

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)

Cluster Extent: 20.34.0 Ha

NATHIKUDI ROUGH STONE AND GRAVEL QUARRY CLUSTER

(3 PROPOSED, 2 ABANDONED & 5 EXISTING)

STUDY PERIOD - October 2022 to December 2022

Located at

S.F.No. 902/1, 903/1, Nathikudi Village

Vembakottai Taluk, Virudhunagar District, Tamil Nadu

Project Proponent: Lessee

Thiru.K.Sugan,

S/o. Kannan,

Door No. 3/93A, Varatharajapuram,

Alamarathupatti Village,

Athur Taluk, Dindigul District - 624 303



(NABET Certificate No: NABET/EIA/2225/RA0277 valid upto 6th July, 2025)

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March 2023

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STUDY PERIOD- OCTOBER 2022 TO DECEMBER 2022

FOR

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(3 PROPOSED, 2 ABANDONED & 5 EXISTING)

Located at

**S.F.No. 902/1, 903/1, Nathikudi Village
Vembakottai Taluk, Virudhunagar District, Tamil Nadu**

Project Proponent: Lessee

Thiru.K.Sugan, S/o. Kannan,

**Door No. 3/93A, Varatharajapuram,
Alamarathupatti Village, Athur Taluk,
Dindigul District - 624 303**

Particulars		Signature
Prepared by	: Dr. Milind P. Kundal (EIA Coordinator)	
Approved and Checked by	: Mr. Timir Shah (Head of ACO & M.D)	
Date: March 2023		

Consultant

This EIA report is prepared by M/S Enviro resource, Mumbai (a consultant organization accredited by QCI/NABET) as per the approved ToR issued by the State Environmental Impact Assessment Authority, Gujarat, vide letter no. SEIAA/TN/F.No.8987/ ToR-1131/2022 dated 25.03.2022.

The report incorporates the introduction of project activity, baseline data generation with respect to environmental components (air, noise, water, land, biological and socioeconomics), identification and prediction of impacts with mitigation measures, recommendation of environmental management plan with environmental monitoring to be implemented including risk assessment and disaster management plan and project benefits etc. as per chapter scheme and EIA notification

UNDERTAKING BY CLIENT

I lessee as K. Sugan of Proposed Rough Stone and Gravel Quarry at S.F. No. 902/1, 903/1, Nathikudi Rough stone and Gravel Quarry Cluster with new proposed area of 1.29.0 Ha, while total cluster area is 20.34.0 Ha located in Nathikudi Village, Vembakottai Taluk, Virudhunagar District, Tamil Nadu. 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.8987/ ToR-1131/2022 dated 25.03.2022 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: 20/03/2023



Thiru.K.Sugan,
S/o. Kannan,
Door No. 3/93A, Varatharajapuram,
Alamarathupatti Village,
Athur Taluk, Dindigul District – 624 303

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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
$\mu\text{g}/\text{m}^3$:	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 Kilometre



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

STATE LEVEL ENVIRONMENT IMPACT
ASSESSMENT AUTHORITY – TAMIL NADU

3rd Floor, Panagal Maaligai,
No.1, Jeemis Road, Saidapet,
Chennai-15.
Phone No. 044-24359973
Fax No. 044-24359975

TERMS OF REFERENCE (ToR)

Lr No. SEIAA-TN/E.No.8987/ToR-1131/2022 Dated: 25.03.2022.

To

Thiru.K.Sugan
S/o.Kannan
No.3/93A, Varathanajapuram
Alamarathupatti
Athur Taluk
Dindigul District – 624303.

Sir / Madam,

Sub: SEIAA, Tamil Nadu – Terms of Reference with public Hearing (ToR) for the proposed Rough stone & Gravel quarry lease over an extent of 1.29.0Ha at S.F.Nos.902/1 and 903/1 of Nathikudi Village, Vembakkonai Taluk, Virudhunagar District, Tamil Nadu by Thiru. K.Sugan - under project category - "B1" and Schedule S.No.1 (a) – ToR issued along with Public Hearing - preparation of EIA report – Regarding.

- Ref:**
1. Online proposal No.SIA/TN/MIN/71875/2022 Dt.03.02.2022
 2. Your application submitted for Terms of Reference dated: 07.02.2022.
 3. Minutes of the 252nd SEAC meeting held on 10.03.2022
 4. Minutes of the 496th Authority meeting held on 24.03.2022.

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


MEMBER SECRETARY
SEIAA-TN

The proponent, Thiru.K.Sugan has submitted application for Terms of Reference (ToR) with public Hearing on 07.02.2022, in Form-I. Pre- Feasibility report for the proposed Rough stone & Gravel quarry lease over an extent of 1.29.0Ha at S.F.Nos.902/1 and 903/1 of Nathikudi Village, Vembakkottai Taluk, Virudhunagar District, Tamil Nadu.

Discussion by SEAC and the Remarks:-

Proposed Rough stone & Gravel quarry lease over an extent of 1.29.0Ha at S.F.Nos.902/1 and 903/1 of Nathikudi Village, Vembakkottai Taluk, Virudhunagar District, Tamil Nadu by Thiru. K.Sugan - For Terms of Reference.

(SIA/TN/MIN/71875/2022 Dt.03.02.2022)

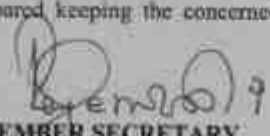
The proposal was placed in 252nd SEAC meeting held on 10.03.2022. The details of the project furnished by the proponent are given in the website (purivesh.nic.in).

The SEAC noted the following:

1. The Project Proponent, Thiru. K.Sugan has applied for Terms for Reference for the proposed Rough stone & Gravel quarry lease over an extent of 1.29.0 Ha in S.F.Nos. 902/1 and 903/1 (Part) of Nathikudi Village, Vembakkottai Taluk, Virudhunagar District, Tamil Nadu.
2. The project/activity is covered under Category "B1" of Item 1(a) "Mining Projects" of the Schedule to the EIA Notification, 2006.
3. The Production for the five years states that total quantity should not exceed 72,165 m³ of rough stone & 15,652 m³ of gravel with ultimate depth of mining is 22m below ground level.

Based on the presentation made by the proponent and the documents furnished, SEAC decided to **recommend the proposal for the grant of Terms of Reference (TOR) with Public Hearing** for the total Production for the period of five years states that total quantity should not exceed 72,165 m³ of rough stone & 15,652 m³ of gravel with ultimate depth of mining is 22m below ground level. Subject to the following TORs 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:

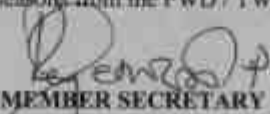
1. The Proponent shall carry out the cumulative & comprehensive environmental impact assessment study due to mining operations carried out in the quarry cluster specifically with reference to the environment in terms of air pollution, water pollution, & health impacts, and accordingly the Environment Management plan should be prepared keeping the concerned


MEMBER SECRETARY
SEIAA-TN

- to as to assess the impacts on the wells due to mining activity. Based on actual monitored data, it may clearly be shown whether working will intersect groundwater. Necessary data and documentation in this regard may be provided.
8. 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.
 9. A detailed study shall be carried out in order to ascertain the status of existing trees (nos., name of the species, age, diameter etc.) both within the mining lease applied area & 300m buffer zone and its management during mining activity.
 10. A detailed mine closure plan for the proposed project shall be included in EIA/EMP report which should be site-specific, along with the exclusive photographs/images/plans showing the proposed conceptual final closure activities.
 11. The Public hearing advertisement shall be published in one major National daily and one most circulated vernacular daily.
 12. 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.529 of 2016 (M.A.No.981/2016, M.A.No.982/2016 & M.A.No.384/2017).
 13. The purpose of Green belt around the project is to capture the fugitive dust emissions, carbon sequestration and to attenuate the noise generated, in addition to reduce the visual impacts. A wide range of indigenous plant species should be planted as given in the **appendix** in consultation with the DFO, State Agriculture University and local school/college authorities. The plant species with dense/moderate canopy of native origin should be chosen. Species of small/medium/tall trees alternating with shrubs should be planted in a mixed manner.
 14. Taller/one year old Saplings raised in appropriate size of bags, preferably eco-friendly bags should be planted in proper spacing as per the advice of local forest authorities/botanist/Horticulturist with regard to site specific choices. The proponent shall earmark the greenbelt area with GPS coordinates all along the boundary of the project site with at least 3 meters wide and in between blocks in an organized manner.
 15. A Disaster management Plan shall be prepared and included in the EIA/EMP Report.


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- quarry and the surrounding habitations in the mind.
2. 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) Highest production achieved in any one year.
 - d) Detail of approved depth of mining.
 - e) Actual depth of the mining achieved earlier.
 - f) Name of the person already mined in that leases area.
 - g) If EC and CTO already obtained, the copy of the same shall be submitted.
 - h) Whether the mining was carried out as per the approved mine plan (or EC if issued) with stipulated benches.
 3. All corner coordinates of the mine lease area, superimposed on a High Resolution Imagery/Topo sheet, topographic sheet, geomorphology, lithology and geology of the mining lease area should be provided. Such an Imagery of the proposed area should clearly show the land use and other ecological features of the study area (core and buffer zone).
 4. The proponent shall furnish photographs of adequate fencing, green belt along the periphery including replantation of existing trees & safety distance between the adjacent quarries & water bodies nearby provided as per the approved mining plan.
 5. The Project Proponent shall provide the details of geological reserves and mineable reserves, planned production capacity, proposed working methodology with justifications, the anticipated impacts of the mining operations on the surrounding environment and the proposed mitigation measures for the same.
 6. The Project Proponent shall provide the Organization chart indicating the appointment of various statutory officials and other competent persons to be appointed as per the provisions of Mines Act'1952 and the MMR, 1961 for carrying out the quarrying operations scientifically and systematically in order to ensure safety and to protect the environment.
 7. 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


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16. A Risk Assessment and management Plan shall be prepared and included in the EIA/EMP Report.
17. The Socio-economic studies should be carried out within a 5 km buffer zone from the mining activity. Measures of socio-economic significance and influence 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.
18. If any quarrying operations were carried out in the proposed quarrying site for which now the EC is sought, the Project Proponent shall furnish the detailed compliance to EC conditions given in the previous EC with the site photographs which shall duly be certified by MoEF&CC, Regional Office, Chennai (or) the concerned DEE/TNPCH.
19. The PP shall use drone video to cover the cluster area showing clearly the extent of operation and the surrounding environment and submit the video as part of EIA report.
20. Concealing any factual information or submission of false/fabricated data and failure to comply with any of the conditions mentioned above may result in withdrawal of this Terms of Reference besides attracting the penal provisions as given in the Environment (Protection) Act, 1986.

Appendix

List of Native Trees Suggested for Planting

1. *Aegle marmelos* - Vilvam
2. *Adenanthera pavonina* - Manjadi
3. *Albizia lebbek* - Vaagai
4. *Albizia amara* - Usil
5. *Bauhinia purpurea* - Mantharai
6. *Bauhinia racemosa* - Aathi
7. *Bauhinia tomentosa* - Iruvathi
8. *Buchanania uillaris* - Kattuma
9. *Borassus flabellifer* - Panai
10. *Butea monosperma* - Murukka maram
11. *Bobax celba* - Ilavu, Sevvilavu
12. *Calophyllum inophyllum* - Purnai
13. *Cassia fistula* - Sarakondrai
14. *Cassia roxburghii* - Sengondrai


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15. *Chloroxylon sweitenia* - Purasa maram
16. *Cochlospermum religiosum* - Kongu, Manjal Ilavu
17. *Cordia dichotoma* - Mookuchali maram
18. *Creteva adansonii* - Mavalungum
19. *Dillenia indica* - Uva, Uzha
20. *Dillenia pentagyna* - Siru Uva, Sitruzha
21. *Diospyros ebenum* - Karungali
22. *Diospyros chloroxylon* - Vaganai
23. *Ficus amplissima* - Kal Itchi
24. *Hibiscus tiliaceus* - Aatra poovarasu
25. *Hardwickia binata* - Aacha
26. *Holoptelia integrifolia* - Aayili
27. *Lamnea coromandelica* - Odhiam
28. *Lagerstroemia speciosa* - Poo Marudhu
29. *Lepisanthus tetraphylla* - Nelkottai maram
30. *Limonia acidissima* - Vila maram
31. *Litsea glutinosa* - Pisin pattai
32. *Madhuca longifolia* - Illuppai
33. *Manilkara hexandra* - Ulakkai Paalal
34. *Minusops elengi* - Magizha maram
35. *Mitragyna parvifolia* - Kadambu
36. *Morinda pubescens* - Nuna
37. *Morinda citrifolia* - Vellai Nuna
38. *Phoenix sylvestre* - Eachai
39. *Pongamia pinnata* - Pungam
40. *Premna mollissima* - Munnai
41. *Premna serratifolia* - Narumunnai
42. *Premna tomentosa* - Purangai Naari, Pudayga Naari
43. *Prosopis cinerea* - Vanni maram
44. *Pterocarpus marsupium* - Vengai
45. *Pterospermum canescens* - Vennangu, Tada
46. *Pterospermum xylocarpum* - Polavu
47. *Puthranjiva roxburghii* - Puthranjivi
48. *Salvadora persica* - Uga Maram
49. *Sapindus emarginatus* - Manipungan, Soapu kai
50. *Saraca asoca* - Asoca



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51. *Streblus asper* - Piraya maram
52. *Strychnos nuxvomica* - Yetti
53. *Strychnos potatorum* - Therthang Kottai
54. *Syzygium cumini* - Naval
55. *Terminalia bellerica* - Thandri
56. *Terminalia arjuna* - Ven marudhu
57. *Toona ciliata* - Sandhana vembu
58. *Thespesia populnea* - Puvarasu
59. *Walsura trifoliata* - valsura
60. *Wrightia tinctoria* - Vep

Discussion by SEIAA and the Remarks:-

The subject was placed in the 496th Authority meeting held on 24.03.2022. After detailed discussions, the Authority accepts the recommendation of SEAC and decided to grant Terms of Reference (ToR) along 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.22-65/2017-1A,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 specifically suggest for sustainable management of the area and restoration of ecosystem for flow of goods and services.
5. The project proponent shall study impact on fish habitats and the food WEB/ food chain in the water body and Reservoir.
6. The Terms of Reference should specifically study impact on soil health, soil erosion, the soil physical, chemical components and microbial components.


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7. The Environmental Impact Assessment should study impact on forest, vegetation, endemic, vulnerable and endangered indigenous flora and fauna.
8. The Environmental Impact Assessment should study impact on standing trees and the existing trees should be numbered and action suggested for protection.
9. The Environmental Impact Assessment should study on wetlands, water bodies, rivers streams, lakes and farmer sites.
10. The Environmental Impact Assessment should hold detailed study on EMP with budget for Green belts/development and mine closure plan including disaster management plan.
11. The Environmental Impact Assessment should study impact on climate change, temperature rise, pollution and above soil & below soil carbon stock.
12. The Environmental Impact Assessment should study impact on protected areas, Reserve Forests, National Parks, Corridors and Wildlife pathways, near project site.
13. The project proponent shall study and furnish the impact of project on plantations in adjoining patta lands, Horticulture, Agriculture and livestock.
14. The project proponent shall study and furnish the details on potential fragmentation impact of natural environment, by the activities.
15. The project proponent shall study and furnish the impact on aquatic plants and animals in water bodies and possible scars on the landscape, damages to nearby caves, heritage site, and archaeological sites possible land form changes visual and aesthetic impacts.
16. The project proponent shall study and furnish the possible pollution due to plastic and microplastic on the environment. The ecological risks and impacts of plastic & microplastics on aquatic environment and fresh water systems due to activities, contemplated during mining may be investigated and reported.
17. The project proponent shall detailed study on impact of mining on Reserve forests free ranging wildlife.

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 had been any increase in production after the EIA Notification 1994 came into force, w.r.t. the highest production achieved prior to 1994.


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- 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.
- 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


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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, 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


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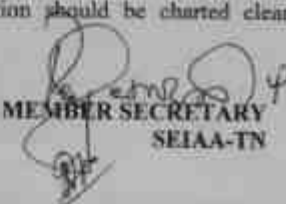
present. In case of any scheduled-I fauna found in the study area, the necessary plan along with budgetary provisions for their conservation should be prepared in consultation with State Forest and Wildlife Department and details furnished. Necessary allocation of funds for implementing the same should 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. 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

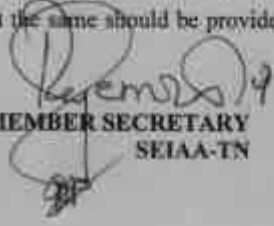

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silica, should be given.

- 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, 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



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- 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.
 - 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


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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 spell 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 spell 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(T) 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(T) 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


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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 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.
15. A specific study on agriculture & livelihood shall be carried out and reported.


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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 its acquisition, nearby (in 2-3 km.) water body, population, within 10km other industries, forest, eco-sensitive zones, accessibility, (note - in case of industrial estate this information may not be necessary)
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 institutions/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:-


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- 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.

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, Virudhunagar District.
7. The EO/BDO, Nathikudi Village, Vembakkottai Taluk, Virudhunagar District
8. Stock File.

Draft EIA/EMP for Nathikudi Rough stone and Gravel Quarry Cluster with new proposed area of 1.29.0 Ha, While total cluster area is 20.34 Ha located in Nathikudi Village, Vembakkottai Taluk, Virudhunagar District, Tamil Nadu.

Lessee: Thiru. K. Sukan (Lease Area: 1.29.0 Ha)

ToR Compliance

TOR COMPLIANCE

The point wise ToR compliances issued by SEIAA, Tamil Nadu for Proposed Nathikudi Rough stone and Gravel quarry project of an area is 1.29.0 Ha, with cluster area 20.34.0 Ha, located in S.F.No. 902/1, 903/1 Nathikudi Village, Vembakottai Taluk, Virudhunagar District, Tamil Nadu. Details of ToR issued by SEIAA are as follows.

LESSEE	Thiru. K. Sukan
PROPOSAL NO	SIA/TN/MIN/71875/2022
TOR LETTER	SEIAA-TN/F.No.8987/ ToR-1131/2022, dated 25.03.2022

TERMS OF REFERENCE (ToR) for Thiru. K. Sukan

Sr. No.	Condition	Compliance
ADDITIONAL CONDITIONS BY SEAC		
1.	The Proponent shall carry out the cumulative & comprehensive impact study due to mining operations carried out in the quarry cluster specifically with reference to the environment in terms of air pollution, water pollution & health impacts, accordingly the Environment Management plan should be prepared keeping the concerned quarry and the surrounding habitations in the mind.	The anticipated impacts due to mining operations carried out in the quarry cluster and its mitigation measures have been discussed in Chapter 4 of Draft EIA Report.
2.	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.	It is a fresh quarry.

Draft EIA/EMP for Nathikudi Rough stone and Gravel Quarry Cluster with new proposed area of 1.29.0 Ha, While total cluster area is 20.34 Ha located in Nathikudi Village, Vembakkottai Taluk, Virudhunagar District, Tamil Nadu.

Lessee: Thiru. K. Sukan (Lease Area: 1.29.0 Ha)

ToR Compliance

Sr. No.	Condition	Compliance
	<p>c) Highest production achieved in any one year</p> <p>d) Detail of approved depth of mining.</p> <p>e) Actual depth of the mining achieved earlier.</p> <p>f) Name of the person already mined in that leases area.</p> <p>g) If EC and CTO already obtained, the copy of the same shall be submitted.</p> <p>h) Whether the mining was carried out as per the approved mine plan (or EC if issued) with stipulated benches.</p>	
3.	<p>All corner coordinates of the mine lease area, superimposed on High Resolution Imagery/Topo sheet, topographic sheet, geomorphology, lithology and geology of the mining lease area should be provided. Such an Imagery of the proposed area should clearly show the land use and other ecological features of the study area (core and buffer zone).</p>	<p>All maps have been provided as.</p> <p>Topo map – Chapter 1, Page No. 36, Figure No. 1.7</p> <p>Geological map – Chapter 2, Page No. 49, Figure No. 2.2</p> <p>Geomorphology map – Chapter 2, Page No. 50, Figure No. 2.3</p> <p>Lithology map – Chapter 2, Page No. 51, Figure No. 2.4</p> <p>Landuse map – Chapter 3, Page No. 74, Figure No. 3.6</p>
4.	<p>The proponent shall furnish photographs of adequate fencing, green belt along the periphery including replantation of existing trees & safety distance between the adjacent quarries & water bodies nearby provided as per the approved mining plan.</p>	<p>The fencing and green belt photos will be attached with Final EIA report.</p>

Draft EIA/EMP for Nathikudi Rough stone and Gravel Quarry Cluster with new proposed area of 1.29.0 Ha, While total cluster area is 20.34 Ha located in Nathikudi Village, Vembakkottai Taluk, Virudhunagar District, Tamil Nadu.

Lessee: Thiru. K. Sujan (Lease Area: 1.29.0 Ha)

ToR Compliance

Sr. No.	Condition	Compliance
5.	The Project Proponent shall provide the details of mineral reserves and mineable reserves, planned production capacity, proposed working methodology with justifications, the anticipated impacts of the mining operations on the surrounding environment and the remedial measures for the same.	The geological reserves, mineable reserves and Yearwise production details has been discussed in Chapter 2, Table No. 2.6, 2.7, 2.8, Page Nos. 54, 55 and 57 The anticipated impacts due to mining operations carried out in the quarry cluster and its mitigation measures have been discussed in Chapter 4 of Draft EIA Report.
6.	The Project Proponent shall provide the Organization chart indicating the appointment of various statutory officials and other competent persons to be appointed as per the provisions of Mines Act'1952 and the MMR, 1961 for carrying out the quarrying operations scientifically and systematically in order to ensure safety and to protect the environment.	The Organization chart has been discussed in Chapter 6
7.	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. Based on actual monitored data, it may clearly be shown whether working will intersect groundwater.	The hydro-geological study has been conducted is Part of Chapter 3, Section 3.10.4, Page Nos. 91.

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Lessee: Thiru. K. Sujan (Lease Area: 1.29.0 Ha)

ToR Compliance

Sr. No.	Condition	Compliance
	Necessary data and documentation in this regard may be provided.	
8.	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.	The baseline data for the environmental and ecological parameters about surface water/ground water quality, air quality, soil quality & flora/fauna including traffic/vehicular movement study have been incorporated in Chapter 3.
9.	A detailed study shall be carried out in order to ascertain the status of existing trees(nos., name of the species, age, diameter etc.,) both within the mining lease applied area & 300m buffer zone and its management during mining activity.	The list of trees in the core and buffer zone have been discussed in Chapter 3 - Section, 3.11, Page No. 108-116
10.	A detailed mine closure plan for the proposed project shall be included in EIA/EMP report which should be site-specific, along with the exclusive photographs / images / plans showing the proposed conceptual final closure activities.	Progressive Mine closure plan is part of Mine Plan attached as Annexure VI .
11.	The Public hearing advertisement shall be published in one major National daily and one most circulated vernacular daily.	The Public hearing advertisement will be published in one major National daily and one most circulated vernacular daily.
12.	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	Noted.

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Lessee: Thiru. K. Sujan (Lease Area: 1.29.0 Ha)

ToR Compliance

Sr. No.	Condition	Compliance
	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).	
13.	The purpose of Green belt around the project is to capture the fugitive emissions, carbon sequestration and to attenuate the noise generated, in addition to improving the aesthetics. A wide range of indigenous plant species should be planted as given in the appendix in consultation with the DFO, State Agriculture University and local school/college authorities. The plant species with dense/moderate canopy of native origin should be chosen. Species of small/medium/tall trees alternating with shrubs should be planted in a mixed manner.	Around 700 trees will be planted around the site. The list of trees to be planted are given below: Neem, Pungam, Poovarasu, Naval, Mantharai, Arasa Maram, Magizham, Vilvam, vaagai, Marudha maram, Thandri, Poovarasu, Quaker buttons, Thethankottai maram, Manjadi, Usil, Aathi, Panai, Uzha, Illuppai, Eachai, Vanni Maram
14.	Taller/one year old Saplings raised in appropriate size of bags, preferably eco-friendly bags should be planted in proper espacement as per the advice of local forest authorities/botanist/Horticulturist with regard to site specific choices. The proponent shall carmark the greenbelt area with GPS coordinates all along the boundary	The green belt plan is enclosed along with mining plates in Annexure VI

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ToR Compliance

Sr. No.	Condition	Compliance
	of the project site with at least 3 meters wide and in between blocks in an organized manner.	
15.	A Disaster management Plan shall be prepared and included in the EIA/EMP Report.	A Disaster management Plan is prepared and included in the Chapter 7, Section 7.3, Page No. 178.
16.	A Risk Assessment and management Plan shall be prepared and included in the EIA/EMP Report.	A Risk Assessment and management Plan is prepared and included in Chapter 7, Section 7.2, Page No. 175.
17.	The Socio-economic studies should be carried out within a 5 km buffer zone from the mining activity. Measures of socio-economic significance and influence 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.	The socio-economic study has been carried out discussed in Chapter 3 - Section, 3.12, Page No. 118-137.
18.	If any quarrying operations were carried out in the proposed quarrying site for which now the EC is sought, the Project Proponent shall furnish the detailed compliance to EC conditions given in the previous EC with the site photographs which shall duly be certified by MoEF&CC, Regional Office, Chennai (or) the concerned DEE/TNPCB.	It is a fresh quarry.
19.	The PP shall use drone video to cover the cluster area showing clearly the extent of operation and the surrounding environment and submit the video as part of EIA report.	Noted.

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ToR Compliance

Sr. No.	Condition	Compliance
20.	Concealing any factual information or submission of false/fabricated data and failure to comply with any of the conditions mentioned above may result in withdrawal of this Terms of Reference besides attracting penal provisions in the Environment (Protection) Act, 1986.	Noted.
ADDITIONAL CONDITIONS BY SEIAA		
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.	Noted and public hearing details will be included along with final EIA report of Chapter 7.
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.	Noted and will be complied in Final EIA report.
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.	The biodiversity has been studied and discussed in Chapter 3 -Section, 3.11, Page No. 108-117.
4.	Action should specifically suggest for sustainable management of the area and restoration of ecosystem for flow of goods and services.	It is a fresh Rough Stone and Gravel Quarry with a proposed depth of 22m only and hence, no need of mitigation and restoration / reclamation of the applied lease area.

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		The mined out area is fenced on top of open cast working with S1 fencing. Low lying areas with water logging shall be used for fish culture. No immediate proposals for closure of pit as the rough stone persist still at deeper level.
5.	The project proponent shall study impact on fish habitats and the food WEB/ food chain in the water body and Reservoir.	There is no water body within 1km surrounding the project site. Hence there won't be much impact on fish habitats and the food WEB/ food chain in the water body and Reservoir.
6.	The Terms of Reference should specifically study impact on soil health, soil erosion, the soil physical, chemical components and microbial components.	The soil samples have been collected surrounding the project site and physical, chemical components and microbial components study has been carried out and the results are tabulated in Chapter 3, Page No.77
7.	The Environmental Impact Assessment should study impact on forest, vegetation, endemic, vulnerable and endangered indigenous flora and fauna.	The biological environment impacts, and its mitigation measures has been given in Chapter 4, Page No.162
8.	The Environmental Impact Assessment should study impact on standing trees and the existing trees should be numbered and action suggested for protection.	There is no existing trees in the project site and surrounding the project site. Only thorny shrubs were present.
9.	The Environmental Impact Assessment should study on wetlands, water bodies, rivers streams, lakes and farmer sites.	The water environment impacts and its mitigation measures has been given in Chapter 4, Page No.151
10.	The Environmental Impact Assessment should hold detailed study on EMP with budget for Green belt development and mine closure plan including disaster management plan.	The EMP details has been given in Chapter 10, Page No 197.

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ToR Compliance

Sr. No.	Condition	Compliance
11.	The Environmental Impact Assessment should study impact on climate change, temperature rise, pollution and above soil & below soil carbon stock.	Noted and will be complied in Final EIA report.
12.	The Environmental Impact Assessment should study impact on protected areas, Reserve Forests, National Parks, Corridors and Wildlife pathways, near project site.	There is Mottamalai Reserve Forest located at 9.74 km from the Project Site. Hence our project will not cause any damage to reserve forest. There is no protected areas, National Parks, Corridors and Wildlife pathways near project site.
13.	The project proponent shall study and furnish the impact of project on plantations in adjoining patta lands, Horticulture, Agriculture and livestock.	There is no plantation surrounding 500m from project site. Hence there won't be any impact in adjoining patta lands, Horticulture, Agriculture and livestock.
14.	The project proponent shall study and furnish the details on potential fragmentation impact of natural environment, by the activities.	Noted and will be complied in Final EIA report.
15.	The project proponent shall study and furnish the impact on aquatic plants and animals in water bodies and possible scars on the landscape, damages to nearby caves, heritage sites, and archaeological sites possible land form changes visual and aesthetic impacts.	The safety distance has been provided for Kayalkudi River. Hence there won't be much impact on aquatic plant and animals. There is no caves, heritage sites and archaeological sites near the project site.
16.	The project proponent shall study and furnish the possible pollution due to plastic and microplastic on the environment. The ecological risks and impacts of plastic & microplastics on aquatic environment and fresh water systems due to activities, contemplated during mining may	There will not be any plastic and microplastic pollution due to mining activity. Also, we ensure that we won't use any single use plastics in the project site.

