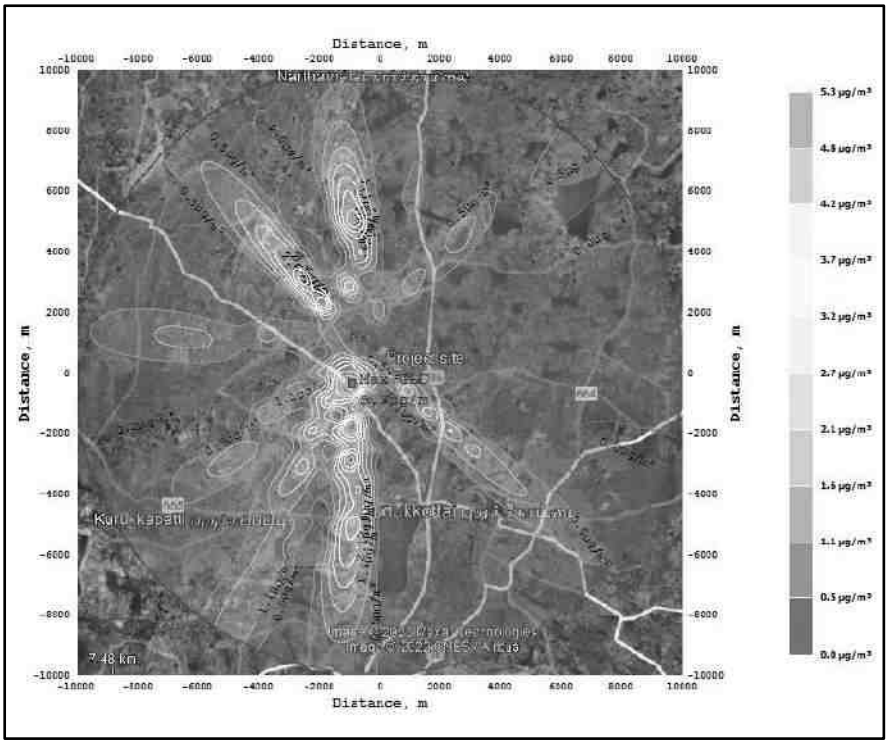


FIGURE 4.4: ISOPLETH OF MAXIMUM PREDICTED 24 HOURLY GROUND – LEVEL CONCENTRATIONS FOR SO2

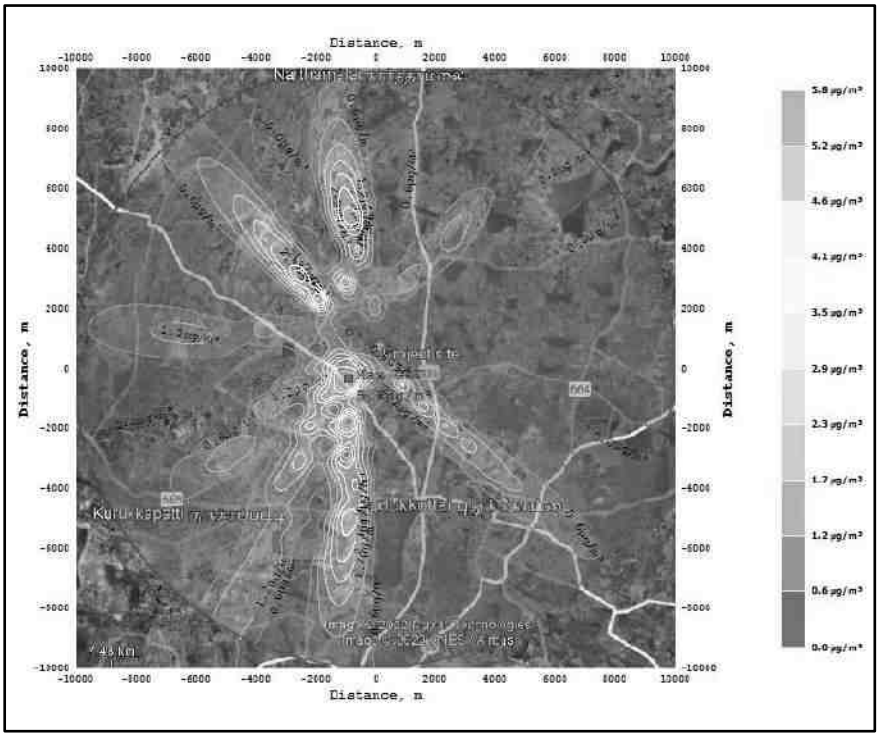


FIGURE 4.5: ISOPLETH OF MAXIMUM PREDICTED 24 HOURLY GROUND – LEVEL CONCENTRATIONS FOR NO2

4.3.2 RESULTANT IMPACT

The resultant impact due to construction activities (excavation and crushing) on the ambient air quality for PM_{10}, $PM_{2.5}$, SO_2 and NO_2 at monitoring station project site respectively is presented in **Table 4.2** which shows that, the resultant concentration level is within the NAAQS.

TABLE 4.2: RESULTANT LEVELS DUE TO EXCAVATION

S.No.	Locations	PM_{10} (µg/m³)			$PM_{2.5}$ (µg/m³)			SO_2 (µg/m³)			NO_2 (µg/m³)		
		Inc	Max	Total	Inc	Max	Total	Inc	Max	Total	Inc	Max	Total
1	AAQ-1	2.3	52.6	54.9	1.3	30.4	31.7	0.5	10.9	11.4	0.6	25.9	26.5
2	AAQ-2	1.1	51.4	52.5	0.7	28.4	29.1	0.1	10.6	10.7	0.1	25.7	25.8
3	AAQ-3	0	52.3	52.3	0	29	29	0	10.9	10.9	0	26	26
4	AAQ-4	5.8	51.6	57.4	3.3	28.5	31.8	2.1	10.5	12.6	2.2	25.7	27.9
5	AAQ-5	2.3	51.1	53.4	1.3	27.9	29.2	1.1	10.6	11.7	1.3	25.5	26.8
6	AAQ-6	1.1	53.1	54.2	0.7	28.9	29.6	0.1	11	11.1	0.1	26.1	26.2
7	AAQ-7	0	51.9	51.9	0	27.8	27.8	0	9.7	9.7	0	25	25
8	AAQ-8	3.4	51.4	54.8	2	28.2	30.2	1.6	9.4	11	1.7	26.1	27.8
NAAQS (µg/m³)		**100**			**60**			**80**			**80**		

4.3.3 OCCUPATIONAL HEALTH IMPACT

Progressive deposition of inhaled particles or dust results in major health problems. Smaller the particle size (less than PM2.5) higher is the chemical and biological reactivity. These smaller particles reach the deepest portion of the lungs. These micron sized particles, once air-borne, are extremely difficult to be collected or trapped. Lung functions are impaired due to both respirable and non-respirable dust particles. Chronic exposure leads to respiratory illnesses like asthma, emphysema, severe dyspnoea (shortness of breath), and bronchitis and in extreme cases pneumoconiosis or the black- lung disease of miners. The effect of dust may be harmful to the human health.

4.3.4 MITIGATION MEASURES IMPACT ON AIR QUALITY

Mitigate measures suggested for air pollution controls are based on the baseline ambient air quality of the area. From the point of view of maintenance of an acceptable ambient air quality in the region, it is desirable that air quality is monitored on a regular basis to check compliance of standards as prescribed by regulatory authorities. In case of non-compliance, appropriate mitigative measures need to be checked.

4.3.5 MEASURES TO PREVENT GENERATION AND DISPERSAL OF DUST

Dust particles, which are normally generated during mining operations, become air borne, thus leading to increase in particulate matter level in the ambient air. In the proposed mining activity adequate control measures will be adopted during both, mining operations as well as transportation of rough stone within the area.

Water sprinkling system already provided throughout the mine area especially on the mine roads carrying overburden dumpers. Presently tankers used for the dust suppression. The control measures already adopted are given below:

- Regular cleaning and removal of spillage from the roads are done regularly.
- Water spraying on haul roads, service roads and overburden dumps will help in reducing considerable dust pollution.
- Proper and regular maintenance of mining equipment.
- The treated mine water can be utilized for dust suppression in and around mine areas.
- Comprehensive green belt around overburden dumps must be carried out to reduce to fugitive dust emissions in order to create clean and healthy environment.
- Land reclamation may be carried out for dumps where mining activities have been completed.
- The following additional measures will also be adopted such as,
- Dust generation will be reduced by using sharp teeth of shovels.
- Wet drilling will be carried out to control the dust.
- Controlled blasting techniques will be adopted.

- Charge per hole and charge per round will be optimized.
- Cabins for shovel and dumpers and dust masks to workmen will be provided.
- Information on wind direction and meteorology will be considered while planning, so that pollutants, which cannot be fully suppressed by engineering technique, will be prevented from reaching the residential areas.
- A good housekeeping and proper maintenance will be practiced which will help in controlling pollution.

The objective of the system is to eliminate the air borne dust or suppress the dust at its source. The system involves confinement of the dust within the dust producing area by a curtain of moisture and wetting the dust by direct contact between the particles and droplets of water. Adequate number of precision anti-clog nozzles will be installed at suitable locations for suppressing dust by spraying water mixed with suppressant. Suitable control for dust suppression will be provided and the system will be so inter-locked that it functions only when the conveyor system is operating, or the loading operation is on.

4.3.6 GREENBELT

Even with the various dust suppression measures in place, dust generated from mine faces, fine dust produced during blasting operations are difficult to control. Therefore, in addition to the above mitigative measures, it is proposed to have dense green belt in and around the mine site.

4.3.7 OCCUPATIONAL HEALTH & SAFETY MEASURES TO CONTROL DUST INHALATION

All the above precautions will be adopted to minimize dust generation at site and prevent dispersion in the outside environment. However, for the safety of workers at site, engaged at the strategic locations/dust generation points like drills, loading & unloading points, crushing etc., dust masks will be provided. Dust masks will prevent inhalation of RPM thereby reducing the risk of respiratory disorders. Regular health check-up of workers and nearby villagers in the impacted area (1 km from the core zone) should be carried out by the contractor and regular occupational health assessment of employees should be carried out as per the Factories Act.

4.4 IMPACT OF NOISE / VIBRATIONS & MITIGATION MEASURES

4.4.1 Noise Impact Due to Working Environment

High noise levels pose a major health risk to the mine workers. When noise in the form of waves impinges the eardrum, it begins to vibrate, stimulating other delicate tissues and organs in the ear. If the magnitude of noise exceeds the tolerance limits, it is manifested in the form of discomfort leading to annoyance and in extreme cases to loss of hearing.

Detrimental effects of noise pollution are not only related to sound pressure level and frequency, but also on the total duration of exposure and the age of the person. The adverse effects of high noise levels on exposed workers may result in:

- Annoyance;
- Fatigue;
- Temporary shift of threshold limit of hearing;
- Permanent loss of hearing; and
- Hypertension and high blood cholesterol, etc.
- The following are the sources of noise in the Rough stone mine:
- Drilling & Blasting;
- Loading & unloading;
- Vehicular Movement.

The likely generation of noise levels, due to various mining activities will be as given in following **Table-4.3.**

TABLE 4.3 EXPECTED NOISE LEVELS FROM MINING OPERATIONS AT SOURCE

Equipment's	**Expected Noise Levels dB(A)**
Drilling	80-90
Shovel	75-85
Tippers	65-75
Compressor	75-85

Noise pollution is mainly due to operation like drilling & blasting and plying of trucks & HEMM. Cumulative Noise modelling has been carried out considering blasting and compressor operation (drilling) and transportation activities. Predictions have been carried out to compute the noise level at various distances around the different quarries within the 500 m radius. For hemispherical sound wave propagation through homogeneous loss free medium, one can estimate noise levels at various locations at different sources using model based on first principle.

$$Lp_2 = Lp_1 - 20 \log (r_2/r_1) - Ae_{1,2}$$

Where:

Lp_1 & Lp_2 are sound levels at points located at distances r_1 & r_2 from the source.

$Ae_{1,2}$ is the excess attenuation due to environmental conditions. Combined effect of all sources can be determined at various locations by logarithmic addition.

$$Lp_{total} = 10 \log \{10^{(Lp1/10)} + 10^{(Lp2/10)} + 10^{(Lp3/10)} + \ldots\ldots\}$$

Attenuation due to Green Belt has been taken to be 4.9 dB (A). The inputs required for the model are: Source data has been computed taking into account of all the machinery and activities used in the mining process. The predicted noise level are shown in Table 4.4

TABLE 4.4: PREDICTED NOISE INCREMENTAL VALUE

Location ID	Background Value (Day) dB(A)	Nearest House Distance in m	Incremental Value dB(A)	Total Predicted dB(A)	Residential Area Standards dB(A)
Habitation Near P1	48.4	440	44.2	49.8	55
Habitation Near P2	48.4	460	43.8	49.7	

The Existing mines are already part of monitored baseline data.

The resultant Noise level due to monitored values and calculated values at the receptors are based on the mathematical formula considering attenuation due to Green Belt as 4.9 dB (A) the barrier effect. From the above table, the ambient noise levels at all the locations near habitations are within permissible limits of Residential Area (buffer zone)

4.4.2 IMPACTS DUE TO GROUND VIBRATION AND FLY ROCKS

As per the approved Mining Plan Controlled blasting will be carried out with the help of delayed detonators.

Ground vibration due to mining activities in the area are anticipated due to operation of mining machines like excavators, drilling and blasting, transportation vehicles, etc. However, the major source of ground vibration from this mine is blasting. The major impact of the ground vibrations can be observed on the domestic houses located in the villages surrounding the mine lease area. The kachha houses are more prone to cracks and damage due to the vibrations. Apart from this, the ground vibrations may develop a fear factor in the nearby settlements.

Another impact due to blasting activities is fly rocks. These may fall on the houses or agriculture fields nearby the mining lease area and may cause injury to persons or damage to the structures. Nearest major habitation from the mine lease area is in Panampatti Village at ~ 0.64Km N. The ground vibrations at Panampatti Village due to the blasting in Rough stone Mines are calculated using the empirical equation: It is proposed to use about 146 and 137 Kg /day for P1, P2, explosives for blasting for obtaining the desired stone production.

The empirical equation used for assessment of peak particle velocity (PPV) is:

$V= 417.8 \{D/(Q^{0.5})\}^{-1.265}$

Where

V= Peak particle velocity in mm/s

D= Distance between location of blast and gauge point in m

Q=Quantity of explosive per blasting in kg

TABLE 4.5: ESTIMATED PEAK PARTICLE VELOCITY FOR EXPLOSIVE CHARGE

Distance from blasting site, m	Quantity of Explosive/Blast, Kg For different proposed project		PPV, mm/s For different proposed project	
	P1	P2	P1	P2
50	146	137	69.3	66.6
100	146	137	28.8	27.7
150	146	137	17.3	16.6
200	146	137	12.0	11.5
250	146	137	9.0	8.7
300	146	137	7.2	6.9
350	146	137	5.9	5.7
400	146	137	5.0	4.8
450	146	137	4.3	4.1
500	146	137	3.8	3.6
550	146	137	3.3	3.2
600	146	137	3.0	2.9
650	146	137	2.7	2.6
700	146	137	2.5	2.4
750	146	137	2.3	2.2

Note: The empirical formula does not consider the delay factor in blasting due to use of Delay Detonators.

The standards for safe limit of PPV are established by Directorate General of Mines Safety for safe level criteria through Circular No. 7 dated 29/8/1997. Permissible standards of Ground vibration due to blasting as per guidelines of Director General of Mines Safety (DGMS), Dhanbad are given in **Table-4.6**

TABLE 4.6: PERMISSIBLE PEAK PARTICLE VELOCITY (mm/s)

Type of Structure	**Dominant Excitation Frequency, Hz**		
	<8 Hz	**8 – 25 Hz**	**>25 Hz**
A] Buildings/structures not belonging to the owner			
Domestic houses/structures (Kuchha brick and cement)	5	10	15
Industrial Buildings (RCC and framed structures	10	20	25
Objects of historical importance and sensitive structures	2	5	10
B] Buildings belonging to owner with limited span of life			
Domestic houses/structures (Kuchha brick and cement)	10	15	25
Industrial buildings (RCC& framed structures)	15	25	50

Source: DGMS Circular No. 7 dated 29/08/1997

From the above table, the blasting will not cause any significant ground vibrations in the area. The ground vibrations at nearest habitation will be well within the permissible limits recommended by DGMS. However, additional control measures needs to be adopted to avoid the impacts due to ground vibrations and fly rocks due to blasting.

4.4.3 MEASURES FOR MINIMIZING IMPACTS NOISE CONTROL MEASURES

The following control measures will be adopted to keep the ambient noise levels well below the limits. The same will be continued and strengthen in proposed expansion project:

- Drilling will be carried out with sharp drill bits which help in reducing noise.
- Secondary blasting will be totally avoided, and Hydraulic rock breaker/jack hammer drills will be used for breaking boulders.
- 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 between 12.00 Noon to 2.00 PM when there is less human activity.
- Proper maintenance, oiling and greasing of machines at regular intervals will be done to reduce generation of noise.
- Provision of sound insulated chambers for the workers deployed on machines producing higher levels of noise.
- Green Belt/Plantation will be developed around the mining activity area and a long haul roads.

- Personal Protective Equipment (PPE) like earmuffs/ear plugs will be provided to the operators and
- Periodical monitoring of noise will be done.

4.4.4 MEASURES TO CONTROL GROUND VIBRATION & FLY ROCKS

The blasting operations in the mine are carried out by deep hole drilling and blasting using delay detonators, which reduce the ground vibrations. The measures that are generally followed and currently proposed for abatement of ground vibration and fly rocks are detailed below:

- Proper quantity of explosive, suitable stemming materials and appropriate delay system will be adopted to avoid overcharging and for safe blasting.
- Proper blast design will be made to control ground vibration and fly rocks.
- Adequate safe distance from blasting will be maintained.
- The charge per delay will be minimized and preferably more number of delays will be used per blasts;
- During blasting, other activities in the immediate vicinity will be temporarily stopped;
- Drilling parameters like burden, depth, diameter and spacing will be properly designed to give proper blast.
- Muffle blasting using wire mesh and sand bags will be conducted at mine working near ML boundary towards habitation.

4.5 IMPACT ON WATER ENVIRONMENT & MITIGATION MEASURES

4.5.1 IMPACT ON IMPACT ON SURFACE WATER

There is no seasonal stream or nallah flowing through the mining area

The changed topography will alter the drainage within the mining lease area. However, there will not be any changes in the topography or drainage pattern outside the mining lease area. At the end of mining activities after reserves are exhausted, the area will be restored to an acceptable level of self-sustaining eco-system, green belt will be developed in safety zone and upper benches of mine area. No surface water will be utilized for mining operation. Moreover, there would not be any discharge from mine into the surface water body as no process waste water generation in the mine and allied activities. Hence there would not be any impact on surface water.

Only domestic effluent will be generated from the mine office and rest shelter. The domestic effluent is discharged in septic tank followed by soak pit. Besides, there will be no toxic element in the mined out material, which may contaminate ground/ surface water. It is, therefore, apparent that there will be negligible impact of mining on the surface water regime.

4.5.2 IMPACT ON GROUND WATER

The Rough stone and associated soil in the area does not contain any toxic material. Rough stone constitute of inert and chemically non-reactive ingredients. Also, there is no use of chemicals or hazardous substances in the mining process. Thus, ground water pollution is not envisaged due to the mining operations.

The Water in the area is 65-70m in summer pre monsoon season and 50-65m in post monsoon season which is observed from the nearby bore wells and data obtained from existing private boreholes The lease area is fully covered by Massive Charnokite formation. Hence the Ground water problem will not arise. The ultimate depth of mine (P1) will be 45 m (3m Top soil +2m Weathered formation+40m Rough Stone) while the ultimate depth of mine (P2) will be 45 m (3m Top soil + 2m Weathered rock +40m Rough stone)

Thus, the mining activities will not intersect ground water. The ground water may seep into the working mine pits. This water will be collected in mine sump created in the lower most part and will be allowed to accumulate. This water will be used for dust suppression and plantation. Considering small scale of mining operations, only small quantity of seepage water is expected. Thus, there will not be any significant impact in terms of lowering of ground water table in the nearby villages.

Based on the experience in the nearby quarries, pumping of seepage water from the mine pit is not required due to small seepage potential. After completion of mining, the mined-out pit will be developed into a reservoir by accumulating rainwater into it. Thus, this will help in improving ground water table in the area.

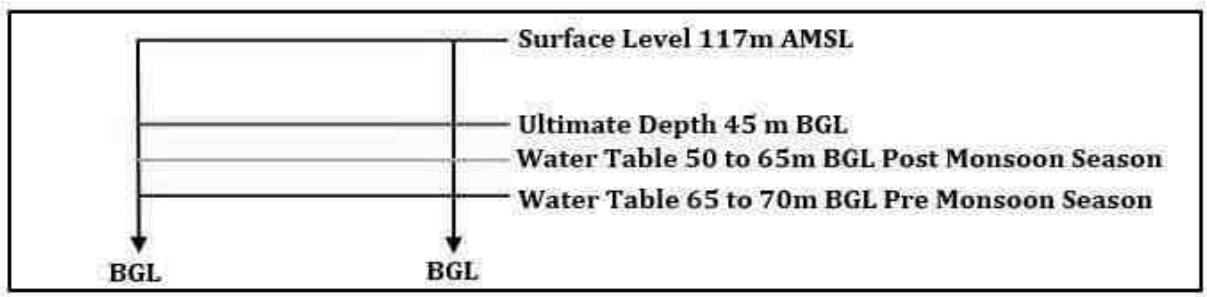


FIGURE 4.6: SCHEMATIC DIAGRAM OF MINE WORKINGS W.R.T. GROUND WATER TABLE

4.5.3 MITIGATION MEASURES FOR WATER ENVIRONMENT

- No wastewater will be generated during mining operation.
- Septic tanks and soak pits will be provided for the disposal of domestic wastewater generated from mine office.
- Garland drains will be provided to prevent the entry of rainwater into the mining pit.

- Construction of settling tanks at points to arrest silt.
- Rainwater falling in the mining pit will be collected in lower benches & will be used for dust suppression & plantation.
- Regular monitoring of ground water quality will be carried out.

4.5.4 MITIGATION MEASURES FOR WATER ENVIRONMENT

- No waste water will be generated during mining operation.
- Septic tanks and soak pits will be provided for the disposal of domestic wastewater generated from mine office.
- Garland drains will be provided to prevent the entry of rainwater into the mining pit.
- Construction of settling tanks at points to arrest silt.
- Rainwater falling in the mining pit will be collected in lower benches & will be used for dust suppression & plantation.
- Regular monitoring of ground water quality will be carried out.

4.5.4 ARTIFICIAL RECHARGE AND RAIN WATER HARVESTING

The mine management will Roof top harvesting structures in the public buildings in nearby villages with prior consent from local gram panchayats to collect rainwater and charge to ground through available dug well/ tube well**.** Also, the reservoir/dam in the nearby area will act as an additional source of water to the nearby villagers and will also help in recharging ground water table of the area.
The cluster area has potential to harvest rainwater water will be harvested in mining area in nonworking mining pits and will be utilized for dust suppression and plantation.

4.6 IMPACT ON LAND ENVIRONMENT& MITIGATION MEASURES

The land environment comprises of Geology, land use and soil the impact and mitigation of land all land environment component is given below.

4.6.1 IMPACT ON GEOLOGY

Mining is the extraction of valuable minerals or other geological materials from the earth. Mining activity is hence exploitation of Geology. Mining will lead to change in geological setting of the area. Mining will also change the geomorphology of the area i.e. the flat land topography of the area will change to undulating topography with pits. If mining is not done systematically, it may also generate hazards such as landslides i.e. dump failure in terms of mining. The impact of mining activity on geology will be limited to only cluster area. The area is structurally with no occurrence of fault and no karst topography observed in area.

4.6.2 IMPACT ON LANDUSE

The Rough stone mining activity will slightly change the present landscape of the ML area. The land use of the area at the time of lease grant was Govt Land for which LOI issued by District Collector, Salem District. Any change in land use will lead to land degradation as the ecosystem of the area gets disturbed. The present topography of the ML area will be affected mainly due to Rough stone Mine and allied activities i.e. mineral transport and manual crushing. The potential adverse impact of opencast Rough stone mining will be in the form of change in land use pattern. So reclamation of mined out land will be given due importance as a step for sound land resource management in the form of reclaimed land and water body. The land use of mine lease area at present, at the end of mining plan period and at the end of mine life as per closure plan will be as follows:

TABLE 4.7(a): LAND USE PATTERN OF MINE LEASE AREA OF PROJECT- 1

S. No.	Description	Present area (Ha)	Area at the end of this quarrying period (Ha)
1.	Area under quarry	Nil	2.65.8
2.	Infrastructure	Nil	0.01.0
3.	Roads	Nil	0.02.0
4.	Green Belt	Nil	0.20.0
5.	Unutilized Land	4.77.0	1.88.2
Total		**4.77.0**	**4.77.0**

TABLE 4.7(b): LAND USE PATTERN OF MINE LEASE AREA OF PROJECT- 2

S. No.	Description	Present area (Ha)	Area at the end of this quarrying period (Ha)
1.	Area under quarry	Nil	3.41.0
2.	Infrastructure	Nil	0.01.0
3.	Roads	Nil	0.02.0
4.	Green Belt	Nil	1.20.0
5.	Unutilized Land	4.90.5	1.26.5
Total		**4.90.5**	**4.90.5**

No adverse impact is anticipated on land use of buffer zone associated due to the Rough stone mining, as all the activities will be confined within the project site only. Mined out Rough stone will be and will be further transported to the consuming industries to nearby consumers

4.6.3 IMPACT ON SOIL

No OB is expected to be generated during plan period. 100% ROM is saleable. The soil will be properly preserved in safety zone and will be utilized for plantation purpose. The silt may get carried to the nearby seasonal streams with the surface runoff during rains and may cause siltation of the seasonal water bodies located outside the mining area.

Sub-grade material there is no overburden available in the lease which can be readily available for backfilling. There is no O/B or waste material available in the lease or nearby areas.

4.6.4 MITIGATION MEASURES FOR LAND ENVIRONMENT

- Mining activity will be carried out in planned manner as per approved mine plan.
- Mining bench dimension will be maintained for stability of area.
- Land reclamation will be carried out as per approved progressive mine closure plan.
- Thick Plantation will be carried out in safety zone in order to maintain the eco system of area which will be disturbed due to land degradation.
- Construction of Garland drains around mine lease area connected to settling tank will control soil erosion.
- Development of green belt around mine lease area and grasses plantation to control soil erosion.

4.7 SOCIO - ECONOMIC ENVIRONMENT

It is obvious to assume that the activities of the mining operations will improve the socio-economic levels in the study area. The anticipated impact of this project on various aspects is described in the following sections

4.7.1 IMPACT ON HUMAN SETTLEMENT

There is no human settlement in or adjacent to the cluster area of Rough stone Mine. Nearest human settlement from cluster area as Panampatti Village~ 650m N, there will not be any impact on the human settlement in the area. The operation of the Rough stone mine and associated activities will improve the economic development, civic amenities, and educational facilities in the project vicinity. Overall, due to employment generation and economic progress, there will be positive changes in the socio-economic condition of the people residing in the vicinity of the project site.

4.7.2 EMPLOYMENT

This is a Rough stone mining project. The mine will provide manpower for P1 55 and P2 53 numbers of persons (each Mine Block) for mine management and another for activities such as excavation, transportation etc. Mostly local persons will be employed in the mine.

Additional manpower requirement in the mine will be employed from the nearby villages. Thus, there will not be any population growth in the area due to the Rough stone mining project.

4.7.3 IMPACT ON CIVIC AMENITIES

The existing infrastructure facilities are sufficient to cater the needs of the Rough stone mine. However, the mine management will take efforts as a part of CER for improvement in civic amenities like sanitation, drinking water facilities, transport road, etc in the nearby villages.

4.7.4 IMPACT ON HEALTH CARE FACILITIES

There are primary health care facilities in the nearby villages and hospital is available in Salem town. Mine management will also conduct periodic medical camps in the nearby villages as a part of CER.

4.7.5 IMPACT ON ECONOMIC ASPECTS

The mine will have fulltime (P1 for 55 and P2 for 53 nos.) for mine management such as excavation, transportation etc. Mostly local persons will be employed in the mine. The local population will be given preference in employment. The employment potential will improve economic conditions of these families directly and provide employment to many other families indirectly who are involved in business and service-oriented activities. This will, in-turn improve the quality of life in the region.

4.8 OCCUPATIONAL HEALTH & SAFETY

4.8.1 IDENTIFICATION OF WORK-RELATED HEALTH HAZARDS

Details of the principle environmental and occupational risks that are likely to be created are given in **Table-4.8.**

TABLE 4.8: WORK RELATED HEALTH HAZARDS

Sr. No.	Hazardous Activities	Type of Hazards	Severity of Injury
1	Drilling	Exposed to high level of Noise	Hearing impairment
		Exposed to dusty environment	Respiratory diseases
2	Blasting	Struck by fly rock	Serious Physical injury
		Exposed to dusty environment	Respiratory diseases
		Exposed to high level noise	Hearing impairment
		Exposed to excessive vibration	Cracks to permanent structures
3	Loading	Struck by rolling big boulders	Serious injury and equipment damage

Sr. No.	Hazardous Activities	Type of Hazards	Severity of Injury
		Struck by fall of objects	Serious Physical injury
4	Transportation	Accidental runaway of vehicle	Serious injury, and equipment damage
		Fall of vehicle from height while reversing	
		Exposed to high level noise	Hearing impairment
		Fire in engine due to over heating	Serious Physical injury
5	Storage of oil, lubricant	Leaks and spills	Fire & vigorous chemical reaction
6	Battery maintenance handling	Acid spillage	Acid burns
7	Use/repair of hydraulic jacks & pumps	High pressure operation	Physical injury
		Oil spillage	
		Rupture of hydraulic hoses	

The mine management takes full responsibility for the protection of the workers against sickness, disease and injury arising out of their employment and have adopted certain principles about occupational health services, like establishing and maintaining a safe and healthy working environment which will facilitate optimal physical and mental health in relation to work.

The following occupational health measures shall also be adopted**:**

a) Identification and assessment of the risks from health hazards in the workplace;
b) Surveillance of the factors in the working environment and working practices which may affect workers health, including sanitary installations and canteens; and
c) Planning and organization of work, including the design of workplaces, choice, maintenance and condition of machinery and other equipment and substances used in work.

4.8.2 MEDICAL SURVEILLANCE AND EXAMINATIONS

To evaluate the impacts from Rough stone mining project activities on health of workers, baseline health studies will be conducted on every worker before joining their duties.

- Identifying workers with conditions that may be aggravated by exposure to dust & noise and establishing baseline status for determining changes in health
- Evaluating the effect of dust and noise on workers
- Enabling corrective action to be taken when necessary
- providing health education and awareness
- The medical surveillance program will consist of the following:
- Pre-employment medical examinations

- Periodic medical examinations
- Health & Safety awareness and training
- Record keeping

4.8.2.1 HISTORY:

The initial medical and occupational history cover previous exposure to dust, personal habits (e.g. smoking, etc.) and history of present or past respiratory disorders (particularly tuberculosis).

4.8.2.2 OCCUPATIONAL HEALTH MONITORING

All the employees in the mine will be subjected to pre-employment & periodic medical examination to assess the occupational health impacts. The tests will be conducted as per Form O as given in the Mines Rules, 1955 for the following parameters:

1. Height & Weight
2. Eyes
3. Ears
4. Respiratory Systems
5. Circulatory Systems
6. Abdomen
7. Nervous systems
8. Locomotory systems
9. Skin
10. Hydrocele
11. Hernia
12. Any other abnormality
13. Urine tests
14. Skiagram of chest
15. Complete Blood picture
16. Any other test considered by the Doctor

Based on the medical findings, the worker will be placed for appropriate jobs and necessary safety training will be provided.

4.8.2.3 AWARENESS AND TRAINING PROGRAM

All workers will be subjected to pre-employment and periodic awareness program on health and safety issues of mining and related activities. They would also be imparted with proper training and would be made to understand the health impacts of inhaling high concentration of dust laden air. All the workers will also be provided training in first aid.

- Holders of first aid certificate will be given refresher training once in two years
- Rescue trained person will acquire highest standards of proficiency in first aid
- Ambulance van will be provided fully equipped with lifesaving drugs, medicines and appliances needed in emergency

RECORD KEEPING

A Registered Medical Practitioner (Doctor) will be appointed for examining the workers. All the health records of the workers will be maintained in separate file in site office and the records will be regularly updated.

IMPLEMENTATION OF OH&S

For implementation of Occupational Health & Safety in the mining project, a safety committee will be formed. The hierarchy of the committee and responsibilities of individual members will be as shown in **Table 4.9.**

TABLE 4.9: OH&S COMMITTEE & ITS RESPONSIBILITIES

Sr. No.	Designation	Responsibility
1.	Mines Manager	Overall responsibility of Occupational Health & Safety in the Mines
2.	Mining Engineer / Foreman	Adherence to OH&S guidelines and provision of training and conducting awareness programs
3.	EH&S Manager	Assisting mines manager in ensuring Occupational Health, Safety and environmental compliance
4.	Doctor	Pre-employment and periodic examination / health check up and updating the records, provision of first aid training.

4.8.3 PUBLIC HEALTH IMPLICATIONS OF THE PROJECT

There is no human settlement in or adjacent to the cluster area of Rough stone Mine. Nearest human settlement from cluster area as Panampatti Village~ 650m, N direction

As observed from the modeling results, the dust emissions and noise from the mining project will not cause any significant impact on the ambient air quality and ambient noise levels in the surrounding villages. The mine will be operated during day time only. Thus, there will not be any disturbance to the nearby habitations during night. The mineral transportation will be carried out through existing mines road from mines. Thus, there will not be any disturbance to the normal traffic of the area. Also, the mine management will conduct periodic medical camps in the nearby villages to provide medical facilities to the villagers. Thus, no significant impact is envisaged on the public health due to the project.

4.9 IMPACT ON LOCAL TRANSPORT INFRASTRUCTURE I.E. TRAFFIC STUDY

1. The approach (metal) road is situated on the Eastern side of the applied area which connects to the Vadamalappur – Ayingudi village Road at a distance 1.0km on the Southeastern side.
2. The Nearest National Highway (NH - 336) Pudukkottai – Trichy Road – 1.27 Km

- E side.

3. The State Highway (SH-71) Viralimalai - Pudukkottai –1.0Km– Southwestern side

The total maximum production per annum from new proposed mine is 214,705m^3 of Rough stone while per day 715.68 m^3 will be handled per day for proposed mining project. The excavated Rough stone will be dispatched to the consuming industries through 20tonne capacity trucks/Dumpers to consumers from mine site. Considering 300 days of mine working in a year. About approx. 72 trips of 20 tonne capacity trucks will be required for transportation of Rough stone to user consuming industry. The Rough stone will be transported through the existing roads network.

Traffic study measurements were performed at one location at confluence of Pudukottai to Trichy Road (NH-336): 1.27 Km, E direction to assess impact on local transport infrastructure due to this mining project. The mineral from the proposed mining project will be loaded and transported through at Pudukottai to Trichy road (NH336): 1.27 Km, E direction. Excavated Rough stone will be dispatched as accordingly mentioned in **Table 4.10.**

TABLE 4.10: TRANSPORT ROAD DETAILS

Name of Road	Direction		Distance from project site
	Up	Down	
Highway (NH 336)	Pudukottai	Trichy	1.27 Km, E direction

Traffic data was collected continuously for 24 hours by visual observation and counting of vehicles under three categories, viz., heavy motor vehicles, light motor vehicles and two/three wheelers. As traffic densities on the roads are high, two skilled persons were deployed simultaneously at each station during each shift- one person on each of the two directions for counting the traffic. Counted data sheet is provided in **Table 4.10** and PCU is calculated in **Table 4.10.** At the end of each hour, fresh counting and recording was undertaken.

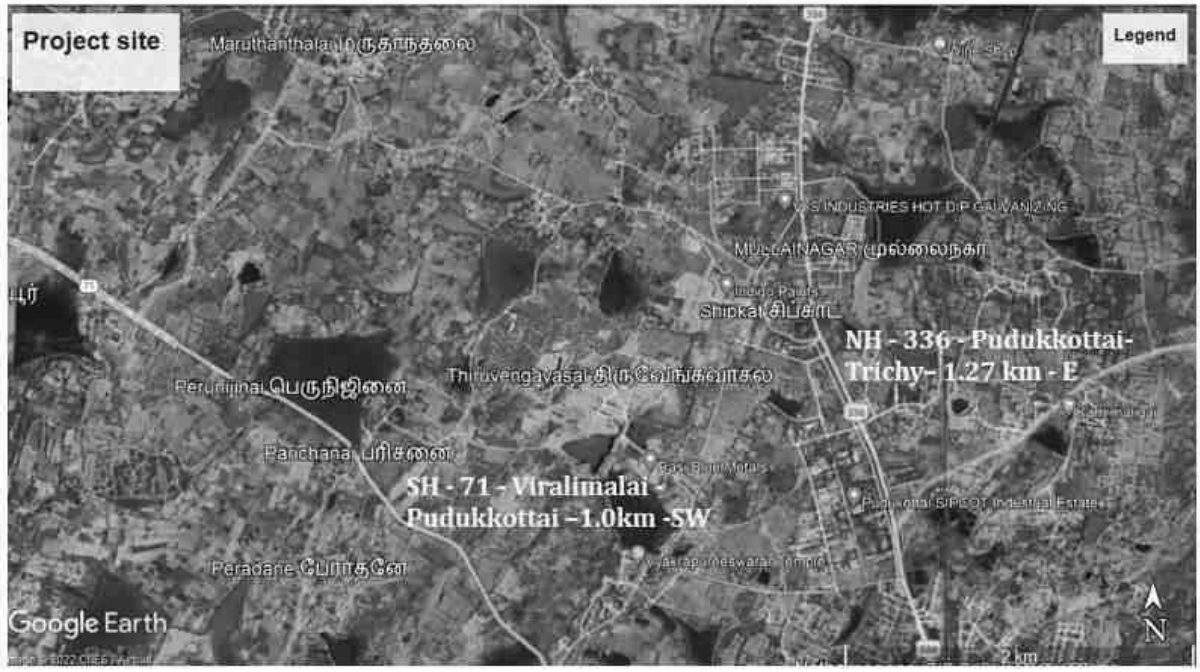


FIGURE 4.7: ROAD CONNECTIVITY MAP WITH FOR TRAFFIC MONITORING

TABLE 4.11: TRAFFIC VOLUME COUNT SURVEY (HOURLY)

S. No.	Vehicle Distribution	No. of Vehicles/Day		Total Number of Vehicle in PCU/Day		
		Towards Pudukottai	Towards Trichy	Equivalent Factor	Towards Pudukottai	Towards Trichy
1.	Two Wheelers	180	156	0.5	90	78
2.	Three Wheelers	142	98	1	142	98
3.	Cars	185	165	1	185	165
4.	Bus	36	31	3	108	93
5.	Tractor	28	27	4	112	108
6.	Trucks	88	85	3	264	255
TOTAL		**659**	**562**	**-**	**901**	**689**

TABLE 4.12: EXISTING TRAFFIC SCENARIO AND LOS

Road	Total V (Volume in PCU/day)	C (Capacity in PCU/day.)	Existing V/C Ratio	LOS
Highway (NH 366)	1590	3600	0.441	C

V = Volume in PCU's /hr, C= Capacity PCU's /hr, LOS = Level of Service

V/C	LOS	Performance
0.0 – 0.2	A	Excellent
0.2 – 0.4	B	Very Good
0.4 – 0.6	C	Good
0.6 – 0.8	D	Fair/ Average
0.8 – 1.0	E	Poor
1.0 & Above	F	Very Poor

Note: IRC is accepting the fact that, in Indian roads the real congestion starts when V/C ratio is >1, i.e. for forced flow. Till this limit the road is free for traffic movement without any impediments. Hence it is acceptable as normal up to V/C = 1 and the performance will be taken as good only.

During Mine Operation

Total Capacity of proposed mine	214,705m^3
No. of working days	300
Extraction and Transportation of mineral	715.68 m^3 /day
Working hours per day	8
Dumpers Capacity	20
Frequency of trucks/Dumpers deployed/day	120 trips per day approx..

TABLE 4.13: MODIFIED TRAFFIC SCENARIO AND LOS

Road	Increased Volume in PCU/day	Volume (V)	Capacity (C)	Modified V/C Ratio	LOS
Highway (NH-366)	120	1590+120=1710	1710	0.475	C

Not much impact on local transport. The LOS value from the proposed mining project will change; the performance change from Very Good (B) to Good (C). The existing roads network will be sufficient to cater the transport needs of the mine. However, mine management will periodically maintain the transport road in proper condition to avoid any impacts on traffic infrastructure. Rough stone will be transported in trucks covered with tarpaulin. Major part of transportation will comprise of local or state highway which will be periodically maintained.

4.10 IMPACT ON BIOLOGICAL ENVIRONMENT

IMPACT ON TERRESTRIAL FLORA

- Dust deposition on leaf lamina observed on nearby local plant species which may results in decline the rate of photosynthesis and retards the plant growth.

MEASURES FOR MINIMIZING IMPACT ON FLORA

- Dust issues are mainly raised in the area due to unpaved road, cumulative fugitive dust emissions by various mining activities.
- To mitigate the impact regular water sprinkling will be carried out within the mine lease area as well as approach road.
- Stabilization of soil/waste dumps by grass cover shall be done.

IMPACT ON WILDLIFE

- There is no Wildlife Sanctuary and Biosphere Reserve within 10 km radius of the project site.
- No rare, endemic & endangered species are reported in the buffer zone. However, during mining, the management will practice scientific method of mining with proper Environmental Management Plan including pollution control measures especially for air and noise, to avoid any adverse impact on the surrounding wildlife.
- Fencing around the mine lease area to restrict the entry of stray animals
- Green belt development will be carried out which will help in minimizing adverse impact on the flora found in the area.

MEASURES FOR MINIMIZING IMPACT ON FAUNA

Following measures will be adopted to minimize the impact of mining on faunal environment of the area.

- Measures will be taken to curb pollution due to mining activities on air, water, land & noise environment. Plantation around mine area will help in creating habitats for small faunal species and to create better environment for various fauna. Creating and developing awareness for nature and wildlife in the adjoining villages.

STUDY OF IMPACT ON AQUATIC ECOLOGY

- Mining activities will not disturb the existing aquatic ecology as there is no effluent discharge proposed from the Rough stone mine.
- Mining activity may increase sediment load and total dissolved solids in streams due to, surface run off, erosion activity of loosened soil especially during rainy season and may affect water quality of natural water body and stream within mine lease area.

4.10.1 MITIGATION MEASURES

- Periodic maintenance of mineral transport road.
- Covered Transport of stone mine to consuming industry.
- Development of thick plantation around mine lease area
- Monitoring of dust fall at agriculture land located nearby the mining area

4.11 GREENBELT DEVELOPMENT & PLANTATION PROGRAMME

Proposed Greenbelt Development & Plantation Programme

It is proposed to develop plantation at 2 M x 2 M spacing, the rate of survival is aimed at 70 to 80% by regular watering & fencing to keep plants safe from animal grazing. Local species will be planted in consultation with local horticulturist. Diseased plants will be replaced by planting new saplings.

The basic approach towards the development of Green belt /plantation in the lease area is with a view to provide an aesthetic look, eliminating fugitive emissions and for controlling the impact of noise, etc. A Green Belt will be developed based on the following principles:

- Plants that grow fast will be preferred.
- Preference for high canopy covers plants with local varieties
- Perennial and evergreen plants will be preferred.
- Plants having a high Air Pollution Tolerance Index (APTI) will be preferred.
- The development of green belt is an important aspect for any project because:
- It improves the ambient air quality by controlling Suspended Particulate Matter in air.
- It helps in noise attenuation for the surrounding area.
- It helps in attracting new birds and insects as their habitation.
- It maintains the ecological balance.
- It increases the aesthetic value of site.

Plantation along the Safety Zone

Thick plantation will be carried out on the safety barrier and undisturbed area within the mine lease. Also plantation will be developed around temporary waste dumps. Soil generated during mining will be separately stacked and will be used for plantation.