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ToR Compliance

Sr. No.	Condition	Compliance
	be investigated and reported.	
17.	The project proponent shall detailed study on impact of mining on Reserve forests free ranging wildlife.	There is Mottamalai Reserve Forest located at 9.74 km from the Project Site.
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.	It is a fresh quarry.
2)	A copy of the document in support of the fact that the Proponent is the rightful lessee of the mine should be given.	The copy of LOI i.e. Precise Area Communication Letter in the name of all Lessee is attached as Annexure I. Page No. 236-238
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	All corner coordinates of the mine lease area are superimposed on High Resolution Imagery Figure 1.4 in Chapter 1, Page No. 34 The topo map showing mine lease area and land use

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ToR Compliance

Sr. No.	Condition	Compliance
	Imagery of the proposed area should clearly show the land use and other ecological features of the study area (core and buffer zone).	and other ecological features of the study area (core and buffer zone)
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, radius is given, on Chapter-2 Figure No.2.2, Page No. 49.
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
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	The proponent has framed its Environmental Policy and the same is Attached as Annexure VI, Page No. 232

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ToR Compliance

Sr. No.	Condition	Compliance
	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. 56
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, Table No.2.9, Page No. 56
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.	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. 69-73. There is no wildlife sanctuary and national park, migratory routes of fauna in the study area

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Sr. No.	Condition	Compliance
11)	Details of the land for any Over Burden Dumps outside the mine lease, such as extent of land area, distance from mine lease, its land use. R&R issues, if any, should be given.	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	Not applicable since no forest land involved in mine lease area.

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ToR Compliance

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	(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.	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 3.11, Page No. 108 to 117.
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	Details biological study (flora & fauna) within 10 km radius of the project site have been incorporated in Chapter 3, Section 3.11, Page No. 108 to 117.

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	fauna, endangered, endemic and RET Species duly authenticated, separately for core and buffer zone should be furnished based on such primary field survey, clearly indicating the Schedule of the fauna present. In case of any scheduled-I fauna found in the study area, the necessary plan along with budgetary provisions for their conservation should be prepared in consultation with State Forest and Wildlife Department and details furnished. Necessary allocation of funds for implementing the same should be made as part of the project cost.	
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	The project does not fall under CRZ.

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ToR Compliance

Sr. No.	Condition	Compliance
	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.	There is no Rehabilitation and resettlement is involved. Land classified as Government land
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	Baseline environmental monitoring was conducted in the core zone and buffer zone during October 2022 to December 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 .

Draft EIA/EMP for Nathikudi Rough stone and Gravel Quarry Cluster with new proposed area of 1.29.0 Ha, While total cluster area is 20.34 Ha located in Nathikudi Village, Vembakkottai Taluk, Virudhunagar District, Tamil Nadu.

Lessee: Thiru. K. Sujan (Lease Area: 1.29.0 Ha)

ToR Compliance

Sr. No.	Condition	Compliance
	<p>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.</p>	
23)	<p>Air quality modeling should be carried out for prediction of impact of the project on the air quality of the area. It should also take into account the impact of movement of vehicles for 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.</p>	<p>Air quality modeling was carried out for the rough stone mining project using AERMOD as incorporated in Chapter-4, Section 4.3, Page No. 138 to 145, while Incremental due to mining is provided in Table 4.2, Page No. 144.</p>

Draft EIA/EMP for Nathikudi Rough stone and Gravel Quarry Cluster with new proposed area of 1.29.0 Ha, While total cluster area is 20.34 Ha located in Nathikudi Village, Vembakkottai Taluk, Virudhunagar District, Tamil Nadu.

Lessee: Thiru. K. Sugan (Lease Area: 1.29.0 Ha)

ToR Compliance

Sr. No.	Condition	Compliance
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. 45
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 near by 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. 151.
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.	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, 152

Draft EIA/EMP for Nathikudi Rough stone and Gravel Quarry Cluster with new proposed area of 1.29.0 Ha, While total cluster area is 20.34 Ha located in Nathikudi Village, Vembakkottai Taluk, Virudhunagar District, Tamil Nadu.

Lessee: Thiru. K. Sujan (Lease Area: 1.29.0 Ha)

ToR Compliance

Sr. No.	Condition	Compliance
	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.	Details of water bodies is given in Chapter-3, Section-3.10.2.
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: 121 AMSL Depth: 22m (2m Gravel + 20m Rough Stone) Further details are given in Chapter-2.
31)	A time bound Progressive Greenbelt Development Plan shall be prepared in a tabular form (indicating the linear and quantitative coverage, plant species and time frame) and submitted, keeping in mind, the same will have to be executed up front on commencement of the Project. 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	Progressive green belt development plan is prepared and attached mining Plate no. IV. It is shown in Chapter 2, Figure 2.5, Page No. 57 While details of Plantation is part of Chapter 4, Section 4.11 Page No. 163.

Draft EIA/EMP for Nathikudi Rough stone and Gravel Quarry Cluster with new proposed area of 1.29.0 Ha, While total cluster area is 20.34 Ha located in Nathikudi Village, Vembakkottai Taluk, Virudhunagar District, Tamil Nadu.

Lessee: Thiru. K. Sujan (Lease Area: 1.29.0 Ha)

ToR Compliance

Sr. No.	Condition	Compliance
	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.	Impact on local transport infrastructure due to the project 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. 159 of 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. 59.
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 No. 2.6 Page No. 60
35)	Occupational Health impacts of the Project should be anticipated and the proposed preventive measures spelt out in detail. Details of pre-	Details of anticipated occupational health impacts and proposed preventive measures are discussed in Section 4.8 in Chapter 4, Page No. 156

Draft EIA/EMP for Nathikudi Rough stone and Gravel Quarry Cluster with new proposed area of 1.29.0 Ha, While total cluster area is 20.34 Ha located in Nathikudi Village, Vembakkottai Taluk, Virudhunagar District, Tamil Nadu.

Lessee: Thiru. K. Sujan (Lease Area: 1.29.0 Ha)

ToR Compliance

Sr. No.	Condition	Compliance
	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.	The public health implications due to the project are discussed in Section 4.8.3 in Chapter 4, Page No. 158.
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.	Will be done after the Public Hearing.
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.	Environmental Management Plan for the project is discussed in detail in Chapter 9.
39)	Public Hearing points raised and commitment of the Project Proponent on the same along with time bound Action Plan with budgetary provisions to	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.

Draft EIA/EMP for Nathikudi Rough stone and Gravel Quarry Cluster with new proposed area of 1.29.0 Ha, While total cluster area is 20.34 Ha located in Nathikudi Village, Vembakkottai Taluk, Virudhunagar District, Tamil Nadu.

Lessee: Thiru. K. Sujan (Lease Area: 1.29.0 Ha)

ToR Compliance

Sr. No.	Condition	Compliance												
	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.	There is no litigation pending against the project.												
41)	The cost of the Project (capital cost and recurring cost) as well as the cost towards implementation of EMP should be clearly spelt out.	<table border="1"> <thead> <tr> <th>S.No.</th> <th>Description</th> <th>Cost</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Operational cost</td> <td>21,29,000</td> </tr> <tr> <td>2</td> <td>EMP Cost</td> <td>59,00,000</td> </tr> <tr> <td></td> <td>Total</td> <td>80,29,000</td> </tr> </tbody> </table>	S.No.	Description	Cost	1	Operational cost	21,29,000	2	EMP Cost	59,00,000		Total	80,29,000
S.No.	Description	Cost												
1	Operational cost	21,29,000												
2	EMP Cost	59,00,000												
	Total	80,29,000												
42)	A Disaster management Plan shall be prepared and included in the EIA/EMP Report.	Disaster Management Plan is included in Section 7.3 of Chapter 7, Page No. 178 to 181.												
43)	Benefits of the Project if the Project is implemented should be spelt out. The benefits of the Project shall clearly indicate environmental, social, economic, employment potential, etc.	The Project benefits are clearly spelt out in Chapter 8.												
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	All general are followed while preparing EIA/EMP.												

Draft EIA/EMP for Nathikudi Rough stone and Gravel Quarry Cluster with new proposed area of 1.29.0 Ha, While total cluster area is 20.34 Ha located in Nathikudi Village, Vembakkottai Taluk, Virudhunagar District, Tamil Nadu.

Lessee: Thiru. K. Sujan (Lease Area: 1.29.0 Ha)

ToR Compliance

Sr. No.	Condition	Compliance
	<p>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.</p> <p>Where the documents provided are in a language other than English, an English translation should be provided.</p> <p>The Questionnaire for environmental appraisal of mining projects as devised earlier by the Ministry shall also be filled and submitted.</p> <p>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.II (I) 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 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.</p>	

Draft EIA/EMP for Nathikudi Rough stone and Gravel Quarry Cluster with new proposed area of 1.29.0 Ha, While total cluster area is 20.34 Ha located in Nathikudi Village, Vembakkottai Taluk, Virudhunagar District, Tamil Nadu.

Lessee: Thiru. K. Sujan (Lease Area: 1.29.0 Ha)

ToR Compliance

Sr. No.	Condition	Compliance
	<p>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.</p> <p>As per the circular no. J-11011/61S/2010-IA.II(I) dated 30.5.2012, certified report of the status of compliance of the conditions stipulated in the environment clearance for the existing operations of the project, should be obtained from the Regional Office of Ministry of Environment, Forest and Climate Change, as may be applicable.</p> <p>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.</p>	

Draft EIA/EMP for Nathikudi Rough stone and Gravel Quarry Cluster with new proposed area of 1.29.0 Ha, While total cluster area is 20.34 Ha located in Nathikudi Village, Vembakkottai Taluk, Virudhunagar District, Tamil Nadu.

Lessee: Thiru. K. Sugan (Lease Area: 1.29.0 Ha)

Chapter 1: Introduction

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 Nathikudi Rough stone and Gravel quarry project Cluster Quarries consisting of three Proposed and five Existing Quarries with total extent of Cluster of 20.34.0 Ha at Nathikudi Village, Vembakkottai Taluk, Virudhunagar District, Tamil Nadu, cluster area is calculated as per MoEF & CC Notification S.O. 2269(E) Dated 1st July 2016.

1.2 HISTORY OF THE PROJECT

Lessee Thiru. K. Sugan has applied for TOR in order to prepare EIA report for grant of Environmental Clearance for proposed Rough stone mine having an area of 1.29.0 Ha, with a cluster area of 20.34.0 Ha at Nathikudi Village, Vembakkottai Taluk, Virudhunagar 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 20.34.0 Ha (5 Existing + 3 Proposed) as the cluster area more than 5 Ha but less than 100 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
Thiru. K.Sugan	KV1/485/2019-Mines	18.09.2021	5 years
	ToR Letter No.	Letter Date	-
	SEIAA-TN/F.No.8987/ToR-1131 / 2022	25.03.2022	-

Draft EIA/EMP for Nathikudi Rough stone and Gravel Quarry Cluster with new proposed area of 1.29.0 Ha, While total cluster area is 20.34 Ha located in Nathikudi Village, Vembakkottai Taluk, Virudhunagar District, Tamil Nadu.

Lessee: Thiru. K. Sujan (Lease Area: 1.29.0 Ha)

Chapter 1: Introduction

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 over an area of 1.29.0 Ha, with cluster area 20.34.0 Ha, located in S.F.No. 902/1, 903/1 Nathikudi Village, Vembakkottai Taluk, Virudhunagar 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 & gravel and 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 October 2022 to December 2022.

The application for TOR was submitted 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) to prepare the Environmental Impact Assessment and Environmental Management Plan. The cluster details are provided in **Table 1.2**.

Draft EIA/EMP for Nathikudi Rough stone and Gravel Quarry Cluster with new proposed area of 1.29.0 Ha, While total cluster area is 20.34 Ha located in Nathikudi Village, Vembakkottai Taluk, Virudhunagar District, Tamil Nadu.

Lessee: Thiru. K. Sugan (Lease Area: 1.29.0 Ha)

Chapter 1: Introduction

TABLE 1.2: LIST OF QUARRIES WITHIN THE CLUSTER

Code	Name of the lessee	S.F.Nos	Extent Area (Ha)	Period of lease
Proposed				
P1.	Thiru. K. Sugan	Nathikudi, Vembakottai	902/1, 903/1 (1.29.0)	KV1/485/2019. 18.09.2021.
P2	S.Soundararajan	Nathikudi, Vembakottai	915/3, 916/4B, 916/4C2, 916/7B (2.88.0)	KV1/726/2021, 20.09.2021
P3	Ranjith Blue Metals	Nathikudi, Vembakottai	968/5, 969, 971/2 (2.72.0)	KV1/130/2021 15.02.2021
Existing				
E1.	G.Guruvammal	Nathikudi, Vembakottal	903/2 (1.35.0)	KV1/705/2012, dated: 04.08.2017 23.08.2017 to 22.08.2022
E2	M/s.Ranjith Blue Metals	Nathikudi, Vembakottai	899/1B2, 901/2A, 901/1A2A (1.60.0)	KV1/738/2017, dated: 27.03.2018 02.04.2018 to 01.04.2023
E3	P.Jeyaraman	Nathikudi, Vembakottai	916/4C1, 916/7A, 920/1A1, 920/1A3 (2.97.50)	KV1/424/2018 dated: 29.01.2019 01.02 2019 to 31.01.2024
E4	S.Soundararajan	Nathikudi, Vembakottai	922/2, 922/3, 922/4 (2.92.0)	KV1/10050/2017. Dated:10.06.2019 18.10.2019 to 17.10.2024
E5	R.Vishnuprasath	Nathikudi, Vembakottai	886/10, 886/1A1, 886/4 (3.47.0)	KV1/825/2017 dated: 01.02.2019 08.02.2019 to 07.02.2024
Abandoned				
A1	M.Pandi	Nathikudi, Vembakottai	924 (0.53.5)	KV1/1525/2010, dated: 12.01.2011 25.01.2011 to 24.01.2016
A2	L.Gayathri	Nathikudi, Vembakottai	919/2B (0.60.0)	KV1/794/2012, dated: 12.09.2013 23.09.2013 to 22.09.2018
Total Extent			20.34.0	

Draft EIA/EMP for Nathikudi Rough stone and Gravel Quarry Cluster with new proposed area of 1.29.0 Ha, While total cluster area is 20.34 Ha located in Nathikudi Village, Vembakkottai Taluk, Virudhunagar District, Tamil Nadu.

Lessee: Thiru. K. Sujan (Lease Area: 1.29.0 Ha)

Chapter 1: Introduction

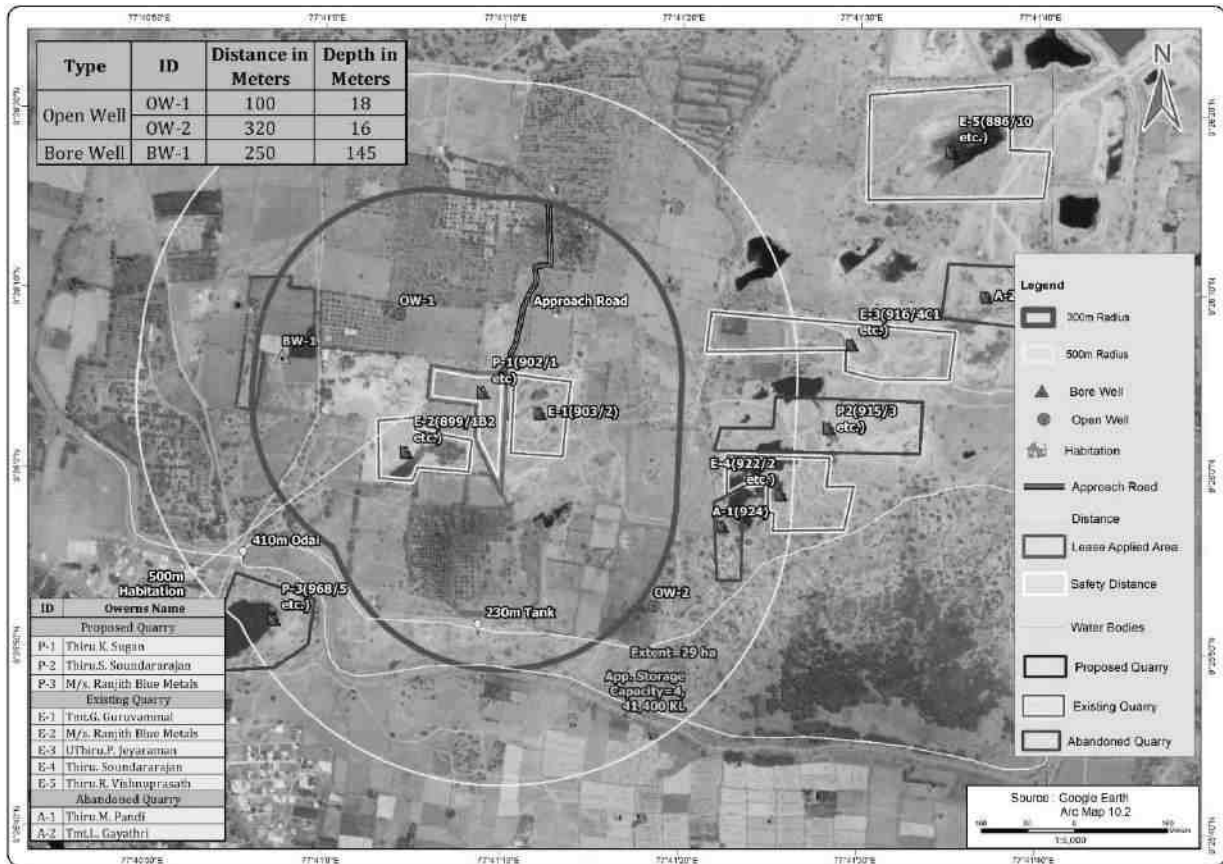


FIGURE 1.1: GOOGLE MAP OF CLUSTER MINES (EXISTING & PROPOSED)

The application for TOR was submitted to prepare EIA report for grant of Environmental Clearance (Form-1, PFR and Approved Mine Plan) for the rough stone mine was considered vide Application no. SIA/TN/MIN/71875/2022 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 Virudhunagar. 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

Draft EIA/EMP for Nathikudi Rough stone and Gravel Quarry Cluster with new proposed area of 1.29.0 Ha, While total cluster area is 20.34 Ha located in Nathikudi Village, Vembakkottai Taluk, Virudhunagar District, Tamil Nadu.

Lessee: Thiru. K. Sukan (Lease Area: 1.29.0 Ha)

Chapter 1: Introduction

(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

- The lessee has applied for Rough Stone Quarry Lease Dated: 21.10.2019
- Precise Area Communication Letter was issued by the Assistant Director, Geology and Mining, Virudhunagar District, Rc.No. KV1/485/2019-Mines, Dated: 18.09.2021.
- The Mining Plan was prepared by Recognized Qualified Person and approved by Assistant Director, Geology and Mining, Virudhunagar District, Rc.No. KV1/485/2019, Dated: 19.11.2021.
- 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/71875/2022 and ToR was granted by SEAC with letter no. SEIAA-TN/F.No.8987/ ToR-1131/2022, dated 25.03.2022.

A. Project Proposal

TABLE 1.3: PROJECT DETAILS

Proposed Project	Nathikudi Rough stone and Gravel quarry project – 1.29.0 Ha
Location of the Project	Nathikudi Village, Vembakottai Taluk, Virudhunagar 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 1.29.0 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 20.34.0 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

Draft EIA/EMP for Nathikudi Rough stone and Gravel Quarry Cluster with new proposed area of 1.29.0 Ha, While total cluster area is 20.34 Ha located in Nathikudi Village, Vembakkottai Taluk, Virudhunagar District, Tamil Nadu.

Lessee: Thiru. K. Sugan (Lease Area: 1.29.0 Ha)

Chapter 1: Introduction

Lessee has obtained Letter of Intent from Assistant Director, Geology and Mining, Virudhunagar District, Rc.No. KV1/485/2019-Mines, Dated: 18.09.2021 for rough stone mine for a lease area of 1.29.0 Ha while cluster area 20.34.0 Ha located at S.F.No. 902/1, 903/1 of Nathikudi Village, Vembakkottai Taluk, Virudhunagar 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 Assistant Geologist, Department of Geology and Mining, Virudhunagar, Tamil Nadu. Copy of approval letter is enclosed as **Annexure II**.

TABLE 1.4: MINING PLAN DETAILS

Name of Lessee	S.F. Nos.	Approved Mine Plan Letter No.
Thiru. K. Sugan	902/1, 903/1 of Nathikudi Village	Rc.No. KV1/485/2019, Dated: 19.11.2021

1.5 INTRODUCTION OF PROJECT PROPONENT

Details of the lessee are given below.

TABLE 1.5: PROJECT PROPONENT DETAILS

Lessee Name	Thiru.K.Sugan, S/o. Kannan
Address	Door No. 3/93A, Varatharajapuram, Alamarathupatti Village, Athur Taluk, Dindigul District – 624 303
Mobile No	9894685633
Email ID	manisuganthy@gmail.com

1.6 BRIEF DESCRIPTION OF THE PROJECT

This is a case of proposed Nathikudi Rough stone and Gravel quarry project (Cluster Area is 20.34.0 Ha) located in S.F.No. 902/1, 903/1 Nathikudi Village, Vembakkottai Taluk, Virudhunagar 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. 80.29** lakhs. A detail of mine is presented in **Table 1.6**.

TABLE 1.6: BRIEF DESCRIPTION OF THE PROJECT

Location of Project	S.F.No. 902/1, 903/1 Nathikudi Village, Vembakkottai Taluk, Virudhunagar District, Tamil Nadu
Topo sheet Number	58 – G/11
Type of Mining	Open Cast Mechanized Mining

Draft EIA/EMP for Nathikudi Rough stone and Gravel Quarry Cluster with new proposed area of 1.29.0 Ha, While total cluster area is 20.34 Ha located in Nathikudi Village, Vembakkottai Taluk, Virudhunagar District, Tamil Nadu.

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Seismic Zone	Seismically, this area is categorized under Zone-III as per IS-1893 (Part-1)-2002. Hence, seismically the site is medium Damage Risk Zone. With MSK scale of VII.	
No of Working Days	300days/ year	
Mine Area	1.29.0 Ha	
Mine Location on WGS 1984 datum	Latitude	Longitude
	09°25'58.57"N to 09°26'05.73"N	77°41'05.80"E to 77°41'10.25"E

1.7 LOCATION OF THE PROJECT

The proposed mine is in Nathikudi Village, Vembakottai Taluk, Virudhunagar District, Tamil Nadu. The nearest railway station is Srivilliputtur -8.21km – Northwest. The Nearest National Highway (NH - 744) Kollam – Madurai Road is situated about 9.72 km on the Northwestern side of the lease applied area. The State Highway (SH-183) Sivakasi - Alangulam Road is about 5.4km on the Southeastern side of the lease applied area. The area is included in Survey of India Toposheet No. 58 – G/11 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:1.7**. The environmental setting and the project details is presented in **Table-1.8**. Photographs of the Rough stone Mine are given in **Figure: 1.6**. There is no critically polluted identified cluster by CPCB/MOEF in the vicinity of the project.

Draft EIA/EMP for Nathikudi Rough stone and Gravel Quarry Cluster with new proposed area of 1.29.0 Ha, While total cluster area is 20.34 Ha located in Nathikudi Village, Vembakkottai Taluk, Virudhunagar District, Tamil Nadu.

Lessee: Thiru. K. Sujan (Lease Area: 1.29.0 Ha)

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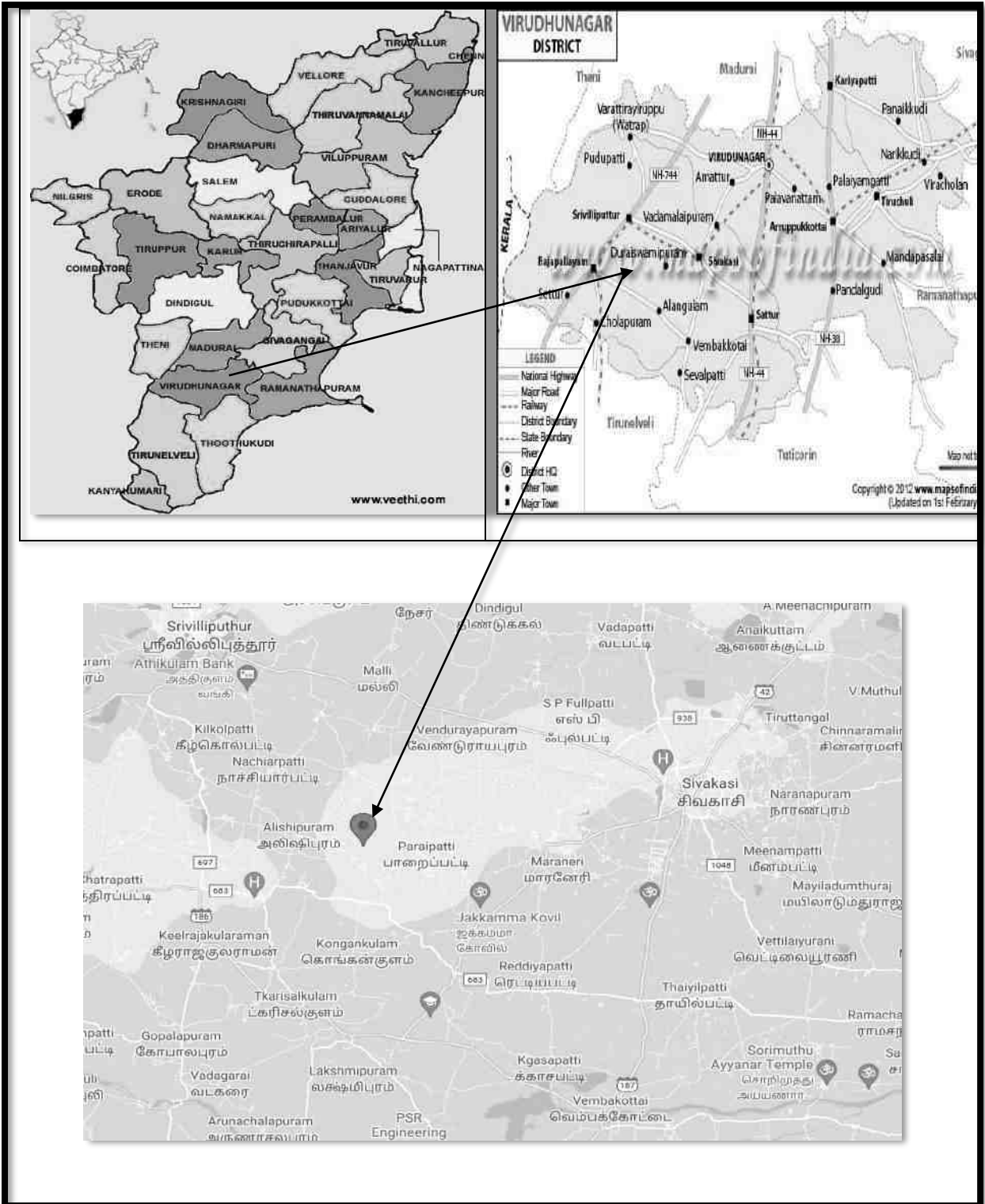


FIGURE 1.2: LOCATION MAP

Draft EIA/EMP for Nathikudi Rough stone and Gravel Quarry Cluster with new proposed area of 1.29.0 Ha, While total cluster area is 20.34 Ha located in Nathikudi Village, Vembakkottai Taluk, Virudhunagar District, Tamil Nadu.

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FIGURE 1.3: ROUTE CONNECTIVITY MAP

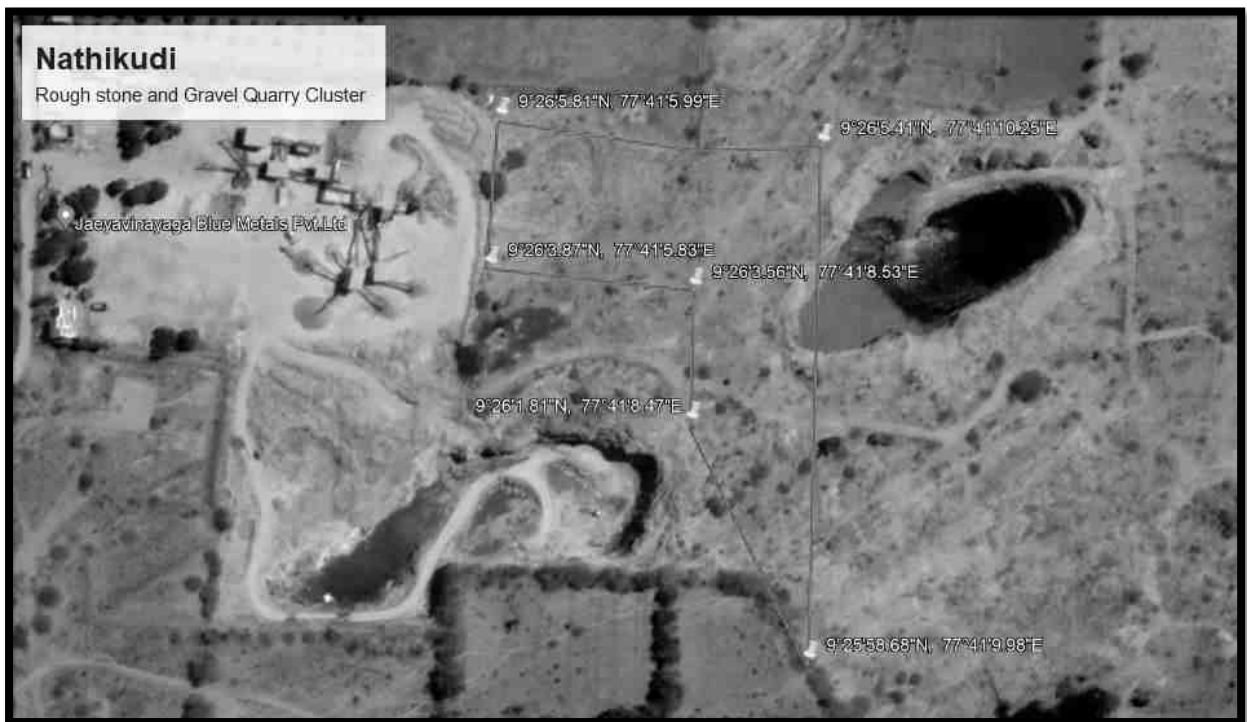


FIGURE 1.4: MINE LOCATION ON WGS 84 DATUM

Draft EIA/EMP for Nathikudi Rough stone and Gravel Quarry Cluster with new proposed area of 1.29.0 Ha, While total cluster area is 20.34 Ha located in Nathikudi Village, Vembakkottai Taluk, Virudhunagar District, Tamil Nadu.