TABLE 4.14: PROPOSED AFFORESTATION PROGRAM

Year	Project 1		Project 2	
	No. of Sapling	Area (in sq.m.)	No. of Sapling	Area (in sq.m.)
1st	44	400	44	400

Year	Project 1		Project 2	
	No. of Sapling	Area (in sq.m.)	No. of Sapling	Area (in sq.m.)
2nd	44	400	44	400
3rd	44	400	44	400
4th	44	400	44	400
5th	44	400	44	400
Total	**220**	**2000**	**220**	**2000**

Selection of plant species with special reference

TABLE 4.15: SELECTION OF PLANT SPECIES WITH SPECIAL REFERENCE

Sr. No.	Plant species	Common Hindi Name	Purpose of plantation of species
1.	*Aegle marmelos*	Bael	Pollution Tolerant Plants Automobile
2.	*Albizzia lebbeck*	Shirish ke phool	
3.	*Butea frondosa*	Palash	
4.	*Alstonia scholaris*	Saptaparna	Best dust filtering capacity Plants
5.	*Ailanthus excelsa*	Adu Ghoda Neem	
6.	*Ficus benghalensis*	Banyan	
7.	*Ficus religiosa*	Peepal	
8.	*Cassia fistula*	Amalatas	Exhaust pollution Control Plants
9.	*Delonix regia*	Gulmohar	
10.	*Phyllanthus emblica*	Amla	Medicinal value Plants
11.	*Terminalia cattapa*	Jungali Badam	
12.	*Azadiracta indica*	Neem	
13.	*Tectona grandis*	Sagwan	Economic value Plants
14.	*Pongamia pinnata*	Karanj	
15.	*Shorea robusta*	Sal	
16.	*Cymbopagon martini*	Gandhabel	Soil Conservation Plants
17.	*Ziziphus jujube*	Bada Bare	Fruit bearing Plants
18.	*Psidigium guava*	Amrud	
19.	*Syzygium cumini*	Jamun	
20.	*Mangifera indica*	Mango	
21.	*Dalbergiasisso*	Seesam	Nitrogen Assimilation Plants
22.	*Cassia siamea*	Kassod	
23.	*Polyalthia longifolia*	Devdaru	Aesthetic beautification Plants

CHAPTER 5: ANALYSIS OF ALTERNATIVES

5.1 SITE ALTERNATIVES

A comparison of alternatives helps to determine the best method of achieving the project objectives with minimum environmental impacts or indicates the most environment friendly and cost-effective options. Every mine needs to be planned in away that the mineral is extracted to the maximum extent without causing severe irreversible environmental damages. The mine plan and mine closure plan has been approved by the competent Authority prior to submission of the Form-1 and PFR.

5.2 ANALYSIS OF ALTERNATIVE TECHNOLOGY

5.2.1 CHOICE OF METHOD OF MINING

The mechanized method will be adopted because of the following reasons:

- Mining operations is proposed to be carried out by opencast mechanized method by deploying drilling and blasting method, loader and tipper/dumper combination.
- There is no overburden present.
- The mineral i.e. Rough stone is available at surface.
- The mining by opencast method is highly productive & economical as compared to underground method; and
- Underground mining is not economical and practically not feasible in the present case.

Hence, conventional open cast mechanized method of mining involving excavation through drilling and blasting will be done with excavated material will be loaded with into tipper and transported to consumer.

CHAPTER 6: ENVIRONMENTAL MONITORING PROGRAMME

6.1 INTRODUCTION

Post Environmental Clearance Monitoring is an essential part to check the impact of project related activity. Hence monitoring of various environmental parameters will be carried out on a regular basis to ascertain the following as:

- Status of Pollution within the mine site and in its vicinity.
- Generate data for predictive or corrective purpose in respect of pollution.
- Examine the efficiency of pollution control system adopted at the site.
- To assess environmental impacts.

Monitoring will be carried out at the site as per the norms of CPCB. Environmental Monitoring Programme has been/will be conducted for various environmental components as per conditions stipulated in Environmental Clearance Letter issued by SEIAA & Consent to Operate issued by TNPCB.

Six monthly compliance reports will be submitted to TNPCB/MOEF for the periods of January to June and July to December will be submitted on regular basis on 1st June and 1st December of each calendar year. Quarterly compliance Report for conditions stipulated in Consent to Operate will be submitted to TNPCB on regular basis.

6.2 FORMATION OF ENVIRONMENTAL MANAGEMENT CELL (EMC)

Monitoring is as important as that of control of pollution since the efficacy of pollution control measures adopted can only be determined by monitoring. An Environmental Management Cell will be established for implementing the Environmental Management Plan and conducting periodic environmental monitoring of important and crucial environmental parameters to assess the status of environment regularly during mine operations. With the knowledge of baseline conditions, the monitoring program will serve as an indicator for any deterioration in environmental conditions due to operation of the mine and so that suitable additional mitigation steps could be taken in time to safeguard the environment. The organizational chart of Environment Management Cell is as given in **Figure 6.1**.

6.3 IMPLEMENTATION SCHEDULE OF MITIGATION MEASURES

The mitigation measures suggested in **Chapter-4** will be implemented to reduce the impact on environment due to the operations of the Rough stone mining projects. To

facilitate easy implementation of mitigation measures, these are phased as per the priority implementation as given in **Table-6.1**.

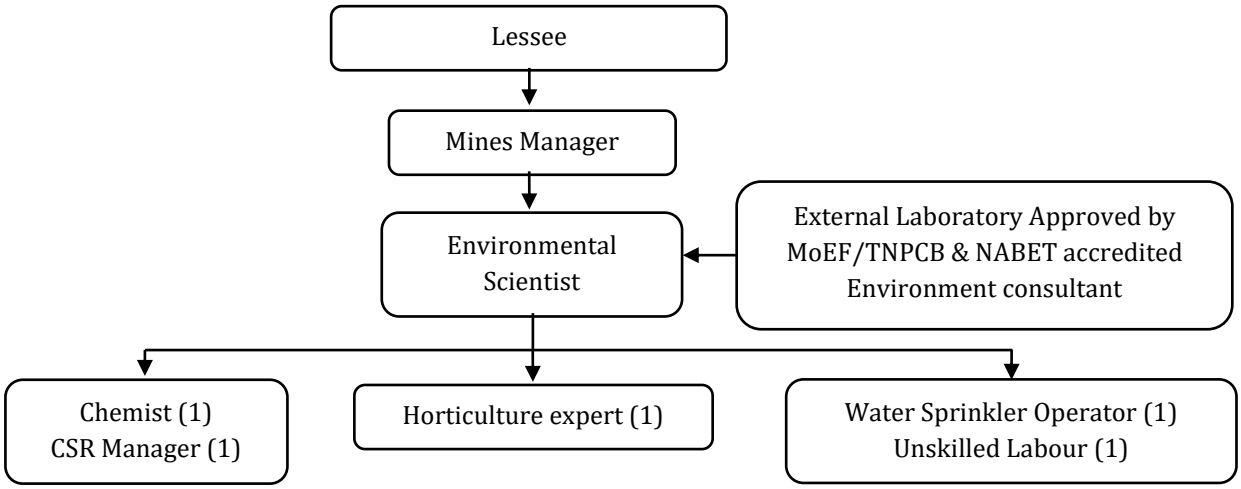


FIGURE 6.1: ORGANIZATION CHART OF ENVIRONMENTAL MANAGEMENT CELL (EMC)

6.3.1 RESPONSIBILITIES OF EMC

The responsibilities of the EMC include the following:

A. Environmental monitoring of the core and buffer zone.
B. Commissioning of pollution control equipment.
C. Specification and regulation of maintenance schedules for pollution control equipment.
D. Ensuring that standards are maintained.
E. Developing the green belt.
F. Ensuring optimum water usage.
G. Carrying out the Environmental Management Plan.
H. Organizing meetings of the Environmental Management Committee and reporting to the committee.

TABLE 6.1: IMPLEMENTATION SCHEDULE

Sr. No.	Recommendations	Time Requirement	Schedule
1	Air pollution control measures	Will be further improved at the time of start of mine after grant of EC and lease renewal.	Immediate
2	Water pollution control measures	Will be further improved at the time of start of mine after grant of EC.	Immediate
3	Noise control measures	Will be further improved at the time of start of mine after grant of EC.	Immediate

Sr. No.	Recommendations	Time Requirement	Schedule
4	Ecological preservation and upgrade	May be started before grant of EC and will be continued in phase-wise manner till life of the mine.	Immediate & Progressive

6.4 MEASUREMENT METHODOLOGIES

6.4.1 INSTRUMENTS TO BE USED

The following instruments are being used for data collection work in the monitoring schedule:

1. Respirable Dust Sampler (RDS)
2. Fine Particulate Sampler (FPS)
3. Dry and Wet Bulb Thermometer.
4. Sound Level Meter
5. Micro Meteorological Station
6. Water Level Indicator
7. Global Positioning System (GPS)

In addition to the above instruments, the data on land use, vegetation and agricultural crops will be collected by the field team by meeting with many local inhabitants in the study area and different government departments /agencies.

6.4.2 MONITORING PROGRAMME

The environmental monitoring for the Rough stone mine operations will be conducted for following aspects:

- Ambient Air quality
- Water table depth
- Surface and ground water quality
- Ambient Noise Levels
- Soil Quality
- Green belt & Plantation
- CSR Activities

The following routine monitoring program will be implemented under the post-project monitoring. Environmental monitoring of ambient air quality, surface and ground water quality, ambient noise levels, etc. will be carried out through MOEF accredited agencies regularly and reports will be submitted to TNPCB/MoEF.

Air Pollution

The ambient air quality will be monitored as per EC Conditions/Central Pollution Control Board guidelines at one location in mine lease area and four locations in nearby villages.

Water Table Depth

The depth of ground water table in the area will be monitored regularly in the wells/ borewell located in four nearby villages. The water table depth at Pre-monsoon (May month) and Pre-Monsoon (November Month) will be measured and records will be maintained.

Water quality

Ground water samples from four villages surrounding the project area will be analyzed. The water quality monitoring will be carried out once during every season. Surface water sample will be collected from mine pit, when available.

Ambient Noise Levels

Noise levels in the core zone and in surrounding villages will be monitored regularly. Ambient noise level monitoring will be carried out at 1 location in mine lease area and in 7 locations in nearby villages. Noise level monitoring will be conducted once in each season.

Soil quality

Soil quality monitoring will be carried out in the plantation area within the mine lease area and in the agricultural fields located nearby the mine lease area. 1 sample from core zone in mine lease and 7 samples from nearby villages will be collected and analyzed, once in a year, preferably during dry season.

CSR Activities

Social welfare activities conducted in nearby villages will be regularly monitored for their effectiveness and accordingly new activities will be planned.

6.4.2.1 MONITORING SCHEDULE

The proposed environmental monitoring schedule is given in **Table 6.2**.

TABLE 6.2: PROPOSED ENVIRONMENTAL MONITORING SCHEDULE

S. No.	Environment Attributes	Location	Monitoring		Parameters
			Duration	Frequency	
1	Air Quality	2 Locations (1 Core & 1 Buffer)	24 hours	Once in 6 months	Fugitive Dust, $PM_{2.5}$, PM_{10}, SO_2 and NO_x.
2	Meteorology	At mine site before start of Air Quality Monitoring & IMD Secondary Data	Hourly / Daily	Continuous online monitoring	Wind speed, Wind direction, Temperature, Relative humidity and Rainfall
3	Water Quality Monitoring	2 Locations (1SW & 1 GW)	-	Once in 6 months	Parameters specified under IS:10500, 1993 & CPCB Norms
4	Hydrology	Water level in open wells in buffer zone around 1 km at specific wells	-	Once in 6 months	Depth in bgl
5	Noise	2 Locations (1 Core & 1 Buffer)	Hourly – 1 Day	Once in 6 months	Leq, Lmax, Lmin, Leq Day & Leq Night
6	Vibration	At the nearest habitation (in case of reporting)	–	During blasting Operation	Peak Particle Velocity
7	Soil	2 Locations (1 Core & 1 Buffer)	–	Once in six months	Physical and Chemical Characteristics
8	Greenbelt	Within the Project Area	Daily	Monthly	Maintenance

6.5 ENVIRONMENTAL POLICY

6.5.1 Environmental Policy of the Company

Environmental policy by lessee is attached as **Annexure VII**

6.5.2 Organization Set-up

The company has clearly defined duties and responsibilities for the employees. Organizational setup for environment management is shown in **Figure 6.1.**

6.5.3 Environmental Management Cell

An Environmental Management Cell (EMC) will be established in the mine under the control of Mines Manager. The EMC will be headed by an Environmental scientist having adequate qualification and experience in the field of environmental management. The responsibilities of EMC will be as follows:

1. Implementation of pollution control measures as suggested in Environmental Management Plan and recommended in EC
2. Conducting environmental monitoring as per EMP and EC stipulation through external laboratories approved by MoEF/TNPCB and NABL
3. Ensuring compliance with other conditions stipulated in Environmental Clearance for the project.
4. Ensuring compliance with the conditions stipulated in 'Consent to Operate' for the project.
5. Timely submission of compliance status to MoEF/ TNPCB
6. Seeking experts' guidance, as and when required.
7. Conducting CSR activities in nearby villages.

6.5.4 Audit & Review

Review and audit is essentially a management tool. However, its application is crucial at the operational level for verification and feedback on the effectiveness of organization system and environmental performance. Basically, auditing involves in the following items:

- Line management system
- Awareness and training
- Procedures: standards, targets
- Plans: Waste, contingency, pollution control compliance
- Verify environmental impact assessment
- Verify mitigation
- Reporting and communication
- Documentation
- Feedback

Internal Audit:

A system of auditing will be undertaken for mining operations and includes the use of trained internal and external auditors. In addition, auditing should be undertaken to ensure compliance with all the applicable legislations.

Audit Type Frequency:

- Internal: - From other site in-charge every 6 months
- External - independent expert Every 12 months

The company shall depute internal / external auditors who are trained and certified as competent EMS auditors by an independent and external standard organization. The results of monitoring and auditing shall be regularly reported through the senior management team to ensure that action items are addressed.

6.5.5 Non-conformity, Corrective Action and Preventive Action

As per the Environmental Policy of the company, non-conformities, corrective actions, and preventive actions shall be managed in accordance with *Nonconformance, Preventive and Corrective Action Procedure.* This procedure, which relates to all projects of the company, details the processes to be utilized with respect to the identification of non-conformances, the application of appropriate corrective actions(s) to address non-conformances and the establishment of preventive actions to avoid non-conformances. The key elements of the process include:

- identification of Non-conformance and /or Non-compliances
- Recording of Non-conformance and/or Non-compliance
- Evaluation of the Non-conformance and/or Non-compliance to determine specific corrective and preventive actions
- Corrective and preventive actions to be assigned to responsible persons and
- Management Review of corrective actions to ensure the status and effectiveness of the actions

6.5.6 Management Review

A comprehensive review of the objectives and targets associated with the individual project of the company shall be undertaken on an annual basis via the business planning (1 year outlook) and business strategy (5-year outlook) processes. These reviews, which include involvement from the senior site management and other key personnel, assess the performance of the mine over the previous year and develop goals and targets for the following period.

6.6 OCCUPATIONAL HEALTH AND SAFETY

Occupational health and safety are very closely related to productivity and good employer-employee relationship. The main factors of occupational health in mine are fugitive dust and noise. Safety of employees during operation and maintenance of mining equipment and handling of explosive materials is to be taken care of as per the Mine Regulations, 1965 and circulars of DGMS. To avoid any adverse effects on the health of

workers due to dust, heat, noise and vibration, sufficient measures are proposed in the EMP. These include:

- Provision of rest shelters for mine workers with amenities like drinking water, toilets etc.;
- Provision of personnel protection devices for the workers;
- Rotation of job for workers exposed to high noise areas;
- First-aid facilities.
- Occupational Health Survey of the employees will be carried out at regular intervals.

6.7 BUDGETARY ALLOCATION FOR ENVIRONMENTAL MONITORING

The details of monitoring of pollution along with annual recurring cost are given in **Table-6.3**.

TABLE 6.3 COST OF ENVIRONMENTAL MONITORING PROGRAMME

S. No.	Description of item	Capital Cost (Rs.)
1	Air Pollution Control - Water sprinkling on haul road & plantation	52,000
2	Water Pollution Control (Settling tank, Garland Drains, etc.)	18,000
3	Noise Level Monitoring	2,000
4	Ground Vibration Test	4,000
Total EMP Cost		**76,000**
Total EMP Cost for five years		**3,80,000**

CHAPTER 7: ADDITIONAL STUDIES

7.1 PUBLIC CONSULTATION

Draft EIA/EMP for Proposed Rough stone Mine in an area of 9.67.5 (i.e. individual lease areas of 4.77.0 Ha, 4.90.5 Ha), located in Survey Nos. 20/1, 20/2, 270/2, 270/3, 270/4, 257/9, 257/8A & 257/10A, of Panampatti village and 11/2A, 12/1A & 12/1B (Part) Thiruvengaivasal village & 236/1A,236/1B,236/1C, 236/1D,236/1E,236/2,236/3,236/4, 236/5,236/6,236/7,236/9, 236/10, 236/11, 236/12,236/13, 236/14, 19/3,235/9B & 235/11 of Panampatti Village, Illuppur Taluk, Pudukkottai District, Tamil Nadu is prepared as per the TOR issued by SEIAA, Tamil Nadu and the report is submitted for public consultation process as per the provisions of EIA Notification 2006 and amendments thereof.

After completing the public consultation process, the issues raised and commitment of Project Proponent during the public hearing will be incorporated in the final EIA/EMP report. The following Additional Studies were/will be carried out in as per Terms of Reference: Risk Assessment & Disaster Management Plan.

7.2 RISK ASSESSMENT

Hazard analysis involves the identification and quantification of various hazards (unsafe conditions) that exist in the mines. On the other hand, risk analysis deals with the identification and quantification of risks, mining equipment and personnel are exposed to, due to accidents resulting from the hazards present in the mine. Risk analysis follows an extensive hazard analysis. It involves the identification and assessment of risks the neighboring populations are exposed to because of hazards present.

In the sections below, the identification of various hazards, probable risks, maximum credible accident analysis, and consequence analysis are addressed which gives a broad identification of risks involved. Based on the risk estimation disaster management plan has to be prepared.

The mining will be carried out under the management control and direction of a qualified Mine Manager holding a second-class manager's certificate of competency. The DGMS have been regularly issuing standing orders, model standing orders and circulars to be followed by the mine management in case of disaster, if any. 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 above hazard/disasters, the following control measures will be adopted:

- All safety precautions and provisions of the Mine Act, 1952 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 office and mining area;
- Provisions of all the safety appliances such as safety boot, helmets, goggles etc. will be made available to the employees and regular check for their use;
- Training and refresher courses for all the employees working in hazardous premises; Under mines rules all employees of mines shall have to undergo the training at a regular interval;
- Working of mine, as per approved plans and regularly updating the mine plans;
- Regular maintenance and testing of all mining equipment as per manufacturer's guidelines;
- Suppression of dust on the haulage roads;
- Increasing the awareness of safety and disaster through competitions, posters and other similar drives.

7.2.1 Measures to Prevent Accidents due to Trucks and Dumpers

- All transportation within the main cluster area would be carried out under the direct supervision and control of the management;
- The vehicles will be maintained in good repairs and checked thoroughly at least once a week by a competent person authorized for this purpose by the management;
- Broad signs would be provided at each and every turning point specially for the guidance of the drivers;
- To avoid dangers while reversing the vehicles, all areas as far as possible, will be made man free and
- A statutory provision of the fence, constant education, training etc. will go a long way in reducing the incidence of such accidents.

7.2.2 POST COVID HEALTH MANAGEMENT PLAN FOR P1 TO P2

COVID – 19 ailments as a result of SARS-CoV-2 Coronavirus is exceptionally a brand new disorder, with sparkling data being known on a dynamic basis approximately the natural history of the ailment, specifically in terms of post-healing occasions.

After acute COVID-19 illness, recovered sufferers might also preserve to record wide sort of signs and signs and symptoms including fatigue, body pain, cough, sore throat, trouble in respiration, and so forth. As of now there is limited evidence of submit-COVID sequalae and similarly studies is needed and is being actively pursued. A holistic method is needed for follow up care and nicely-being of all post COVID getting better patients.

Post-COVID Follow Up Protocol –

- Keeping COVID appropriate behavior (use of mask, hand & respiratory hygiene, bodily distancing).
- Drink adequate amount of heat water (if not contra-indicated).
- Make sure your places of work are smooth and hygienic
- Surfaces (e.g. desks and tables) and gadgets (e.g. phones, helmet) want to be wiped with disinfectant often
- Positioned sanitizing hand rub dispensers in prominent locations around the place of work. make certain these dispensers are regularly refilled
- Displaying posters regarding hand-washing
- Make certain arrangement that workforce, contractors and clients have get right of entry to places wherein they could wash their fingers with soap and water
- Display posters promoting breathing hygiene.
- Brief your personnel, contractors and clients that if COVID-19 starts off evolved spreading for your community everyone with even a mild cough or low-grade fever (37.three°C or extra) want to live at home. They must additionally stay home (or earn a living from home) in the event that they have had to take easy medications, consisting of paracetamol/acetaminophen, ibuprofen or aspirin, which may also mask symptoms of infection
- Keep communicating and selling the message that people need to stay at home even though they have just moderate signs of COVID-19.
- Recall whether a face-to-face assembly or occasion is wanted. ought to it be replaced by way of a teleconference or online event?
- Should the assembly or event be scaled down in order that fewer humans attend?
- Pre-order sufficient supplies and materials, such as tissues and hand sanitizer for all employees. Have surgical mask available to provide every person who develops respiration signs.
- it's also suggested with the aid of the Ministry of AYUSH that the use of Chyawanprash within the morning (1 teaspoonful) with luke heat water/milk is tremendously advocated (underneath the path of Registered Ayurveda physician) as in the clinical exercise Chyawanprash is believed to be powerful in put up-restoration duration.
- If there's continual dry cough / sore throat, do saline gargles and take steam inhalation. The addition of herbs/spices for gargling/steam inhalation. Cough medicinal drugs must be taken on recommendation of clinical medical doctor or qualified practitioner of Ayush.
- Search for early warning symptoms like high grade fever, breathlessness, Sp02 < 95%, unexplained chest ache, new onset of misunderstanding, focal weakness.
- Avoid smoking and intake of alcohol.

- Talk in your personnel and contractors approximately the plan and ensure they are aware of what they need to do – or no longer do – below the plan. Emphasize key points which include the importance of staying faraway from work even though they have got only moderate symptoms or have had to take easy medicines (e.g. paracetamol, ibuprofen) which can also masks the signs
- The plan must deal with a way to preserve your commercial enterprise running although an extensive variety of personnel, contractors and suppliers cannot come for your administrative center - both because of local restrictions on journey or because they're unwell.

7.3 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 order of priorities. The disaster/ emergency situations will be countered with an organizational chart entrusting responsibility to various mine personnel with their specific roles during emergency and will be updated from time to time.

- Aid and medical care for victims;
- Protect other people;
- Minimize damage to property and the environment;
- Initially contain and finally control the accident;
- Ensure the safe rehabilitation of the affected area; and
- Retain relevant documents and equipment for later investigation of the cause and circumstances of the emergency

The composition of the disaster management team will be:-

1. Mines Manager
2. Site Supervisors/ Foremen
3. Personnel/Administrative Manager/Environmental Manager
4. First Aid Expert/ Medical Coordinator
5. Transport in-charge

For effective implementation of the disaster management plan, the following facilities would be widely circulated and personnel training through rehearsals/drills.

Infrastructure at site

1. Emergency Control Room

Site office will be used as Emergency Control Room. Following facilities will be kept ready at the site office for use in emergency conditions:

a. Master plan of the mines.
b. First aid boxes.
c. Gas masks.
d. Mobile phone with charging facility.
e. Loud speakers
f. Emergency lighting system.
g. Stretchers.
h. Transport facility.