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FIGURE 1.5: LEASE BOUNDARY

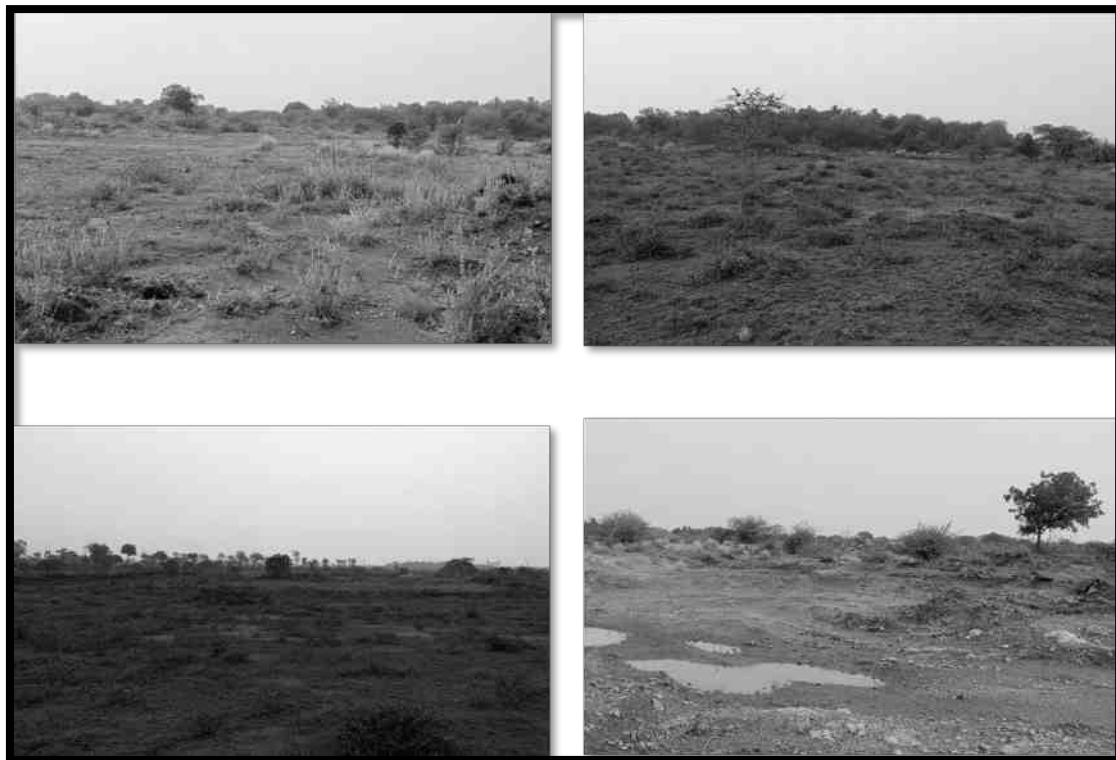


FIGURE 1.6: PHOTOGRAPHS OF MINE

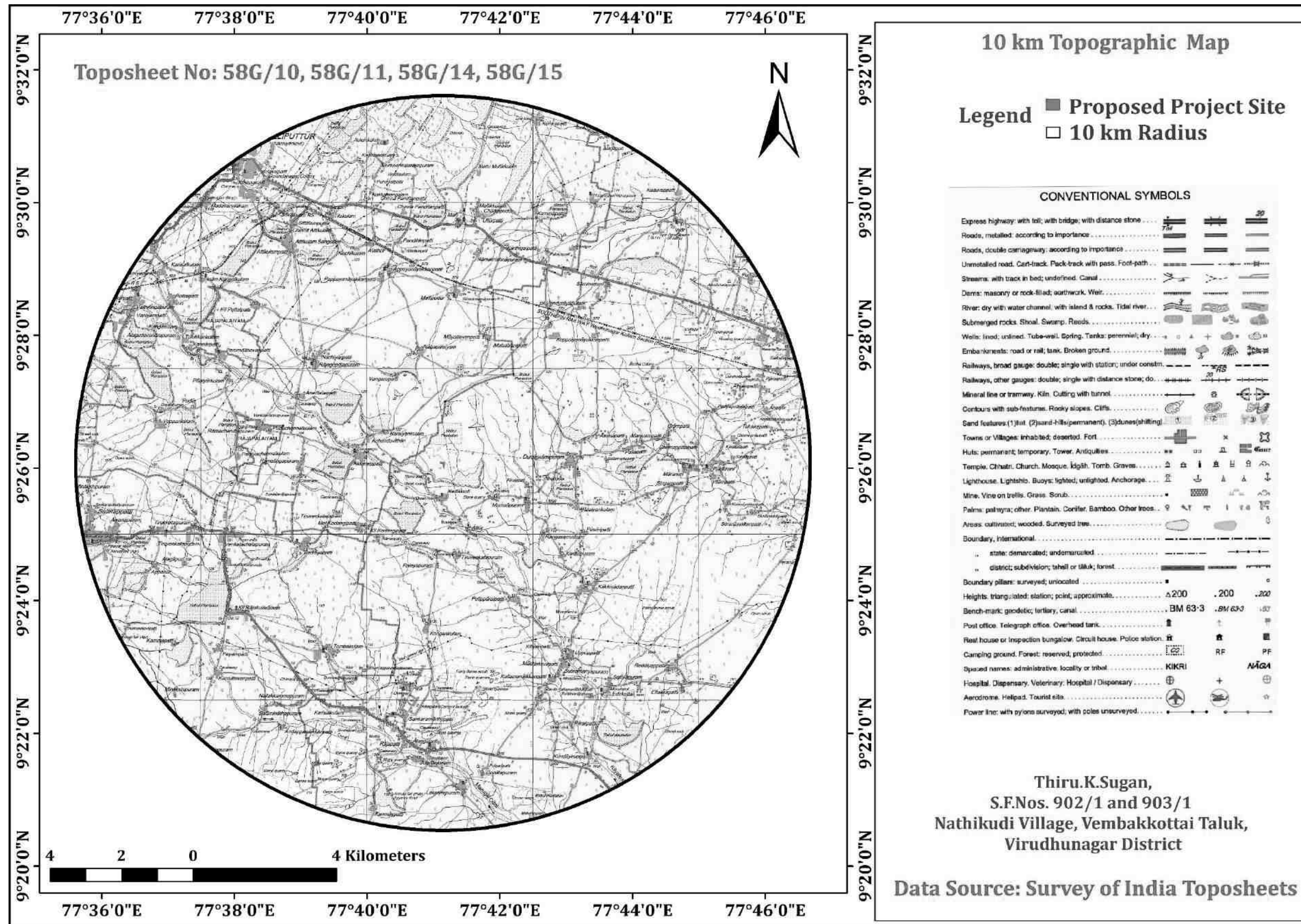


FIGURE 1.7: TOPOGRAPHICAL MAP OF STUDY AREA (10 KM RADIUS)

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TABLE 1.7: PROJECT DETAILS

S. No.	Particulars	Details		
1.	Type of Project	Nathikudi Rough stone and Gravel quarry project		
2.	Mine area applied	1.29.0 Ha		
3.	Project Location	S.F.No. 902/1, 903/1 Nathikudi Village, Vembakkottai Taluk, Virudhunagar District, Tamil Nadu.		
4.	Mine Location on WGS 1984 datum	Latitude		Longitude
		09°25'58.57"N to 09°26'05.73"N		77°41'05.80"E to 77°41'10.25"E
5.	Topo sheet Number	58 – G/11		
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 flat terrain. The area has gentle sloping towards North eastern side and altitude of the area is 121m above from Mean sea level. The land is not fit for vegetation/ Cultivation. The area is dry barren land.		
8.	Site elevation above Mean Sea Level	121 m (Max)		
9.	Reserves	Description	Rough stone	Gravel in m³
		Geological Reserves	2,58,000 m ³	25,800 m ³
		Mineable	72,165 m ³	15,652 m ³
		Five years plan period As in the approved mining plan	72,165 m ³	15,652 m ³
10.	Lease period	5 years		
11.	Proposed depth of Mining	The ultimate depth of mining is about 22m (2m Gravel + 20m Rough stone)		
12.	Existing Pit Dimension	Nil		
13.	Ultimate Pit Dimension	118 m (L) x 82m (W) x 22m (D) BGL		

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S. No.	Particulars	Details		
14.	Land Use Pattern	Land use pattern Quarry Pits -20% Trees/Agri land - 20% Habitation - 30% Tank & Odai - 20% Roads - 10%		
15.	Climatic Conditions	Rainfall - 820mm/annum • Temperature - 42°C - 23°C		
16.	Ground water level	The Ground water is about 65m - 60m depth below Ground level.		
17.	Seismic zone	Seismically, this area is categorized under Zone-III as per IS-1893 (Part-1)-2002. Hence, seismically the site is High Damage Risk Zone. With MSK scale of VII.		
18.	Nearest State/National Highway	The Nearest National Highway (NH - 744) Kollam - Madurai Road is situated about 9.72 km on the Northwestern side of the lease applied area. The State Highway (SH-183) Sivakasi - Alangulam Road is about 5.4km on the Southeastern side of the lease applied area		
19.	Nearest Railway Station	Srivilliputtur -8.21km - Northwest		
20.	Nearest Air Port	Madurai Airport - 62.86km - Northeast		
21.	Nearest village/major town	Nathikudi :0.68 Km - South		
22.	Nearest Town, city, District Headquarters along with distance in kms.	Virudhunagar : 33.32 Km, Northeast Direction Vembakottai : 14.17 Km, SE Direction		
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	Water bodies	Distance (Km)	Direction
		Red lake	0.63	SE
		Kayalkudi River	0.9	S

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S. No.	Particulars	Details		
		Mamsapuram Pond 2	2.44	SE
		Idayankulam Lake	3.21	SE
		Mamsapuram Pond 1	2.96	SE
		Ettakkapatti lake	8.66	SE
		Periyakulam Kanmai	9.97	NW
		Madavaarkulam Temple Pond	9.86	NW
		Sengulam Kanmai	9.86	NW
27.	Reserve Forest within 10Km Radius	Reserve Forest	Distance (Km)	Direction
		Mottamalai R.F.	9.75	NW
28.	Nearest Hospital	Government Primary Health Center – Maraneri – 6.68 km, E		
29.	Details of other quarries for a radius of 500m around the quarry site	<p>The details of the quarries located within the radius of 500m from the proposed project site.</p> <p>Abandoned quarries – 2 Nos (1.13.5Ha)</p> <p>Existing quarries – 5 Nos (12.31.5Ha)</p> <p>Proposed quarry – 3 Nos (6.89.0Ha)</p> <p>the total extent of the existing and proposed quarry within the radius of 500m is 20.34.0 Ha</p>		
30.	Man power	Total Employees proposed for the quarry operation is 15Nos.		
31.	Water requirement & source	Total water requirement for 2.0KLD from water vendors & nearby Bore well.		
32.	Overburden /Waste	The overburden in the form of Gravel is 15,652m³ up to depth for 2m for during this period		
33.	Cost of the project	Project cost = Rs. 80,29,000/-		

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

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the rough stone is widely used for domestic construction project like Hospital, School, Gov Virudhunagar District.

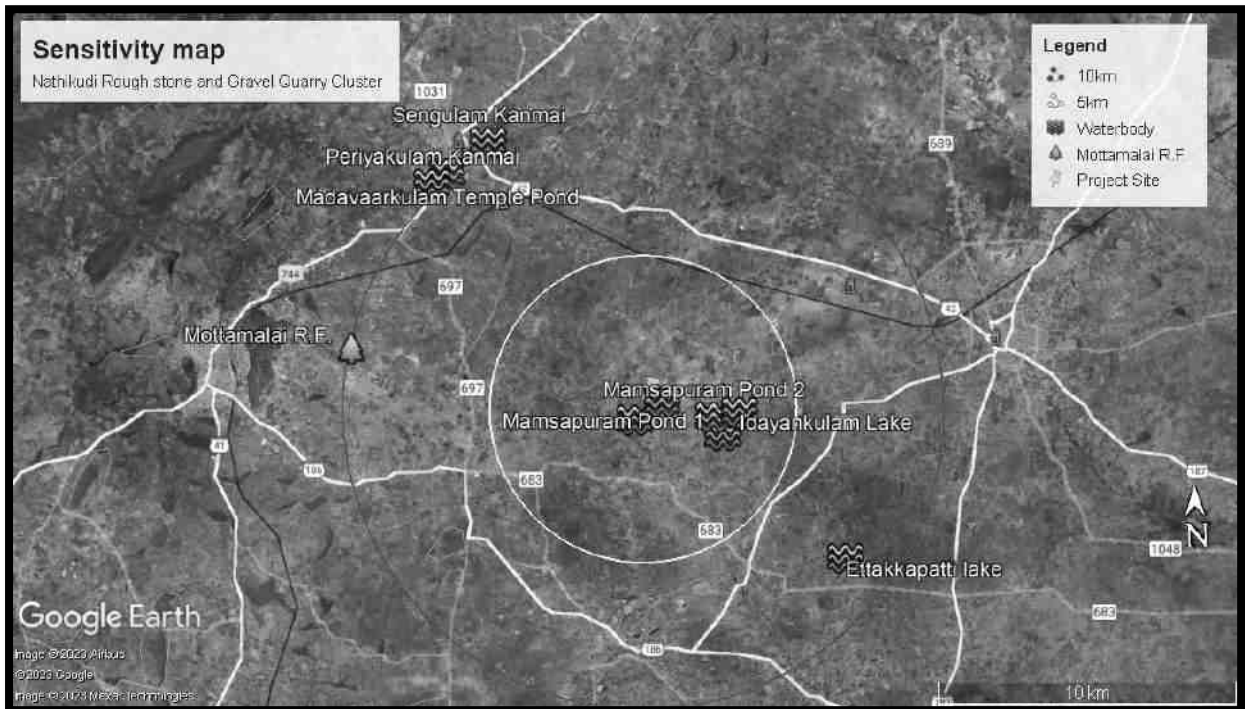


FIGURE 1.8: ENVIRONMENTAL SENSITIVITY MAP

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 October -2022 to December - 2022).

1.10 DATA GENERATION

The data has been generated by Enviro Tech Services, Ghaziabad (U.P) in accordance with the requirement of statutory agencies from October -2022 to December - 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

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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:

- Introduction
- Project Description
- Analysis of Alternatives (Technology and site)
- Description of the Environment
- Anticipated Environmental Impact & Mitigation Measures
- Environmental Monitoring Programme
- Additional Studies
- Project Benefits
- Environmental Cost Benefit Analysis
- Environmental Management Plan
- Summary & Conclusion
- 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.

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- 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 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 8 ground water locations.
4	Soil Quality	Physical and Chemical parameters.	Grab samples collected once during study period from 8 locations.
5	Ecology	<ul style="list-style-type: none"> • Existing terrestrial flora and fauna covering Core Zone (1.29.0 Ha) & Buffer Zone (10-Km radius). • Existing aquatic ecological status in 	Through field studies once during study period. Secondary data also collected.

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S. No.	Attributes	Parameters	Frequency
		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.

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 vide its letter No. SEIAA-TN/F.No.8987/ ToR-1131/2022, dated 25.03.2022

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Chapter 2: Project Description

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 Mine of area 1.29.0 Ha, with cluster area 20.34.0 Ha, located in S.F.No. 902/1, 903/1 Nathikudi Village, Vembakottai Taluk, Virudhunagar District, Tamil Nadu. 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

1	S.F. No.	S.F.No. 902/1, 903/1	
2	Village	Nathikudi Village,	
3	Taluka and District	Vembakottai Taluk, Virudhunagar District	
4	State	Tamil Nadu	
5	Toposheet No.	58 - G/11	
6	Latitude & Longitude	Latitude	Longitude
		09°25'58.57"N to 09°26'05.73"N	77°41'05.80"E to 77°41'10.25"E

The proposed area does not fall within 10 km radius of any eco – sensitive zone, Wild life Sanctuary, National Park, Tiger Reserve, Elephant Corridor and Biosphere Reserves.

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Lessee: Thiru. K. Sujan (Lease Area: 1.29.0 Ha)

2.4 REQUIREMENTS FOR THE PROJECT

2.4.1 Land Requirement

Lessee has obtained Letter of Intent by District Collector, Virudhunagar district for rough stone mine for a lease area 1.29.0 Ha located at Survey Nos. 902/1, 903/1 in Nathikudi Village, Vembakottai Taluk, Virudhunagar District, Tamil Nadu. The LOI is provided for lease period of 5 years.

2.4.2 Water Requirement

Total water requirement for the project will be **2.0 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**

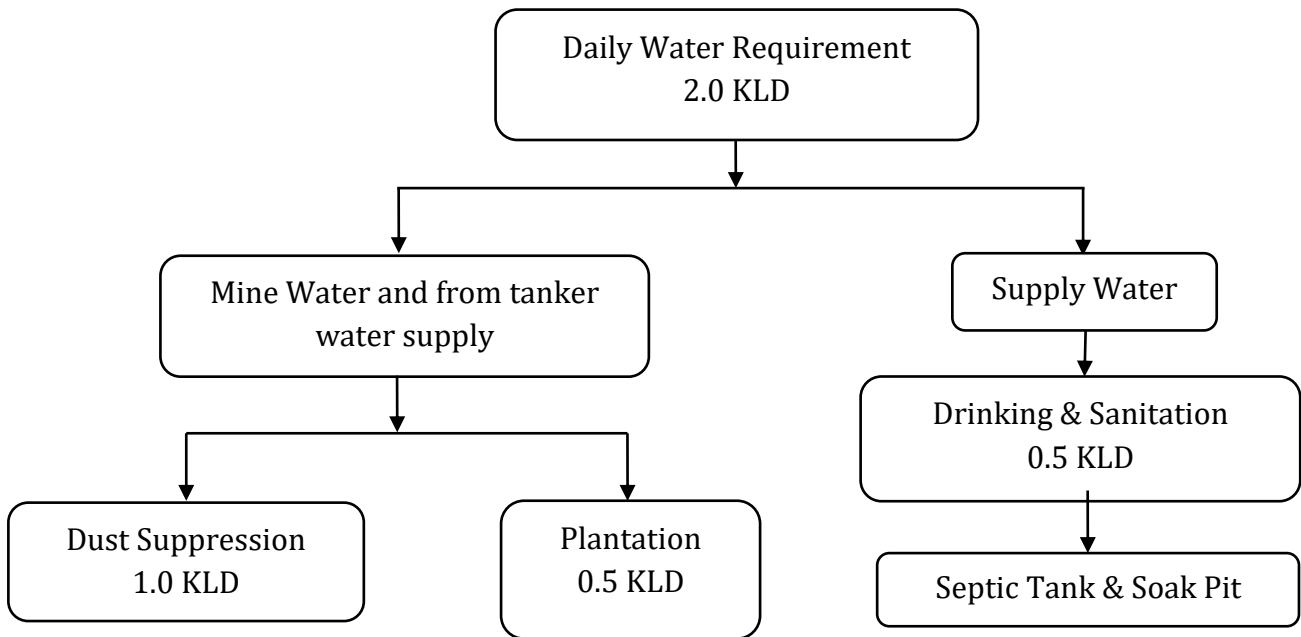


FIGURE 2.1: WATER BALANCE DIAGRAM

TABLE 2.2: DAILY WATER REQUIREMENT (KLD)

Particulars	Source	Quantity
Dust Suppression	From Existing bore wells from nearby area/Rain water harvesting pits	1.0
Green Belt & Plantation	From Existing bore wells from nearby area / Rain water harvesting pits	0.5
Domestic Use	From Existing, bore wells and drinking water will be sourced from Approved Water vendors.	0.5
Total		2.0

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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	Nos
Skilled Labour		
1.	Mine Foreman/ Manager	1
2.	Blaster/mate	1
3.	Excavator- Operator	3
4.	Jack hammer operator	4
Semi-Skilled		
5	Security	1
Unskilled		
6.	Labour Helper	2
7.	Cleaner & Co-Operator	3
Total		15

(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

Diesel (HSD) used for quarrying machineries will be around **60,338 Litres** of HSD for the entire project life. Diesel will be brought from nearby diesel pumps.

1. For Gravel:

Per hour Excavator will consume = 10 liters / hour
 Per hour Excavator will excavate = 60m³of Gravel
 For = 15652/60 = 261 hours
 Diesel consume working days = 261 hours x 10 litres
 Total diesel consumption = 2610 Litres of HSD will be utilized for Gravel

2. For Rough Stone:

Per hour Excavator will consume = 16 liters / hour
 Per hour Excavator will excavate = 20m³ of Rough stone
 For = 72165/20 = 3608 hours

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Diesel consume working hours = 3608 hours x 16 litres

Total diesel consumption= 57,728 Litres of HSD will be utilized for Rough stone
Total diesel consumption= 60,338 Litres of HSD will be utilized for entire life.

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	Nos
1.	Jack hammer (30-35mm dia hole)	1.2m to 2.0m	Compressed air	2
2.	Compressor	400 psi	Diesel drive	1
3.	Excavator with Bucket and Rock Breaker	300	Diesel drive	1
4.	Tippers	20 tonnes	Diesel drive	1

(Source: Approved Mining Plan)

2.4.7 Lorry Load Calculation

One lorry load = 6m³ (approx.)
 Total No of working days = 300 days per year
 Total quantity to be removed in this five years plan period = 72,165 m³
 Hence total lorry loads per day = 72,165 m³ / 6m³
 = 12027 Lorry loads
 = 12027 / 5 years
 = 2405 / 300 days

Rough stone = 8 Lorry loads per day
 Total quantity to be removed in this five years plan period = 15,652 m³ Gravel
 Hence total lorry loads per day = 15,652 m³ / 6m³
 = 2608 Lorry loads
 = 2608 / 3 years
 = 870 / 300 days

Gravel load per day = 2-3 Lorry loads per day

2.5 PROJECT COST

The estimated cost of the proposed rough stone quarry is 21,29,000 proposed is given below in **Table. 2.5**

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Chapter 2: Project Description

TABLE 2.5: ESTIMATION OF PROJECT COST

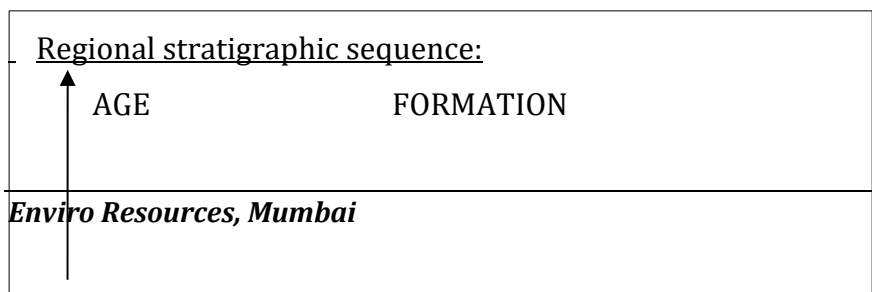
Description	Project
Land cost	Rs.1,29,000/-
Machinery to be used	Rs.10,00,000/-
Refilling/ Fencing	Rs.1,95,000/-
Labourers shed	Rs.1,50,000/-
Sanitary facility	Rs.80,000/-
Others items	Rs.50,000/-
Drinking water facility for the labourers	Rs.1,00,000/-
Sanitary arrangement	Rs.50,000/-
Safety kit	Rs.50,000/-
Water sprinkling	Rs.1,00,000/-
Garland drain	Rs.1,65,000/-
Greenbelt etc.	Rs. 60,000/-
Total Cost	Rs.21,29,000/-

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

The most of the area in Virudhunagar District is covered by a vast tract of black soil with residual hills and knolls. Since the area is covered by thick pediments, the geology of the area is studied in available exposure and quarry section opened up for l limestone, dimension stone and blue metals for various purposes. The area exposes Khondalite Group of rocks and migmatite gneisses of Precambrian (V.R.Sowmi Narayanan, etal.,). The Khondalite Group of rocks comprises Charnockite, crystalline limestone/calc gneiss, garnet ferrous quartz felspathic gneiss (leptynite), all these litho units probably represent a sequence of metamorphosed sedimentary units of arenaceous, calcareous and argillaceous composition with various intermixtures of different proportions (V .R.Sowmi Narayanan, etal.,). Granite and quartz veins form the younger intrusive.



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Recent - Quaternary formation (Gravel)
 -----Unconformity-----
 Archaean - Charnockite
 Peninsular Gneiss complex

The Geological map is presented in **Figure 2.2**.