- ***Assembly Points***

Assembly points will be set up in the Mine lease at farthest from the location of likely hazardous events, where pre-designated persons from the works, contractors and visitors would assemble in case of emergency. Up-to-date list of pre-designated employees of various departments will be available at these points so that roll call could be taken. Pre-designated persons would take charge of these points and mark presence as the people come into it.

- ***Communication System***

Different types of alarms to differentiate types of emergencies will be assigned and communicated. Alarms will be followed by an announcement over Public Address System. In case of failure of alarm system, communication will be made through Public Address System (loud speakers). If everything fails, a messenger will be used for sending the information.

- ***Warning System and Control***

The Control Centres will be located at an area of minimum risk or vulnerability in the premises concerned, considering the wind direction, areas which might be affected by fire/explosion, toxic releases, etc. For promptness and efficiency, the premises/storage sites will be divided into number of zones, which will be clearly marked on the site plan.

- ***Emergency Services***

This includes the fire-fighting system, first aid centre, ambulance etc. Alternate sources of power supply, communication with local bodies, fire brigade etc., will be identified and clearly demarcated at control room. Adequate number of external and internal telephone connections will be provided.

- ***Fire Protection System***

The fire protection system in the proposed Rough stone mine consist of portable fire extinguishers of suitable types and capacities to be placed in transport vehicles and

additional fire extinguishers at site office. Water pumps will be used for supporting the firefighting arrangements.

Emergency control procedure –

The onset of the emergency will likely begin with a major fire or explosion or wall collapse along the excavation and will need to be detected by various safety devices as well as by operating personnel in service. If located by a member of the staff on duty, the latter (according to the emergency procedure of the site of which he is sufficiently informed) will go to the nearest alarm point, break the windows, and trigger the alarms. He will also do his best to inform the location and nature of the incident to the emergency control room. In accordance with the emergency procedure at work, the following key activities will take place immediately to interpret and take control of the emergency.

- An on-scene fire crew, led by a firefighter, will arrive with fire foam tenders and other essential equipment at the scene of the event.
- The emergency security controller's duties will begin at the main gate office.
- The incident controller will rush to the scene of the emergency and, with the assistance of the rescue team, begin dealing with the situation.
- The site's chief controller will arrive at MECR with members of his advisory and communication teams and take complete leadership of the facility.
- He will get constant information from the incident controller and make choices and provide orders to:
    - Incident commander
    - Mine command centers
    - Control panel for emergency security

Alarm system during disaster –

On getting the message of disaster from Site Controller, putting out fires group, the mine control room orderly will sound alarm howling for 5 minutes. Occurrence regulator will orchestrate to communicate debacle message through open location framework. On getting the message of "Crisis Over" from Incident Controller the crisis control room chaperon will give "All Clear Signal", by sounding caution straight for 2 minutes. The elements of alert framework will be disclosed to the whole gang to try not to freeze or misjudge during calamity. To forestall or deal with peril/calamities assuming any the accompanying control measures have been taken on.

Generally security precautionary measures and arrangements of Metalliferous Mines Regulations (MMR), 1961 is completely followed during all mining tasks.

- Recognition of generally wellbeing safeguards for impacting and capacity of explosives according to MMR 1961.
- Section of unapproved people into mine and partnered regions is totally restricted.

- Putting out fires and first-help arrangements in quite a while office complex and mining region are given.
- Arrangements of all the wellbeing apparatuses, for example, security boot, head protectors, goggles, dust veils, ear attachments and ear muffs and so forth are made accessible to the representatives and the utilization of same is totally stuck to through normal checking.
- Preparing and supplemental classes for every one of the representatives working in risky premises.
- Working of mine, according to supported plans and routinely refreshing the mine arrangements.
- Cleaning of mine appearances is routinely finished.
- Treatment of explosives, charging and impacting are done simply by qualified people following SOP.
- Checking and customary support of wreath channels and earthen bunds to stay away from any inflow of surface water in the mine pit.
- Arrangement of high limit reserve siphons with generator sets with enough diesel for crisis siphoning particularly during rainstorm.
- An impacting SIREN is utilized at the hour of impacting for sound sign.
- Prior to impacting and after impacting, red and green banners are shown as visual signs.
- Cautioning notice loads up showing the hour of impacting and NOT TO TRESPASS are shown at conspicuous spots.
- Standard support and testing of all mining gear were completed according to maker's rules.

7.4 CUMULATIVE IMPACT STUDY

Cluster Details:

CODE	Name of the Owner	S.F. Nos & Village	Extent	Status
PROPOSED QUARRIES				
P1	**M/s. Om Shri Vari Stones Pvt Ltd,** No.24/2(l1/2), Raja Street Ext., Mandaveli Chennai – 600 028	20/1, 20/2, 270/2, 270/3, 270/4, 257/9, 257/8A & 257/10A – Panampatti Village	4.77.0 ha	ToR obtained vide Lr. No. SEIAA-TN/F.No.8584/ SEAC/ToR-1028/2021 Dated:26.08.2021
P2	**M/s. Om Shri Vari Stones Pvt Ltd,** No.24/2(l1/2), Raja Street Ext., Mandaveli Chennai – 600 028	1l/2A, 12/1A & 12/1B (Part) of Thiruvengaivasal Village & 236/1A, 236/1B, 236/1C, 236/1D, 236/1E, 236/2, 236/3, 236/4, 236/5, 236/6, 236/7,236/9,	4.90.5 ha	ToR obtained vide Lr. No. SEIAA-TN/F.No.8685/ SEAC/ToR-1044/2022 Dated:31.01.2022

CODE	Name of the Owner	S.F. Nos & Village	Extent	Status
		236/10, 236/11, 236/12, 236/13, 236/14, 19/3, 235/9B & 235/11 of Panampatti Village		
TOTAL			**9.67.5 ha**	
EXISTING QUARRIES				
CODE	**Name of the Owner**	**S.F. No & Village**	**Extent**	**Lease Period**
E1	**Thiru. S.A. Subbaiah**	42/2 Thiruvengaivasal Village	0.01.5 ha	23.09.2016 – 22.09.2021
E2	**Thiru. S.A. Subbaiah**	42/3 Thiruvengaivasal Village	0.01.5 ha	23.09.2016 – 22.09.2021
E3	**Thiru. M. Ramesh**	11/1 & 11/2B Thiruvengaivasal Village	2.86.0 ha	09.03.2017 – 08.03.2022
E4	**Thiru. R. Chinnathambi**	12/3, etc., Thiruvengaivasal Village	3.03.0 ha	31.07.2019 – 30.07.2024
TOTAL			**5.92.0 ha**	
TOTAL CLUSTER EXTENT			**15.59.5 ha**	

All existing and proposed projected area located in Panampatti and Thiruvengaivasal Village, Illuppur Taluk, Pudukkottai District, Tamil Nadu hence the Cluster is named as Melur Cluster.

TABLE 7.1: SALIENT FEATURES OF PROPOSED AND EXISTING MINES IN CLUSTER

PROPOSAL "P1"		
Name of the Mine	M/s. Om Shri Vari Stones Pvt Ltd	
Survey Nos	20/1,20/2,270/2,270/3,270/4,257/9,257/8A & 258/10A Panampatti Village	
Land Type	Non-Forest Land / Patta Land	
Extent	4.77.0 ha	
Mining Plan Period / Lease Period	5Years	
Ultimate Pit Dimension	275m (L) x 105m (W) x 45m (D) BGL	
Latitude between	10°25'21.87"N to 10°25'32.47"N	
Longitude between	78°46'00.15"E to 78°46'10.71"E	
Highest Elevation	117 m (Max) above Mean Sea Level	
Machinery Proposed	Jack Hammer	12
	Compressor	3
	Excavator bucket & Rock breaker attached	3
	Tippers (20 tonnes Capacity)	7

Proposed Blasting Method	Controlled Blasting Method	
Manpower Proposed	55 Nos	
Total Project Cost	Rs. 1,08,78,000/-	
PROPOSAL "P2"		
Name of the Mine	M/s. Om Shri Vari Stones Pvt Ltd	
Survey Nos	Survey No. 11/2A, 12/1A & 12/1B (Part) Thiruvengaivasal village and 236/1A, 236/1B, 236/1C, 236/1D, 236/1E, 236/2, 236/3, 236/4, 236/5 ,236/6, 236/7,236/9,236/10 236/11, 236/12, 236/13, 236/14, 19/3,235/9B & 235/11 Panampatti Village, Illuppur Taluk, Pudukkottai District, Tamil Nadu.	
Land Type	Non-Forest Land / Patta Land	
Extent	4.90.5 ha	
Mining Plan/Lease Period	5 Years	
Latitude between	10°25'28.72"N to 10°25'36.27"N	
Longitude between	78°46'07.27"E to 78°46'20.71"E	
Highest Elevation	117 m (Max) above Mean Sea Level	
Ultimate Pit Dimension	Pit -I 185m (L) x 207m (W) x 45m (D) BGL Pit -I 66m (L) x 93m (W) x 30m (D) BGL Pit -I 55m (L) x 46m (W) x 20m (D) BGL Pit -I 58m (L) x 24m (W) x 10m (D) BGL	
Machinery Proposed	Jack Hammer	12
	Compressor	3
	Excavator bucket & Rock breaker attached	3
	Tippers (20 tonnes Capacity)	1
Proposed Blasting Method	Controlled Blasting Method	
Manpower Proposed	53 Nos	
Total Project Cost	Rs. 1,06,24,000/-	
EXISTING MINE "E1"		
Name of the Mine	ThiruS.A Subbaiah	
Survey Nos	42/2	
Land Type	Non-Forest Land / Patta Land	
Extent	0.01.5 ha	
Production in m^3	1500 m^3	
Mining Plan/Lease Period	23.09.2016 to 22.09.2021 (Lease Expired)	
Ultimate Pit Depth	12m x 12m x 18m	
Latitude and Longitude	10°25 '8.81"N to 10°25'09.27"N	

	78°46'19.56"E to 78°46'20.08"E
Proposed Blasting Method	Controlled Blasting Method
Manpower Proposed	11 Nos
Total Project Cost	Rs. 12,52,000/-
EXISTING MINE "E2"	
Name of the Mine	ThiruS.A Subbaiah
Survey Nos	42/3
Land Type	Non-Forest Land / Patta Land
Extent	0.01.5 ha
Production in m^3	3135 m^3
Mining Plan/Lease Period	23.09.2016 to 22.09.2021 (Lease Expired)
Ultimate Pit Depth	14x11x28m(d)
Latitude and Longitude	10°25'08.33"N to 10°25'08.77"N 78°46'20.91"E to 78°46'20.62"E
Proposed Blasting Method	Controlled Blasting Method
Manpower Proposed	11 Nos
Total Project Cost	Rs. 12,52,000/-
EXISTING MINE "E3"	
Name of the Mine	Thiru.M Ramesh
Survey Nos	11/1 & 11/2B
Land Type	Non-Forest Land / Patta Land
Extent	2.86.0 ha
Production in m^3	341852
Mining Plan/Lease Period	5 Years 09.03.2017 to 08.03.2022
Ultimate Pit Dimension	170m (L) x 54m (W) x 4m (D) BGL
Latitude between	10°25'21"N to 10°25'30"N
Longitude between	78°46'10"E to 78°46'18"E
Proposed Blasting Method	Controlled Blasting Method
Manpower Proposed	11 Nos
Total Project Cost	Rs. 72,96,000/-
EXISTING MINE "E4"	
Name of the Mine	Thiru. R. Chinnathambi
Survey Nos	1/5, 11/16, 11/17, 11/21, 11/22, 11/23, 11/25,12/3, 12/4, 12/19, 12/20, 19/1, 19/2, 19/3, 19/4, 19/11, 19/12, 19/16 & 19/17
Land Type	Non-Forest Land / Patta Land
Extent	3.05.0 ha
Production in m^3	1,61,963 m^3

Mining Plan/Lease Period	5 Years 31.07.2019 to 30.07.2024	
Ultimate Pit Dimension	172m (L) x 64m (W) x 42m (D) BGL	
Latitude between	10°26'51.23"N to 10°26'57.62"N	
Longitude between	78°46'20.23"E to 78°46'25.38"E	
Ultimate pit details	238m x 127m x 32m BGL	
Highest Elevation	110 m (Max) above Mean Sea Level	
Machinery Proposed	Jack Hammer	6
	Compressor	1
	Excavator bucket & Rock breaker attached	1
	Tippers (20 tonnes Capacity)	2
Proposed Blasting Method	Controlled Blasting Method	
Manpower Proposed	24 Nos	
Total Project Cost	Rs. 38,83,550/-	

The Cumulative Impact is anticipated due to drilling & blasting and excavation and transportation activities from proposed mines within the 500 meter radius from the proposed mines and major impact anticipated is on Air & Noise Environment and Ground Vibrations due to blasting. The current monitoring was done as existing quarry are working which gives the ambient or present condition of air quality as well as noise.

TABLE 7.2: PREDICTED AIR INCREMENTAL VALUE

S.No.	Locations	PM10 (µg/m3)			PM2.5 (µg/m3)			SO2 (µg/m3)			NO2 (µg/m3)		
		Inc	Max	Total	Inc	Max	Total	Inc	Max	Total	Inc	Max	Total
1	AAQ-1	2.3	52.6	54.9	1.3	30.4	31.7	0.5	10.9	11.4	0.6	25.9	26.5
2	AAQ-2	1.1	51.4	52.5	0.7	28.4	29.1	0.1	10.6	10.7	0.1	25.7	25.8
3	AAQ-3	0	52.3	52.3	0	29	29	0	10.9	10.9	0	26	26
4	AAQ-4	5.8	51.6	57.4	3.3	28.5	31.8	2.1	10.5	12.6	2.2	25.7	27.9
5	AAQ-5	2.3	51.1	53.4	1.3	27.9	29.2	1.1	10.6	11.7	1.3	25.5	26.8
6	AAQ-6	1.1	53.1	54.2	0.7	28.9	29.6	0.1	11	11.1	0.1	26.1	26.2
7	AAQ-7	0	51.9	51.9	0	27.8	27.8	0	9.7	9.7	0	25	25
8	AAQ-8	3.4	51.4	54.8	2	28.2	30.2	1.6	9.4	11	1.7	26.1	27.8

Existing Mines are part of Baseline Study.

TABLE 7.3: MAXIMUM GROUND LEVEL CONCENTRATION

Pollutants	Max. GLC observed, (µg/m³)	Distance and Direction
PM_{10}	11.3	1000 m, SW
$PM_{2.5}$	6.6	1000 m, SW

Pollutants	Max. GLC observed, (µg/m^3)	Distance and Direction
SO_2	5.3	1000 m, SW
NO_2	5.8	1000 m, SW

Noise Environment –

Noise pollution is mainly due to operation like drilling & blasting and plying of trucks & HEMM. Cumulative Noise modelling has been carried out considering blasting and compressor operation (drilling) and transportation activities. Predictions have been carried out to compute the noise level at various distances around the different quarries within the 500 m radius. For hemispherical sound wave propagation through homogeneous loss free medium, one can estimate noise levels at various locations at different sources using model based on first principle.

$$Lp_2 = Lp_1 - 20 \log (r_2/r_1) - Ae_{1,2}$$

Where:

Lp_1& Lp_2 are sound levels at points located at distances r_1& r_2 from the source.

$Ae_{1,2}$ is the excess attenuation due to environmental conditions. Combined effect of all sources can be determined at various locations by logarithmic addition.

$$Lp_{total} = 10 \log \{10^{(Lp1/10)} + 10^{(Lp2/10)} + 10^{(Lp3/10)} + \ldots\ldots\}$$

Attenuation due to Green Belt has been taken to be 4.9 dB (A). The inputs required for the model are: Source data has been computed taking into account of all the machinery and activities used in the mining process.

TABLE 7.4: PREDICTED NOISE INCREMENTAL VALUE

Location ID	Background Value (Day) dB(A)	Nearest House Distance in m	Incremental Value dB(A)	Total Predicted dB(A)	Residential Area Standards dB(A)
Habitation Near P1	48.4	440	44.2	49.8	55
Habitation Near P2	48.4	460	43.8	49.7	

Existing Mines are part of Baseline Study

The resultant Noise level due to monitored values and calculated values at the receptors are based on the mathematical formula considering attenuation due to Green Belt as 4.9 dB (A) the barrier effect. From the above table, the ambient noise levels at all the locations near habitations are within permissible limits of Residential Area (buffer zone)

TABLE 7.5: ESTIMATED PEAK PARTICLE VELOCITY OF EXPLOSIVE CHARGE FOR PROPOSED MINES

Distance from blasting site, m	Quantity of Explosive/Blast, Kg For different proposed project		PPV, mm/s For different proposed project	
	P1	P2	P1	P2
50	146	137	69.3	66.6
100	146	137	28.8	27.7
150	146	137	17.3	16.6
200	146	137	12.0	11.5
250	146	137	9.0	8.7
300	146	137	7.2	6.9
350	146	137	5.9	5.7
400	146	137	5.0	4.8
450	146	137	4.3	4.1
500	146	137	3.8	3.6
550	146	137	3.3	3.2
600	146	137	3.0	2.9
650	146	137	2.7	2.6
700	146	137	2.5	2.4
750	146	137	2.3	2.2

Note: The empirical formula does not consider the delay factor in blasting due to use of Delay Detonators.

The nearest habitation from cluster is Panampatti Village at 0.65 Km in N direction. From the above table, the blasting will not cause any significant ground vibrations in the area. The ground vibrations at nearest habitation will be well within the permissible limits recommended by DGMS.

TABLE 7.6: ESTIMATED PEAK PARTICLE VELOCITY OF EXPLOSIVE CHARGE FOR EXISTING MINES

Distance from blasting site, m	Quantity of Explosive/Blast, Kg For different Existing project			PPV, mm/s For different Existing project		
	E1	E2	E3	E1	E2	E3
50	1	1	54	3.0	3.0	36.9

Distance from blasting site, m	**Quantity of Explosive/Blast, Kg For different Existing project**			**PPV, mm/s For different Existing project**		
	E1	**E2**	**E3**	**E1**	**E2**	**E3**
100	1	1	54	1.2	1.2	15.4
150	1	1	54	0.7	0.7	9.2
200	1	1	54	0.5	0.5	6.4
250	1	1	54	0.4	0.4	4.8
300	1	1	54	0.3	0.3	3.8
350	1	1	54	0.3	0.3	3.2
400	1	1	54	0.2	0.2	2.7
450	1	1	54	0.2	0.2	2.3
500	1	1	54	0.2	0.2	2.0
550	1	1	54	0.1	0.1	1.8
600	1	1	54	0.1	0.1	1.6
650	1	1	54	0.1	0.1	1.4
700	1	1	54	0.1	0.1	1.3
750	1	1	54	0.1	0.1	1.2

TABLE 7.7: SOCIO ECONOMIC BENEFITS FROM THE CLUSTER

	Project Cost in Rs.	**CER @ 2% in Rs.**
P1	1,02,84,000	2,14,000
P2	1,04,15,000	2,09,000
E1	12,02,000	50,000
E2	12,02,000	50,000
E3	71,18,000	1,78,000
E4	37,88,550	95,000
Total	**3,40,09,550**	**7,96,000**

CER allocation has been made as per MoEF & CC OM F.No.22-65/2017-IA.III, Dated: 01.05.2018. As per para 6 (II) of the office memorandum, all the mines being a green field project & Capital Investment is ≤ 100 crores, they shall contribute 2% of Capital Investment towards CER as per directions of EAC/SEAC and the total CER amount from the Cluster is **Rs. 7,96,000/-.**

TABLE 7.8: EMPLOYMENT BENEFITS FROM THE CLUSTER

Mine Code	**Direct Employment Nos**	**Indirect Employment Nos.**
P1	20	35
P2	20	33

Mine Code	Direct Employment Nos	Indirect Employment Nos.
E1	5	6
E2	5	6
E3	5	6
E4	10	14
Total	**65**	**100**

Direct employment of 65 people will 100 will get indirect employment due to the cluster while

Greenbelt Development –

TABLE 7.9: GREENBELT DEVELOPMENT BENEFITS FROM THE CLUSTER

Code	No of Trees proposed to be planted	Survival %	Area Covered Sq.m	Name of the Species	No. of Trees expected to be grown
P1	220	80%	2000	Neem, Pungan, Casuarinas and other regional trees Neem	175
P2	220	80%	2000		175
E1	-	-	-		-
E2	-	-	-		-
E3	-	-	-		-
E4	350	80%	3000		280
Total	**790**	**80%**	**7000**		**630**

Based on the Mining Plans its anticipated that there shall be growth of native species of Neem, Casuarina, Pungan, etc. in the Cluster 790 nos of Trees Planted over a period of 5 Years with Survival Rate of 80% and expected growth is around 630 Trees over an area of 7000 Sq.m.

CHAPTER 8: PROJECT BENEFITS

8.1 NEED BASED ASSESSMENT

Socio-economic survey conducted in the villages located within 10 km radius of the Proposed Rough stone Quarry of proposed area 9.67.5 (i.e. individual lease areas of 4.77.0 Ha, 4.90.5 Ha), located in Survey Nos. 20/1, 20/2, 270/2, 270/3, 270/4, 257/9, 257/8A & 257/10A, of Panampatti village and 11/2A, 12/1A & 12/1B (Part) Thiruvengaivasal village&236/1A,236/1B,236/1C,236/1D,236/1E,236/2,236/3,236/4,236/5,236/6,236/7,236/9, 236/10, 236/11, 236/12,236/13, 236/14, 19/3,235/9B & 235/11 of Panampatti Village, Illuppur Taluk, Pudukkottai District, Tamil Nadu. Villages are lacking in basic amenities like healthcare, transportation, treated drinking water, higher education and sanitation facilities etc. The survey also reveals that the literacy rate in the area is low and the people are mostly engaged in mining and agriculture related activities.

8.2 PROPOSED WELFARE MEASURES

To address some of the expectations of local people and as a commitment towards the Corporate Social Responsibility, the project proponent through the mine management will adopt following socio-economic welfare measures in the nearby villages within 2.5 km distance. Further need will be assessed as per issues raised during public hearing.

8.2.1 WELFARE ACTIVITIES

Apart from direct and indirect employment opportunities, the mine management will carry out welfare activities in the surrounding two villages for improving the conditions of the villages.

8.3 EMPLOYMENT POTENTIAL

The mine will provide fulltime employment for mine management to 108 nos (P1,P2). for activities such as excavation, transportation etc. Mostly local persons will be employed in the mine. The impact of mining on the economic aspects can be clearly anticipated. The employment potential will ameliorate economic conditions of these families directly and provide employment to many other families indirectly who are involved in business and service-oriented activities.