2.8 GEOMORPHOLOGY

Virudhunagar district is bordered by Western Ghats (Ridge and valley complex) in the West. Vally fill area is observed in Watrap block. A major part of the district constitutes a plain terrain with a gentle slope toward East and Southeast, except for the hilly terrain in the west. The prominent geomorphic units identified in the district through interpretation of Satellite imagery are; 1. Flood Plain, 2. Bazada, 3. Pediment, 4. Shallow & deep buried Pediments and 6. Structural Hills. **(Source: <http://cgwb.gov.in/District Profile/TamilNadu/Virudhunagar.pdf>)**

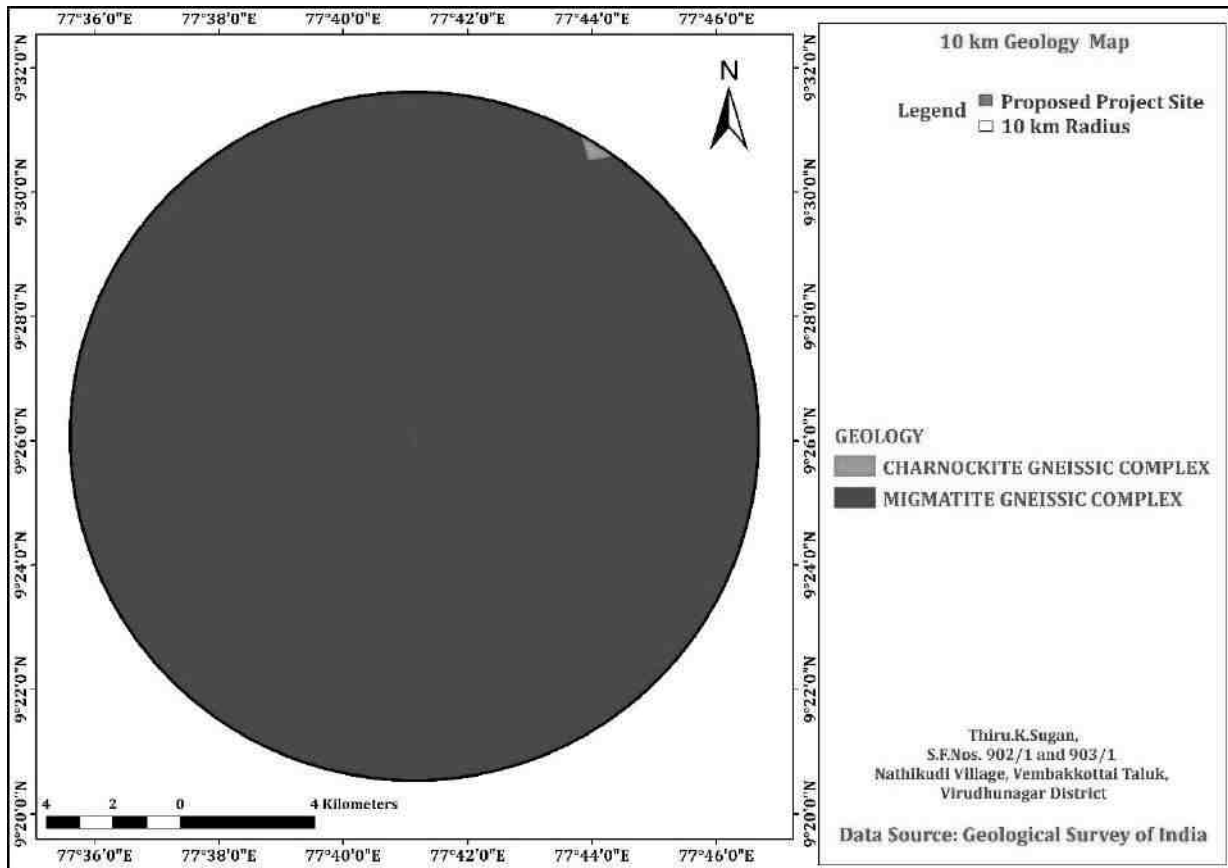


FIGURE 2.2: GEOLOGICAL OF STUDY AREA

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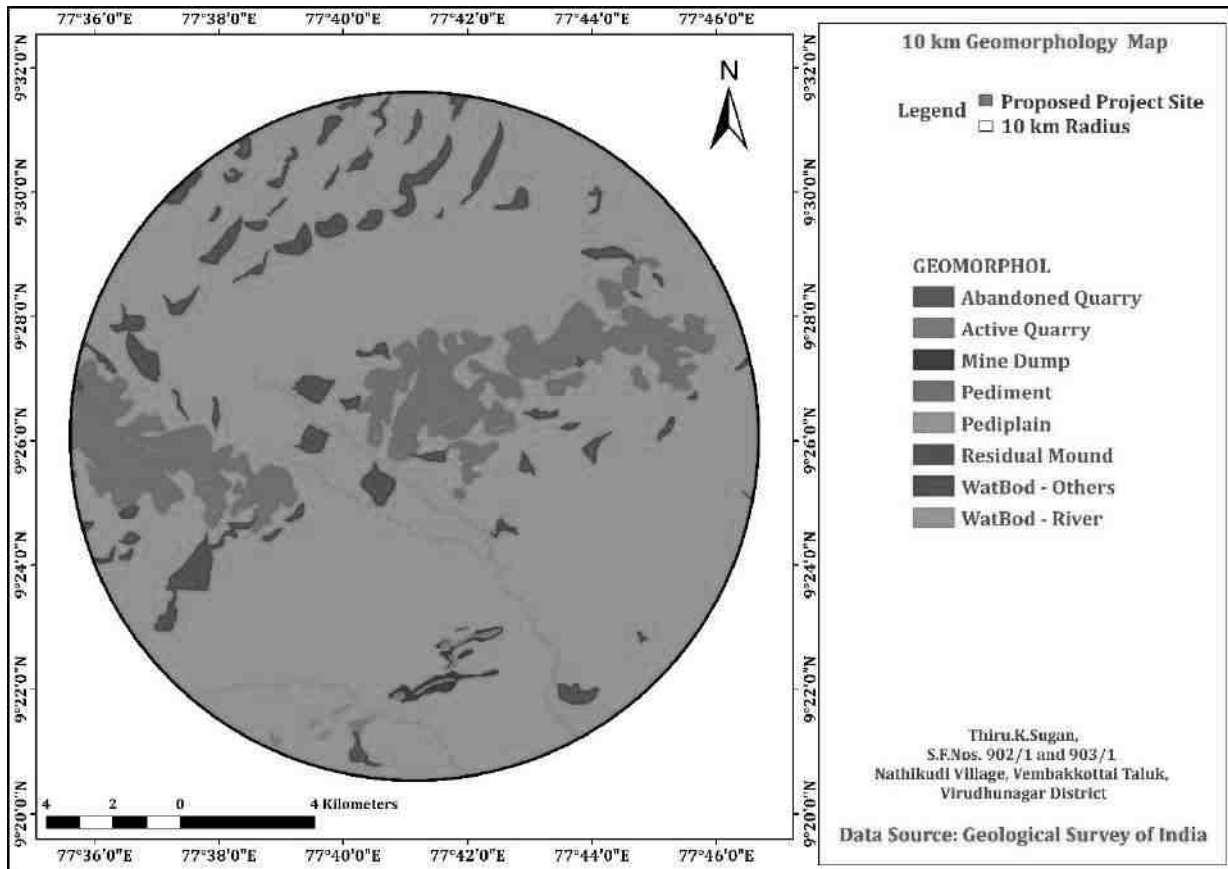


FIGURE 2.3: GEOMORPHOLOGY OF STUDY AREA

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 is mostly covered with Hornblende Biotite Gneiss followed by calc granulite with limestone while small patches of Granite and quartzite are observed in patches. Small patch of amphibolite is also observed.

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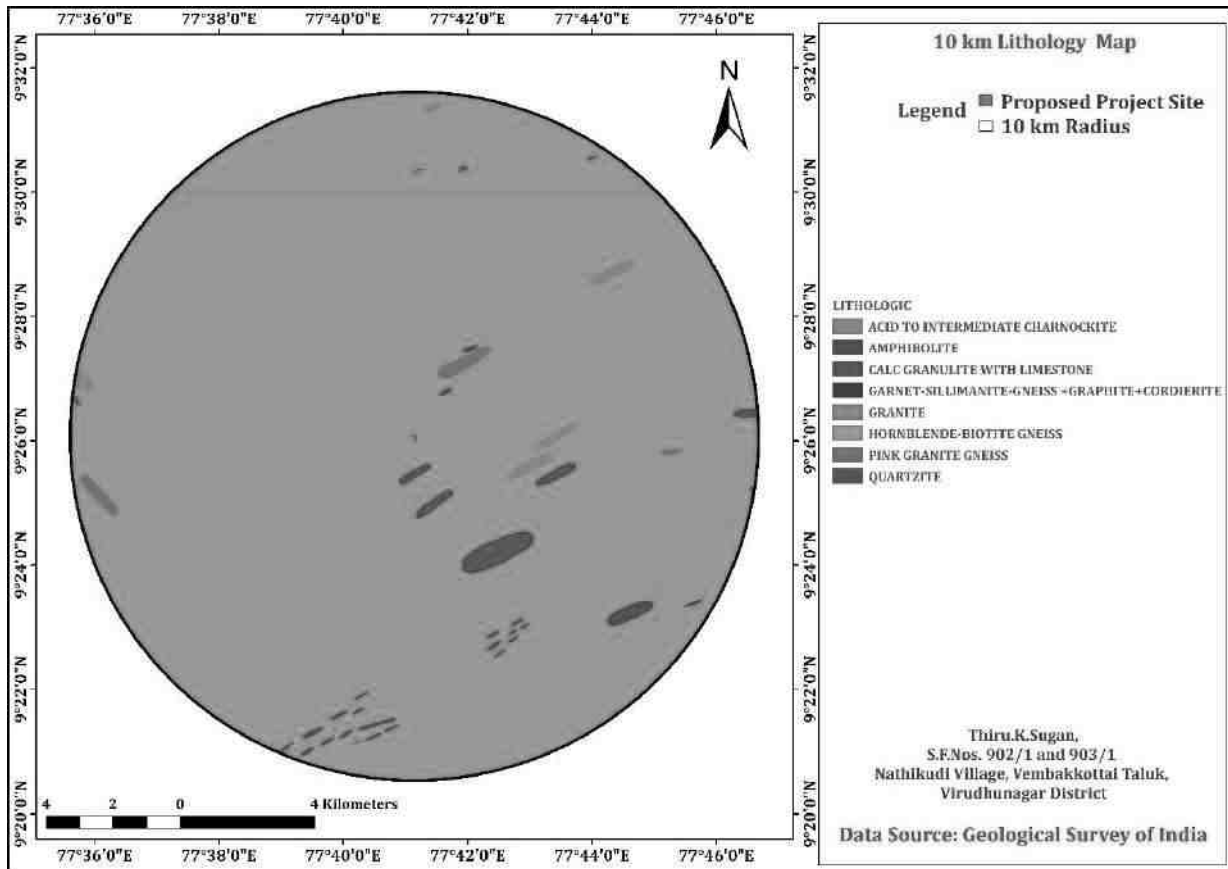


FIGURE 2.4: LITHOLOGY OF STUDY AREA

2.10 PHYSIOGRAPHY AND DRAINAGE PATTERN

The major part of Virudhunagar district falls in Vaippar - Gundar river basin. Vaippar, Arjuna River, Gundar and Deviar are the important rivers. The drainage pattern, in general, is dendritic. All the rivers are seasonal and carry substantial flows during monsoon period. Vaippar, which is one of the important rivers of the district, flow and drain in the Vembakkam and Sattur blocks. The Arjuna river, flowing in the central part of the district, has its origin from the Sattur Watrap Hills and is formed by Kovillar, periyar and Chittar rivers. The Gundar river originates at an altitude of 500 m. amsl near Kottaimalai of Saptur reserve forest in Varushanadu hills in Madurai district

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

The lease applied area is flat terrain. The area has gentle sloping towards North eastern side and altitude of the area is 121m above from Mean sea level. The land is not fit for vegetation/ Cultivation. The area is dry barren land.

The water table is found at a depth of 65m in summer and at 60m in rainy seasons. Average rainfall is about 989mm.

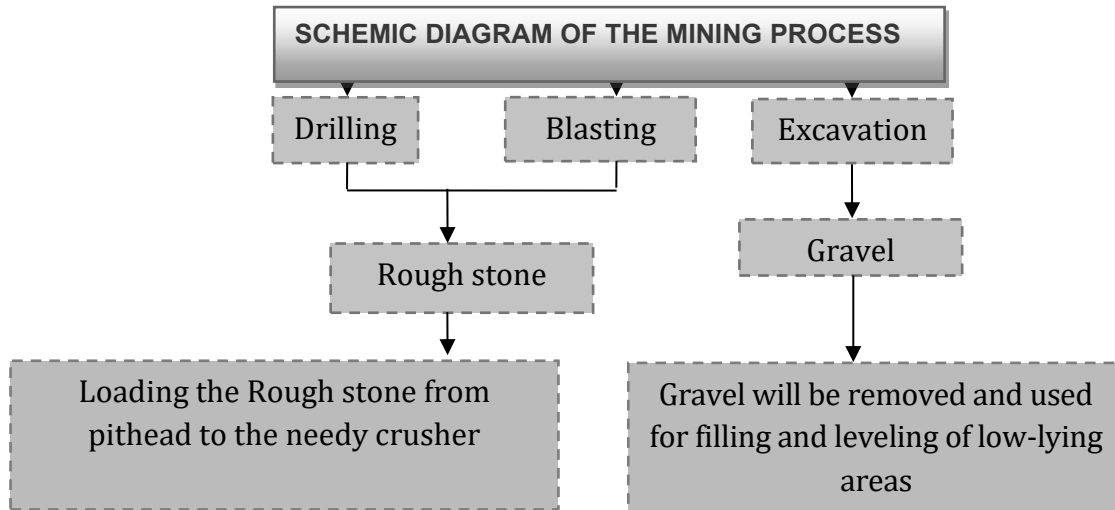
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2.11 DETAILS OF MINING

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 m³. The volume is multiplied by 2.5MT/m³ (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 in **Table 2.6**.

TABLE 2.6: SUMMARY OF AVAILABLE GEOLOGICAL RESERVE

GRAVEL	
Depth of Estimation of Resources	2m

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Total Geological Resources (Area x Depth)	=12900m ² x 2 =25800m ³
Rough Stone	
Depth of Estimation of Resources	20m
Total Geological Resources (Area x Depth)	=12900m ² x 20 = 258000m ³

(Source: Approved Mining Plan)

Available Geological Resources of Top Soil : 25800 m³
 Available Geological Resources of Rough stone : 2,58,000 m³

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 2.7: SUMMARY OF MINEABLE RESERVE

Section	Bench	Length in (m)	Width in (m)	Depth in (m)	Mineable Reserves of Rough stone (m ³)	Gravel (m ³)
XY-AB	I	118	42	2	-	9912
	II	114	38	5	21660	-
	III	104	28	5	14560	-
	IV	94	18	5	8460	-
	V	84	8	5	3360	-
	Total					48040
XY-CD	I	35	82	2	-	5740
	II	31	80	5	12400	-
	III	21	75	5	7875	-
	IV	11	70	5	3850	-
	Total					24125
Grand Total					72165	15652

(Source: Approved Mining Plan)

Total Mineable Recoverable Reserves of Rough stone @ 100% : 2,73,335 m³

The mineable reserves have been computed as **72165 m³** of Rough Stone for five years at the rate of 100% recovery and **15652 m³** of Gravel upto a depth of 22m (2m Gravel + 20m Rough Stone) below from the general ground level.

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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 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

➤ Topsoil / Waste

There is no topsoil in this proposed site. The overburden is in the form of Gravel formation. The Gravel will be directly loaded into tippers for the filling and levelling of low lying areas, this will be done only after obtaining permission and paying necessary seigniorage fee to the Government.

➤ Overburden / Waste

The overburden is in the form of Gravel formation. The Gravel will be directly loaded into tippers for the filling and levelling of low lying areas, this will be done only after obtaining permission and paying necessary seigniorage fee to the Government. The excavated rough stone 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.

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➤ **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 2.8**. The Plan showing mine development during the plan period is given in **Figure 2.5**.

TABLE 2.8: YEAR- WISE DEVELOPMENT & PRODUCTION

Year	Section	Bench	Length in (m)	Width in (m)	Depth in (m)	Recoverable Reserve of Roughstone in(m ³)100%	Gravel (m ³)
I	XY-AB	i	52	42	2		4368
		ii	48	38	5	9120	
		iii	38	28	5	5320	
	Total					14440	4368
II	XY-AB	i	43	42	2		3612
		ii	43	38	5	8170	
		iii	43	28	5	6020	
	Total					14190	3612
III	XY-AB	i	23	42	2		1932
		ii	23	38	5	4370	
		iii	23	28	5	3220	
	X1Y1-CD	i	35	82	2		5740
		ii	31	80	5	12400	
		Total					19990
IV	X1Y1-CD	iii	21	75	5	7875	
		iv	11	70	5	3850	
	Total					11725	
V	XY-AB	iv	94	18	5	8460	
		v	84	8	5	3360	
	Total					11820	
Grand Total						72165	15652

(Source: Approved Mining Plan)

Total Recoverable Reserves of Rough stone @ 100% : 72,165 m³

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Total Proposed Reserves of Gravel : 15,652 m³

The recoverable reserves have been computed as **72,165 m³** of rough stone at the rate of 100% recovery for the period of five years upto a maximum depth of 22 m (2m Gravel + 20m Rough Stone) below ground level.

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 on 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 $1.5 \times 1 \times 1 = 1.5\text{m}^3$.

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 2.9: BLASTING PROGRAM FOR THE PRODUCTION PER DAY

Particulars	Qty
No. of holes	42
Pattern of hole	Zigzag- Multi-rows
Inclination of holes	80° from horizontal
Yield (Tons)	125
Powder factor (Tons/Kg of explosives)	6
Total explosive required (Kg-Slurry explosives)	21
Charge/hole (Kg)	0.5
Use of detonators	25millisecond relays
Detonating fuse	Detonating Cord

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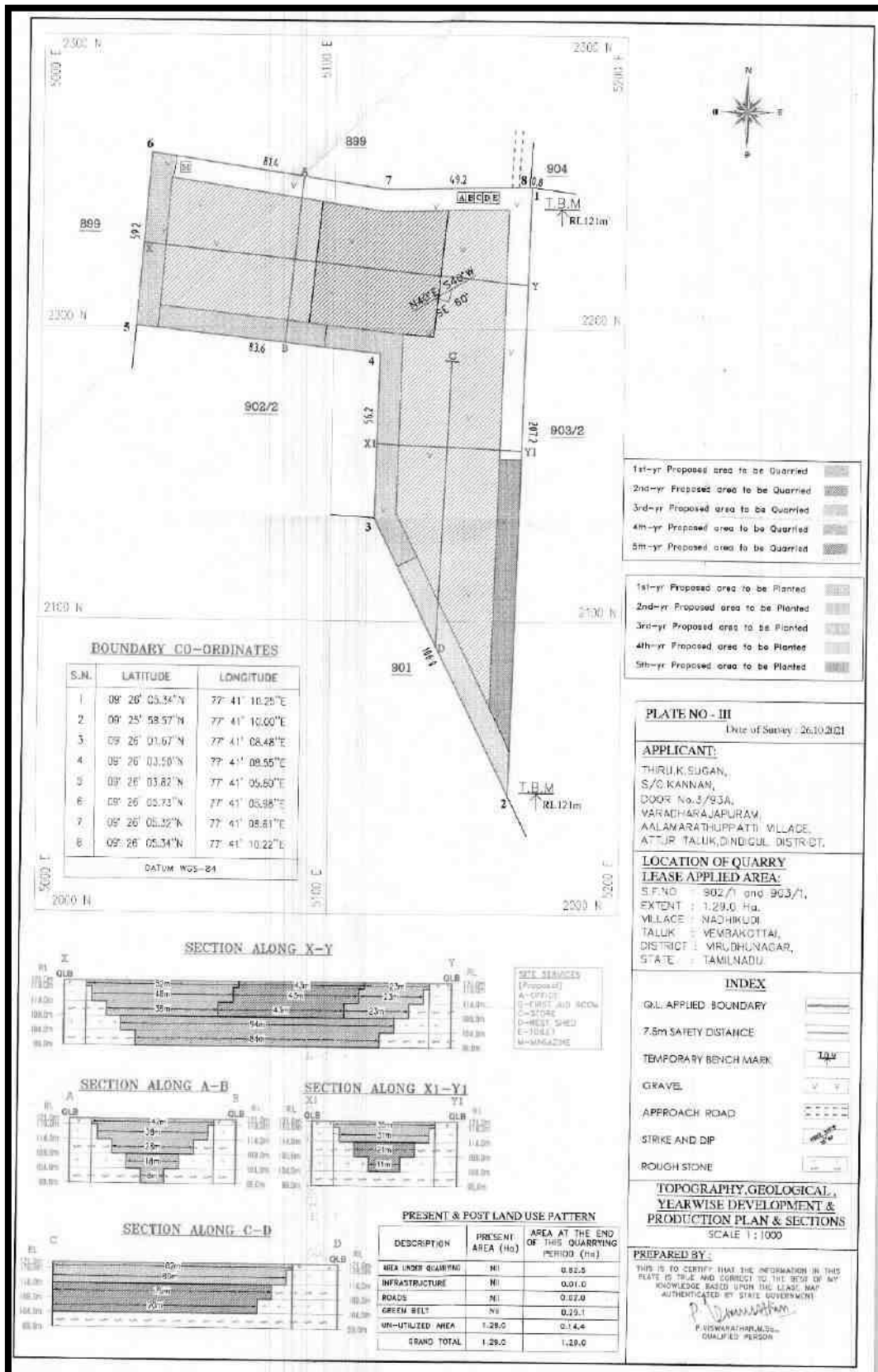


FIGURE 2.5: PRODUCTION AND DEVELOPMENT PLAN AND SECTION

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2.16.2 Frequency of Blasting

Blasting will be carried out only in Day time between 1.00 to 2.00 P.M.

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**.

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2.18 LAND USE PATTERN OF MINE LEASE AREA

- **Land form:** The lease applied area is exhibits an undulated 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, The applicant has awarded tender from the Government.

The existing and proposed land use pattern of the mine lease area upto conceptual stage is given in **Table 2.10**.

TABLE 2.10: EXISTING AND PROPOSED LAND USE PATTERN OF MINE LEASE AREA

S. No.	Description	Present area (Ha)	Area at the end of this quarrying period(Ha)
1.	Area under quarrying	Nil	0.82.5
2.	Infrastructure	Nil	0.01.0
3.	Roads	Nil	0.02.0
4.	Green Belt	Nil	0.29.1
5.	Unutilized Area	1.29.0	0.14.4
Total		1.29.0	1.29.0

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

Following site services will be provided at the mine:

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.

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- **First-Aid Room:** A first-aid room with all necessary medical facilities will be provided as per mines act and mines rules.

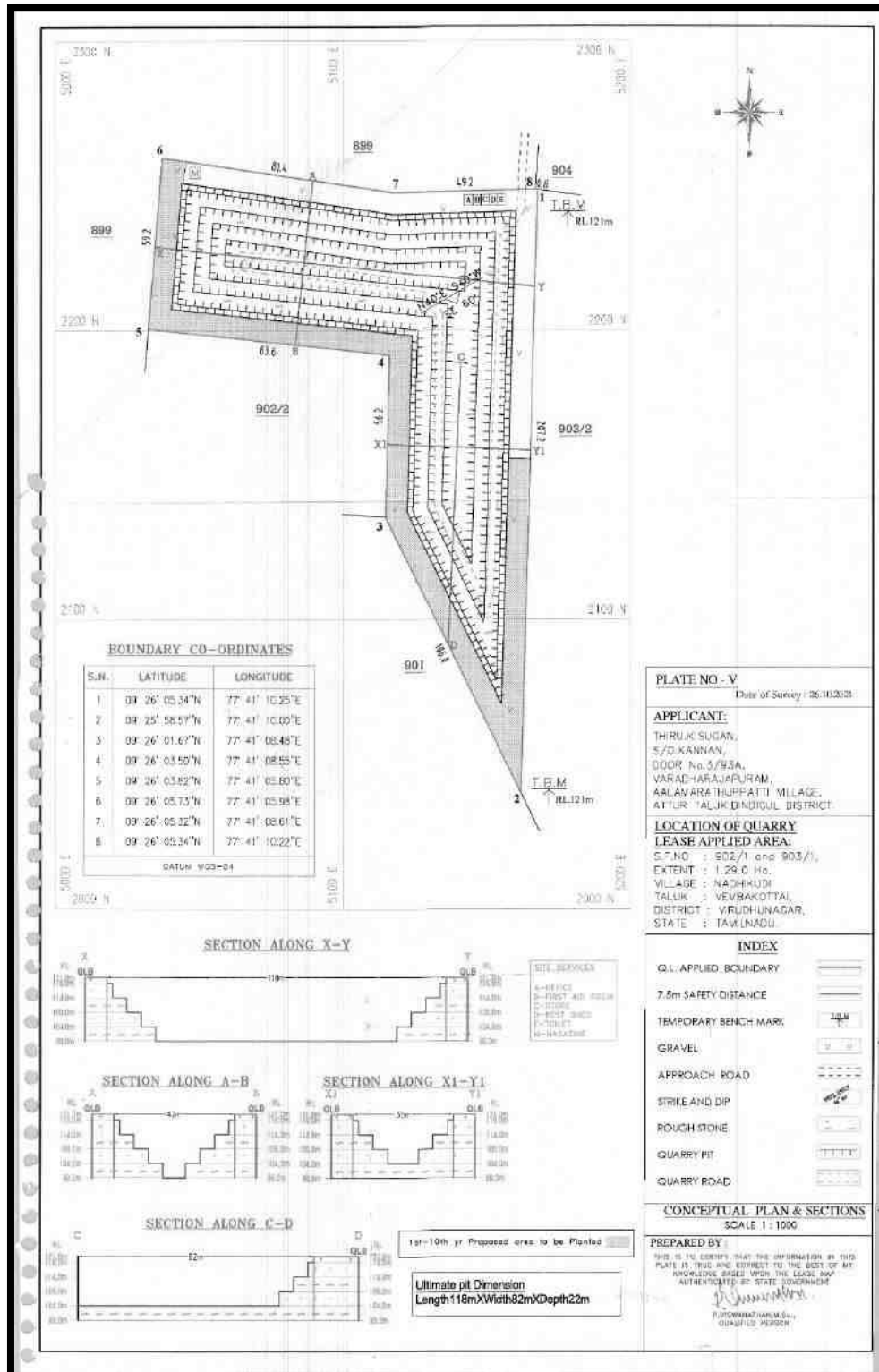


FIGURE 2.6: CONCEPTUAL PLAN

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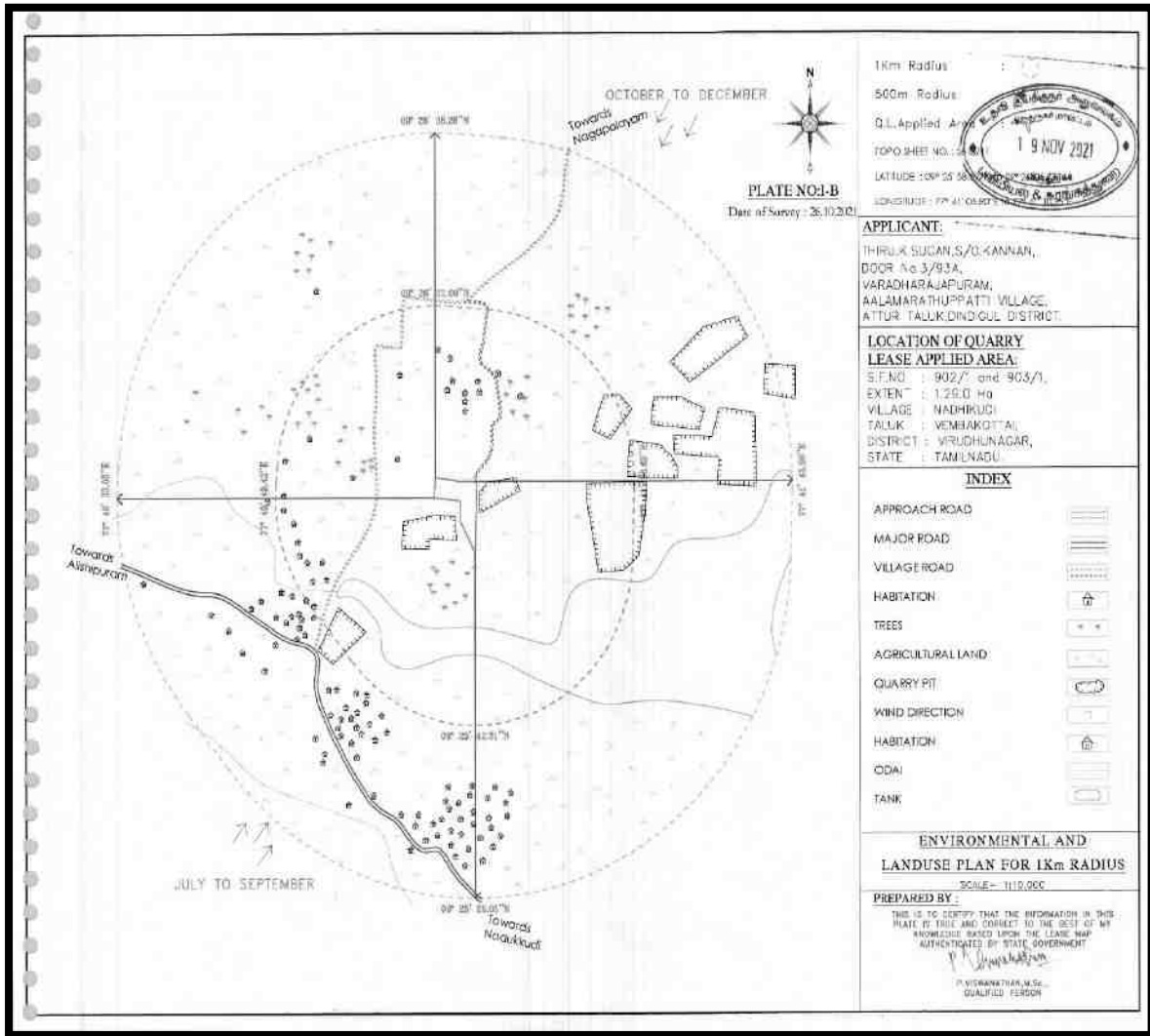


FIGURE 2.7: ENVIRONMENTAL & LAND USE PLAN

2.20 POTENTIAL IMPACTS & MITIGATION MEASURES

The expected anticipated adverse environmental impacts and mitigation measures are summarized in **Table-2.11**.

TABLE 2.11: 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	<ul style="list-style-type: none"> • Use of dust aprons on drilling equipment and adopting wet drilling methods. • Avoiding blasting during

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Environmental Component	Project Activities	Impacts	Mitigation Measures
			<p>adverse weather conditions.</p> <ul style="list-style-type: none"> • Use of controlled blasting practice • Development of greenbelt.
	Extraction of Mineral, Loading / unloading activities	Increase in SPM/RPM levels in ambient air and SO ₂ /NO _x concentration levels in ambient air due to vehicular emissions.	<ul style="list-style-type: none"> • 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 /NO _x concentration levels in ambient air due to vehicular emissions.	<ul style="list-style-type: none"> • 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 /NO _x concentrations in ambient air.	<ul style="list-style-type: none"> • Regular maintenance of all equipment to minimize particulate matter and gaseous emissions from diesel engines.
	All activities	Excessive occupational exposures to airborne particulate matter.	<ul style="list-style-type: none"> • Provision of dust masks to workers exposed to dusty operations / areas.

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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	<ul style="list-style-type: none"> • 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.	<ul style="list-style-type: none"> • 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.	<ul style="list-style-type: none"> • 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.

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Environmental Component	Project Activities	Impacts	Mitigation Measures
			<ul style="list-style-type: none"> • 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 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.	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • There will not be any process effluent discharge from the mine. • Rain water accumulated in

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Environmental Component	Project Activities	Impacts	Mitigation Measures
		untreated for greenbelt development	<p>mine pit will be discharged in nearby drainage after passing through settling pond.</p> <ul style="list-style-type: none"> • 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.	<ul style="list-style-type: none"> • 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 will be limited to lease area.
Hydrogeology and Drainage pattern	Mining activities	May impact regional hydrology and drainage pattern of the area.	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • Development of thick plantation around mine lease area, waste dump area and on undisturbed area.

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Lessee: Thiru. K. Sujan (Lease Area: 1.29.0 Ha)

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Environmental Component	Project Activities	Impacts	Mitigation Measures
		<p>settling of air borne dust on soil outside ML area.</p> <p>Land degradation due to disposal of solid wastes.</p>	<ul style="list-style-type: none"> • 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 area.	<ul style="list-style-type: none"> • 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. • 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	<ul style="list-style-type: none"> • 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

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Environmental Component	Project Activities	Impacts	Mitigation Measures
			<p>housekeeping at working places.</p> <ul style="list-style-type: none"> • 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.	<ul style="list-style-type: none"> • 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.