The employment of local people in project will upgrade the prosperity of the region. These will in-turn marginally improve the socio-economic conditions of the area.

8.4 BUDGET FOR SOCIO-ECONOMIC WELFARE ACTIVITIES

Considering this case greenfield project. As per Memorandum No:F NO 22-65/2017-IA-III dated 01/05/2018 the applicable CER is 2% in greenfield of project cost. The proposed

utilization of the budget of CSR activities affidavit furnished to SEIAA-TN. Further CSR activities will be identified as per public comments during public hearing.

TABLE 8.1: CER COST

Details	Project Cost in Rs.	CER @ 2% in Rs.
P1	1,02,84,000	2,14,000
P2	1,04,15,000	2,09,000

8.5 SUMMARY

The project activity and the management will support the local Panchayat and provide other forms of assistance for the development of public facilities in this region. The mine management will recruit semi-skilled & unskilled workers from the nearby villages. The overall effect will improve the buying power of employees and thus a higher standard of living. Transport, medical, educational, and other civic amenities will get a boost in future. This is envisaged as a major positive benefit.

CHAPTER 9: ENVIRONMENTAL COST BENEFIT ANALYSIS

9.0 ENVIRONMENTAL COST BENEFIT ANALYSIS

As per EIA Notification dated 14th September, 2006; as amended from time to time, this Chapter on 'Environmental Cost Benefit Analysis' is applicable only if it is recommended at the Scoping stage.

Post, mining activities, the area under mining will be utilized as water reservoir after discontinuation of the mining activity.

In post-mining, the left-out voids of opencast mines behave as huge groundwater reservoirs and contain groundwater runoff. Thus, development of water reservoir will help in maintaining and conserving the groundwater levels of the area.

CHAPTER 10: ENVIRONMENTAL MANAGEMENT PLAN (EMP)

10.1 INTRODUCTION

The environmental management plan consists of following set of mitigation, management, monitoring and institutional measures to be taken during implementation and operation of the project, to eliminate adverse environmental impacts or reduce them to acceptable levels.

- Overall conservation of environment.
- Minimization of natural resources and water.
- Safety, welfare and good health of the work force and populace.
- Ensure effective operation of all control measures.
- Vigilance against probable disasters and accidents.
- Monitoring of cumulative and longtime impacts.
- Ensure effective operation of all control measures.
- Waste generation and pollution.
- Judicious use of the present environmental management plan addresses, the components of environment, which are likely to be affected by the different operations in expansion project.

Environmental Management Plan, which will be implemented in the proposed project, is detailed under the following heads:

- Air Quality Management
- Noise Management
- Water Management
- Solid Waste Management
- Land Reclamation
- Greenbelt Development & Plantation

10.2 AIR QUALITY MANAGEMENT

To minimize impacts of mining on different environmental parameters and to keep air and water quality within prescribed limits of CPCB, an Environmental Management Plan (EMP) has been prepared. This will help in resolving all environmental and ecological issues due to mining in the area

The environmental management plan includes all preventive as well as mitigation measures to minimize impact on environment along-with reclamation and rehabilitation measures for mined out land.

The individual operations which will generate particulate matter are excavation, loading, unloading and transportation etc. The general air pollution in case of mining operation

includes dust, smoke, Sulphur dioxide, Nitrogen dioxide etc. These can have adverse effects on the human health conditions, depending upon the concentration, particle size and duration of exposure with the above pollutants. However, proper precautions will help in minimizing the adverse impact due to air pollution.

10.2.1 PREVENTION AND CONTROL OF AIR POLLUTION

A. Dust Pollution

The main pollutant in air is Particulate Matter (PM10), which is generated due to various mining activities. However, to reduce the impact of dust pollution the following steps will be taken during various mining activities.

a) During drilling and blasting operations

- Use of dust aprons on drilling equipment and adopting wet drilling methods.
- Avoiding blasting during adverse weather conditions.
- Use of controlled blasting practice

Thus, pollution generated will be minimized due to drilling & blasting.

b) During loading and transportation operation

- The ripped and fragmented Rough stone would be raised using Hydraulic Excavator & Front End Loader and will be loaded to the tippers.
- Regular sprinkling of water on haul and access roads.
- Periodic maintenance of haul roads
- All tippers would be covered by tarpaulin sheets at top and avoid spillage.
- Regular maintenance of all equipment to minimize particulate matter and gaseous emissions from diesel engines.

c) Monitoring of air pollution

- Periodic ambient air quality monitoring will be carried out to assess the quality and for timely corrective actions.

B. Prevention and Control of Gaseous Pollution

In mining activities, the only source of gaseous emissions is from diesel engines, other vehicles and equipment's.

The emissions from diesel engines of the machinery could be visible as smoke or invisible gases such as Sulphur Dioxide, Oxides of Nitrogen and un-burnt Hydrocarbons due to incomplete combustion of fuel. The reasons may be quality of fuel, improper operation of the engine, etc.

Proper maintenance of machines improves combustion process and brings the reduction in pollution. The effect of these gases will be limited to the surrounding of the equipment in operation only and will not affect the nearby community.

10.3 NOISE & GROUND VIBRATION MANAGEMENT

10.3.1 NOISE ABATEMENT AND CONTROL

- Small scale blasting will be carried out.
- Charge per delay will be kept optimum.
- Blasting will be conducted during lunch (noon) time when no employees are present in mine working area.
- Periodic maintenance of all mining machinery and transport vehicles
- Provision of effective silencers to all mine machinery
- Provision of ear plugs/ear muffs to workers exposed to high noise generating operations
- Development of thick plantation around mine lease boundary to act as a noise screen.
- Regular noise monitoring will be carried-out.

10.3.2 VIBRATION ABATEMENT

- Even though there is no habitation in the vicinity of the lease, the blasting pattern would be designed to keep the ground vibrations & noise to a minimum.
- The frequency of blasting too would be optimized by adopting multi-row blasting using delay detonators.
- Fly rock control would be given high priority and the blasting pattern, stemming column, charge per hole, etc., as discussed earlier, are likely to control fly rock. In addition, the detonating cord trunk line would be covered with drill chips and cutting to keep the air blast to a minimum.

10.4 WATER MANAGEMENT

10.4.1 SURFACE WATER MANAGEMENT

The changed topography will alter the drainage within the mining lease area. However, there will not be any changes in the topography or drainage pattern outside the mining lease area. At the end of mining activities after reserves are exhausted, the area will be restored to an acceptable level of self-sustaining eco-system, which will comprise of will be developed in upper benches and safety zone and at the end of lease period mining pits will be converted into water reservoir with suitable slope and fenced boundaries

No surface water will be utilized for mining operation. Moreover, there would not be any discharge from mine into the surface water body as no process waste water generation in the mine and allied activities. Hence there would not be any impact on surface water. Only domestic effluent will be generated from the mine office and rest shelter. The domestic

effluent is discharged in septic tank followed by soak pit. Besides, there will be no toxic element in the mined out material, which may contaminate ground/ surface water.

10.4.2 GROUND WATER MANAGEMENT

The Water in the area is 70m in summer season and 65m in rainy season which is observed from the nearby bore wells and data obtained from existing private boreholes The lease area is fully covered by Massive Charnokite Formation. Hence the Ground water problem will not arise. Thus, the mining activities will not intersect ground water.

10.4.3 WASTE WATER MANAGEMENT

- Septic tanks and soak pits will be provided for the disposal of domestic waste water generated from mine office.
- Garland drains will be provided to prevent the entry of rainwater into the mining pit.
- Construction of settling tanks at points to arrest silt.
- Rainwater falling in the mining pit will be collected in lower benches & will be used for dust suppression & plantation.
- Regular monitoring of ground water quality will be carried out.

10.4.4 WATER CONSERVATION MEASURES

Optimum Utilization of Water

Initially, water will be sourced which will be met from mine pit water (when available) and by tankers from nearby bore wells**.** Water for drinking purposes will be supplied from nearby borewell.

Water Recycling

No waste water generation envisaged. Septic tanks and soak pits will be provided for the disposal of domestic waste water generated from mine office while rainwater falling during rainy season i.e. Monsoon in the mining pit will be collected in lower benches & will be used for dust suppression & plantation

Rain Water Harvesting

The mine management will Roof top harvesting structures in the public buildings in nearby villages with prior consent from local gram panchayats to collect rain water and charge to ground through available dug well/ tube well**.** Also, the reservoir developed in mined out pit will act as an additional source of water to the nearby villagers and will also help in recharging ground water table of the area. The mine has potential to harvest rain water in non-mining pits and will be utilized for dust suppression and plantation.

10.5 SOLID WASTE MANAGEMENT

No top soil or subgrade present within lease area. The Total excavated ROM is saleable; therefore, recovery is 100%.

10.6 LAND RECLAMATION

Land reclamation will be carried out as per approved progressive mine closure plan. Mined out area will be developed as water body, which will act as rain water harvesting structure help in increasing water level in nearby area. Plantation will be carried out all along the safety zone and upper benches.

10.7 GREEN BELT DEVELOPMENT

Green belt & plantation has been/shall be carried out in the lease area with a view to provide green belt and to give an aesthetic look, for eliminating fugitive emissions and controlling impact of noise etc. At the conceptual stage, Greenbelt /plantation will be developed on safety zone and upper benches of pit having. In Total 5850 trees will be planted in 16000 square meter area i.e. 1.6 Ha of land.

10.8 CORPORATE SOCIAL RESPONSIBILITY

The mine management will support the local Panchayat and provide other forms of assistance for the development of public facilities in this region. The mine management will recruit semi-skilled & unskilled workers from the nearby villages. The overall effect will improve the buying power of employees and thus a higher standard of living viz. better education, improved health and sanitation facilities, housing and acquisition of consumer durables. Transport, medical, educational and other civic amenities will get a boost in future. This is envisaged as a major positive benefit.

10.9 INDUSTRIAL HYGIENE, OCCUPATIONAL HAZARDS AND SAFETY

The working conditions in the mines are governed by the enactments of the Director General of Mines Safety (DGMS). As per the guidelines of the Mines Act, the management will take all necessary precautions. Normal sanitary facilities will be provided within the lease area. The management will carry out periodic health checkup of workers.

Occupational hazards involved in mines are related to dust pollution, noise pollution, and injuries from moving belt conveyors, equipment and fall from high places. DGMS has given necessary guidelines for safety against these occupational hazards. The management will strictly follow these guidelines. All necessary first aid and medical facilities will be provided to the workers. The mine will be well equipped with proper fire protection and firefighting equipment. All operators and mechanics will be trained to handle fire-fighting equipment's. Further all the necessary protective equipment's such as helmets, reflective

jackets, safety goggles, earplugs, earmuffs, etc. will be provided to persons working in risky areas.

10.10 BUDGETARY ALLOCATION FOR ENVIRONMENTAL MANAGEMENT PROGRAMME

The details of Environmental Management Programme for different environmental protection and control activities along with capital and annual recurring cost are given in **Table 10.1**

TABLE 10.1: BUDGET FOR IMPLEMENTATION OF EMP (P1,P2)

S. No.	Description of item	Capital Cost (Rs.)
1	Air Pollution Control - Water sprinkling on haul road & plantation	52,000
2	Water Pollution Control (Settling tank, Garland Drains, etc.)	18,000
3	Noise Level Monitoring	2,000
4	Ground Vibration Test	4,000
Total EMP Cost		**76,000**
Total EMP Cost for five years		**3,80,000**

10.11 CONCLUSION

As discussed, it is safe to say that the project is not likely to cause any significant impact on the ecology of the area, as adequate preventive measures will be adopted to contain the various pollutants within permissible limits. Green belt development around the area would also be taken up as an effective pollution control technique, as well as to control the pollutants released due to mining.

CHAPTER 11: SUMMARY & CONCLUSION

11.1 INTRODUCTION

Rough Stone is the major requirements for construction industry. This EIA report is prepared by considering Cumulative load of all proposed & existing quarries of Rough Stone Quarries Cluster consisting of 2 Proposed and 4 Existing Quarry with total extent of Cluster of 15.59.5 Ha in Panampatti Village, Illuppur Taluk, Pudukottai District, Tamil Nadu State, cluster area calculated as per MoEF & CC Notification S.O. 2269(E), Dated 1st July 2016.

This EIA Report is prepared in compliance with ToR obtained vide –

- Letter No. SEIAA-TN/F.No.8584/SEAC/ToR-1028/2021
- Letter No. SEIAA-TN/F.No.8685/SEAC/ToR-1044/2022

The Baseline Monitoring study has been carried out during the period of March to May 2021 and this EIA and EMP report is prepared for considering cumulative impacts arising out of these projects, the Cumulative Environmental Impact Assessment study is undertaken, which is followed by preparation of a detailed Environmental Management Plan (EMP) individually to minimize those adverse impacts.

"Draft EIA report prepared on the basis of ToR Issued & Standard ToR for carrying out Public Hearing for the Grant of Environmental Clearance from SEIAA, - Tamil Nadu"

TABLE 11.1: DETAILS OF PROPOSED PROJECT PROPONENT

Name of the Project	Tvl. Om Shri Vari Stones (P) Ltd
S.F. No. (P1,P2)	Survey No. 20/1, 20/2, 270/2,270/3, 270/4, 257/9,257/8A & 257/10A, Survey No. 11/2A, 12/1A & 12/1B (Part) and 236/1A, 236/1B, 236/1C, 236/1D, 236/1E, 236/2, 236/3, 236/4, 236/5 ,236/6, 236/7,236/9,236/10 236/11, 236/12, 236/13, 236/14, 19/3,235/9B & 235/11
Extent	9.67.5 (i.e. individual lease areas of 4.77.0 Ha, 4.90.5 Ha)
Land Type	Non forest Land / Patta land
Village Taluk and District	Panampatti and Thiruvengaivasal Village, Illuppur Taluk, Pudukkottai District, Tamil Nadu.

TABLE 11.2: QUARRY DETAILS WITHIN 500 M RADIUS

PROPOSED QUARRIES				
CODE	**Name of the Owner**	**S.F. Nos & Village**	**Extent**	**Status**
P1	**M/s. Om Shri Vari Stones Pvt Ltd,** No.24/2(l1/2), Raja Street Ext., Mandaveli Chennai – 600 028	20/1, 20/2, 270/2, 270/3, 270/4, 257/9, 257/8A & 257/10A – Panampatti Village	4.77.0 ha	ToR obtained vide Lr. No. SEIAA-TN/F.No.8584/ SEAC/ToR-1028/2021 Dated:26.08.2021
P2	**M/s. Om Shri Vari Stones Pvt Ltd,** No.24/2(l1/2), Raja Street Ext., Mandaveli Chennai – 600 028	1l/2A, 12/1A & 12/1B (Part) of Thiruvengaivasal Village & 236/1A, 236/1B, 236/1C, 236/1D, 236/1E, 236/2, 236/3, 236/4, 236/5, 236/6, 236/7,236/9, 236/10, 236/11, 236/12, 236/13, 236/14, 19/3, 235/9B & 235/11 of Panampatti Village	4.90.5 ha	ToR obtained vide Lr. No. SEIAA-TN/F.No.8685/ SEAC/ToR-1044/2022 Dated:31.01.2022
TOTAL			**9.67.5 ha**	
EXISTING QUARRIES				
CODE	**Name of the Owner**	**S.F. No & Village**	**Extent**	**Lease Period**
E1	**Thiru. S.A. Subbaiah**	42/2 Thiruvengaivasal Village	0.01.5 ha	23.09.2016 – 22.09.2021
E2	**Thiru. S.A. Subbaiah**	42/3 Thiruvengaivasal Village	0.01.5 ha	23.09.2016 – 22.09.2021
E3	**Thiru. M. Ramesh**	11/1 & 11/2B Thiruvengaivasal Village	2.86.0 ha	09.03.2017 – 08.03.2022
E4	**Thiru. R. Chinnathambi**	12/3, etc., Thiruvengaivasal Village	3.03.0 ha	31.07.2019 – 30.07.2024
TOTAL			**5.92.0 ha**	
TOTAL CLUSTER EXTENT			**15.59.5 ha**	

TABLE 11.3 (a): SALIENT FEATURES OF THE PROPOSAL (P1)

S. No.	Particulars	Details	
1	Type of Project	Rough Stone Mine	
2	Mine area applied	4.77.0 Ha	
3	Project Location	Survey No. 20/1, 20/2, 270/2,270/3, 270/4, 257/9,257/8A & 257/10A, Panampatti Village, Illuppur Taluk, Pudukkottai District, Tamil Nadu	
4	Location on WGS 1984 datum	**Latitude**	**Longitude**
		10°25'21.87"N to 10°25'32.47"N	78°46'00.15"E to 78°46'10.71"E
5	Topo sheet Number	58 - J/15	

S. No.	Particulars	Details		
6	Land use at the proposed project site	Non-Forest Land / Patta Land Land Cover: Barren Land which is not fit for vegetation/cultivation		
7	Site Topography	The lease applied area is exhibits plain topography. The area has gentle sloping towards Southern side.		
8	Site elevation	117m (Max) above Mean Sea Level		
9	Reserves	**Top soil**	**Weathered formation**	**Rough stone**
	Geological Reserves	1,43,100 m^3	95,400 m^3	19,08,000 m^3
	Mineable Reserves	83,232 m^3	48,918 m^3	5,04,990 m^3
	Recoverable Reserves	83,232 m^3	48,918 m^3	5,04,990 m^3
10	Lease period	5 years		
11	Proposed depth of Mining	**45m** below ground level (3m Top soil+2m Weathered formation+40m Rough Stone)		
12	Ultimate pit dimension	275m (L) x 105m (W) x 45m (D) BGL		
13	Climatic Conditions	IMD Data, Pudukkottai (1971-2000) • Avg. Ambient air temp – 42 ^{o} C to 20^o C • Annual rainfall - 887 mm		
14	Ground water level	The Ground water is about **70m- 65m** depth from ground level.		
15	Seismic zone	Seismically, this area is categorized under Zone-II as per IS-1893 (Part-1)-2002. Hence, seismically the site is Less Damage Risk Zone. With MSK scale of VII.		
16	Land Use Pattern	**Description**	**Percentage**	
		Old Pits/Crusher	11%	
		Trees	05%	
		Roads	06%	
		Habitation	04%	
		Seasonal Agricultural Land	25%	
		Barren Land	22%	
		Waterbodies	27%	
17	Nearest State/National Highway	NH - 336 - Pudukkottai- Trichy– 1.27 km - E SH - 71 - Viralimalai - Pudukkottai –1.0km -SW		
18	Nearest Railway Station	Vellanur – 6.0Km – North eastern side.		

S. No.	Particulars	Details
19	Nearest Air Port	Trichy Airport – 38.0km – NW
20	Nearest village/major town	Perunijinai : 1.0Km, SW Pudukkottai : 7.0 Km, SE
21	Nearest Town, city, District Headquarters along with distance in kms.	Pudukkottai : 7.0 Km, SE
22	Nearest Hospital	Pudukkottai – 7.0 Km, SE
23	Ecologically sensitive zone	No wildlife sanctuary, national park or biosphere reserve within 500m radius of mine lease area.
24	Reserved/Protected forests	No wildlife sanctuary, national park or biosphere reserve within 500m radius of mine lease area.
25	Historical/tourist places	None within 300m radius of mine lease area
26	Water bodies within 10 Km Radius	The Government Poramboke Vaikkal is passing in S.F.No. 257/1 & 270/1 on the Northern side and Kidaivilluthan Kulam is located in S.F.No. 27 on the Southeastern side of the applied area ➢ Vellar River – 7.0km – S ➢ Perunjunai Periya Kanmai – 0.60km – W ➢ Thiruvengaianathar tank -0.70 km SE ➢ Mullai nagar lake – 1.97 km NE
27	Reserve Forest within 10Km Radius	Reserve forest: ➢ Pudukkottai R.F. – 3.9km – SE ➢ Narathamalai R.F. – 7.5km- N ➢ Kudumaiyamalai R.F -8.90 km SW
28	Details of other quarries for a radius of 500m around the quarry site	There are following quarries located within the radius of 500m from the proposed project site. Details: Lease expired quarry– 1 No (0.64.5 Ha) Existing quarry– 4 Nos (5.92 Ha) Proposed quarry– 2 Nos (9.67.5Ha) The total extent of the Existing and proposed quarry within the radius of 500m is **15.59.5 Ha.** The project falls under the cluster situation.
29	Man power	Total Employees proposed for the quarry operation is **55 Nos.**

S. No.	Particulars	Details
30	Water requirement & source	Total water requirement for **7.9 KLD** from water vendors & nearby Bore well.
31	Overburden /Waste	The overburden in the form of Topsoil is about 83,232m^3 up to depth for 3m and Weathered Rock is about 48,918m^3 up to depth for 2m for a period of three years.
32	Cost of the project	**The Project Cost:** A. Operational cost = Rs. 1,02,84,000/- B. EMP cost = Rs.3,80,000/- Total Project Cost = Rs. 1,06,64,000/- CER Cost (2.0%) = Rs.2,14,000/- Total cost = Rs. 1,08,78,000/-

TABLE 11.3 (b): SALIENT FEATURES OF THE PROPOSAL (P2)

S. No.	Particulars	Details		
1	Type of Project	Rough Stone Mine		
2	Mine area applied	4.90.5 Ha		
3	Project Location	Survey No. 11/2A, 12/1A & 12/1B (Part) Thiruvengaivasal village and 236/1A, 236/1B, 236/1C, 236/1D, 236/1E, 236/2, 236/3, 236/4, 236/5 ,236/6, 236/7,236/9,236/10 236/11, 236/12, 236/13, 236/14, 19/3,235/9B & 235/11 Panampatti Village, Illuppur Taluk, Pudukkottai District, Tamil Nadu.		
4	Location on WGS 1984 datum	**Latitude**	**Longitude**	
		10°25'28.72"N to 10°25'36.27"N	78°46'07.27"E to 78°46'20.71"E	
5	Topo sheet Number	58 - J/15		
6	Land use at the proposed project site	Non-Forest Land / Patta Land Land Cover: Barren Land which is not fit for vegetation/cultivation		
7	Site Topography	The lease applied area is exhibits plain topography. The area has gentle sloping towards Southern side.		
8	Site elevation	117 m (Max) above Mean Sea Level		
9	Reserves	**Top soil**	**Weathered formation**	**Rough stone**
	Geological Reserves	1,47,150 m^3	98,100 m^3	19,62,000 m^3
	Mineable Reserves	99,039 m^3	54,824 m^3	4,75,915 m^3

S. No.	Particulars	Details		
	Recoverable Reserves	99,039 m^3	54,824 m^3	4,75,915 m^3
10	Lease period	5 years		
11	Proposed depth of Mining	**45m** below ground level (3m Top soil + 2m Weathered rock +40m Rough stone)		
12	Ultimate Pit Dimension	Pit -I 185m (L) x 207m (W) x 45m (D) BGL Pit -I 66m (L) x 93m (W) x 30m (D) BGL Pit -I 55m (L) x 46m (W) x 20m (D) BGL Pit -I 58m (L) x 24m (W) x 10m (D) BGL		
13	Climatic Conditions	IMD Data, Pudukkottai (1971-2000) • Avg. Ambient air temp – 42 ^{o} C to 20^o C Annual rainfall - 887 mm		
14	Ground water level	The Ground water is about **70 to 65m** depth from ground level.		
15	Seismic zone	Seismically, this area is categorized under Zone-II as per IS-1893 (Part-1)-2002. Hence, seismically the site is Less Damage Risk Zone. With MSK scale of VII.		
16	Land Use Pattern	**Description**	**Percentage**	
		Old Pits/Crusher	11%	
		Trees	05%	
		Roads	06%	
		Habitation	04%	
		Barren Land	22%	
		Seasonal Agri. Land	25%	
		Odai & Private Building	27%	
17	Nearest State/National Highway	NH - 336 - Pudukkottai- Trichy– 1.27 km - E SH - 71 - Viralimalai - Pudukkottai –1.0km -SW		
18	Nearest Railway Station	Vellanur Railway station – 6.0km – NE		
19	Nearest Air Port	Trichy Airport – 38.0 Km, NW		
20	Nearest village/major town	Perunijinai : 1.0 Km, SW Pudukkottai : 7.0 Km, SE		
21	Nearest Town, city, District Headquarters along with distance in kms.	Pudukkottai : 7.0 Km, SE		
22	Nearest Hospital	Pudukkottai – 7.0 Km, SE		

S. No.	Particulars	Details
23	Ecologically sensitive zone	No wildlife sanctuary, national park or biosphere reserve within 10m radius of mine lease area.
24	Reserved/Protected forests	No wildlife sanctuary, national park or biosphere reserve within 10m radius of mine lease area.
25	Historical/tourist places	None within 300m radius of mine lease area
26	Water bodies within 10 Km Radius	The Government Poramboke Vaikkal is passing in S.F.No. 270/1 on the southern side applied area. Hence 50m safety distance has been maintained ➢ Vellar River – 7.0km – S ➢ Perunjunai Periya Kanmai – 0.60km – W ➢ Thiruvengaianathar tank -0.70 km SE ➢ Mullai nagar lake – 1.97 km NE
27	Reserve Forest within 10Km Radius	Reserve forest: ➢ Pudukkottai R.F. – 3.9km – SE ➢ Narathamalai R.F. – 7.5km- N ➢ Kudumaiyamalai R.F -8.90 km SW
28	Details of other quarries for a radius of 500m around the quarry site	There are following quarries located within the radius of 500m from the proposed project site. Details: Existing quarry – 1No (2.86.0Ha) Expired quarry – 1No(0.64.5Ha) Proposed quarries – 2Nos (9.67.5Ha) The total extent of the Existing and proposed quarries within the radius of 500m is **12.53.5Ha**. The project area falls under the Cluster situation
29	Man power	Total Employees proposed for the quarry operation is **53 Nos**.
30	Water requirement & source	Total water requirement for **7.9 KLD** from water vendors & nearby Bore well.
31	Overburden /Waste	The overburden in the form of Top soil and Weathered formation, the Top soil and Weathered formation will be directly loaded into tippers for the filling and levelling of low-lying areas.
32	Cost of the project	**The Project Cost:** A. Operational cost = Rs. 1,00,35,000/- B. EMP cost = Rs.3,80,000/- Total Project Cost = Rs. 1,04,15,000/-

S. No.	Particulars	Details
		CER Cost (2.0%) = Rs.2,09,000/- Total cost = Rs. 1,06,24,000/-

11.1.1 STATUTORY DETAILS

PROPOSAL – P1

- The proponent applied for Rough Stone Quarry Lease Dated: 25.06.2021
- Precise Area Communication Letter was issued by the District Collector, Pudukkottai district, Rc.No.32/2021 (G&M), dated 23.02.2021.
- The Mining Plan was prepared by Recognized Qualified Person and approved by Deputy Director, Department of Geology and Mining, Pudukkottai, vide Rc.No.33/2021 (G&M), dated: 17.03.2021.
- The proposed project falls under "B1" Category as per Order Dated: 04.09.2018 & 13.09.2018 passed by Hon'ble National Green tribunal, New Delhi in O.A. No. 173 of 2018 & O.A. No, 186 of 2016 and MoEF & CC Office Memorandum F. No. L-11011/175/2018-IA-II (M) Dated: 12.12.2018
- Proponent applied for ToR for Environmental Clearance vide. online Proposal No. SIA/TN/MIN/63144/2021 and ToR was granted by SEAC with letter no. SEIAA-TN/F.No.8584/SEAC/ToR-1028/2021, dated 26.08.2021.

PROPOSAL – P2

- The proponent applied for Rough Stone Quarry Lease Dated: 02.08.2021
- Precise Area Communication Letter was issued by the District Collector, Pudukkottai district, Rc.No.32/2021 (G&M), dated 23.02.2021.
- The Mining Plan was prepared by Recognized Qualified Person and approved by Deputy Director, Department of Geology and Mining, Pudukkottai, vide Rc.No.32/20211 (G&M), dated: 28.04.2021.
- The proposed project falls under "B1" Category as per Order Dated: 04.09.2018 & 13.09.2018 passed by Hon'ble National Green tribunal, New Delhi in O.A. No. 173 of 2018 & O.A. No, 186 of 2016 and MoEF & CC Office Memorandum F. No. L-11011/175/2018-IA-II (M) Dated: 12.12.2018
- Proponent applied for ToR for Environmental Clearance vide. online Proposal No. SIA/TN/MIN/65957/2021 and and ToR was granted by SEAC with letter no. SEIAA-TN/F.No.8685/SEAC/ToR-1044/2022, dated 31.01.2021

11.2 PROJECT DESCRIPTION

The proposed projects are site specific and there is no additional area required for this project. There is no effluent generation/discharge from the proposed quarries. Method is mining is common for all the proposed quarries in the cluster. Rough Stone is proposed to be excavated by opencast mechanized method involving splitting of rock mass of

considerable volume from the parent rock mass by jackhammer drilling and blasting, hydraulic excavators are used for loading the Rough Stone from pithead to the needy crushers and rock breakers to avoid secondary blasting.

TABLE 11.4: SITE CONNECTIVITY TO THE PROJECT AREA

Mode	Description
Road connectivity	➢ The approach (metal) road is situated on the Eastern side of the applied area which connects to the Vadamalappur – Ayingudi village Road at a distance 1.0km on the Southeastern side. ➢ The Nearest National Highway (NH - 336) Pudukkottai – Trichy Road – 1.27Km - E side. ➢ The State Highway (SH-71) Manapparai - Pudukkottai – 1.0Km – Southeastern side
Railway station & Railway line	➢ The Nearest Railway station is Vellanur – 6.0Km – Northeastern side. ➢ The Nearest Railway line is Tiruchirappalli – Pudukottai –2.0Km- Eastern side.
Air port	The Nearest Airport is Trichy – 38.0Km – North western side.

TABLE 11.5(a): LAND USE PATTERN OF THE LEASE APPLIED AREA (P1)

S. No.	Description	Present area (Ha)	Area at the end of this quarrying period (Ha)
6.	Area under quarry	Nil	2.65.8
7.	Infrastructure	Nil	0.01.0
8.	Roads	Nil	0.02.0
9.	Green Belt	Nil	0.20.0
10.	Unutilized Land	4.77.0	0.88.2
Total		**4.77.0**	**4.77.0**

TABLE 11.5(b): LAND USE PATTERN OF THE LEASE APPLIED AREA (P2)

S. No.	Description	Present area (Ha)	Area at the end of this quarrying period (Ha)
11.	Area under quarry	Nil	3.41.0
12.	Infrastructure	Nil	0.01.0
13.	Roads	Nil	0.02.0

S. No.	Description	Present area (Ha)	Area at the end of this quarrying period (Ha)
14.	Green Belt	Nil	0.20.0
15.	Unutilized Land	4.90.5	1.26.5
Total		**4.90.5**	**4.90.5**

11.2.1 METHOD OF MINING

Proposed Method of Mining is common for all the Proposed Projects – The method of mining is Opencast Mechanized Mining Method is being proposed by formation of 5.0 meter height bench with a bench width not less than the bench height. The Rough Stone is a batholith formation and the splitting of rock mass of considerable volume from the parent rock mass will be carried out by deploying jackhammer drilling and Slurry Explosives will be used for blasting. Hydraulic Excavators attached with Rock Breakers unit will be deployed for breaking large boulders to required fragmented sizes to avoid secondary blasting and hydraulic excavators attached with bucket unit will be deployed for loading the Rough Stone into the tippers and then the stone is transported from pithead to the nearby crushers.

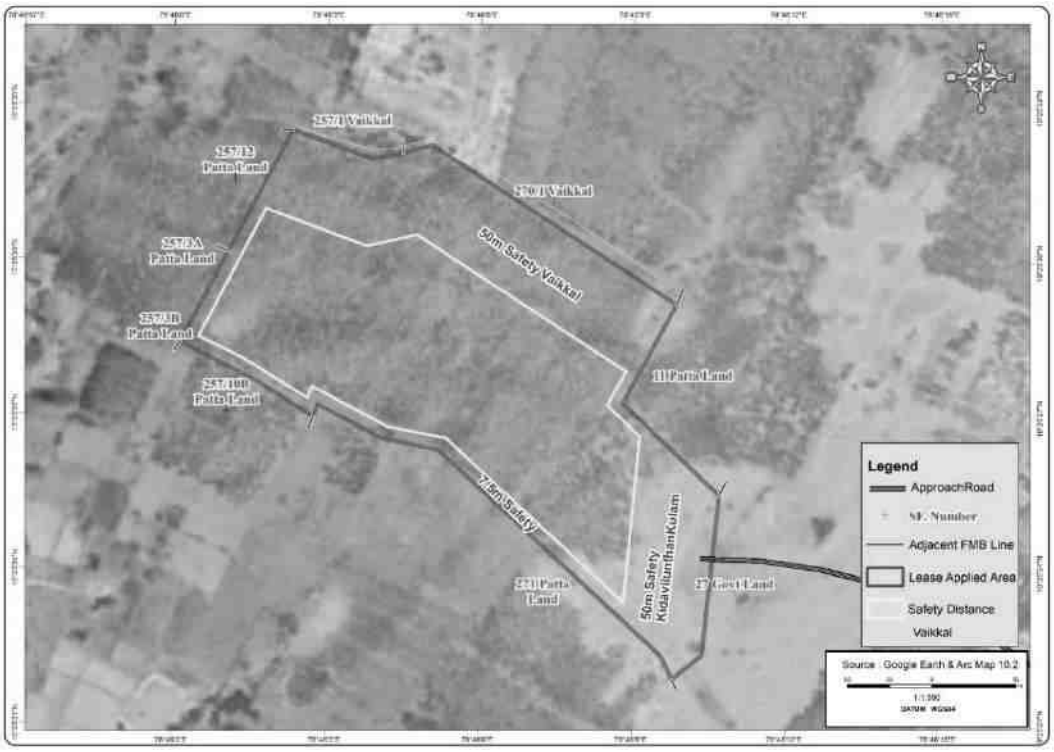


FIGURE 11.1(a): GOOGLE IMAGE SHOWING APPLIED QUARRY LEASE AREA PROJECT 1

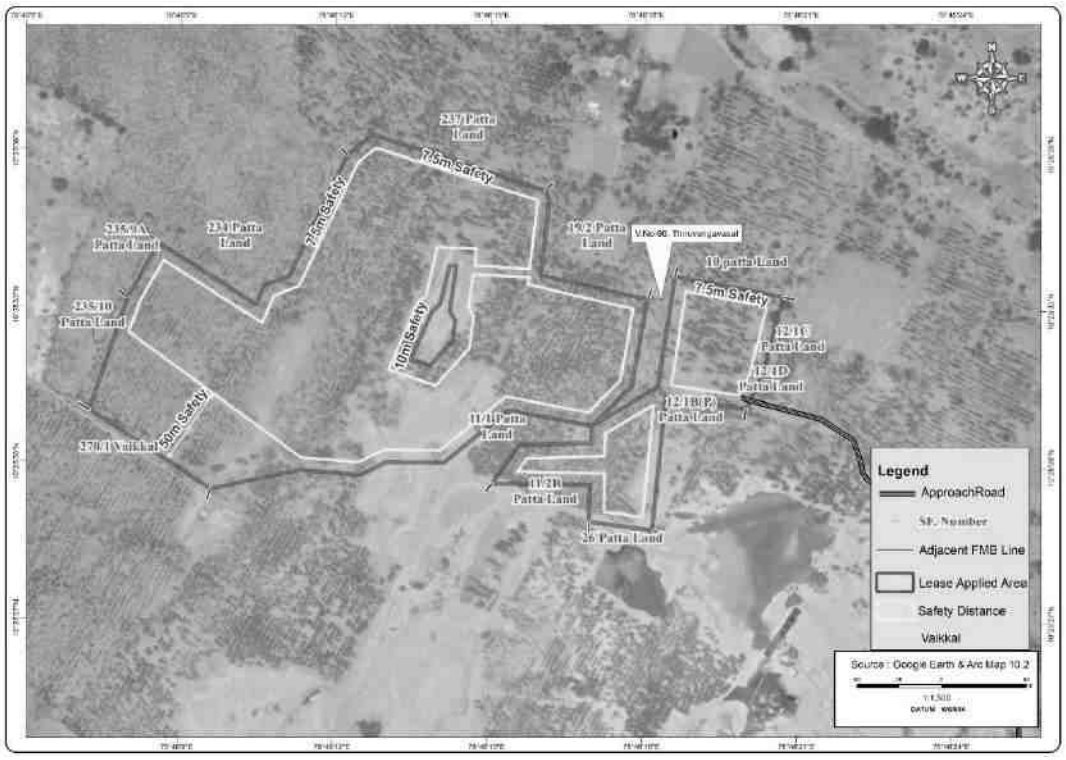


FIGURE 11.1(b): GOOGLE IMAGE SHOWING APPLIED QUARRY LEASE AREA PROJECT 2

TABLE 11.6: PROPOSED MACHINERY DEPLOYMENT

S.No	Particulars	Size capacity	Motive Power	P1	P2
				Numbers	
1.	Jack hammer (30-35mm dia hole)	1.2m -2.0m	Compressed air	12	12
2.	Compressor	400 psi	Diesel drive	3	3
3.	Excavator with Bucket and Rock Breaker	300	Diesel drive	3	3
4.	Tippers	20 tonnes	Diesel drive	7	1

11.2.2 CONCEPTUAL MINING PLAN/ FINAL MINE CLOSURE PLAN

- At the end of life of mine, the excavated mine pit / void will act as artificial reservoir for collecting rain water and helps to meet out the demand or crises during drought season.
- After mine closure the greenbelt developed along the safety barrier and top benches and temporary water reservoir will enhance the ecosystem
- Mine Closure is a process of returning a disturbed site to its natural state or which prepares it for other productive uses that prevents or minimizes any adverse effects on the environment or threats to human health and safety.

- The principal closure objectives are for rehabilitated mines to be physically safe to humans and animals, geo-technically stable, geo-chemically non-polluting/ non-contaminating, and capable of sustaining an agreed post-mining land use.

TABLE 11.7: ULTIMATE PIT DIMENSION

PROPOSAL – P1			
Pit	**Length (Max) (m)**	**Width (Max) (m)**	**Depth (Max)**
I	275	105	45
PROPOSAL – P2			
Pit	**Length (Max) (m)**	**Width (Max) (m)**	**Depth (Max)**
I	185	207	45
	66	93	30
	55	46	20
	58	24	10

11.3 DESCRIPTION OF THE ENVIRONMENT

Field monitoring studies to evaluate the base line status of the project site were carried out during December 2021 to February 2022 as per CPCB guidelines. Environmental Monitoring data has been collected with reference to proposed quarry by Enviro Tech Services, Ghaziabad an NABL Certified & MoEF Notified Laboratory

11.8: ENVIRONMENT MONITORING ATTRIBUTES

S. No.	Attributes	Parameters	Frequency
1	Ambient Air Quality	PM_{10}, SO_2, NO_X, & mineralogical composition of PM_{10}, particularly for free silica	24 hourly samples, twice a week for three months at 8 locations.
2	Meteorology	Wind speed, Wind direction, Temperature, Relative humidity and Rainfall	Continuous hourly recording (one season) at project site. Secondary data from the nearest IMD station.
3	Water quality	Physical and Chemical parameters.	Grab samples collected once during study period from 5 ground water and 3 surface water locations.
4	Soil Quality	Physical and Chemical parameters.	Grab samples collected once during study period from 8 locations.
5	Ecology	Existing terrestrial flora and fauna covering Core	Through field studies once during study period. Secondary data also collected.

S. No.	Attributes	Parameters	Frequency
		Zone (1.00.0 Ha) & Buffer Zone (10-Km radius). Existing aquatic ecological status in Buffer Zone (10-Km radius).	
6	Noise levels	Noise levels in dB (A) Day and Night.	Hourly Noise levels in and around the project area for 24 hours at each location once during study period at 8 locations.
7	Land use	Current land use scenario	Once during study period based on recent satellite imagery and ground-truthing at site.
8	Geology	Geological details	Once during study period. Data collected from secondary sources
9	Hydrogeology	Drainage area and pattern, nature of streams, aquifer characteristics, recharge and discharge areas, etc.	Based on primary and secondary sources, once during study period.
10	Socio-Economic aspects	Socio-economic aspects like demography, population dynamics, infrastructure resources, health status, economic resources, etc.	From primary and secondary sources (like census abstracts of census of India 2011) once during the study period.

TABLE 11.9: LAND ENVIRONMENT

S.No	Level I	Level -II	Area (Km^2)	Percentage (%)
1	Built-up Land	Built-up Land	17.57	5.15
2	Forest	Dense jungle	26.35	7.72
3	Agricultural Land	Crops	143.8	42.11
4	Waste Land	Plantation	49.92	14.62
		Scrub/shrub	18.71	5.48
		Bare Land	63.24	18.5
5	Water Body	Water Body	20.81	6.10
6	Other	Mining land	1.1	0.32
		Total	**341.5**	**100**

The new proposed area of 9.67.5 (i.e. individual lease areas of 4.77.0 Ha, 4.90.5 Ha) contributes about 0.32% of the total mining area within the study area. This small percentage of Mining Activities shall not have any significant impact on the environment.

11.3.1 SOIL ENVIRONMENT

Physical Characteristics –

- pH of the soil samples varied from 7.33 to 8.22 indicating slightly alkaline soil
- Bulk density of the soil samples varied from 0.95 to 1.26 g/cm^3
- Organic matter in the soil samples varied from 1.34 to 2.00 %
- Total Nitrogen in the soil samples varied from 149 to 266 mg/kg
- Water Holding Capacity (WHC) in the soil samples varied from 23 to 44.3%.

11.3.2 WATER ENVIRONMENT

Surface Water

The physico-chemical characteristics of surface water are presented in Table above and are compared with the standards. The pH of the water samples collected was 7.16 and 7.66 and within the acceptable limit of 6.5 to 8.5. The total dissolved solids were found in the range of 263 and 533 mg/L in all samples. The total hardness was 39.9 and 192.5 mg/L for all samples collected at 4 locations.

In all samples, iron content was between <0.02 and 0.19 mg/L, Nitrate was between <0.1 and 23 mg/l, fluoride was 0.13 and 15.5 mg/L, chloride was <0.02 and 0.28 mg/L, Sulphate was 0.19 and 20 mg/L, alkalinity was 65.6 and 263 mg/L, calcium was 22 and 31.3 mg/L and magnesium was 22.8and 148 mg/L. The overall surface water quality was found to be good in most. The levels of heavy metals content were found to be within permissible limits.

Ground Water

The physico-chemical characteristics of groundwater are presented in Table above and are compared with the standards. The pH of the water samples collected ranged from 6.46 to 7.83 and within the acceptable limit of 6.5 to 8.5. The total dissolved solids were found in the range of 412 to 529 mg/L in all samples. The total hardness varied between 136 to 196 mg/L for all samples collected at 8 locations.

In all samples, iron content is 0.15 to 0.19 mg/L, Nitrate in between 13 to 26 mg/l, fluoride varied between 0.16 to 0.19 mg/L, chloride <0.1 to ,0.1 mg/L, Sulphate 17.4 to 34 mg/L, alkalinity 133 to 196 mg/L, calcium 23 to 41.6 mg/L and magnesium in between 17 to 23.7 mg/L. The overall ground water quality was found to be good. The levels of heavy metals content were found to be within permissible limits.

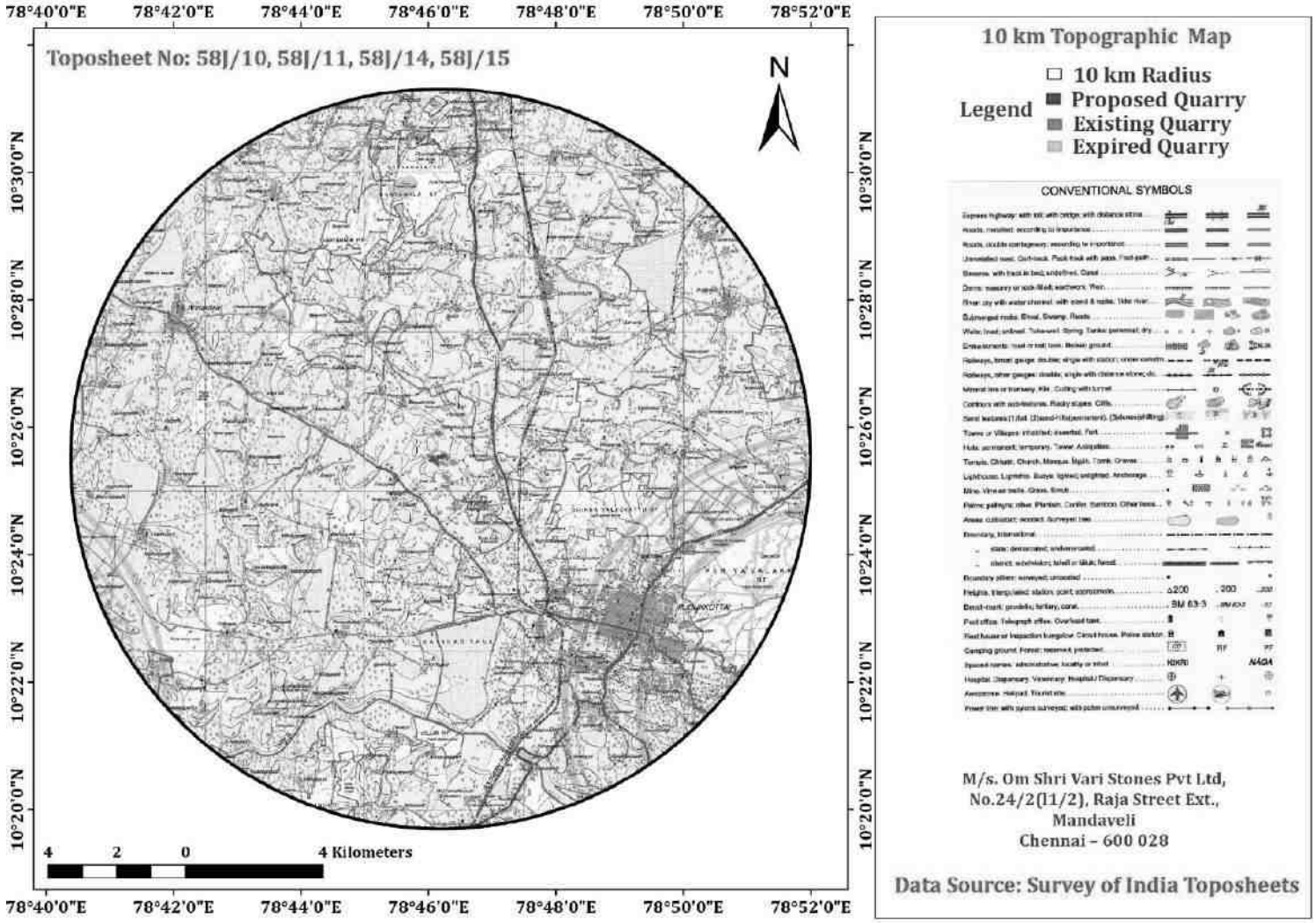


FIGURE 11.2: TOPOSHEET MAP COVERING 10 KM RADIUS

11.3.3 AIR ENVIRONMENT

The baseline studies on air environment include identification of specific air pollution parameters and their existing levels in ambient air. The ambient air quality with respect to the study zone of 10 km radius around the proposed quarry forms the baseline information.