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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 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 **Enviro Tech Service (ETS), Ghaziabad** it is an NABL and MOEF recognized laboratory for various components of environment, viz. Air, Noise, Water, Land was carried out during **October 2022 to December 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;

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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 25th September 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. 09°25'58.57"N to 09°26'05.73"N latitude and 77°41'05.80"E to 77°41'10.25"E longitude and elevation 93 to 224 meter are observed. The project is in Survey of India topo sheet no 58G/11 while 10 km radius study area covers four topo sheets 58G/10, 58G/11, 58G/14 & 58G/15 as Figure 1: 10 Km radius topo map of study area.

Table 3.1: Data Specification Used for Presents Study

Satellite/ Image	Sensor	Spatial resolution	Date of Acquisition
Sentinel-2A	Sentinel-2	10 m	25 th September 2022
Cartosat	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

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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 particularly important for better comprehension and delineation of the land use classes. Hence, Sentinental 2A data and SRTM data having 30 m 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.

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 93 to 224m MSL are observed in the study area.

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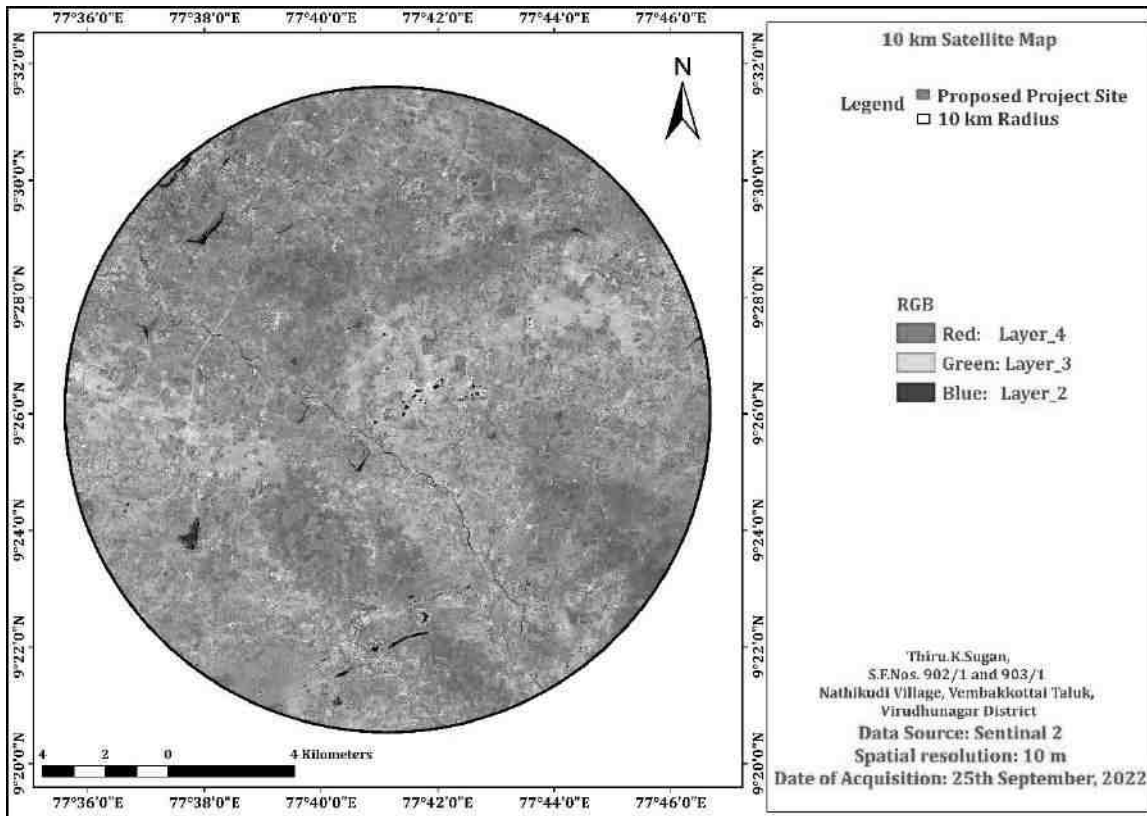


FIGURE 3.1: FCC OF THE 00-10 KM RADIUS WITH PROJECT LOCATION

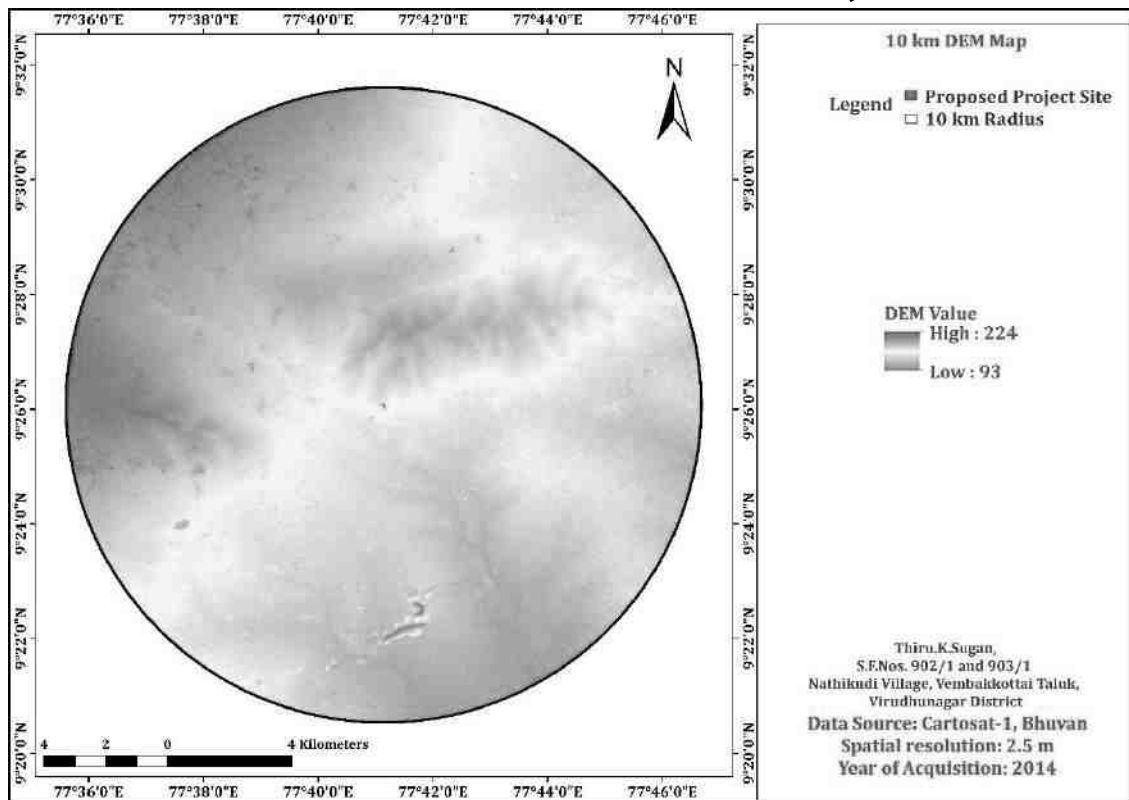


FIGURE 3.2: DIGITAL ELEVATION MODEL WITH IN 10 KM RADIUS

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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** of which waste land has the highest category of land which comprises of Scrub/shrub 45.46% (143.16 Km²) & bare land 16.04 % (50.52 Km²), followed by agricultural land which is combination of plantation, and crop land 27.26 % (85.89 Km²), followed by built-up land 9.28 % (29.25 Km²), followed by mining land 0.96% (3.05 km²), followed by water body comprises of 0.88 % (2.8 Km²) and the last is forest land which comprises of 0.06% (0.19 km²). 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 SH 183 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	29.25	9.28
2	Forest	Dense Forest	0.19	0.06
3	Agricultural Land	Plantation	32.02	10.16

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S.No	Level I	Level -II	Area (Km ²)	Percentage (%)
		Crops Land	53.87	17.10
4	Waste Land	Scrub/shrub	143.16	45.46
		Bare land	50.52	16.04
5	Water Body	Water Body	2.8	0.88
6	Others	Mining land	3.05	0.96
Total			314.86	100

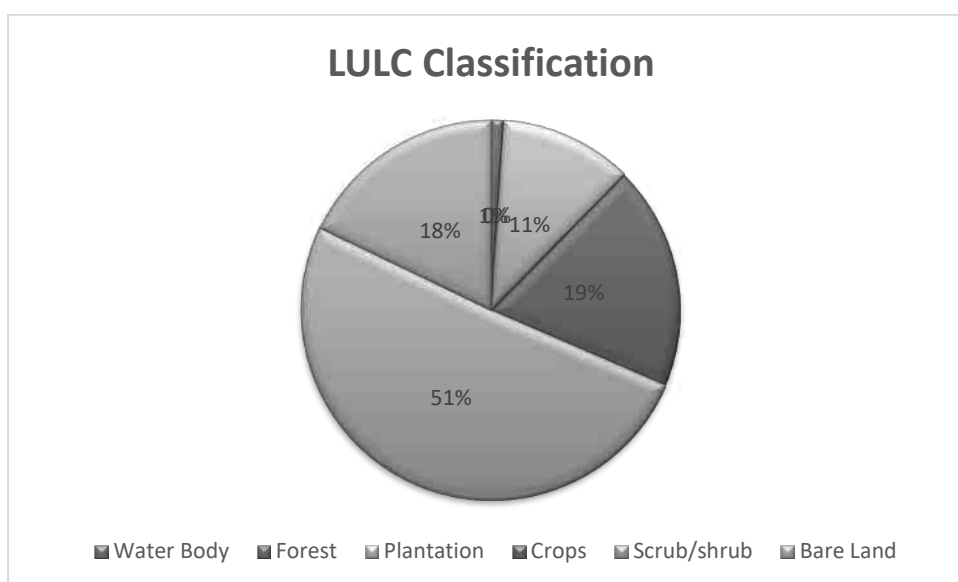


FIGURE 3.5: PIE CHART OF THE LU/LC CLASSIFICATION WITHIN 10 KM RADIUS

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) 27.26 % and by water bodies (Rivers Stream Canals) 0.88 %. The total mining area within the study area is 0.96 %. The cluster area 20.34.0 Ha contributes to 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 SPATIAL DATA FROM SOI TOPOGRAPHICAL SHEETS

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.

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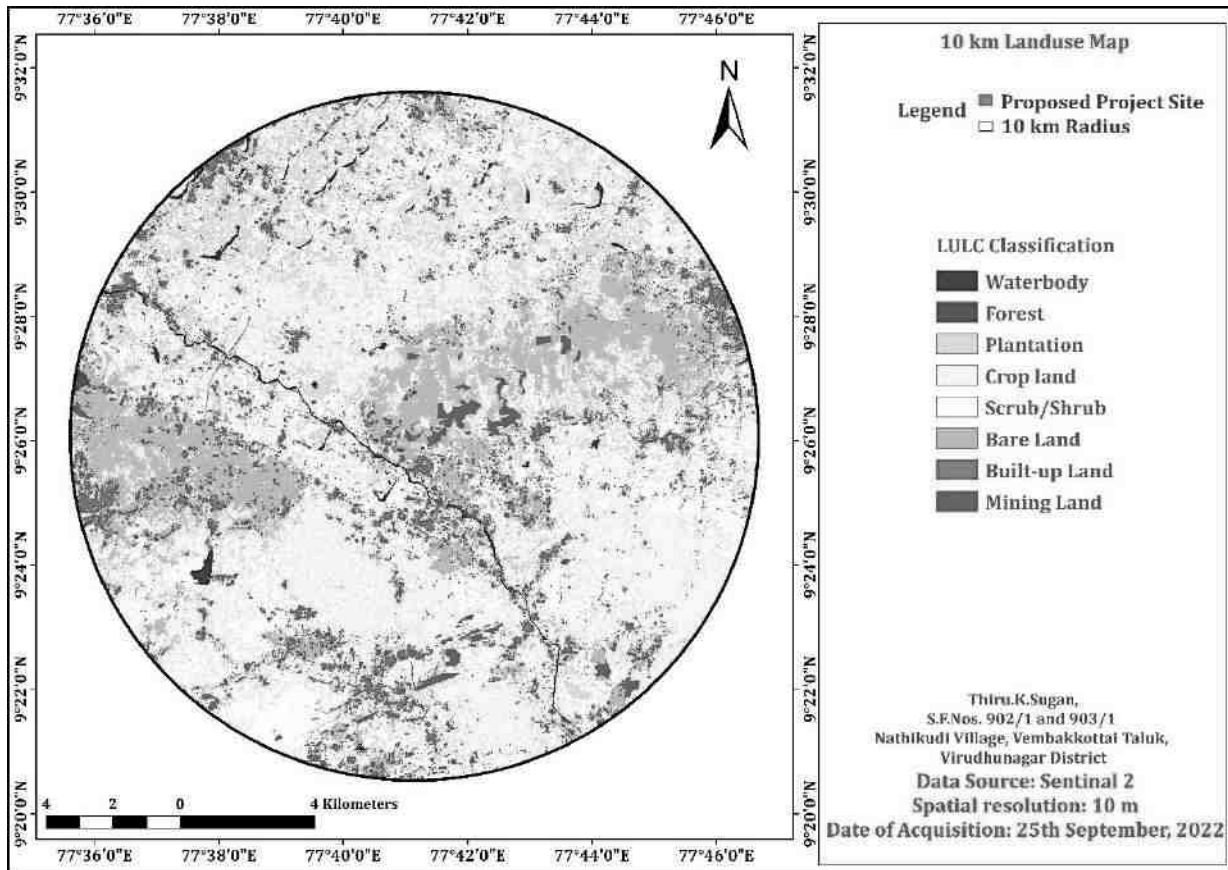


FIGURE 3.6: LU/LC DETAILS OF 10 KM RADIUS

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. There is a road network connecting built-up areas and industries. As the terrain conditions are black cotton soil and bit undulated terrain and there is a drainage network around the site location. No National parks and wild life sanctuaries located in the study area.

3.7 SOIL CHARACTERISTICS

Soils in the area have been classified into i) Deep red Loam ii) Black soil iii) Red sandy soil. Most of the study area is covered by Black soil. Ferruginous red soils are also seen at places. Black soils are deep to very deep and generally occurs in the depressions adjacent to hilly areas, in the western and central part of district. Alluvial soils occur along the river courses. Red sandy soil is seen all around the Sattur, Kariyapatti, Aruppukotai and Thiruchuli blocks.

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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 8 samples within the study area were collected and analyzed. The details of the soil sampling locations are given in **Table 3.3** and shown in **Figure-3.7**. The sampling was carried out once in the study period during Post Monsoon- season.

TABLE 3.3: DETAILS OF SOIL SAMPLING LOCATIONS

S. No	Monitoring locations (Soil)	Distance from the Project boundary (km)	Coordinate
1.	Project Site	-	9°26'4.12"N 77°41'9.02"E
2.	Nadukkudi Village	0.63 km, SW	9°25'43.78"N 77°40'57.08"E
3.	Government Middle school, M.Kodangipatti	2.88 km, SW	9°25'8.76"N 77°39'50.43"E
4.	Jothi Primary School, Reddiapatty	4.54 km, SW	9°24'49.08"N 77°38'59.18"E
5.	Sri Ramalakshmi Pyrotechics	2.10 km, NE	9°26'45.47"N 77°42'0.89"E
6.	Vinayagar colony,koppaiyanaickerpatti	5.15 km, NE	9°28'14.56"N 77°42'49.89"E
7.	Nariyankulam - Elementary school, Achchandavilthan	1.94 km, NW	9°26'32.57"N 77°40'15.37"E
8.	Mamsapuram Panchayat office, Nadukkudi	2.56 km, SE	9°25'24.82"N 77°42'25.93"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 3.4**.

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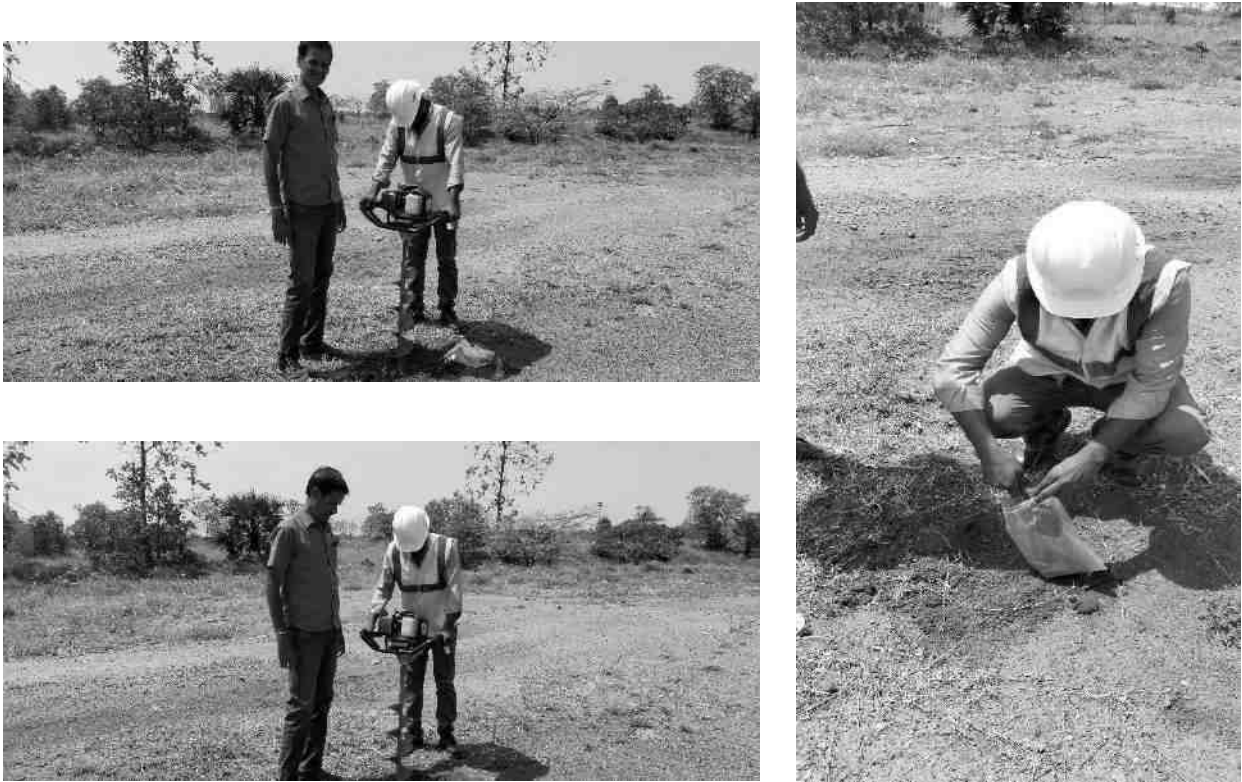


FIGURE 3.6A: SITE PHOTOGRAPHS OF SOIL SAMPLING LOCATIONS

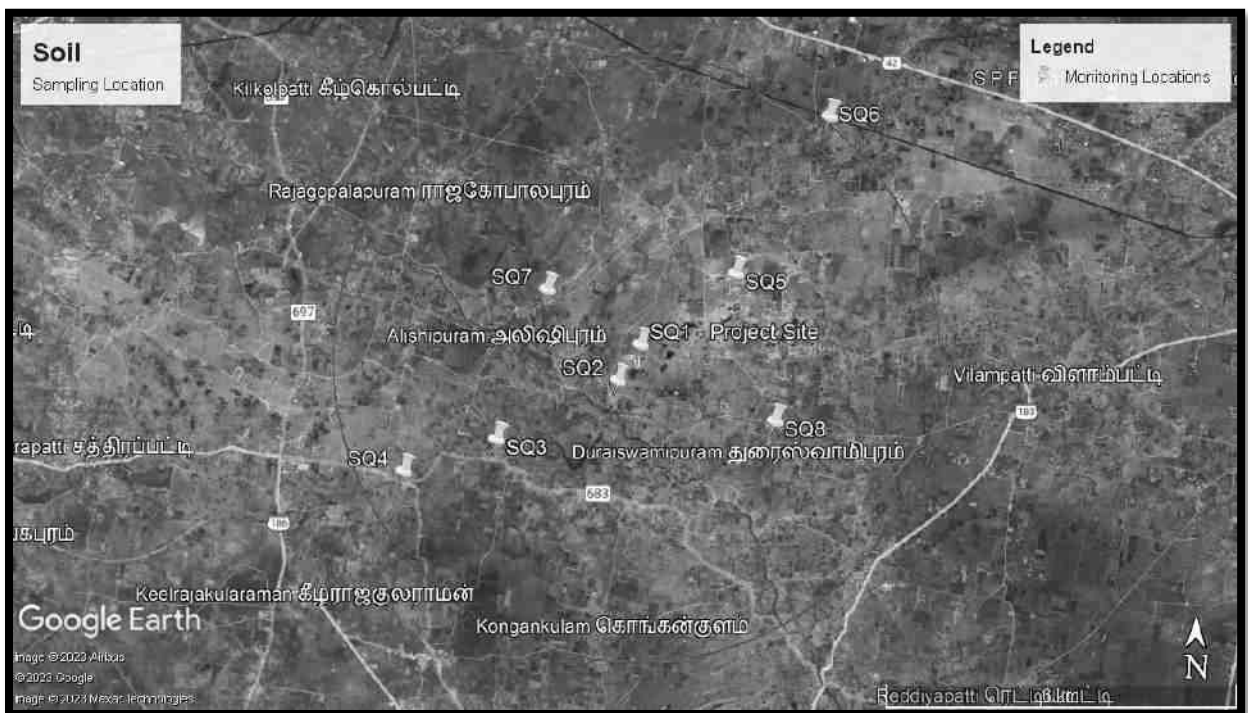


FIGURE 3.7: STUDY AREA MAP WITH SOIL SAMPLING LOCATIONS

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TABLE 3.4: TEST RESULTS OF SOIL

Date of Sampling	15.12.2022	Sampling Method	ETS/STP/SOIL-01
Analysis Start Date	18.12.2022	Sample Quantity	2.0 Kg.
Analysis End Date	22.12.2022	Packing Condition	SEALED
Sampling Done By	ETS STAFF	Packed In	POLY BAG

S. No.	Test Parameter	Unit	S1 Results	S2 Results	S3 Results	S4 Results	S5 Results	S6 Results	S7 Results	S8 Results	Test Method
1	pH	...	7.25	8.52	8.10	8.05	8.02	6.83	7.90	7.47	IS 2720 (Part-26)
2	Electrical Conductivity (EC)	µs/cm	360.2	461.0	452.0	368.0	455	412.0	358.0	436	IS 14767
3	Texture	...	Clay Loam	Clay Loam	Clay Loam	Clay Loam	Clay Loam	Clay Loam	Clay Loam	Clay Loam	IS 2720 (Part-4)
4	Sand	%	41.2	41.2	42.5	42.5	38.2	50.4	48.6	53.2	IS 2720 (Part-4)
5	Silt	%	20.2	30.5	30.5	30.5	33.2	25.4	31.3	22.2	IS 2720 (Part-4)
6	Clay	%	36.1	39.5	34.5	28.2	29.5	24.2	20.1	24.5	IS 2720 (Part-4)
7	Water Holding Capacity (WHC)	%	44.2	46.4	30.5	36.0	46.0	47.4	37.1	31.4	IS 2720 (Part-2)

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S. No.	Test Parameter	Unit	S1 Results	S2 Results	S3 Results	S4 Results	S5 Results	S6 Results	S7 Results	S8 Results	Test Method
8	Bulk Density	g/cm ³	1.0	1.20	0.95	1.70	1.15	1.65	1.8	1.0	IS 2386 (Part-4)
9	Porosity	%	37.5	32.6	25.4	32.0	26.0	26.8	33.0	26.2	IS 13030
10	Calcium,(Ca)	mg/kg	1070.1	1035.7	1208.2	1035.5	1170.1	1175.1	1067.4	171.2	IS 2720 (Part-23)
11	Magnesium,(Mg)	mg/kg	31.0	22.0	25.2	27.3	26.2	27.0	28.0	26.0	ETS/STP/SOIL-08
12	Manganese,(Mn)	mg/kg	30.1	18.6	19.5	25.8	21.0	25.8	26.0	20.1	ETS/STP/SOIL-18
13	Zinc,(Zn)	mg/kg	0.55	0.90	2.22	1.21	1.52	1.6	1.2	2.3	ETS/STP/SOIL-18
14	Boron (as B)	mg/kg	0.45	0.80	0.68	0.82	1.23	1.3	0.8	0.7	ETS/STP/SOIL-18
15	Chloride,(Cl)	mg/kg	170.0	155.0	130.5	128.1	124.5	128.2	131.8	134.4	BS 1377 -3
16	Total Soluble Sulphate	%	165.0	154.0	125.1	155.4	180.2	185.6	159.9	128.9	IS 2720 (Part-27)
17	Potassium (K)	mg/kg	242.1	350.2	253.2	310.2	236.2	237.3	351.7	54.8	ETS/STP/SOIL-18
18	Phosphorus (PO4)	mg/kg	40.92	56.65	45.78	62.50	43.34	51.4	41.5	0.8	ETS/STP/SOIL-19
19	Total Nitrogen (N)	mg/kg	142.0	170.5	164.2	170.6	168.0	173.0	175.1	169.1	ETS/STP/SOIL-15

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S. No.	Test Parameter	Unit	S1 Results	S2 Results	S3 Results	S4 Results	S5 Results	S6 Results	S7 Results	S8 Results	Test Method
20	Cadmium,(Cd)	mg/kg	<0.005	<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	<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	<0.005	ETS/STP/SOIL-18
23	Lead,(Pb)	mg/kg	0.62	0.62	0.88	1.20	1.52	1.6	1.2	0.9	ETS/STP/SOIL-18
24	Iron,(Fe)	mg/kg	2.55	2.08	2.23	2.30	1.48	1.5	2.4	2.3	ETS/STP/SOIL-18
25	Organic Matter,(OM)	%	1.55	1.52	1.80	1.82	1.62	1.7	1.9	1.9	IS 2720 (Part-22)
26	Organic Carbon,(OC)	%	0.75	1.51	1.30	1.24	1.15	1.2	1.3	1.3	BS 1377 -3
27	Cation Exchange Capacity (CEC)	meq/100g	34.2	35.1	41.2	29.1	34.5	35.5	30.0	42.4	IS 2720 (Part-24)

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3.7.1 Observations:

- pH of the soil samples varied from 7.25 to 8.52 indicating slightly alkaline soil
- Bulk density of the soil samples varied from 0.95 to 1.8 g/cm³
- Organic matter in the soil samples varied from 1.52 to 1.9 %
- Total Nitrogen in the soil samples varied from 142 to 175.1 mg/kg
- Water Holding Capacity (WHC) in the soil samples varied from 30.5 to 47.4 %.

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 1.52 to 1.9 % indicating moderate organic content in the soil. Overall, the soil quality in the area was found to medium to fair fertile with moderate productivity.

3.8 AIR ENVIRONMENT

3.8.1 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 receives the rain under the influence of both southwest and northeast monsoons. The northeast monsoon chiefly contributes to the rainfall in the district. Most of the precipitation occurs in the form of cyclonic storms caused due to the depressions in Bay of Bengal. The southwest monsoon rainfall is highly erratic and summer rains are negligible. Rainfall data from seven stations over the period 1901-2000 were utilized for analysis and a perusal of the data shows that the normal annual rainfall over the district varies from about 724 to 913 mm. It is minimum around Sathur in the southeastern part of the district. It gradually increases towards west, north and northwest and attains a maximum around Watrap.