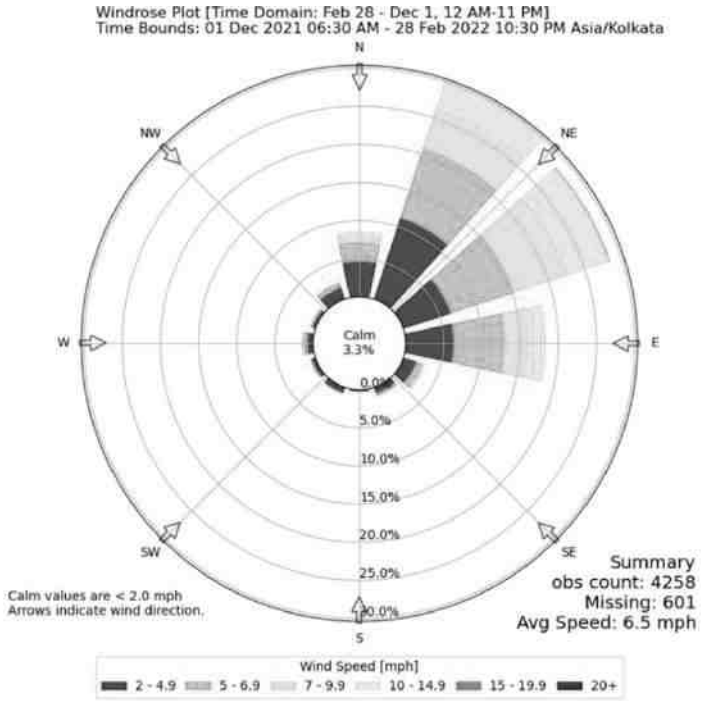


FIGURE 11.3: WIND ROSE DIAGRAM

The results of ambient air quality monitoring for the period (December 2021 to February 2022) are presented in the report. Data has been complied for three months. As per monitoring data, PM_{10} ranges from 21.9 to 30.4 µg/m^3, $PM_{2.5}$ data ranges from 46.2 to 53.1 µg/m^3, SO_2 ranges from 7.8 to 11 µg/m^3 and NO_2 data ranges from 21.4 to 25.9 µg/m^3. The concentration levels of the above criteria pollutants were observed to be well within the limits of NAAQS prescribed by CPCB.

11.3.4 NOISE ENVIRONMENT

Ambient noise levels were measured at 8 (Six) locations around the proposed project area. it is observed that the ambient noise levels at all the monitoring locations and villages, recorded in core zone during daytime were from 39.4 to 48.4 dB (A) Leq and during nighttime were from 35.4 to 40.0 dB (A) Leq. it is observed that the ambient noise levels at all the monitoring locations and villages as the permissible limits of 48.4 dB(A) for daytime and 40.0 dB(A) for night time observed within permissible limit

11.3.5 ECOLOGICAL ENVIRONMENT

The study involved in the collection of primary data by conducting a survey in the field, examination of floral and faunal records in previously published reports and records. Analysis of the information is the view of the possible alteration in the environment of the project site. For the survey of fauna, both direct and indirect observation methods were used. There is no schedule I species of animals observed within study area as per Wildlife Protection Act 1972 as well as no species is in vulnerable, endangered or threatened category as per IUCN. There is no endangered red list species found in the study area. Hence this small operation over short period of time will not have any significant impact on the surrounding flora and fauna.

11.3.6 SOCIO ECONOMIC ENVIRONMENT

It includes demographic structure of the area, provision of basic amenities viz., housing, education, health and medical services, occupation, water supply, sanitation, communication, transportation, prevailing diseases pattern as well as feature like temples, historical monuments etc., at the baseline level. This will help in visualizing and predicting the possible impact depending upon the nature and magnitude of the project. The socio-economic study of surveyed villages gives a clear picture of its population, average household size, literacy rate and sex ratio etc. It is also found that a part of population is suffering from lack of permanent job to run their day-to-day life. Their expectation is to earn some income for their sustainability on a long-term basis. The proposed projects will aim to provide preferential employment to the local people there by improving the employment opportunity in the area and in turn the social standards will improve.

11.4 ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES – IN COMMON FOR ALL PROPOSED QUARRIES

To maintain the environmental commensuration with the mining operation, it is essential to undertake studies on the existing environmental scenario and assess the impact on different environmental components. This would help in formulating suitable management plans sustainable resource extraction.

11.4.1 LAND ENVIRONMENT:

ANTICIPATED IMPACT

- Permanent or temporary change on land use and land cover.
- Change in Topography: Topography of the ML area will change at the end of the life of the mine.
- Movement of heavy vehicles sometimes cause problems to agricultural land, human habitations due to dust, noise and it also causes traffic hazards.

- Due to degradation of land by pitting the aesthetic environment of the core zone may be affected.
- Earthworks during the rainy season increase the potential for soil erosion and sediment laden water entering the water ways.

If no due care is taken wash off from the exposed working area may choke the water course & can also causes the siltation of water course

MITIGATION MEASURES

- The mining activity will be gradual confined in blocks and excavation will be undertaken progressively along with other mitigative measures like phase wise development of greenbelt etc.
- Construction of garland drains all around the quarry pits and construction of check dam at strategic location in lower elevations to prevent soil erosion due to surface runoff during rainfall and also to collect the storm water for various uses within the proposed area
- Green belt development along the boundary within safety zone. The small quantity of water stored in the mined-out pit will be used for greenbelt
- Thick plantation will be carried out on unutilized area, top benches of mined out pits, on safety barrier, etc.,
- At conceptual stage, the land use pattern of the quarry will be changed into Greenbelt area and temporary reservoir
- In terms of aesthetics, natural vegetation surrounding the quarry will be retained (such as in a buffer area i.e., 10 m safety barrier and other safety provided) so as to help minimise dust emissions.
- Proper fencing will be carried out at the conceptual stage, Security will be posted round the clock, to prevent inherent entry of the public and cattle.

11.4.2 WATER ENVIRONMENT

ANTICIPATED IMPACT

- The major sources of water pollution normally associated due to mining and allied operations are:
    - Generation of waste water from vehicle washing.
    - Washouts from surface exposure or working areas
    - Domestic sewage
    - Disturbance to drainage course in the project area
    - Mine Pit water discharge
- Increase in sediment load during monsoon in downstream of lease area
- This being a mining project, there will be no process effluent. Waste from washing of machinery may result in discharge of Oil & grease, suspended solids.

- The sewage from soak pit may percolate to the ground water table and contaminate it.
- Surface drainage may be affected due to Mining
- Abstraction of water may lead to depletion of water table

MITIGATION MEASURES

- Garland drains, settling tank will be constructed along the individual mining leases. The Garland drains of the individual leases will be connected to settling tank and after settling the water will be discharged out to the natural drainage
- Rainwater will be collected in sump in the mining pits and will be allowed to store and pumped out to surface setting tank of 15 m x 10m x 3m to remove suspended solids if any. This collected water will be judiciously used for dust suppression onwards and such sites where dust likely to be generated and for developing green belt. The proponent will collect and judicially utilize the rainwater as part of rainwater harvesting
- Providing benches with inner slopes and through a system of drains and channels, allowing rain water to descent into surrounding drains, so as to minimize the effects of erosion & water logging arising out of uncontrolled descent of water.
- Reuse the water collected during storm for dust suppression and greenbelt development within the mines
- Installing interceptor traps/oil separators to remove oils and greases. Water from the tipper wash-down facility and machinery maintenance yard will pass through interceptor traps/oil separators prior to its reuse;
- Using flocculating or coagulating agents to assist in the settling of suspended solids during monsoon seasons;
- Periodic analysis of quarry pit water and ground water quality in nearby villages.
- Domestic sewage from site office & urinals/latrines provided in ML is discharged in septic tank followed by soak pits.
- Waste water discharge from mine will be treated in settling tanks before using for dust suppression and tree plantation purposes.
- De-silting will be carried out before and immediately after the monsoon season.
- Regular monitoring and analysing the quality of water in open well, bore wells and surface water

11.4.3 AIR ENVIRONMENT

ANTICIPATED IMPACT

- During mining, at various stages activities such as excavation, drilling, blasting, and transportation of materials, particular matter (PM), gases such as Sulphur dioxide, oxides of Nitrogen from vehicular exhaust are the main air pollutants.

- Emissions of noxious gases due to incomplete detonation of explosive may sometimes pollute the air.
- The fugitive dust released from the mining operations may cause effect on the mine workers who are directly exposed to the fugitive dust.
- Simultaneously, the air-borne dust may travel to longer distances and settle in the villages located near the mine lease area.

MITIGATION MEASURES

Drilling – To control dust at source, wet drilling will be practiced. Where there is a scarcity of water, suitably designed dust extractor will be provided for dry drilling along with dust hood at the mouth of the drill-hole collar.

Advantages of Wet Drilling:-

- In this system dust gets suppressed close to its formation. Dust suppression become very effective and the work environment will be improved from the point of occupational comfort and health.
- Due to dust free atmosphere, the life of engine, compressor etc., will be increased.
- The life of drill bit will be increased.
- The rate of penetration of drill will be increased.
- Due to the dust free atmosphere visibility will be improved resulting in safer working conditions.

Blasting –

- Establish time of blasting to suit the local conditions and water sprinkling on blasting face
- Avoid blasting i.e., when temperature inversion is likely to occur and strong wind blows towards residential areas
- Controlled blasting includes Adoption of suitable explosive charge and short delay detonators, adequate stemming of holes at collar zone and restricting blasting to a particular time of the day i.e. at the time lunch hours, controlled charge per hole as well as charge per round of hole
- Before loading of material water will be sprayed on blasted material
- Dust mask will be provided to the workers and their use will be strictly monitored

Haul Road & Transportation –

- Water will be sprinkled on haul roads twice a day to avoid dust generation during transportation
- Transportation of material will be carried out during day time and material will be covered with tarpaulin

- The speed of tippers plying on the haul road will be limited below 20 km/hr to avoid generation of dust.
- Water sprinkling on haul roads & loading points will be carried out twice a day
- Main source of gaseous pollution will be from vehicle used for transportation of mineral; therefore, weekly maintenance of machines improves combustion process & makes reduction in the pollution.
- The un-metalled haul roads will be compacted weekly before being put into use.
- Over loading of tippers will be avoided to prevent spillage.
- It will be ensured that all transportation vehicles carry a valid PUC certificate
- Grading of haul roads and service roads to clear accumulation of loose materials

Green Belt –

- Planting of trees all along main mine haul roads and regular grading of haul roads will be practiced to prevent the generation of dust due to movement of dumpers/trucks
- Green belt of adequate width will be developed around the project areas

Occupational Health –

- Dust mask will be provided to the workers and their use will be strictly monitored
- Annual medical check-ups, trainings and campaigns will be arranged to ensure awareness about importance of wearing dust masks among all mine workers & tipper drivers
- Ambient Air Quality Monitoring will be conducted six month once to assess effectiveness of mitigation measures proposed

11.4.4 NOISE ENVIRONMENT

ANTICIPATED IMPACT

- Noise pollution poses a major health risk to the mine workers. Following are the sources of noise in the existing open cast mine project are being observed such as Drilling, & Blasting, Loading and during movement of vehicles.

MITIGATION MEASURES

- Usage of sharp drill bits while drilling which will help in reducing noise;
- Secondary blasting will be totally avoided and hydraulic rock breaker will be used for breaking boulders;
- Controlled blasting with proper spacing, burden, stemming and optimum charge/delay will be maintained;
- The blasting will be carried out during favourable atmospheric condition and less human activity timings by using nonelectrical initiation system;

- Proper maintenance, oiling and greasing of machines will be done every week to reduce generation of noise;
- Provision of sound insulated chambers for the workers working on machines (HEMM) producing higher levels of noise;
- Silencers / mufflers will be installed in all machineries;
- Green Belt/Plantation will be developed around the project area and along the haul roads. The plantation minimizes propagation of noise;
- Personal Protective Equipment (PPE) like ear muffs/ear plugs will be provided to the operators of HEMM and persons working near HEMM and their use will be ensured though training and awareness.
- Regular medical check–up and proper training to personnel to create awareness about adverse noise level effects.

11.4.5 BIOLOGICAL ENVIRONMENT

ANTICIPATED IMPACT

There are no National Park and Archaeological monuments within project area. There are no migratory corridors, migratory avian-fauna, rare endemic and endangered species. There are no wild animals in the area. No breeding and nesting site were identified in project site. No National Park and Wildlife Sanctuary found within 10km radius. The dumps / bunds around the mine itself act as a good barrier for entry of stray animals. In the post mining stage, barbed wire fencing is proposed all around the mined-out void to prevent fall of animals in the mine pits.

MITIGATION MEASURES

To reduce the adverse effects on natural flora/fauna status of the area due to deposition of dust generated from mining operations, water sprinkling and water spraying systems will be ensured in all dust prone areas to arrest dust generation. Methodical and well-planned plantation scheme will be carried out.

Table 11.10: GREENBELT DEVELOPMENT PLAN

Year	Project 1		Project 2	
	No. of Sapling	Area (in sq.m.)	No. of Sapling	Area (in sq.m.)
1st	44	400	44	400
2nd	44	400	44	400
3rd	44	400	44	400
4th	44	400	44	400
5th	44	400	44	400
Total	**220**	**2000**	**220**	**2000**

11.4.6 SOCIO ECONOMIC ENVIRONMENT

ANTICIPATED IMPACT

- Employment generation due to the project will provide direct employment for about 108 persons (P1,P2).

MITIGATION MEASURES

- Good maintenance practices will be adopted for plant machinery and equipment, which will help to avert potential noise problems.
- Green belt will be developed in and around the project site as per Central Pollution Control Board (CPCB) guidelines.
- Appropriate air pollution control measure will be taken to minimize the environmental impact within the core zone.
- For the safety of workers, personal protective appliances like hand gloves, helmets, safety shoes, goggles, aprons, nose masks and ear protecting devices will be provided as per mines act and rules.
- Benefit to the State and the Central governments through financial revenues by way of royalty, tax, DMF, NMET etc, from this project directly and indirectly.

11.5 ANALYSIS OF ALTERNATIVES (TECHNOLOGY AND SITE)

- The site has been selected based on geological investigation and exploration as below:
- Occurrence of minerals at the specific site.
- Transportation facility for materials & manpower.
- Overall impact on environment and mitigation feasibility
- Socio – economic background.
- The mineral deposits are site specific in nature; hence question of seeking alternate site does not arise for this project.

11.6 ENVIRONMENT MONITORING PROGRAM

Usually, an impact assessment study is carried over short period of time and the data cannot bring out all variations induced by natural or human activities. Hence regular monitoring program of Environmental parameters is essential to consider the changes in the Environment.

The Objective of Monitoring -

- To check or assess the efficiency of the controlling measures;
- To establish a data base for future impact assessment studies.

11.6.1 ENVIRONMENTAL MONITORING CELL

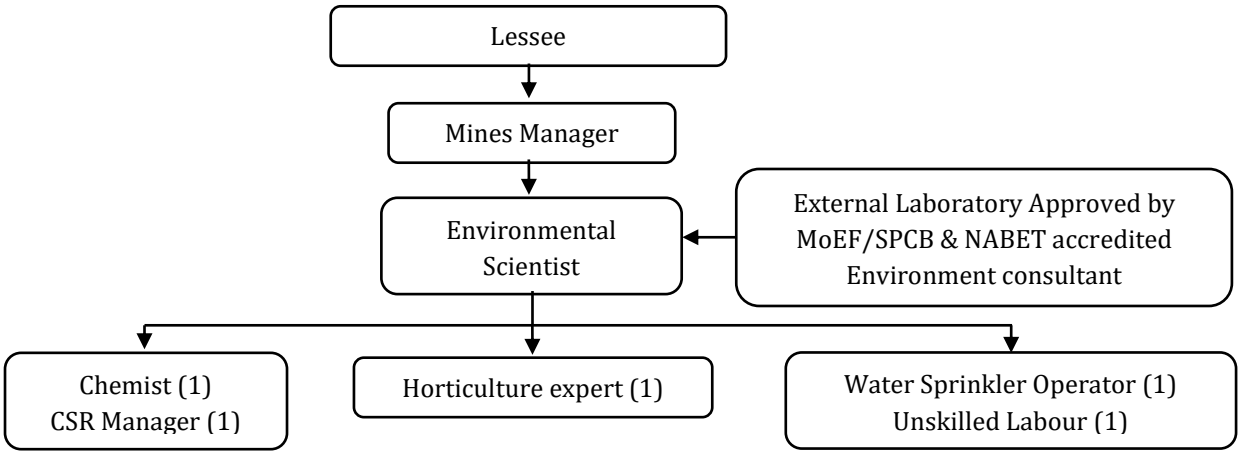


TABLE 11.11: POST ENVIRONMENTAL CLEARANCE MONITORING SCHEDULE

S. No.	Environment Attributes	Location	Monitoring		Parameters
			Duration	Frequency	
1	Air Quality	2 Locations (1 Core & 1 Buffer)	24 hours	Once in 6 months	Fugitive Dust, $PM_{2.5}$, PM_{10}, SO_2 and NO_x.
2	Meteorology	At mine site before start of Air Quality Monitoring & IMD Secondary Data	Hourly / Daily	Continuous online monitoring	Wind speed, Wind direction, Temperature, Relative humidity and Rainfall
3	Water Quality Monitoring	2 Locations (1SW & 1 GW)	-	Once in 6 months	Parameters specified under IS:10500, 1993 & CPCB Norms
4	Hydrology	Water level in open wells in buffer zone around 1 km at specific wells	-	Once in 6 months	Depth in bgl
5	Noise	2 Locations (1 Core & 1 Buffer)	Hourly – 1 Day	Once in 6 months	Leq, Lmax, Lmin, Leq Day & Leq Night

S. No.	Environment Attributes	Location	Monitoring		Parameters
			Duration	Frequency	
6	Vibration	At the nearest habitation (in case of reporting)	–	During blasting Operation	Peak Particle Velocity
7	Soil	2 Locations (1 Core & 1 Buffer)	–	Once in six months	Physical and Chemical Characteristics
8	Greenbelt	Within the Project Area	Daily	Monthly	Maintenance

11.7 ADDITIONAL STUDIES

11.7.1 RISK ASSESSMENT

The methodology for the risk assessment has been based on the specific risk assessment guidance issued by the Directorate General of Mine Safety (DGMS), Dhanbad, vide Circular No.13 of 2002, dated 31st December, 2002. The DGMS risk assessment process is intended to identify existing and probable hazards in the work environment and all operations and assess the risk levels of those hazards to prioritize those that need immediate attention. Further, mechanisms responsible for these hazards are identified and their control measures, set to timetable are recorded along with pinpointed responsibilities. The whole quarry operation will be carried out under the direction of a Qualified Competent Mine Manager holding certificate of competency to manage a metalliferous mine granted by the DGMS, Dhanbad. Risk Assessment is all about prevention of accidents and to take necessary steps to prevent it from happening.

11.7.2 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.