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The district enjoys a subtropical climate. The period from April to June is generally hot and dry. The weather is pleasant during the period from November to January. Usually mornings are more humid than afternoons. The relative humidity is on an average between 65 and 85% in the mornings. Humidity in the afternoon is generally between 40 and 70%. The annual mean minimum and maximum temperatures are 23.78 and 33.95° C respectively. The daytime heat is oppressive and the temperature is as high as 40.2° C. The lowest temperature recorded is of the order of 19.3° C. (Source: http://cgwb.gov.in/District_Profile/TamilNadu/Virudhunagar.pdf)

TABLE 3.5: RAINFALL DATA

Actual Rainfall (mm)					Normal Rainfall (mm)
2017	2018	2019	2020	2021	
800	759.5	713.7	855	968.4	985

(Source: <https://www.twadboard.tn.gov.in/content/Virudhunagar>)

TABLE 3.6: METEOROLOGICAL DATA RECORDED AT SITE

S. No	Parameters		October-2022	November -2022	December-2022
1	Temperature (°C)	Max	35.7	34.5	32.6
		Min	21.8	20.6	20.4
		Avg	26.4	25.2	24.1
2	Relative Humidity (%)	Avg	78	76	74
3	Wind Speed (mph)	Avg	4.5	4.3	4.4
4	Cloud Cover (OKTAS)		6	8	8
5	Wind Direction		SW	W	SW

Source: On-site monitoring/sampling

3.8.2 Analysis of Meteorological Data, Virudhunagar

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

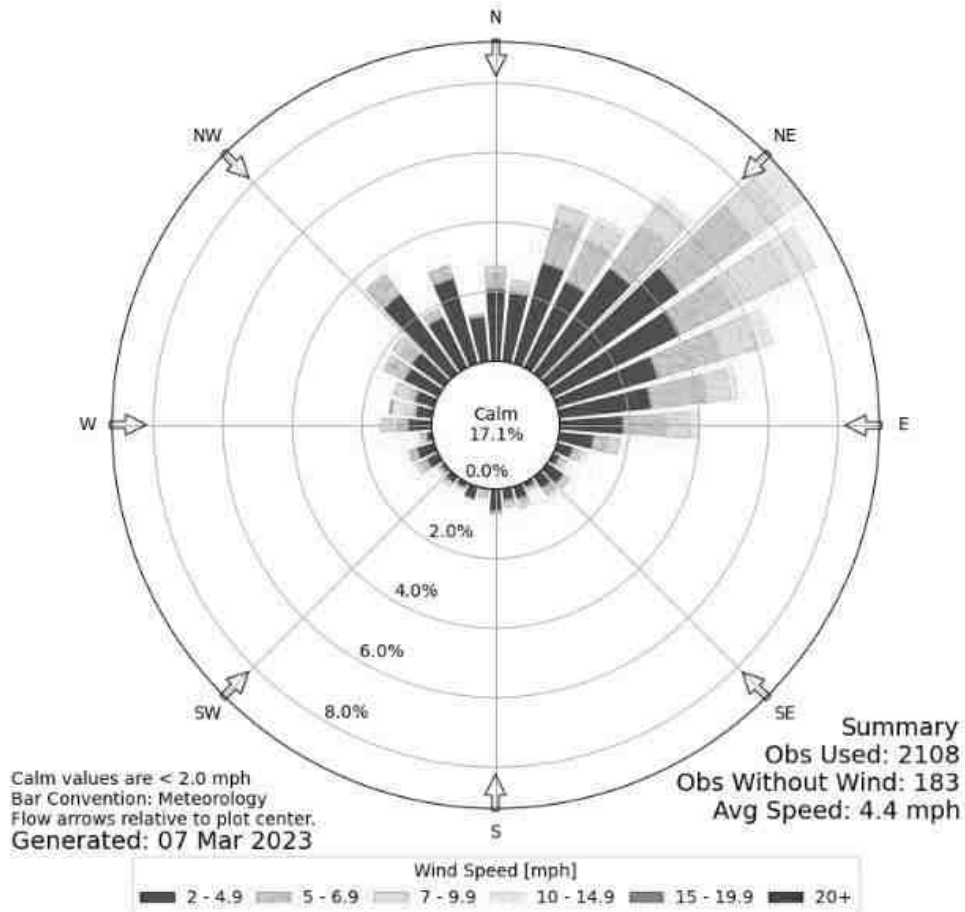


FIGURE 3.8: SITE SPECIFIC WINDROSE OCTOBER 2022 TO DECEMBER 2022

TABLE 3.7: WIND DIRECTION AND WIND SPEED

Wind Direction	Frequency %
Upwind Direction	NE (30 %)
Downwind Direction	SW (15%)
Calm conditions (%)	17.1%
Average Speed	4.4 mph

3.8.3 Baseline Ambient Air Quality

The status of ambient air quality within the study area was monitored during October 2022 to December 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**.

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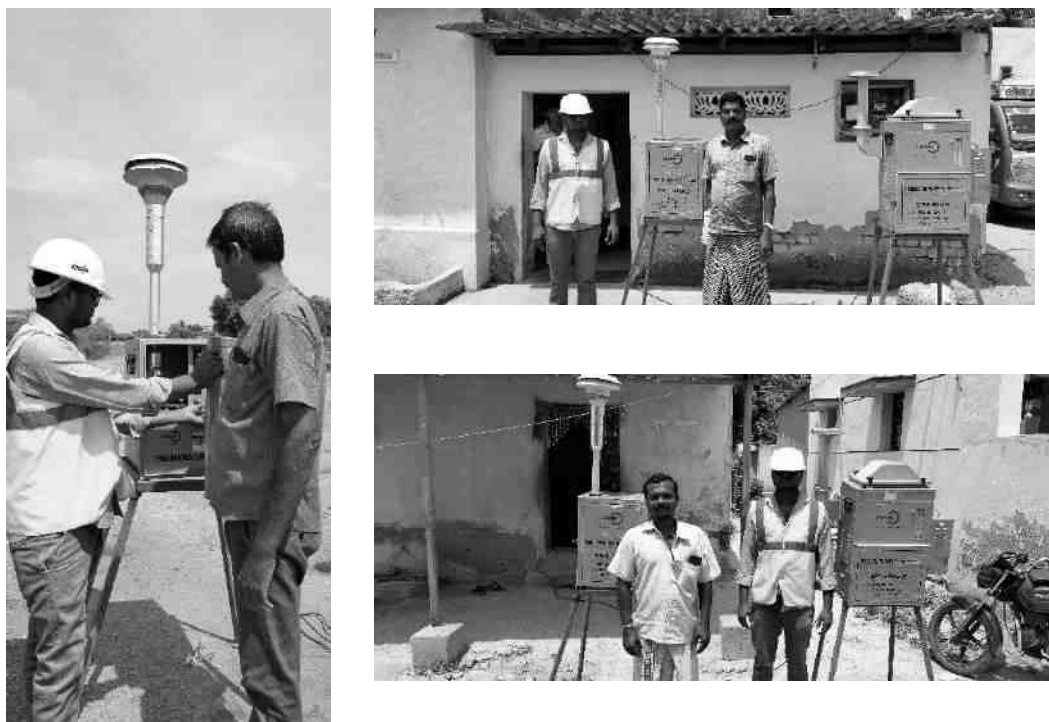
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The various sources of air pollution in the region are stone mining, crushing activities and vehicular traffic. The prime objective of the baseline air quality study (10-km radius) was to assess the existing air quality of the area to form baseline 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 (PM₁₀), Fine Particulates (PM_{2.5}), Sulphur Dioxide (SO₂) 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 SO₂& NO_x 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**.

FIGURE 3.8A: SITE PHOTOGRAPHS OF AIR SAMPLING LOCATIONS



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TABLE 3.8: DETAILS OF AMBIENT AIR QUALITY MONITORING LOCATIONS

S. No.	Station Code	Locations	Distance (Km)	Direction of wind
			w.r.t Project Site	
1	AAQ1	Project Site	0.0	Core zone
2	AAQ 2	Nadukkudi Village	0.63	Nearest Habitation SW
3	AAQ 3	Government Middle school, M. Kodangipatti	2.88	Upwind SW
4	AAQ 4	Jothi Primary School, Reddiapatty	4.54	Upwind SW
5	AAQ 5	Sri Ramalakshmi Pyrotechics	2.10	Downwind NE
6	AAQ 6	Vinayagar colony, koppaiyanaickerpatti	5.15	Downwind NE
7	AAQ 7	Nariyankulam - Elementary school, Achchandavilthan	1.94	Cross wind NW
8	AAQ8	Mamsapuram Panchayat office, Nadukkudi	2.56	Cross wind SE

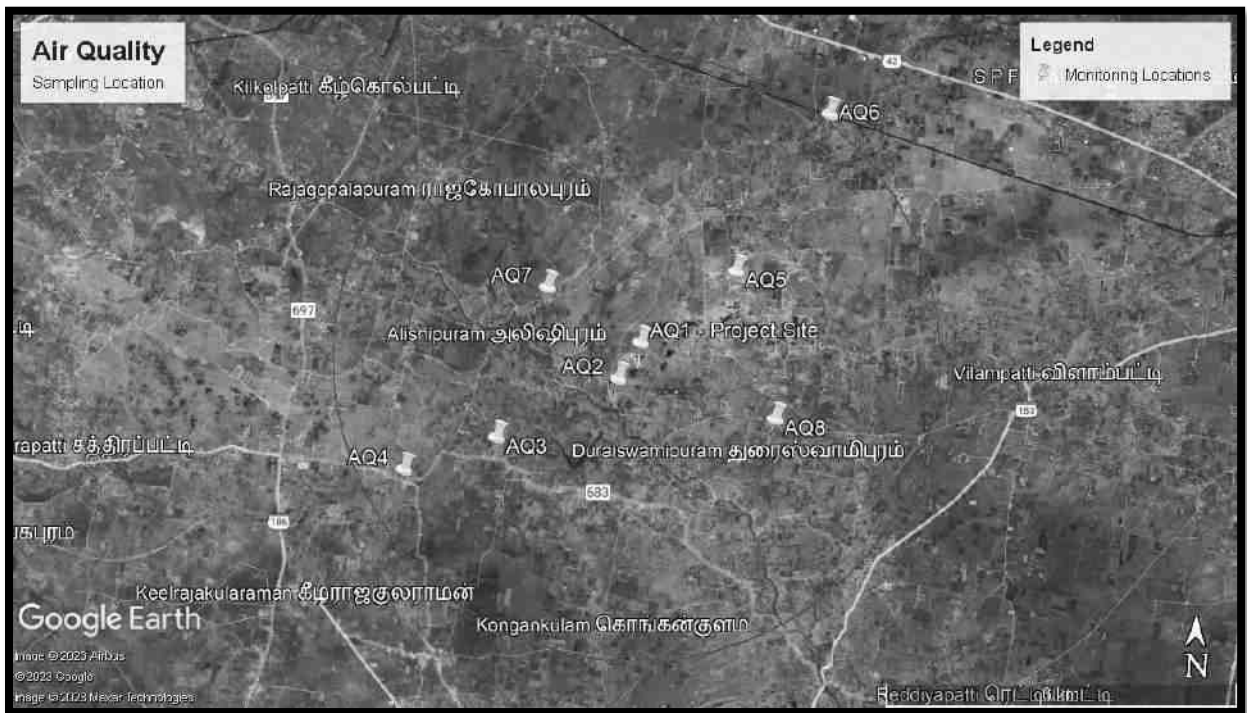


FIGURE 3.9: STUDY AREA MAP WITH AIR MONITORING LOCATIONS

TABLE 3.9: SUMMARY OF AMBIENT AIR QUALITY RESULTS

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Date of Sampling	-	Sampling Method	ETS/STP/AIR-01
Analysis Start Date	05.10.2022	Sample Quantity	-
Analysis End Date	30.12.2022	Packing Condition	-
Sampling Done By	ETS STAFF	Weather Condition	Clear

Station ID	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8
Particulate matter PM-2.5								
Max	46.58	40.09	37.60	37.24	41.28	41.17	41.17	41.93
Min	35.52	33.31	29.98	29.39	32.84	34.74	32.96	33.57
Mean	39.91	36.04	34.57	33.39	37.60	37.49	36.93	37.58
98	45.10	39.27	37.49	36.69	41.28	40.73	40.51	41.24
STDEV	2.37	1.80	2.02	1.89	2.10	1.86	1.84	1.87
Particulate matter PM-10								
Max	79.14	71.27	68.53	67.94	70.91	72.46	72.34	73.63
Min	64.73	58.42	57.82	56.63	48.42	60.92	59.84	60.90
Mean	68.47	62.99	61.40	60.04	62.34	64.92	63.34	64.45
98	78.02	70.61	68.26	66.30	70.47	71.97	71.19	72.43
STDEV	3.55	3.03	2.71	2.64	4.16	2.85	3.02	3.06
Sulphur Di-oxide as SO₂								
Max	15.44	18.68	16.06	16.30	17.49	17.25	13.80	14.10
Min	9.14	9.99	9.52	9.28	10.23	10.95	8.09	8.24
Mean	11.63	12.37	11.77	12.66	13.00	12.69	11.36	11.55
98	15.27	18.46	15.62	16.13	17.11	16.53	13.42	13.70
STDEV	1.74	2.54	1.87	1.64	2.03	1.43	1.27	1.31
Oxide of Nitrogen as NO₂								
Max	33.84	32.60	33.08	35.81	34.50	34.15	32.84	33.45
Min	26.38	24.87	25.22	28.32	27.48	27.36	25.70	26.21
Mean	30.38	29.30	29.32	31.75	30.63	30.74	29.47	29.99
98	33.49	32.49	32.64	35.43	34.28	33.60	32.84	33.45
STDEV	1.69	1.84	1.86	1.66	1.69	1.55	1.78	1.81

3.8.4 Observations of Primary Data:

- PM_{2.5} concentration in the study area varied from 29.39 to 46.58 µg/m³ during the study period.
- PM₁₀ concentration in the study area varied from 48.42 to 79.14 µg/m³ during the study period.
- SO₂ concentration in the study area varied from 8.09 to 18.68 µg/m³ during the study period.
- NO₂ concentration in the study area varied from 24.87 to 35.81 µg/m³ during the study period.

From the above results, it is observed that the ambient air quality with respect to PM₁₀, PM_{2.5}, SO₂, and NO₂ at all the monitoring locations was within the permissible limits specified by CPCB.

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3.9 NOISE ENVIRONMENT

3.9.1 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**.

TABLE 3.10: NOISE SAMPLING LOCATIONS IN THE STUDY AREA

S. No.	Station Code	Locations	Distance (Km)	Direction of wind	Zone
			w.r.t Project Site		
1	N 1	Project Site	-	Core zone	Industrial
2	N 2	Nadukkudi Village	0.63	SW	Residential
3	N 3	Government Middle school, M. Kodangipatti	2.88	SW	Residential
4	N 4	Jothi Primary School, Reddiapatty	4.54	SW	Residential
5	N 5	Sri Ramalakshmi Pyrotechics	2.10	NE	Residential
6	N 6	Vinayagar colony, koppaiyanaickerpatti	5.15	NE	Residential
7	N 7	Nariyankulam - Elementary school, Achchandavilthan	1.94	NW	Residential
8	N8	Mamsapuram Panchayat office, Nadukkudi	2.56	SE	Residential

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FIGURE 3.5: SITE PHOTOGRAPHS OF NOISE SAMPLING LOCATIONS

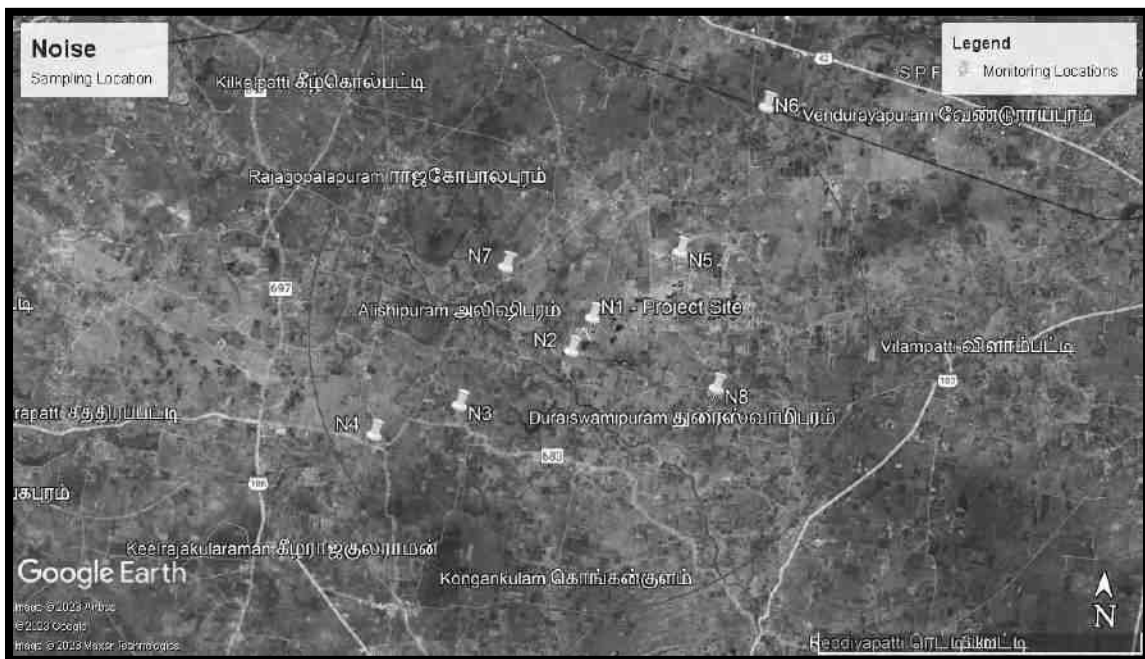


FIGURE 3.10: STUDY AREA MAP WITH NOISE MONITORING LOCATIONS

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

Date of Sampling	-	Sampling Method	ETS/STP/NOISE-01
Analysis Start Date	20.11.2022	Sample Quantity	-
Analysis End Date	21.12.2022	Packing Condition	-
Sampling Done By	ETS STAFF	Category of Area	Industrial Area

Location		N1			N2			N3			N4		
S.No	S.No	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	40.1	49.5	47.0	42.6	45.6	44.4	45.2	55.2	50.2	35.1	37.1	36.1
2	0700	41.5	51.2	48.6	42.6	45.1	44.0	46.5	52.5	49.5	33.2	40.2	36.7
3	0800	42.6	52.6	50.0	43.2	45.2	44.3	45.2	48.6	46.9	34.2	40.5	37.35
4	0900	42.6	53.1	50.5	44.9	49.8	48.0	47.2	46.2	46.7	36.8	39.5	38.15
5	1000	43.1	45.8	44.7	41.9	50.6	48.1	46.2	50.1	48.15	36.5	37.6	37.05
6	1100	44.5	46.6	45.7	42.5	52.6	50.0	45.5	47.3	46.4	38.2	45.2	41.7
7	1200	45.6	47.8	46.8	44.2	54.2	51.6	46.1	49.7	47.9	34.9	41.4	38.15
8	1300	46.9	49.6	48.5	41.6	51.6	49.0	47.2	48.8	48	36.2	41.3	38.75
9	1400	47.1	50.2	48.9	42.2	53.5	50.8	48.2	46.4	47.3	36.2	44.2	40.2
10	1500	45.4	51.8	49.7	42.6	54.5	51.8	47.2	47.2	47.2	35.4	44.8	40.1
11	1600	43.6	52.8	50.3	43.2	46.5	45.2	44.2	52.5	48.35	38.2	40.2	39.2
12	1700	44.8	52.6	50.3	43.5	48.3	46.5	45.8	53.5	49.65	32.5	40.9	36.7
13	1800	46.2	55.3	52.8	42.5	47.6	45.8	44.3	53.0	48.65	32.1	42.4	37.25
14	1900	43.5	52.1	49.7	40.9	49.6	47.1	44.9	50.5	47.7	30.2	39.7	34.95
15	2000	40.9	50.2	47.7	43.5	47.6	46.0	42.6	55.3	48.95	35.8	46.2	41
16	2100	40.5	49.8	47.3	41.5	47.1	45.1	42.9	52.0	47.45	33.4	40.8	37.1

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Location		N1			N2			N3			N4				
S.No	S.No	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	42.6	53.2	47.9	36.1	42.4	39.25		
18	2300	37.5	38.1	37.8	39.8	43.5	42.0	36.1	44.1	40.1	35.2	40.2	37.7		
19	0000	36.1	40.5	38.8	37.6	43.7	41.6	34.4	47.2	40.8	32.9	37.8	35.35		
20	0100	35.3	39.7	38.0	36.8	42.5	40.5	32.9	38.2	35.55	33.5	37.2	35.35		
21	0200	36.1	38.6	37.5	37.3	44.1	41.9	31.6	39.8	35.7	34.2	35.8	35		
22	0300	33.5	35.8	34.8	37.1	39.1	38.2	34.2	38.2	36.2	32.5	34.2	33.35		
23	0400	34.1	37.8	36.3	35.9	39.8	38.3	33.1	37.2	35.15	34.5	36.6	35.55		
24	0500	34.6	36.9	35.9	36.5	38.2	37.4	32.1	35.5	33.8	33.5	35.5	34.5		
Day Mean dB(A)				50.1	Day Mean dB(A)			48.4	Day Mean dB(A)			40.06	Day Mean dB(A)		42.1
Night Mean dB(A)				42.0	Night Mean dB(A)			35.0	Night Mean dB(A)			32.15	Night Mean dB(A)		31.7

Location		N5			N6			N7			N8		
S.No	Time (Hrs)	Min	Max	dB(A)	Min	Max	dB(A)	Min	Max	dB(A)	Min	Max	dB(A)
1	0600	41.2	45.3	43.25	46.2	49.0	47.6	40.2	42.5	41.5	39.6	43.6	42.0
2	0700	42.5	46.2	44.35	48.2	50.5	49.35	41.5	42.6	42.1	40.3	46.5	44.4
3	0800	44.2	44.1	44.15	47.2	53.5	50.35	42.4	44.9	43.8	40.6	48.9	46.5
4	0900	42.8	51.2	47	46.5	48.2	47.35	42.8	45.8	44.6	41.6	49.8	47.4
5	1000	45.5	47.2	46.35	45.2	53.2	49.2	43.8	47.6	46.1	41.9	50.6	48.1
6	1100	47.1	52.5	49.8	44.2	48.5	46.35	44.7	45.5	45.1	42.5	52.6	50.0
7	1200	47.5	51.4	49.45	48.2	49.2	48.7	45.6	49.9	48.3	43.5	49.8	47.7
8	1300	48.5	53.5	51	46.1	51.4	48.75	46.5	50.2	48.7	41.6	51.6	49.0

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Location		N5			N6			N7			N8		
S.No	Time (Hrs)	Min	Max	dB(A)	Min	Max	dB(A)	Min	Max	dB(A)	Min	Max	dB(A)
9	1400	46.1	51.8	48.95	46.5	57.6	52.05	46.4	52.5	50.4	41.5	53.5	50.8
10	1500	47.2	51.3	49.25	47.3	54.4	50.85	45.8	54.2	51.8	42.6	52.6	50.0
11	1600	46.2	51.8	49	46.8	53.2	50	44.2	54.7	52.1	41.6	46.5	44.7
12	1700	46.2	50.4	48.3	47.1	53.8	50.45	43.8	53.9	51.3	43.5	48.3	46.5
13	1800	45.5	50	47.75	46.2	54.7	50.45	42.7	54.2	51.5	42.5	47.6	45.8
14	1900	45.2	47.2	46.2	47.5	51.4	49.45	42.8	51.8	49.3	40.9	48.9	46.5
15	2000	46.5	49.5	48	35.1	46.5	40.8	41.9	50.4	48.0	43.5	47.6	46.0
16	2100	44.1	47.2	45.65	36.4	45.4	40.9	40.5	49.7	47.2	41.5	47.1	45.1
17	2200	43.4	44.6	44	33.7	44.7	39.2	41.5	46.9	45.0	39.8	45.6	43.6
18	2300	31.5	38.9	35.2	34.5	40.2	37.35	39.8	40.2	40.0	38.8	43.5	41.8
19	0000	32.5	38.2	35.35	34.6	38.7	36.65	38.9	42.3	40.9	37.6	42.8	40.9
20	0100	33.5	36.9	35.2	33.2	39.9	36.55	38.4	40.5	39.6	36.8	41.6	39.8
21	0200	31.5	34.5	33	32.1	34.9	33.5	36.5	38.9	37.9	37.3	43.8	41.7
22	0300	34.4	36.8	35.6	30.5	36.6	33.55	35.4	37.8	36.8	36.3	38.9	37.8
23	0400	33.5	36.2	34.85	30.1	38.8	34.45	34.2	36.6	35.6	35.9	36.8	36.4
24	0500	32.2	34.2	33.2	30.2	38.2	34.2	34.8	35.5	35.2	34.8	35.6	35.2
Day Mean dB(A)				45.4	Day Mean dB(A)		50.2	Day Mean dB(A)		46.5	Day Mean dB(A)		45.7
Night Mean dB(A)				34.8	Night Mean dB(A)		37.68	Night Mean dB(A)		32.0	Night Mean dB(A)		33.1

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3.9.2 Observations

From the above table, it is observed that the ambient noise levels at all the monitoring locations and villages as the permissible limits of 55 dB(A) for day time and 45 dB(A) for night time observed within permissible limit.

3.10 WATER ENVIRONMENT

3.10.1 Topography & Drainage Pattern

Topography

The lease applied area is flat terrain. The area has gentle sloping towards North eastern side and altitude of the area is 121m above from Mean sea level. The land is not fit for vegetation/ Cultivation. The area is dry barren land.

Drainage Pattern of the area

The major part of Virudhunagar district falls in Vaippar - Gundar river basin. Vaippar, Arjuna River, Gundar and Deviar are the important rivers. The drainage pattern, in general, is dendritic. All the rivers are seasonal and carry substantial flows during monsoon period. Vaippar, which is one of the important rivers of the district, flow and drain in the Vembakkam and Sattur blocks. The Arjuna river, flowing in the central part of the district, has its origin from the Sattur Watrap Hills and is formed by Kovillar, periyar and Chittar rivers. The Gundar river originates at an altitude of 500 m. amsl near Kottaimalai of Saptur reserve forest in Varushanadu hills in Madurai district.

3.10.2 Rainfall

The district receives the rain under the influence of both southwest and northeast monsoons. The northeast monsoon chiefly contributes to the rainfall in the district. Most of the precipitation occurs in the form of cyclonic storms caused due to the depressions in Bay of Bengal. The southwest monsoon rainfall is highly erratic and summer rains are negligible. Rainfall data from seven stations over the period 1901-2000 were utilized for analysis and a perusal of the data shows that the normal annual rainfall over the district varies from about 724 to 913 mm. It is minimum around Sathur in the southeastern part of the district. It gradually increases towards west, north and northwest and attains a maximum around Watrap. The district enjoys a subtropical climate. The period from April to June is generally hot and dry. The weather is pleasant during the period from November to January. Usually mornings are more humid than afternoons. The relative humidity is on an average between 65 and 85% in the mornings. Humidity in the afternoon is generally between 40 and 70%. The annual mean minimum and maximum temperatures are 23.78 and 33.95° C respectively. The daytime heat is oppressive and the temperature is as high as 40.2° C. The lowest temperature recorded is of the order of 19.3° C.

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Lessee: Thiru. K. Sukan (Lease Area: 1.29.0 Ha)

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3.10.3 HYDROLOGY

The major part of Virudhunagar district falls in Vaippar - Gundar river basin. Vaippar, Arjuna River, Gundar and Deviar are the important rivers. The drainage pattern, in general, is dendritic.

The study area is part of Vaippar river basin. Dendritic to sub dendritic type of drainage is observed in study area. The 10km study area comprises of small stream the major is Kayalkudi River 820 m in south direction.

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

Name of the River/Stream/Nala	Distance from Project Site (Km)	Direction from Project Site
Kayalkudi River	820 m	S

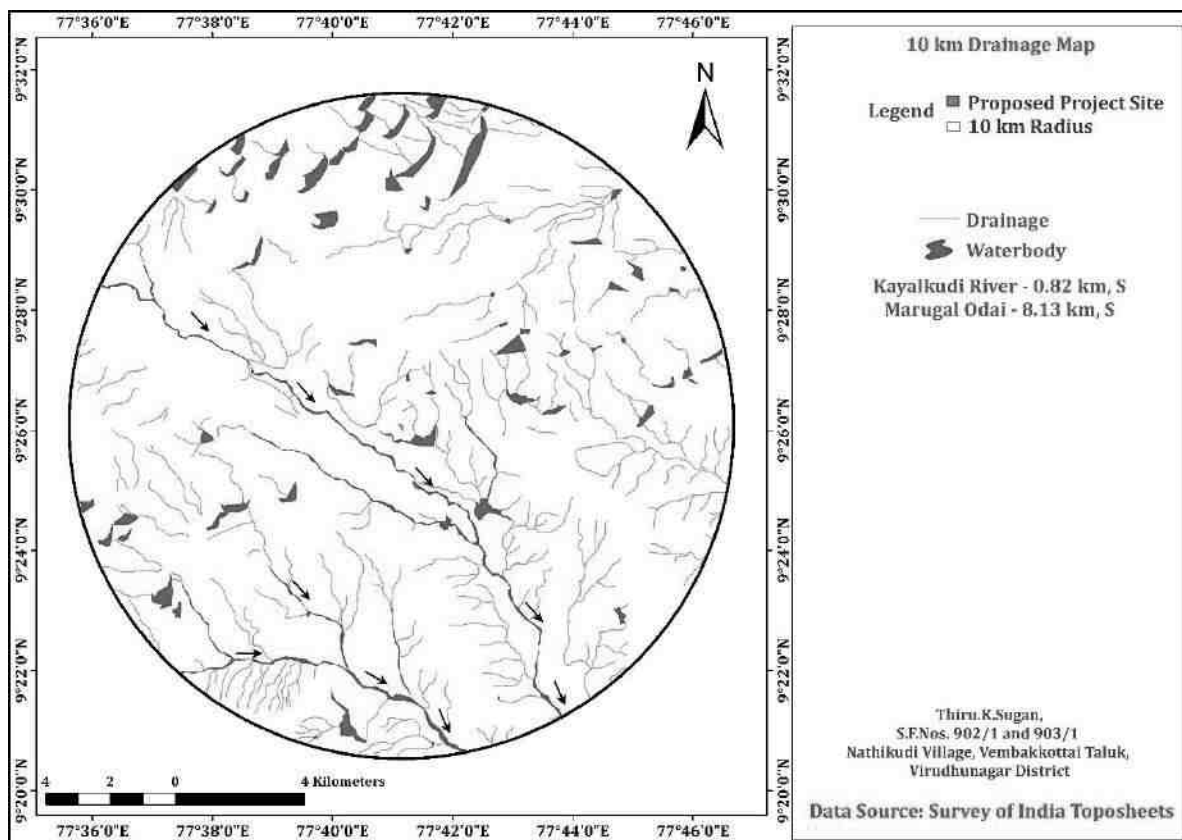


FIGURE 3.11: DRAINAGE PATTERN 10 KM RADIUS

3.10.4 Hydrogeological studies

The district is underlain by both porous and fissured formations (Plate-II). Unconsolidated & Semi-consolidated formations and Weathered, Fissured and Fractured crystalline rocks constitute the important aquifer systems in the district.

The porous formations in the district include sandstones and clays of Recent to subrecent and Tertiary age (Quaternary). The alluvial formations comprising mainly sands, clays and gravels are confined to major drainage courses in the district. The maximum thickness of alluvium is 35.0 m. whereas the average thickness is about 25.0 m. Ground water occurs under phreatic to semi-confined conditions in these formations and is being developed by means of dug wells and filter points. Alluvium, which forms a good aquifer system along the Vaippar and Gundar river bed, which is one of the major sources of water supply to the villages.

The water-bearing properties of crystalline formations, which lack primary porosity, depend on the extent of development of secondary intergranular porosity. The occurrence and movement of ground water in these rocks are generally confined to such spaces. These aquifers are highly heterogeneous in nature due to variation in lithology, texture and structural features even within short distances. Ground water generally occurs under phreatic conditions in the weathered mantle and under semiconfined conditions in the fissured and fractured zones at deeper levels.

The thickness of weathered zone in the district is in the range of 4 to 15 m. The depth of dug wells ranged from 10 to 15 m bgl. The yield of large diameter wells in the district, tapping the weathered mantle of crystalline rocks ranges from 40 to 110 lpm and are able to sustain pumping for 2 to 6 hours per day. The Specific capacity of large diameter wells tested in crystalline rocks ranges from 6.26 to 183.8 lpm / m. of drawdown. The yield characteristics of wells vary considerably depending on the topographic set-up, lithology and nature of weathering.

The yield of bore wells drilled down to a depth of 40 to 70 m, by various state agencies mainly for domestic purposes ranged from 10 to 250 lpm. The yield of successful bore wells ranged up to 6 lps for the drawdown varying between 5.76 and 17.56 m and drilled down to a depth of 200 m bgl during the ground water exploration programme of Central Ground Water Board.

(Source: http://cgwb.gov.in/District_Profile/TamilNadu/Virudhunagar.pdf)

3.10.5 Site Specific Ground Water Table scenario

The depth to water level in the district varied between 0.67 and 12.12 m bgl during pre-monsoon (May 2006) and varied between 0.49 and 8.78 m bgl during post monsoon (Jan 2007). The seasonal fluctuation shows a rise in water level which ranges from 0.35 to 2.8 m. The piezometric head varied between 3.49 and 16.23 m bgl during pre monsoon (May 2006) and 1.29 and 8.06 m bgl during post monsoon (Jan 2007).

As per data obtained from nearby village borewells are tabulated in **Table 3.13 and 3.14**.

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TABLE 3.13: WATER LEVEL

Particulars	Project
Water Table Level	
During summer Pre Monsoon	45-51m
Post Monsoon	40-45m

Particulars	Distance & Direction	Depth (m)	Water Level (m)
Bore Well	250m, NW	145	45-51m (Pre-Monsoon) 40-45m (Post-Monsoon)

TABLE 3.14: WATER LEVEL OBSERVED IN BOREWELLS WITH 2KM RADIUS

Station Code	Latitude	Longitude	Oct	Nov	Dec	Average
	In Degree Decimal		Water Level bgl in m			
A.	9.430619°	77.680425°	41	40	40	40
B.	9.430224°	77.674123°	42	42	42	42
C.	9.425314°	77.685061°	40	41	41	41
D.	9.420740°	77.690795°	41	42	42	42
E.	9.425437°	77.695819°	40	41	41	41
F.	9.428681°	77.699764°	43	44	43	43
G.	9.435591°	77.700300°	40	42	42	41
H.	9.447129°	77.696810°	44	44	45	44
I.	9.441874°	77.671424°	43	44	44	44
J.	9.435985°	77.667335°	45	44	44	44
K.	9.420080°	77.698078°	42	43	43	43

Source: Field Monitoring Data

3.10.6 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 40-50m bgl. The quarrying operations is restricted upto 22 m. 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 at a depth of 40 m. Since the total mining depth is 22 m bgl, the water seepage from the fractured zone is not anticipated.

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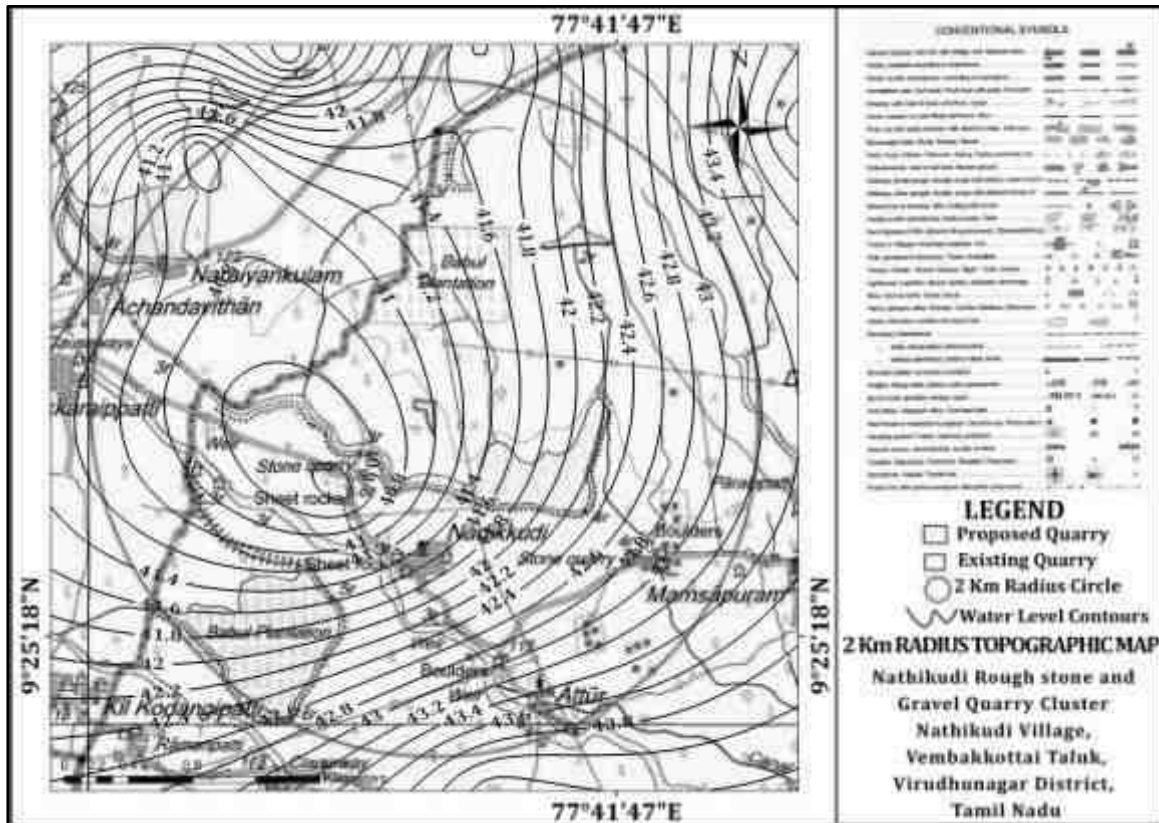


FIGURE 3.12: WATER LEVEL CONTOURS OBSERVED WITHIN 1KM RADIUS

3.10.6.1 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.

The present study utilizes maximum current electrode separation AB/2. The data from this survey are commonly arranged and contoured in the form 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.

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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,

$$\rho_r = F\rho_w = a \phi^m \rho_w$$

ρ_r = Resistivity of Rocks

ρ_w = Resistivity of water in pores of rock

F = Formation Factor

ϕ = Fractional pore volume

A = Constants with values ranging from 0.5 to 2.5

3.10.6.2 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 noise ration can be enhanced by \sqrt{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.

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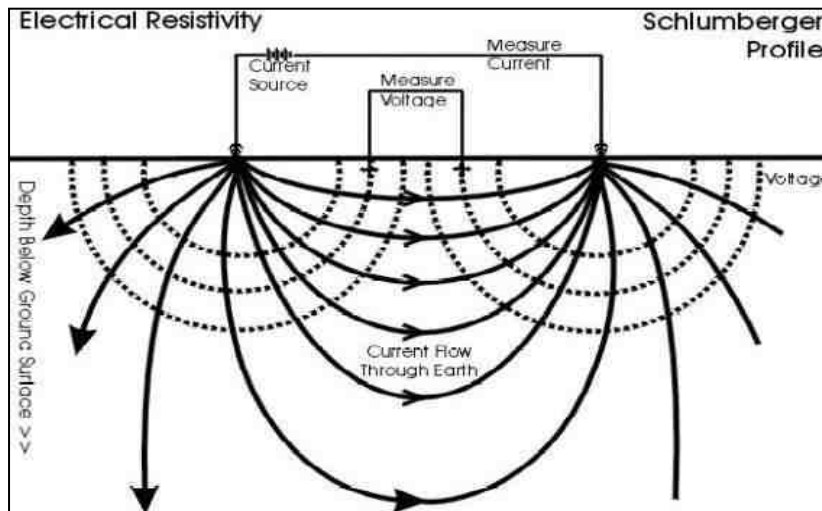


FIGURE 3.13: RESISTIVITY SURVEY PROFILE

Measurements of ground Resistivity is essentially done by sending a current through two electrodes called current electrodes (C₁& C₂) and measuring the resulting potential by two other electrodes called potential electrode (P₁& P₂). 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 3.15: GPS CO-ORDINATES OF VES LOCATION

No of station	Co-ordinates	Vertical Electrical Sounding depth in (m)
Station 1	9°26'4.29"N 77°41'8.92"E	100m

Source: Field Data

3.12.6.3 Data Presentation

TABLE 3.16 VES RESULTS OF STATION 1

S.No	Ab/2	Mn/2	K	R	Rho
1	2	1	6.29	21.81	137.185
2	4	1	25.13	8.14	204.558
3	6	1	56.53	4.45	251.559
4	8	1	100.49	3.03	304.485
5	10	1	157.03	2.29	359.599
6	10	5	158.29	15.51	2455.08
7	15	5	160.5	6.51	1044.86
8	20	5	119.33	3.81	454.647
9	30	5	276.33	2.7	746.091
10	40	5	496.13	2.04	1012.11
11	50	5	305.29	1.7	518.993

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S.No	Ab/2	Mn/2	K	R	Rho
12	60	5	1124.13	1.56	1753.64
13	70	5	1532.33	1.44	2206.56
14	80	5	2003.33	1.34	2684.46
15	90	5	2537.13	1.3	3298.27
16	100	5	3133.73	1.28	4011.17

Source: Field Data

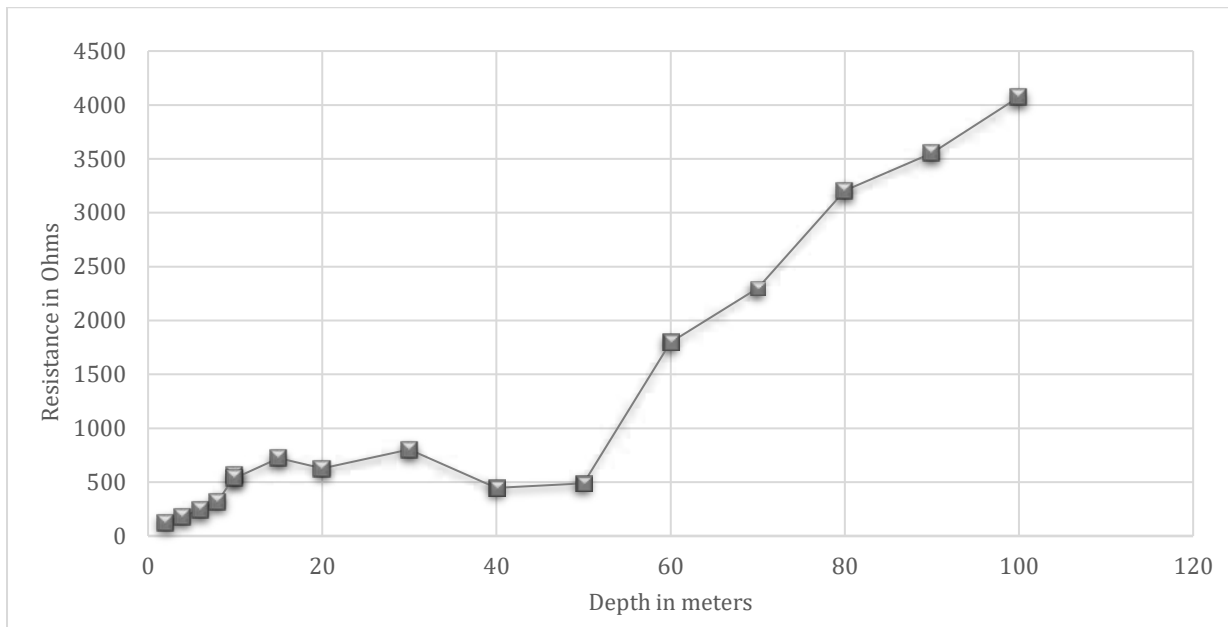


Figure 3.14 DEPTH TO RESISTANCE

3.10.6.4 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.

3.10.7 Water requirement

Total water requirement in the rough stone mine for the project is estimated to be 2.0 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.

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3.10.8 Baseline Status

The existing status of groundwater and surface water quality was assessed by identifying 8 ground water (Bore wells/dug wells) samples in different villages and 1 surface water samples.

The physico-chemical characteristics of ground are given in the **Table 3.18** respectively.

TABLE-3.17: DETAILS OF WATER SAMPLING LOCATIONS

Sr. No.	Station Code	Locations	Distance (Km)	Direction	Source
1	GW 1	Project Site	-	Core zone	Borewell
2	GW 2	Nadukkudi Village	0.63	SW	Borewell
3	GW 3	Government Middle school, M.Kodangipatti	2.88	SW	Borewell
4	GW 4	Jothi Primary School, Reddiapatty	4.54	SW	Borewell
5	GW 5	Sri Ramalakshmi Pyrotechics	2.10	NE	Borewell
6	GW6	Vinayagar colony,koppaiyanaickerpatti	5.15	NE	Borewell
7	GW7	Nariyankulam - Elementary school, Achchandavilthan	1.94	NW	Borewell
8	GW8	Mamsapuram Panchayat office, Nadukkudi	2.56	SE	Borewell
Surface Water					
1	SW1	Red lake	0.61 km	SE	-

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FIGURE 3.15: WATER MONITORING LOCATIONS

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TABLE 3.18: PHYSICO-CHEMICAL CHARACTERISTICS OF GROUND WATER

Date of Sampling	15.12.2022	Sampling Method	ETS/STP/WATER-01
Analysis Start Date	20.12.2022	Sample Quantity	2.0+ 0.5 Litre
Analysis End Date	23.12.2022	Packing Condition	Sealed
Sampling Done By	ETS STAFF	Packed IN	PVC and Glass Bottle

S. No.	Test Parameter	Unit	GW 1 Result	GW 2 Result	GW 3 Result	GW 4 Result	Specification/Limit (As per IS:10500: 2012)		Test Method
							Desirable	Permissible	
1	Colour	Hazen	< 1.0	< 1.0	<1.0	<1.0	5	15	APHA 2120-B
2	Odour	...	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	APHA 2150-B
3	pH	...	7.53	7.67	6.32	7.17	6.5 - 8.5	No Relaxation	APHA 4500-H+
4	Conductivity	µs/cm	673	750	718	689	Not Specified	Not Specified	APHA 2510-B
5	Turbidity	NTU	< 1.0	< 1.0	< 1.0	< 1.0	1	5	APHA 2130-B
6	Total Dissolved Solids,(TDS)	mg/L	464	518	496	476	500	2000	APHA 2540-C
7	Total Hardness, (CaCO ₃)	mg/L	125	210	198	190	200	600	APHA 2340-C
8	Calcium,(Ca)	mg/L	25.6	46.1	30.2	24.6	75	200	APHA 3500:(Ca)-B
9	Magnesium(Mg)	mg/L	16.1	23.0	20.6	22.1	30	100	APHA 3500:(Mg)-B
10	Total Alkalinity (CaCO ₃)	mg/L	189	186	139	169	200	600	APHA 2320-B

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S. No.	Test Parameter	Unit	GW 1 Result	GW 2 Result	GW 3 Result	GW 4 Result	Specification/Limit (As per IS:10500: 2012)		Test Method
							Desirable	Permissible	
11	Chloride,(Cl)	mg/L	70.0	90.2	82.5	75	250	1000	APHA 4500:(Cl-)-B
12	Sulphate,(SO ₄)	mg/L	18.5	24.0	24.3	26	200	400	APHA 4500:(SO ₄)-E
13	Iron,(Fe)	mg/L	0.14	0.18	0.10	0.13	0.3	No Relaxation	APHA-3120B
14	Chlorine (Residual)	mg/L	<0.1	<0.1	<0.1	<0.1	0.2	1	APHA 4500:(Cl)-B
15	Fluoride,(F)	mg/L	0.17	0.16	0.16	0.20	1	1.5	APHA 4500:(F-)-D
16	Nitrate,(NO ₃)	mg/L	15.0	14.2	17.4	25	45	No Relaxation	APHA 4500:(NO ₃ -)-B
17	Copper,(Cu)	mg/L	<0.005	<0.005	<0.005	<0.005	0.05	1.5	APHA 3120B
18	Manganese,(Mn)	mg/L	<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	No Relaxation	APHA-3114C
20	Cadmium,(Cd)	mg/L	<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	0.01	No Relaxation	APHA-3120B
22	Aluminium,(Al)	mg/L	<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	0.01	No Relaxation	APHA-3120B
24	Zinc,(Zn)	mg/L	<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	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	<0.001	0.5	No Relaxation	IS 3025 (Part-39)

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S. No.	Test Parameter	Unit	GW 1 Result	GW 2 Result	GW 3 Result	GW 4 Result	Specification/Limit (As per IS:10500: 2012)		Test Method
							Desirable	Permissible	
28	Phenolic Compound, (C ₆ H ₅ OH)	mg/L	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	0.2	1	APHA 5540-C
30	Cyanide, (CN)*	mg/L	Absent	Absent	Absent	Absent	0.05	No Relaxation	APHA 4500: (CN-)-D
31	Total Coliform Count	MPN/100mL	Absent	Absent	Absent	Absent	Shall Not Be Detectable		IS 1622
32	Escherichia coli	MPN/100mL	Absent	Absent	Absent	Absent	Shall Not Be Detectable		IS 1622
33	Barium,(Ba)	mg/L	<0.005	<0.005	<0.005	<0.005	0.7	No Relaxation	APHA 3120B
34	Ammonia(as Total NH ₃ -N)*	mg/L	<0.05	<0.05	<0.05	<0.05	0.5	No Relaxation	APHA 4500:(NH ₃)-C
35	Sulphide,(H ₂ S)	mg/L	<0.05	<0.05	<0.05	<0.05	0.05	No Relaxation	APHA 4500: (S ₂ -)-D
36	Molybdenum,(Mo)	mg/L	<0.005	<0.005	<0.005	<0.005	0.07	No Relaxation	APHA-3120B
37	Arsenic,(As)	mg/L	<0.005	<0.005	<0.005	<0.005	0.01	0.05	APHA 3120B
38	(TSS)	mg/L	<2.0	<2.0	<2.0	<2.0	Not Specified	Not Specified	APHA 2540-D

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S. No.	Test Parameter	Unit	GW 5 Result	GW 6 Result	GW 7 Result	GW 8 Result	Specification/Limit (As per IS:10500: 2012)		Test Method
							Desirable	Permissible	
1	Colour	Hazen	<1.0	<1.0	< 5	< 5	5	15	APHA 2120-B
2	Odour	...	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	APHA 2150-B
3	pH	...	7.09	7.42	7.66	7.84	6.5 - 8.5	No Relaxation	APHA 4500-H+
4	Conductivity	µs/cm	756	723	837	617	Not Specified	Not Specified	APHA 2510-B
5	Turbidity	NTU	< 1.0	< 1.0	< 1	< 1	1	5	APHA 2130-B
6	Total Dissolved Solids,(TDS)	mg/L	522	499	578	436	500	2000	APHA 2540-C
7	Total Hardness, (CaCO ₃)	mg/L	215	128	223	215	200	600	APHA 2340-C
8	Calcium,(Ca)	mg/L	26	20.6	43.1	40.2	75	200	APHA 3500:(Ca)-B
9	Magnesium(Mg)	mg/L	15.1	15.1	21.9	18.3	30	100	APHA 3500:(Mg)-B
10	Total Alkalinity (CaCO ₃)	mg/L	185	189	192	190.5	200	600	APHA 2320-B
11	Chloride,(Cl)	mg/L	82.0	65	85.4	105.7	250	1000	APHA 4500:(Cl-)-B
12	Sulphate,(SO ₄)	mg/L	21	17.1	23	24.6	200	400	APHA 4500:(SO ₄)-E
13	Iron,(Fe)	mg/L	0.13	0.19	0.25	0.15	0.3	No Relaxation	APHA-3120B
14	Chlorine (Residual)	mg/L	<0.1	<0.1	<0.1	<0.1	0.2	1	APHA 4500:(Cl)-B

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S. No.	Test Parameter	Unit	GW 5 Result	GW 6 Result	GW 7 Result	GW 8 Result	Specification/Limit (As per IS:10500: 2012)		Test Method
							Desirable	Permissible	
15	Fluoride,(F)	mg/L	0.23	0.15	0.16	0.23	1	1.5	APHA 4500:(F-)-D
16	Nitrate,(NO ₃)	mg/L	15	18	15	10.7	45	No Relaxation	APHA 4500:(NO ₃ -)-B
17	Copper,(Cu)	mg/L	<0.005	<0.005	<0.005	<0.005	0.05	1.5	APHA 3120B
18	Manganese,(Mn)	mg/L	<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	No Relaxation	APHA-3114C
20	Cadmium,(Cd)	mg/L	<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	0.01	No Relaxation	APHA-3120B
22	Aluminium,(Al)	mg/L	<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	0.01	No Relaxation	APHA-3120B
24	Zinc,(Zn)	mg/L	<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	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	<0.001	0.5	No Relaxation	IS 3025 (Part-39)
28	Phenolic Compound, (C ₆ H ₅ OH)	mg/L	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	0.2	1	APHA 5540-C
30	Cyanide,	mg/L	Absent	Absent	Absent	Absent	0.05	No Relaxation	APHA 4500:

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S. No.	Test Parameter	Unit	GW 5 Result	GW 6 Result	GW 7 Result	GW 8 Result	Specification/Limit (As per IS:10500: 2012)		Test Method
							Desirable	Permissible	
	(CN)*								(CN-)-D
31	Total Coliform Count	MPN/100mL	Absent	Absent	Absent	Absent	Shall Not Be Detectable		IS 1622
32	Escherichia coli	MPN/100mL	Absent	Absent	Absent	Absent	Shall Not Be Detectable		IS 1622
33	Barium,(Ba)	mg/L	<0.05	<0.005	<0.005	<0.005	0.7	No Relaxation	APHA 3120B
34	Ammonia(as Total NH ₃ -N)*	mg/L	<0.05	<0.05	<0.05	<0.05	0.5	No Relaxation	APHA 4500:(NH ₃)-C
35	Sulphide,(H ₂ S)	mg/L	<0.005	<0.05	<0.05	<0.05	0.05	No Relaxation	APHA 4500: (S ₂ -)-D
36	Molybdenum,(Mo)	mg/L	<0.005	<0.005	<0.005	<0.005	0.07	No Relaxation	APHA-3120B
37	Arsenic,(As)	mg/L	<2.0	<0.005	<0.005	<0.005	0.01	0.05	APHA 3120B
38	(TSS)	mg/L	<0.05	<2.0	<2.0	<2.0	Not Specified	Not Specified	APHA 2540-D

TABLE 3.18a: PHYSICO-CHEMICAL CHARACTERISTICS OF SURFACE WATER

Date of Sampling	12.12.2022	Sampling Method	ETS/STP/WATER-01
Analysis Start Date	14.12.2022	Sample Quantity	2.0+ 0.5 Litre
Analysis End Date	17.12.2022	Packing Condition	Sealed
Sampling Done By	ETS STAFF	Packed IN	PVC and Glass Bottle

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S. No.	Test Parameter	Unit	SW 1 Result	Test Method
1	Colour	Hazen	<1.0	IS:3025 (Pt-4)
2	Odour	---	Agreeable	IS:3025 (Pt-5)
3	Taste		Agreeable	IS:3025 (Pt-8)
4	pH	---	7.54	IS:3025 (Pt-11)
5	Turbidity	NTU	13.17	IS:3025 (Pt-10)
6	Total Dissolve Solid (TDS)	mg/L	640.6	IS:3025 (Pt-16)
7	Total Suspended Solid (TSS)	mg/L	19.3	IS:3025 (Pt-16)
8	Total Alkalinity (CaCO ₃)	mg/L	221.6	IS:3025 (Pt-23)
9	Total Hardness(CaCO ₃)	mg/L	272.3	IS:3025 (Pt-21)
10	Calcium (Ca)	mg/L	90.2	IS:3025 (Pt-40)
11	Magnesium (Mg)	mg/L	48.4	IS:3025 (Pt-45)
12	Chloride (Cl)	mg/L	172.5	IS:3025 (Pt-32)
13	Sulphate (SO ₄)	mg/L	78.1	IS:3025 (Pt-24)
14	Fluoride (F)	mg/L	0.22	IS:3025 (Pt-60)
15	Aluminum (Al)	mg/L	<0.05	IS:3025 (Pt-55)
16	Iron (Fe)	mg/L	0.19	IS:3025 (Pt-53)
17	Nitrate	mg/L	4.05	IS:3025 (Pt-34)
18	Zinc(Zn)	mg/L	<0.01	APHA-3111 (B)
19	Cadmium(Cd)	mg/L	<0.01	APHA-3111 (B)
20	Lead(Pb)	mg/L	<0.01	APHA-3111 (B)
21	Nickel (Ni)	mg/L	0.07	APHA-3111 (B)
22	Conductivity (25 °C)	us/Cm	834.46	APHA-2510
23	Boron	mg/L	<0.05	IS:3025 (Pt-57)
24	Selenium as (Se)	mg/L	<0.05	APHA-method

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S. No.	Test Parameter	Unit	SW 1 Result	Test Method
25	Manganese (Mn)	mg/L	0.08	IS:3025 (Pt-59)
26	Mercury (Hg)	mg/L	<0.001	IS:3025 (Pt-48)
27	Total Arsenic (As)	mg/L	<0.01	IS:3025 (Pt-37)
28	Total chromium (Cr)	mg/L	<0.05	IS:3025 (Pt-52)
29	Molybdenum (Mo)	mg/L	<0.05	IS:3025 (Pt-2)
30	Ammonia (Total Ammonia-N)	mg/L	<0.05	IS:3025 (Pt-34)
31	Chemical Oxygen Demand (COD)	mg/L	27.4	APHA-5220 (B)
32	Biological Oxygen Demand (BOD at 27OC for 3 day)	mg/L	4.0	APHA-4500 (D)
33	Dissolve Oxygen (DO)	mg/L	5.1	APHA-5210
34	Free Residual Chlorine	mg/L	<0.01	IS:3025 (Pt-26)
35	Total Coliform	MPN/100ml	470	IS:1622-1981
36	E.Coil	Coil/100ml	280	IS:1622-1981

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3.10.9 Result Discussion

3.10.9.1 Ground Water Quality

The physico-chemical characteristics of groundwater are presented in Table below and are compared with the standards. The pH of the water samples collected ranged from 6.32 to 7.84 and within the acceptable limit of 6.5 to 8.5. The total dissolved solids were found in the range of 436 to 578 mg/l in all samples. The total hardness varied between 125 to 223 mg/l for all samples collected at 8 locations.

In all samples, iron content is 0.1 to 0.25 mg/l, Nitrate in between 10.7 to 25 mg/l, fluoride varied between 0.15 to 0.23 mg/l, chloride 65 to 105.7 mg/l, Sulphate 17.1 to 26 mg/l, alkalinity 139 to 192 mg/l, calcium 20.6 to 46.1 mg/l and magnesium in between 15.1 to 23 mg/l. The overall ground water quality was found to be good in most of the villages. The levels of heavy metals content were found to be within permissible limits.

3.10.9.2 Surface Water Quality

The results of the surface water samples analyzed are presented in **Table 3.17** and are compared with the standards.

The pH of the water samples collected is 7.54 and is within the acceptable limit of 6.5 to 8.5. The total dissolved solids were found is 640.6 mg/l in all samples. The total hardness is 272.3 mg/l for all samples collected at 1 location only.

In all samples, iron content is 0.19 mg/l, Nitrate is 4.05 mg/l, fluoride is 0.22 mg/l, chloride is 172.5 mg/l, Sulphate is 78.1 mg/l, alkalinity is 221.6 mg/l, calcium is 90.2 mg/l and magnesium is 48.4 mg/l. The overall surface water quality was found to be good in the village. The levels of heavy metals content were found to be within permissible limits.

3.11 BIOLOGICAL ENVIRONMENT

3.11.1 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

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project site and surrounding area within 10 km radius. Accordingly, mitigation measures are planned to sustain the biological diversity.