The objective of the Disaster Management Plan is to make use of the combined resources of the mine and the outside services to achieve the following:

- 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;
- Secure the safe rehabilitation of affected area; and
- Preserve relevant records and equipment for the subsequent inquiry into the cause and circumstances of the emergency

11. 7.3 CUMULATIVE IMPACT STUDY

TABLE 11.12: SALIENT FEATURES OF PROPOSED AND EXISTING MINES IN CLUSTER

PROPOSAL "P1"		
Name of the Mine	M/s. Om Shri Vari Stones Pvt Ltd	
Survey Nos	20/1,20/2,270/2,270/3,270/4,257/9,257/8A & 258/10A Panampatti Village	
Land Type	Non-Forest Land / Patta Land	
Extent	4.77.0 ha	
Mining Plan Period / Lease Period	5Years	
Ultimate Pit Dimension	275m (L) x 105m (W) x 45m (D) BGL	
Latitude between	10°25'21.87"N to 10°25'32.47"N	
Longitude between	78°46'00.15"E to 78°46'10.71"E	
Highest Elevation	117 m (Max) above Mean Sea Level	
Machinery Proposed	Jack Hammer	12
	Compressor	3
	Excavator bucket & Rock breaker attached	3
	Tippers (20 tonnes Capacity)	7
Proposed Blasting Method	Controlled Blasting Method	
Manpower Proposed	55 Nos	
Total Project Cost	Rs. 1,08,78,000/-	
PROPOSAL "P2"		
Name of the Mine	M/s. Om Shri Vari Stones Pvt Ltd	
Survey Nos	Survey No. 11/2A, 12/1A & 12/1B (Part) Thiruvengaivasal village and 236/1A, 236/1B, 236/1C, 236/1D, 236/1E, 236/2, 236/3, 236/4, 236/5 ,236/6, 236/7,236/9,236/10 236/11, 236/12, 236/13, 236/14, 19/3,235/9B & 235/11 Panampatti Village, Illuppur Taluk, Pudukkottai District, Tamil Nadu.	
Land Type	Non-Forest Land / Patta Land	
Extent	4.90.5 ha	
Mining Plan/Lease Period	5 Years	
Latitude between	10°25'28.72"N to 10°25'36.27"N	
Longitude between	78°46'07.27"E to 78°46'20.71"E	
Highest Elevation	117 m (Max) above Mean Sea Level	
Ultimate Pit Dimension	Pit -I 185m (L) x 207m (W) x 45m (D) BGL	

	Pit -I 66m (L) x 93m (W) x 30m (D) BGL Pit -I 55m (L) x 46m (W) x 20m (D) BGL Pit -I 58m (L) x 24m (W) x 10m (D) BGL	
Machinery Proposed	Jack Hammer	12
	Compressor	3
	Excavator bucket & Rock breaker attached	3
	Tippers (20 tonnes Capacity)	1
Proposed Blasting Method	Controlled Blasting Method	
Manpower Proposed	53 Nos	
Total Project Cost	Rs. 1,06,24,000/-	
EXISTING MINE "E1"		
Name of the Mine	ThiruS.A Subbaiah	
Survey Nos	42/2	
Land Type	Non-Forest Land / Patta Land	
Extent	0.01.5 ha	
Production in m^3	1500 m^3	
Mining Plan/Lease Period	23.09.2016 to 22.09.2021 (Lease Expired)	
Ultimate Pit Depth	12m x 12m x 18m	
Latitude and Longitude	10°25 '8.81"N to 10°25'09.27"N 78°46'19.56"E to 78°46'20.08"E	
Proposed Blasting Method	Controlled Blasting Method	
Manpower Proposed	11 Nos	
Total Project Cost	Rs. 12,52,000/-	
EXISTING MINE "E2"		
Name of the Mine	ThiruS.A Subbaiah	
Survey Nos	42/3	
Land Type	Non-Forest Land / Patta Land	
Extent	0.01.5 ha	
Production in m^3	3135 m^3	
Mining Plan/Lease Period	23.09.2016 to 22.09.2021 (Lease Expired)	
Ultimate Pit Depth	14x11x28m(d)	
Latitude and Longitude	10°25'08.33"N to 10°25'08.77"N 78°46'20.91"E to 78°46'20.62"E	
Proposed Blasting Method	Controlled Blasting Method	
Manpower Proposed	11 Nos	
Total Project Cost	Rs. 12,52,000/-	
EXISTING MINE "E3"		
Name of the Mine	Thiru.M Ramesh	
Survey Nos	11/1 & 11/2B	

Land Type	Non-Forest Land / Patta Land	
Extent	2.86.0 ha	
Production in m^3	341852	
Mining Plan/Lease Period	5 Years 09.03.2017 to 08.03.2022	
Ultimate Pit Dimension	170m (L) x 54m (W) x 4m (D) BGL	
Latitude between	10°25'21"N to 10°25'30"N	
Longitude between	78°46'10"E to 78°46'18"E	
Proposed Blasting Method	Controlled Blasting Method	
Manpower Proposed	11 Nos	
Total Project Cost	Rs. 72,96,000/-	
EXISTING MINE "E4"		
Name of the Mine	Thiru. R. Chinnathambi	
Survey Nos	1/5, 11/16, 11/17, 11/21, 11/22, 11/23, 11/25,12/3, 12/4, 12/19, 12/20, 19/1, 19/2, 19/3, 19/4, 19/11, 19/12, 19/16 & 19/17	
Land Type	Non-Forest Land / Patta Land	
Extent	3.05.0 ha	
Production in m^3	1,61,963 m^3	
Mining Plan/Lease Period	5 Years 31.07.2019 to 30.07.2024	
Ultimate Pit Dimension	172m (L) x 64m (W) x 42m (D) BGL	
Latitude between	10°26'51.23"N to 10°26'57.62"N	
Longitude between	78°46'20.23"E to 78°46'25.38"E	
Ultimate pit details	238m x 127m x 32m BGL	
Highest Elevation	110 m (Max) above Mean Sea Level	
Machinery Proposed	Jack Hammer	6
	Compressor	1
	Excavator bucket & Rock breaker attached	1
	Tippers (20 tonnes Capacity)	2
Proposed Blasting Method	Controlled Blasting Method	
Manpower Proposed	24 Nos	
Total Project Cost	Rs. 38,83,550/-	

The Cumulative Impact is anticipated due to drilling & blasting and excavation and transportation activities from proposed mines within the 500 meter radius from the proposed mines and major impact anticipated is on Air & Noise Environment and Ground Vibrations due to blasting. The current monitoring was done as existing quarry are working which gives the ambient or present condition of air quality as well as noise.

TABLE 11.13: PREDICTED AIR INCREMENTAL VALUE

Locations	PM_{10} (µg/m³)			$PM_{2.5}$ (µg/m³)			SO_2 (µg/m³)			NO_2 (µg/m³)		
	Inc	Max	Total	Inc	Max	Total	Inc	Max	Total	Inc	Max	Total
AAQ-1	2.3	52.6	54.9	1.3	30.4	31.7	0.5	10.9	11.4	0.6	25.9	26.5
AAQ-2	1.1	51.4	52.5	0.7	28.4	29.1	0.1	10.6	10.7	0.1	25.7	25.8
AAQ-3	0	52.3	52.3	0	29	29	0	10.9	10.9	0	26	26
AAQ-4	5.8	51.6	57.4	3.3	28.5	31.8	2.1	10.5	12.6	2.2	25.7	27.9
AAQ-5	2.3	51.1	53.4	1.3	27.9	29.2	1.1	10.6	11.7	1.3	25.5	26.8
AAQ-6	1.1	53.1	54.2	0.7	28.9	29.6	0.1	11	11.1	0.1	26.1	26.2
AAQ-7	0	51.9	51.9	0	27.8	27.8	0	9.7	9.7	0	25	25
AAQ-8	3.4	51.4	54.8	2	28.2	30.2	1.6	9.4	11	1.7	26.1	27.8
NAAQS (µg/m³)	100			60			80			80		

TABLE 11.14: MAXIMUM GROUND LEVEL CONCENTRATION

Pollutants	Max. GLC observed, (µg/m3)	Distance and Direction
PM_{10}	11.3	1000 m, SW
$PM_{2.5}$	6.6	1000 m, SW
SO_2	5.3	1000 m, SW
NO_2	5.8	1000 m, SW

Noise Environment –

Noise pollution is mainly due to operation like drilling & blasting and plying of trucks & HEMM. Cumulative Noise modelling has been carried out considering blasting and compressor operation (drilling) and transportation activities. Predictions have been carried out to compute the noise level at various distances around the different quarries within the 500 m radius. For hemispherical sound wave propagation through homogeneous loss free medium, one can estimate noise levels at various locations at different sources using model based on first principle.

$$\mathbf{Lp_2 = Lp_1 - 20 \log (r_2/r_1) - Ae_{1,2}}$$

Where:

Lp_1& Lp_2 are sound levels at points located at distances r_1& r_2 from the source.

$Ae_{1,2}$ is the excess attenuation due to environmental conditions. Combined effect of all sources can be determined at various locations by logarithmic addition.

$$\mathbf{Lp_{total} = 10 \log \{10^{(Lp1/10)} + 10^{(Lp2/10)} + 10^{(Lp3/10)} + \ldots\ldots\}}$$

Attenuation due to Green Belt has been taken to be 4.9 dB (A). The inputs required for the model are: Source data has been computed taking into account of all the machinery and activities used in the mining process.

TABLE 11.15: PREDICTED NOISE INCREMENTAL VALUE

Location ID	Background Value (Day) dB(A)	Nearest House Distance in m	Incremental Value dB(A)	Total Predicted dB(A)	Residential Area Standards dB(A)
Habitation Near P1	48.4	440	44.2	49.8	55
Habitation Near P2	48.4	460	43.8	49.7	

The resultant Noise level due to monitored values and calculated values at the receptors are based on the mathematical formula considering attenuation due to Green Belt as 4.9 dB (A) the barrier effect. From the above table, the ambient noise levels at all the locations near habitations are within permissible limits of Residential Area (buffer zone)

TABLE 11.16: ESTIMATED PEAK PARTICLE VELOCITY OF EXPLOSIVE CHARGE FOR PROPOSED MINES

Distance from blasting site, m	Quantity of Explosive/Blast, Kg For different proposed project		PPV, mm/s For different proposed project	
	P1	P2	P1	P2
50	146	137	69.3	66.6
100	146	137	28.8	27.7
150	146	137	17.3	16.6
200	146	137	12.0	11.5
250	146	137	9.0	8.7
300	146	137	7.2	6.9
350	146	137	5.9	5.7
400	146	137	5.0	4.8
450	146	137	4.3	4.1
500	146	137	3.8	3.6
550	146	137	3.3	3.2
600	146	137	3.0	2.9
650	146	137	2.7	2.6
700	146	137	2.5	2.4
750	146	137	2.3	2.2

Note: The empirical formula does not consider the delay factor in blasting due to use of Delay Detonators.

The nearest habitation from cluster is Melur Village at 0.55 Km in NE direction. From the above table, the blasting will not cause any significant ground vibrations in the area. The ground vibrations at nearest habitation will be well within the permissible limits recommended by DGMS.

TABLE 11.17: ESTIMATED PEAK PARTICLE VELOCITY OF EXPLOSIVE CHARGE FOR EXISTING MINES

Distance from blasting site, m	Quantity of Explosive/Blast, Kg For different Existing project			PPV, mm/s For different Existing project		
	E1	E2	E3	E1	E2	E3
50	1	1	54	3.0	3.0	36.9
100	1	1	54	1.2	1.2	15.4
150	1	1	54	0.7	0.7	9.2
200	1	1	54	0.5	0.5	6.4
250	1	1	54	0.4	0.4	4.8
300	1	1	54	0.3	0.3	3.8
350	1	1	54	0.3	0.3	3.2
400	1	1	54	0.2	0.2	2.7
450	1	1	54	0.2	0.2	2.3
500	1	1	54	0.2	0.2	2.0
550	1	1	54	0.1	0.1	1.8
600	1	1	54	0.1	0.1	1.6
650	1	1	54	0.1	0.1	1.4
700	1	1	54	0.1	0.1	1.3
750	1	1	54	0.1	0.1	1.2

TABLE 11.18: SOCIO ECONOMIC BENEFITS FROM THE MINES

	Project Cost in Rs.	CER @ 2% in Rs.
P1	1,02,84,000	2,14,000
P2	1,04,15,000	2,09,000
E1	12,02,000	50,000
E2	12,02,000	50,000
E3	71,18,000	1,78,000
E4	37,88,550	95,000
Total	**3,40,09,550**	**7,96,000**

CER allocation has been made as per MoEF & CC OM F.No.22-65/2017-IA.III, Dated: 01.05.2018. As per para 6 (II) of the office memorandum, all the mines being a green field

project & Capital Investment is ≤ 100 crores, they shall contribute 2% of Capital Investment towards CER as per directions of EAC/SEAC and the total CER amount from the Cluster is **Rs. 7,96,000/-.**

TABLE 11.19: EMPLOYMENT BENEFITS FROM 6 MINES

Mine Code	Direct Employment Nos	Indirect Employment Nos.
P1	20	35
P2	20	33
E1	5	6
E2	5	6
E3	5	6
E4	10	14
Total	**65**	**100**

Direct employment of 65 people will 100 will get indirect employment due to the cluster while

Greenbelt Development –

TABLE 11.20: GREENBELT DEVELOPMENT BENEFITS FROM THE CLUSTER

Code	No of Trees proposed to be planted	Survival %	Area Covered Sq.m	Name of the Species	No. of Trees expected to be grown
P1	220	80%	2000	Neem, Pungan, Casuarinas and other regional trees Neem	175
P2	220	80%	2000		175
E1	-	-	-		-
E2	-	-	-		-
E3	-	-	-		-
E4	350	80%	3000		280
Total	**790**	**80%**	**7000**		**630**

Based on the Mining Plans its anticipated that there shall be growth of native species of Neem, Casuarina, Pungan, etc. in the Cluster 790 nos of Trees Planted over a period of 5 Years with Survival Rate of 80% and expected growth is around 630 Trees over an area of 7000 Sq.m

11.8 PROJECT BENEFITS

Proposed Project for Quarrying Rough Stone at Panampatti Village aims to 1266768 m^3 Rough Stone over a period of 5 Years. This will enhance the socio-economic activities in the adjoining areas and will result in the following benefits

- Increase in Employment Potential
- Improvement in Socio-Economic Welfare
- Improvement in Physical Infrastructure

- Improvement in Social infrastructure

11.9 ENVIRONMENT MANAGEMENT PLAN

The Environment Monitoring Cell discussed formed by the mine management will ensure effective implementation of environment management plan and to ensure compliance of environmental statutory guidelines through Mine Management Level.

The said team will be responsible for:

1. Implementation of pollution control measures as suggested in Environmental Management Plan and recommended in EC
2. Conducting environmental monitoring as per EMP and EC stipulation through external laboratories approved by MoEF/SPCB and NABL
3. Ensuring compliance with other conditions stipulated in Environmental Clearance for the project.
4. Ensuring compliance with the conditions stipulated in 'Consent to Operate' for the project.
5. Timely submission of compliance status to MoEF/ SPCB
6. Seeking experts' guidance, as and when required.
7. Conducting CSR activities in nearby villages.
8. Co-ordination of the environment related activities within the project as well as with outside agencies
9. Collection of health statistics of the workers and population of the surrounding villages
10. Green belt development
11. Monitoring the progress of implementation of the environmental monitoring programme
12. Monitoring of the water/ waste water quality, air quality and solid waste generated
13. Analysis of the water and air samples collected through external laboratory
14. Implementation and monitoring of the pollution control and protective measures/ devices which shall include financial estimation, ordering, installation of air pollution control equipment, waste water treatment plant, etc
15. Compliance to statutory provisions, norms of State Pollution Control Board, Ministry of Environment and Forests and the conditions of the environmental clearance as well as the consents to establish and consents to operate.

11.10 CONCLUSION

It can be concluded from overall assessment of the impacts, in terms of positive and negative effects on various environmental components, that the mining activities will not have any adverse effect on the surrounding environment.

To mitigate any impacts due to the mining activities, a well-planned EMP and a detailed post project monitoring system is provided for regular monitoring and immediate rectification at site. Due to the cluster quarrying activities, socio economic conditions in and around the project site will be improved substantially. Hence, the Prior Environmental Clearance shall be granted at the earliest.

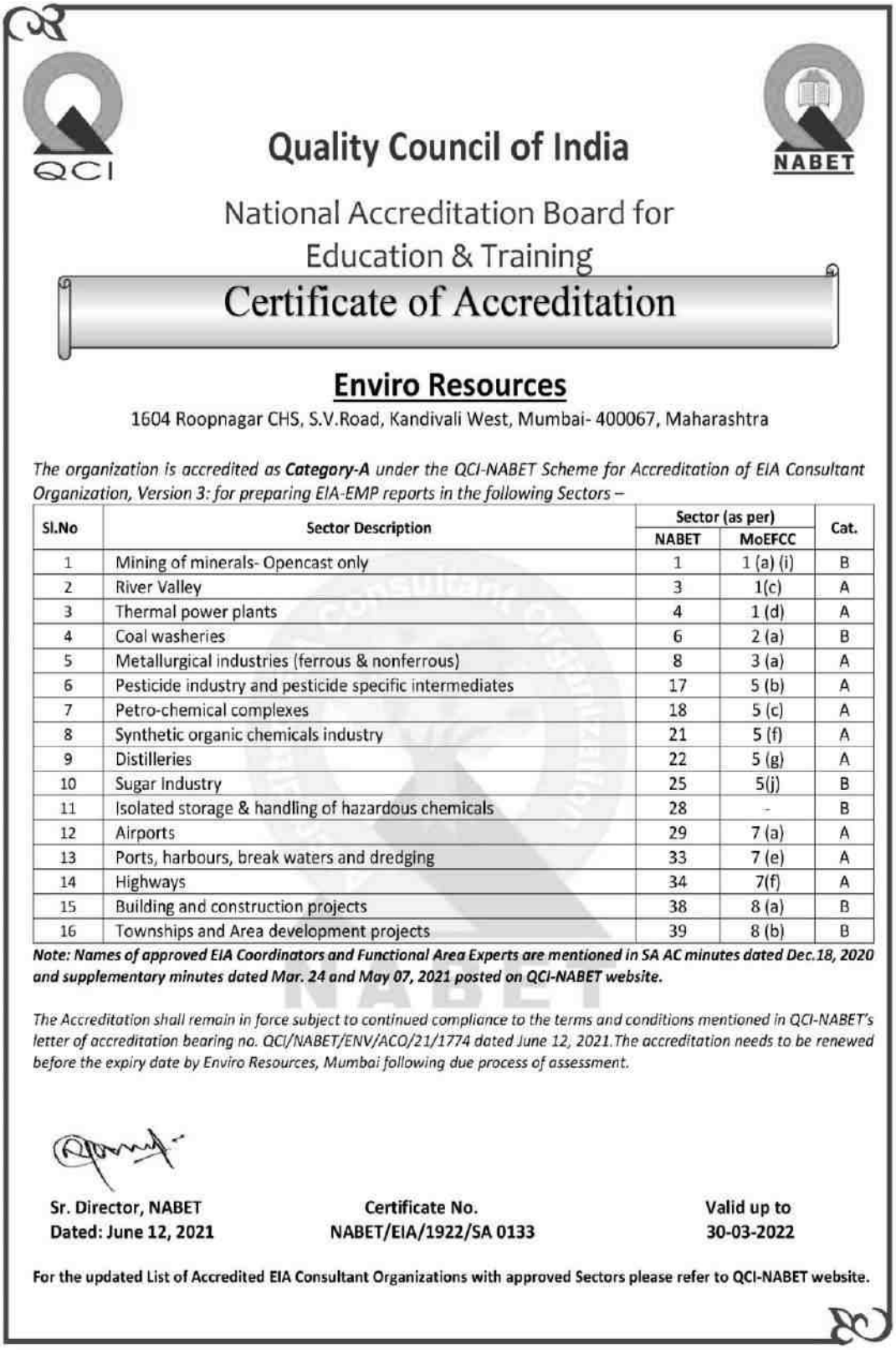
CHAPTER 12: DISCLOSURE OF CONSULTANTS

12.1 Disclosure of Consultant

M/s Enviro Resources is a NABET Accredited EIA consultant as per NABET Certificate: NABET/EIA/1922/SA0133. The registered office of Enviro Resources is at E-604, Crystal Plaza, New Link Road, Andheri (W), Mumbai 400 053, Maharashtra. NABET Certificate is provided in **Figure 12.1.**

M/s Enviro Resources is engaged in providing following environmental consultancy services to their valuable clients:

1) Obtaining **Environmental Clearance** from Department of Environment of State Govt. and MoEF & CC, GOI
2) Environmental Impact Assessment **(EIA)** studies and Environmental Management Plan **(EMP)**
3) Environmental Due Diligence Services
4) Consent to Establish, Operate, Renewal& its amendments from State Pollution Control Board
5) **CRZ Clearance** from Central & State CZMA (Coastal Zone Management Authority)
6) **Forest Clearance** from MoEF & CC, GOI
7) Environmental **Compliance Report** preparation for Environmental Clearances, Consent to Establish and Consent to Operate
8) Designing and Commissioning of **ETP, STP, WTP**& Zero Liquid Discharge **(ZLD)** Plant
9) Preparation of Quantitative Risk Analysis **(QRA), HAZOP, HAZID**, Disaster Management Plan **(DMP)** Reports.
10) Preparation of On-site & Off-site Emergency Preparedness Plan
11) Reply for legal directions & Revocation of closure.



Quality Council of India

National Accreditation Board for Education & Training

Certificate of Accreditation

Enviro Resources

1604 Roopnagar CHS, S.V.Road, Kandivali West, Mumbai- 400067, Maharashtra

*The organization is accredited as **Category-A** under the QCI-NABET Scheme for Accreditation of EIA Consultant Organization, Version 3: for preparing EIA-EMP reports in the following Sectors –*

Sl.No	Sector Description	Sector (as per)		Cat.
		NABET	MoEFCC	
1	Mining of minerals- Opencast only	1	1 (a) (i)	B
2	River Valley	3	1(c)	A
3	Thermal power plants	4	1 (d)	A
4	Coal washeries	6	2 (a)	B
5	Metallurgical industries (ferrous & nonferrous)	8	3 (a)	A
6	Pesticide industry and pesticide specific intermediates	17	5 (b)	A
7	Petro-chemical complexes	18	5 (c)	A
8	Synthetic organic chemicals industry	21	5 (f)	A
9	Distilleries	22	5 (g)	A
10	Sugar Industry	25	5(j)	B
11	Isolated storage & handling of hazardous chemicals	28	-	B
12	Airports	29	7 (a)	A
13	Ports, harbours, break waters and dredging	33	7 (e)	A
14	Highways	34	7(f)	A
15	Building and construction projects	38	8 (a)	B
16	Townships and Area development projects	39	8 (b)	B

Note: Names of approved EIA Coordinators and Functional Area Experts are mentioned in SA AC minutes dated Dec.18, 2020 and supplementary minutes dated Mar. 24 and May 07, 2021 posted on QCI-NABET website.

The Accreditation shall remain in force subject to continued compliance to the terms and conditions mentioned in QCI-NABET's letter of accreditation bearing no. QCI/NABET/ENV/ACO/21/1774 dated June 12, 2021.The accreditation needs to be renewed before the expiry date by Enviro Resources, Mumbai following due process of assessment.

Sr. Director, NABET
Dated: June 12, 2021

Certificate No.
NABET/EIA/1922/SA 0133

Valid up to
30-03-2022

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

FIGURE 12.1: NABET CERTIFICATE ENVIRO RESOURCES, MUMBAI

National Accreditation Board
for Education and Training
(Member - International Accreditation Forum & Pacific Accreditation Cooperation)

QCI/NABET/ENV/ACO/22/2291 March 30, 2022

To

Enviro Resources
1604 Roopnagar CHS, S.V.Road, Kandivali West,
Mumbai -400067, Maharashtra

Sub.: Extension of Validity of Accreditation till June 29, 2022 – regarding
Ref.. Certificate no. NABET/EIA/1922/SA0133

Dear Sir/Madam

This has reference to the accreditation of your organization under the QCI-NABET EIA Scheme, the validity of **Enviro Resources** is hereby extended till June 29, 2022, or completion of the assessment process, whichever is earlier.

The above extension is subject to the submitted documents/required information with respect to your application and timely submission and closure of NC/Obs during the process of assessment.

You are requested not to use this letter after the expiry of the above-stated date.

With best regards.

(A K Jha)
Sr. Director, NABET

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FIGURE 12.2: NABET EXTENSION LETTER ENVIRO RESOURCES, MUMBAI