3.11.2 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.

3.11.3 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

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floristic diversity and faunal wealth in the surrounding area up to 10 km radius of the proposed project site.

3.11.4 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 conducted and there are no forest blocks in study area. The detailed ecological assessment of the study area 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 and faunal 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 area of all the proposed mine site.
- After surveying the core and buffer areas, a detailed floral inventory has been compiled. List of all plants of 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.

3.11.5 Site selection criteria

The core study area is located at Nathikudi Village, Vembakkottai Taluk, Virudhunagar 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.

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3.11.6 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.

3.11.7 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 in the 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 ([wiienviis.nic.in/Database/Schedule Species Database](http://wiienviis.nic.in/Database/Schedule%20Species%20Database)) and Zoological Survey of India (ZSI).

3.11.7.1 Survey and Monitoring of Mammals

Intensive survey was done by line transect method (Walking and in vehicle) for all major habitats for surveying 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.

3.11.7.2 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.

3.11.7.3 Survey and Monitoring of reptiles

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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.

3.11.8 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.

3.11.9 Flora in Buffer Zone

Similar type of environment also in buffer area but with more flora diversity compare than core zone are because 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 59 species belonging to 39 families have been recorded from the buffer zone. Floral (62) varieties among them trees (25), shrubs (11) and herbs (14) and climbers (9) were identified. The result of 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.

TABLE 3.19: FLORA IN CORE ZONE

S. No	Scientific Name	Family	Local Name
TREES			
1	<i>Mangifera indica</i>	Anacardiaceae	Manga maram
2	<i>Azadirachta indica</i>	Meliaceae	Vembu
3	<i>Vachellia nilotica</i>	Fabaceae	Karuvelam maram
4	<i>Cocos nucifera</i>	Arecaceae	Thennai maram
5	<i>Borassus flabellifer</i>	Arecaceae	Panai maram
6	<i>Morinda citrifolia</i>	Rubiaceae	Nuna maram
HERB			
7	<i>Leucas aspera</i>	Lamiaceae	Thumbai
8	<i>Tribulus terrestris</i>	Zygophyllales	Nerunji

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S. No	Scientific Name	Family	Local Name
9	<i>Cynodon dactylon</i>	Poaceae	Arugampul
SHRUB			
10	<i>Calotropis gigantea</i>	Apocynaceae	Erukku
11	<i>Abutilon indicum</i>	Malvaceae	Thuththi
12	<i>Mimosa pudica</i>	Mimosaceae	Thottalchinungi
13	<i>Senna auriculata</i>	Fabaceae	Avarai
CLIMBER			
14	<i>Passiflora foetida</i>	Passifloraceae	Sirupunaikkali
15	<i>Cissus quadrangularis</i>	Vitaceae	Perandai

TABLE 3.20: FLORA IN BUFFER ZONE

S. No	Scientific Name	Family	Local Name	Resource use type
TREE				
1.	<i>Ficus recemosa</i>	Moraceae.	Athi	EM
2.	<i>Lawsonia inermis</i>	Lythraceae	Marudaani	EM
3.	<i>Azadirachta indica</i>	Meliaceae	Vembu	M
4.	<i>Musa</i>	Musaceae	Vazhaimaram	EM
5.	<i>Mangifera indica</i>	Anacardiaceae	Manga	E
6.	<i>Ficus benghalensis</i>	Moraceae	Alamaram	E
7.	<i>Tamarindus indica</i>	Legumes	Puliyamaram	EM
8.	<i>Ficus religiosa</i>	Moraceae	Arasanmaram	M
9.	<i>Bambusa bambo</i>	Poaceae	Moonghil	E
10.	<i>Morinda citrifolia</i>	Rubiaceae	Nuna maram	M
11.	<i>Syzygium cumini</i>	Myrtaceae	Navalmaram	EM
12.	<i>Tectona grandis</i>	Verbenaceae	Thekku	E
13.	<i>Psidium guajava</i>	Myrtaceae	Koyya	EM
14.	<i>Emblica officinalis</i>	Phyllanthaceae	Nelli	EM
15.	<i>Carica papaya L</i>	Caricaceae	Pappali maram	EM
16.	<i>Vachellia nilotica</i>	Fabaceae	Karuvelam maram	M
17.	<i>Manilkara zapota</i>	Sapotaceae	Sapota	E
18.	<i>Calophyllu inophyllum</i>	Calophyllaceae	Punnai	M
19.	<i>Cocos nucifera</i>	Arecaceae	Thennai maram	EM
20.	<i>Borassus flabellifer</i>	Arecaceae	Panai maram	E
21.	<i>Vitex negundo</i>	Verbenaceae	Nochi	E
22.	<i>Annona reticulata</i>	Annonaceae	Seethapazham	E
23.	<i>Murraya koenigii</i>	Asclepiadaceae	Velipparuthi	EM
24.	<i>Citrus lemon</i>	Rutaceae	Ezhumuchaipalam	EM
25.	<i>Eucalyptus globules</i>	Myrtaceae	Eucalyptus	EM
HERB				
26.	<i>Solanumnigrum</i>	Solanaceae	Manathakkali	EM

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S. No	Scientific Name	Family	Local Name	Resource use type
27.	<i>Cyperus compressus</i>	Cyperaceae	Kunnakora	NE
28.	<i>Eclipta prostrata</i>	Asteraceae	Karisilanganni	EM
29.	<i>Centella asiatica</i>	Apiaceae	Vallarai	EM
30.	<i>Phyllanthus amarus</i>	Phyllanthaceae	Kilanelli	M
31.	<i>Leucas aspera</i>	Lamiaceae	Thumbai	M
32.	<i>Achyranthes aspera</i>	Amaranthaceae	Nayuruv	M
33.	<i>Ocimum tenuiflorum</i>	Lamiaceae	Thulasi	M
34.	<i>Cyperus rotundus</i>	Cyperaceae	Korai	NE
35.	<i>Boerhavia diffusa</i>	Nyctaginaceae	Mukurattai	M
36.	<i>Tridax procumbens</i>	Asteraceae	Veetukaayapoondur	M
37.	<i>Cynodon dactylon</i>	Poaceae	Arugampul	E
38.	<i>Acalypha indica</i>	Euphorbiaceae	Kuppaimeni	M
39.	<i>Commelina benghalensis</i>	Commelinaceae	Kanamvazha	M
SHRUB				
40.	<i>Solanum torvum</i>	Solanaceae	Sundaika	EM
41.	<i>Phoenix pusilla</i>	Arecaceae	Icham	EM
42.	<i>Abutilon indicum</i>	Meliaceae	Thuthi	M
43.	<i>Senna auriculata</i>	Fabaceae	Avarai	M
44.	<i>Nerium indicum</i>	Apocynaceae	Arali	M
45.	<i>Hibiscus rosa-sinensis</i>	Malvaceae	Chemparuthi	EM
46.	<i>Jatropha curcas</i>	Euphorbiaceae	Kattamanakku	EM
47.	<i>Calotropis gigantea</i>	Apocynaceae	Erukku	M
48.	<i>Abrus precatorius</i>	Fabaceae	Kundumani	M
49.	<i>Xorococ cinea</i>	Rubiaceae	Idlipoo	M
50.	<i>Mimosa pudica</i>	Mimosaceae	Thottalchinungi	M
CLIMBER				
51.	<i>Jasminum augustifolium</i>	Oleaceae	Malli	EM
52.	<i>Cissus quadrangularis</i>	Vitaceae	Perandai	M
53.	<i>Lagenaria siceraria</i>	Cucurbitaceae	Sorakkai	EM
54.	<i>Coccinia grandis</i>	Cucurbitaceae	Kovai	M
55.	<i>Clitoria ternatea</i>	Fabaceae	Sangupoo	M
56.	<i>Solanum trilobatum</i>	Solanaceae	Thuthuvelai	EM
57.	<i>Trichosanthes dioica</i>	Cucurbitaceae	Kovakkai	EM
58.	<i>Passiflora foetida</i>	Passifloraceae	Sirupunaikkali	
59.	<i>Clitoria ternatea</i>	Fabaceae	Karkakartum	M

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

3.11.10 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

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with Red Data Book and Indian Wildlife Protection Act, 1972. There are no rare, endangered, threatened (RET) and endemic species present in core area.

3.11.11 FAUNA IN CORE ZONE

A total of 22 varieties of species observed in the Core zone of Nathikudi village, rough stone quarry. Among them numbers of Insects 9 (37.5%), Reptiles 4 (20.83%), Mammals 3 (12.5%) and Avian 6 (29.16%). A total of 22 species belonging to 19 families have been recorded from the core mining lease area. 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 3.21**.

TABLE 3.21: LIST OF FAUNA IN CORE ZONE

S. No	Scientific Name	Family Name	WPA Schedule	IUCN List
INSECTS				
1	<i>Danaus plexippus</i>	Nymphalidae	Schedule IV	LC
2	<i>Catopsilia pyranthe</i>	Peridae	NL	LC
3	<i>Hieroglyphus sp</i>	Acrididae	NL	LC
4	<i>Hamitermes silvestri</i>	Blattodea	NL	LC
5	<i>Mantis religiosa</i>	Mantidae	NL	NL
6	<i>Crausius morosus</i>	Lonchodidae	NL	LC
7	<i>Sympetrum fonscolombii</i>	Libellulidae	NL	LC
8	<i>Acraea violae</i>	Nymphalidae	NL	LC
9	<i>Danaus genutia</i>	Nymphalidae	NL	NL
REPTILES				
10	<i>Hemidactylus frenatus</i>	Gekkonidae	NL	LC
11	<i>Sitanaponticeriana</i>	Agamidae	NL	LC
12	<i>Calotes versicolor</i>	Agamidae	NL	LC
13	<i>Eutropis carinata</i>	Scincidae	NL	LC
MAMMALS				
14	<i>Rattus rattus</i>	Muridae	Schedule IV	LC
15	<i>Mus booduga</i>	Muridae	Schedule IV	NL
16	<i>Herpestes javanicus</i>	Herpestidae	Schedule II	LC
AVES				
17	<i>Merops orientalis</i>	Meropidae	NL	LC

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18	<i>Bubulcus ibis</i>	Ardeidae	NL	LC
19	<i>Acridotheres tristis</i>	Sturnidae	NL	LC
20	<i>Coturnix coturnix</i>	Phasianidae	Schedule IV	LC
21	<i>Corvus splendens</i>	Corvidae	NL	LC
22	<i>Dicrurus macrocercus</i>	Dicruridae	Schedule IV	LC

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

3.11.10.1 FAUNA IN BUFFER ZONE

Taxonomically a total of 40 species belonging to 29 families have been recorded from the buffer zone area. Based on habitat classification the majority of species were Insects 14 (35%), followed by Birds 15 (37.5%), Reptiles 5 (12.5%), Mammals 3 (7.5%) and amphibians 3 (7.5%). There are one Schedule II species and twenty-two species are under schedule IV according to Indian wild life Act 1972. A total 15 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 3.22**.

TABLE 3.22: FAUNA IN BUFFER ZONE

S.No	Scientific Name	Family Name	WPA Schedule	IUCN List
INSECTS				
1	<i>Apis cerana</i>	Apidae	Schedule IV	LC
2	<i>Danaus plexippus</i>	Nymphalidae	Schedule IV	LC
3	<i>Danaus chrysippus</i>	Nymphalidae	Schedule IV	LC
4	<i>Danaus genutia</i>	Nymphalidae	Schedule IV	LC
5	<i>Eurythyrea austriaca</i>	Buprestidae	Schedule IV	NA
6	<i>Sympetrum fonscolombii</i>	Libellulidae	NL	LC
7	<i>Camponotus Vicinus</i>	Formicidae	NL	NL
8	<i>Ceratogomphus pictus</i>	Gomphidae	Schedule IV	
9	<i>Danainae</i>	Nymphalidae	NL	LC
10	<i>Euploea core</i>	Nymphalidae	Schedule IV	LC
11	<i>Mantis religiosa</i>	Mantidae	NL	NL
12	<i>Hieroglyphus sp</i>	Acrididae	NL	LC
13	<i>Zizina Otis indica</i>	Lycaenidae	Schedule IV	LC
14	<i>Tirumala limniace</i>	Nymphalidae	Schedule IV	LC
REPTILES				
15	<i>Calotes versicolor</i>	Agamidae	NL	LC
16	<i>Eutropis carinata</i>	Scincidae	NL	LC
17	<i>Hemidactylus frenatus</i>	Gekkonidae	NL	LC
18	<i>Sitanaponticeriana</i>	Agamidae	NL	LC

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S.No	Scientific Name	Family Name	WPA Schedule	IUCN List
19	<i>Mabuya carinatus</i>	Scincidae	NL	LC
MAMMALS				
20	<i>Funambulus palmarum</i>	Sciuridae	Schedule IV	LC
21	<i>Mus booduga</i>	Muridae	Schedule IV	LC
22	<i>Herpestes javanicus</i>	Herpestidae	Schedule II	LC
AVES				
23	<i>Eudynamys</i>	Cuculidae	Schedule IV	LC
24	<i>Bubulcus ibis</i>	Ardeidae	NL	LC
25	<i>Acridotheres tristis</i>	Sturnidae	NL	LC
26	<i>Corvus splendens</i>	Corvidae	NL	LC
27	<i>Merops orientalis</i>	Meropidae	NL	LC
28	<i>Pycnonotus cafer</i>	Pycnonotidae	Schedule IV	LC
29	<i>Psittacula krameri</i>	Psittaculidae	NL	LC
30	<i>Accipiter badius</i>	Accipitridae	NL	LC
31	<i>Coturnix coturnix</i>	Phasianidae	Schedule IV	LC
32	<i>Dicrurus macrocercus</i>	Dicruridae	Schedule IV	LC
33	<i>Dicrurus macrocercus</i>	Dicruridae	Schedule IV	LC
34	<i>Francolinus pondicerianus</i>	Phasianidae	Schedule IV	LC
35	<i>Coturnix coturnix</i>	Phasianidae	Schedule IV	LC
36	<i>Amaurornis phoenicurus</i>	Rallidae	NL	LC
37	<i>Fulica atra</i>	Rallidae	Schedule IV	LC
38	<i>Sphaerotheca breviceps</i>	Dicroglossidae	Schedule IV	LC
39	<i>Rana hexadactyla</i>	Ranidae	Schedule IV	LC
40	<i>Hoplobatrachus tigerinus</i>	Chordata	Schedule IV	LC

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

3.11.11 Interpretation & Conclusion

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 mining operation over short period of time will not have any significant impact on the surrounding flora and fauna.

3.12 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.

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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 the project.

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

3.12.1 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

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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.

3.12.2 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

3.13 ADMINISTRATIVE SETUP OF VIRUDHUNAGAR DISTRICT

An official Census 2011 detail of Virudhunagar, 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 Virudhunagar District of Tamil Nadu.

In 2011, Virudhunagar had population of 1,942,288 of which male and female were 967,709 and 974,579 respectively. In 2001 census, Virudhunagar had a population of 1,751,301 of which males were 870,376 and remaining 880,925 were females. Virudhunagar District population constituted 2.69 percent of total Tamilnadu population. In 2001 census, this figure for Virudhunagar District was at 2.81 percent of Tamilnadu population.

There was change of 10.91 percent in the population compared to population as per 2001. In the previous census of India 2001, Virudhunagar District recorded increase of 11.90 percent to its population compared to 1991.

3.13.1 Virudhunagar District Density

The initial provisional data released by census India 2011, shows that density of Virudhunagar district for 2011 is 458 people per sq. km. In 2001, Virudhunagar district density was at 409 people per sq. km. Virudhunagar district administers 4,241 square kilometers of areas.

3.13.2 Virudhunagar Literacy Rate

Average literacy rate of Virudhunagar in 2011 were 80.15 compared to 80.15 of 2001. If things are looked out at gender wise, male and female literacy were 87.71 and 72.69 respectively. For 2001 census, same figures stood at 83.96 and 63.64 in Virudhunagar District. Total literate in Virudhunagar District were 1,398,788 of which male and female

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were 760,375 and 638,413 respectively. In 2001, Virudhunagar District had 1,136,574 in its district.

3.13.3 Virudhunagar Sex Ratio

With regards to Sex Ratio in Virudhunagar, it stood at 1007 per 1000 male compared to 2001 census figure of 1012. The average national sex ratio in India is 940 as per latest reports of Census 2011 Directorate. In 2011 census, child sex ratio is 955 girls per 1000 boys compared to figure of 958 girls per 1000 boys of 2001 census data.

3.13.4 Virudhunagar Child population

In census enumeration, data regarding child under 0-6 age were also collected for all districts including Virudhunagar. There were total 197,134 children under age of 0-6 against 209,147 of 2001 census. Of total 197,134 male and female were 100,827 and 96,307 respectively. Child Sex Ratio as per census 2011 was 955 compared to 958 of census 2001. In 2011, Children under 0-6 formed 10.15 percent of Virudhunagar District compared to 11.94 percent of 2001. There was net change of -1.79 percent in this compared to previous census of India.

3.13.5 Virudhunagar Houseless Census

In 2011, total 239 families live on footpath or without any roof cover in Virudhunagar district of Tamil Nadu. Total Population of all who lived without roof at the time of Census 2011 numbers to 637. This approx 0.032% of total population of Virudhunagar district.

3.13.6 Virudhunagar District Urban/ Rural

Out of the total Virudhunagar population for 2011 census, 50.47 percent lives in urban regions of district. In total 980,226 people lives in urban areas of which males are 487,349 and females are 492,877. Sex Ratio in urban region of Virudhunagar district is 1011 as per 2011 census data. Similarly child sex ratio in Virudhunagar district was 960 in 2011 census. Child population (0-6) in urban region was 95,884 of which males and females were 48,920 and 46,964. This child population figure of Virudhunagar district is 10.04 % of total urban population. Average literacy rate in Virudhunagar district as per census 2011 is 84.31 % of which males and females are 90.47 % and 78.25 % literates respectively. In actual number 745,569 people are literate in urban region of which males and females are 396,639 and 348,930 respectively.

As per 2011 census, 49.53 % population of Virudhunagar districts lives in rural areas of villages. The total Virudhunagar district population living in rural areas is 962,062 of which males and females are 480,360 and 481,702 respectively. In rural areas of Virudhunagar district, sex ratio is 1003 females per 1000 males. If child sex ratio data of

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Virudhunagar district is considered, figure is 951 girls per 1000 boys. Child population in the age 0-6 is 101,250 in rural areas of which males were 51,907 and females were 49,343. The child population comprises 10.81 % of total rural population of Virudhunagar district. Literacy rate in rural areas of Virudhunagar district is 75.88 % as per census data 2011. Gender wise, male and female literacy stood at 84.90 and 66.95 percent respectively. In total, 653,219 people were literate of which males and females were 363,736 and 289,483 respectively.

3.14 STUDY AREA

The 10km radius village map is shown in **Figure 3.16**.

3.14.1 Reconnaissance

EIA study for Rough Stone Mine by Thiru. K. Sugan for Total Proposed Production of 72,165 m³ of Rough Stone, S.F. No. 902/1, 903/1, over an extent of 1.29.0 Ha. of Nathikudi Village, Vembakkottai Taluk, Virudhunagar District, Tamilnadu, India. The details of information on demographic structure of the villages in the study area are presented in in **Table 3.23**.

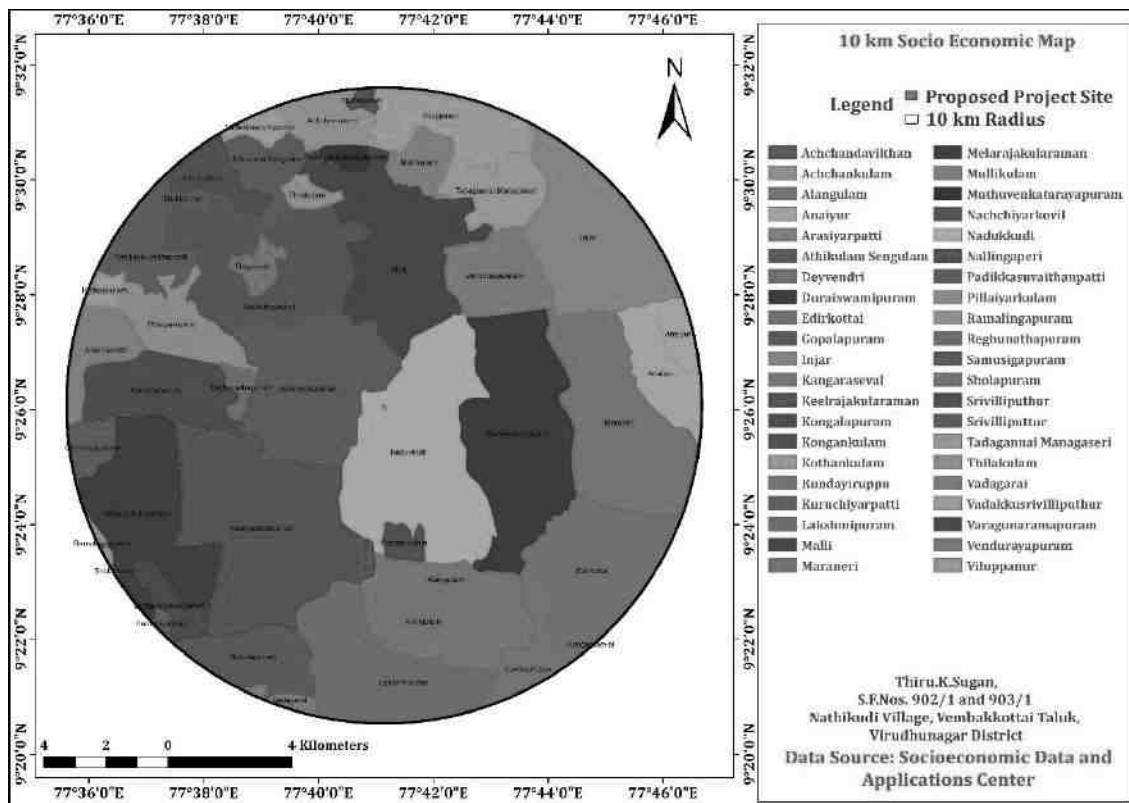


FIGURE 3.16: VILLAGE MAP OF THE STUDY AREA

TABLE 3.23: LIST OF VILLAGES IN THE STUDY AREA

District	Villages
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Virudhunagar	Achchandavilthan, Achchangulam, Alangulam, Anaiyur (Part), Arasiyarpatti, Athikulam Sengulam, Deyvendri, Duraiswamipuram, Edirkottai, Gopalapuram, Injar, Kangaraseval, Keelrajakularaman, Kongalapuram, Kongankulam, Kothankulam, Kundayiruppu, Kuruchiyarpatti, Lakshmipuram, Maili, Maraneri, Melarajakularaman (Part), Mullikulam, Muthuvenkatarayapuram, Nachchiyarkovil, Nadukkudi, Nallingaperi, Pillaiyarkulam, Reghunathapuram, Sholapuram, Srivilliputtur, Tadagannai, Managaseri, Thilakulam, Vadagarai, Vadakkusrivilliputhur, Varagunaramapuram, Vendurayapuram, Viluppanur
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Source: Primary Census Abstract 2011, Virudhunagar District, State Tamil Nadu

3.14.2 Baseline Status

Baseline information is collected after delineation of the baseline study area 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

3.14.3 Demographic Structure

The demographic structure of the study area was derived primarily from data of Census record of one district covering 38 villages. Summary of demographic structure is presented in **Table 3.24**. The demographic structures of each village in the study area as per Census 2011 are presented in **Table 3.25**.

TABLE 3.24: SUMMARY OF DEMOGRAPHIC STRUCTURE IN STUDY AREA

Demographic Parameters	Details
No. of States	1
No. of District	1
No. of Block	5
No. of Villages	38
Total No. of Households	44441
Total Population	156561
Density of Population (per km ²)	498

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Sex Ratio (No. of female\ 1000 males)	1009
Child Population	15598
Scheduled Castes	46475
Scheduled Tribes	143
Literacy	104536
Male	57639
Female	46897

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

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TABLE 3.25: DEMOGRAPHIC STRUCTURE OF VILLAGE IN THE STUDY AREA

SN	Villages	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: Virudhunagar														
1.	Achchandavilthan	1881	6365	3190	3175	622	317	305	1419	703	716	0	0	0
2.	Achchangulam	285	1156	600	556	149	72	77	467	249	218	0	0	0
3.	Alangulam	122	493	244	249	58	26	32	97	50	47	0	0	0
4.	Anaiyur (Part)	1364	4919	2408	2511	610	288	322	2630	1281	1349	0	0	0
5.	Arasiyarpatti	1050	3784	1872	1912	388	223	165	1296	662	634	0	0	0
6.	Athikulam Sengulam	1033	3542	1775	1767	370	198	172	1919	966	953	0	0	0
7.	Deyvendri	277	943	477	466	125	65	60	336	166	170	0	0	0
8.	Duraiswamipuram	2332	8642	4270	4372	901	442	459	3028	1515	1513	0	0	0
9.	Edirkottai	1203	4329	2129	2200	465	254	211	331	156	175	0	0	0
10.	Gopalapuram	423	1461	708	753	128	61	67	385	189	196	0	0	0
11.	Injar	1901	7386	3637	3749	739	377	362	1028	514	514	0	0	0
12.	Kangaraseval	429	1627	790	837	180	96	84	408	187	221	0	0	0
13.	Keelrajakularaman	2575	8986	4487	4499	817	413	404	2319	1160	1159	40	23	17
14.	Kongalapuram	675	2336	1150	1186	202	108	94	17	10	7	0	0	0
15.	Kongankulam	318	1050	507	543	87	44	43	138	64	74	0	0	0
16.	Kothankulam	1407	4898	2438	2460	519	282	237	1697	861	836	0	0	0
17.	Kundayiruppu	1846	6812	3365	3447	852	424	428	1677	820	857	0	0	0
18.	Kuruchiyarpatti	205	741	361	380	62	30	32	115	51	64	0	0	0
19.	Lakshmipuram	1603	5610	2771	2839	577	251	326	1327	652	675	5	3	2

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SN	Villages	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
20.	Maili	1681	5839	2940	2899	36	16	20	1454	718	736	1	0	1
21.	Maraneri	2706	9746	4733	5013	1046	508	538	4251	2110	2141	0	0	0
22.	Melarakulamaraman (Part)	5238	16652	8394	8258	1617	843	774	2978	1502	1476	96	46	50
23.	Mullikulam	466	1658	803	855	176	92	84	608	306	302	0	0	0
24.	Muthuvenkatarapuram	561	1862	915	947	175	103	72	770	393	377	0	0	0
25.	Nachchiyarkovil	800	2712	1325	1387	260	130	130	1113	558	555	0	0	0
26.	Nadukkudi	1348	4797	2383	2414	575	296	279	2439	1231	1208	0	0	0
27.	Nallingaperi	159	532	265	267	37	24	13	187	94	93	0	0	0
28.	Pillaiyarkulam	524	2134	1071	1063	281	141	140	174	86	88	0	0	0
29.	Reghunathapuram	735	2694	1355	1339	231	122	109	1332	681	651	0	0	0
30.	Sholapuram	3248	11607	5830	5777	1147	610	537	3283	1640	1643	0	0	0
31.	Srivilliputtur	877	3161	1604	1557	281	142	139	1364	686	678	0	0	0
32.	Tadagannai Managaseri	602	2143	1049	1094	210	109	101	719	351	368	0	0	0
33.	Thilakulam	368	1289	652	637	127	76	51	271	129	142	0	0	0
34.	Vadagarai	992	3454	1720	1734	316	156	160	91	42	49	0	0	0
35.	Vadakkusrivilliputhur	604	2157	1070	1087	261	123	138	1318	647	671	0	0	0
36.	Varangunaramapuram	385	1357	696	661	142	67	75	97	44	53	0	0	0
37.	Vendurayapuram	661	2383	1195	1188	285	155	130	528	266	262	0	0	0

Draft EIA/EMP for Nathikudi Rough stone and Gravel Quarry Cluster with new proposed area of 1.29.0 Ha, While total cluster area is 20.34 Ha located in Nathikudi Village, Vembakkottai Taluk, Virudhunagar District, Tamil Nadu.

Lessee: Thiru. K. Sugas (Lease Area: 1.29.0 Ha)

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SN	Villages	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
38.	Viluppanur	1557	5304	2719	2585	544	285	259	2864	1431	1433	1	0	1
Total		44441	156561	77898	78663	15598	7969	7629	46475	23171	23304	143	72	71

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

3.14.4 Salient Features of Demographic Structure

In the study area, Virudhunagar 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, Alangulam 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.

3.14.5 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 3.26**.

TABLE 3.26: INFRASTRUCTURE RESOURCE BASE OF THE STUDY AREA

SN	Villages	Education	Medical	Water	Sanitation	Communication	Transportation	Road	Bank	Power	SHG
1.	Achchandavilthan	GPS(5),PPS,GMS	PHSC,M&CWC	TWT,TWU,HP,TW/B	CD,OD,ND,OPDU,OKD	TP,PCO,MPC	GBS,PBS	BTPR,GKR,WBM,AWR,F	COB,ACS	PSDU,PSAU,PSALU	SHG

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Lessee: Thiru. K. Sujan (Lease Area: 1.29.0 Ha)

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SN	Villages	Education	Medical	Water	Sanitation	Communication	Transportation	Road	Bank	Power	SHG
2.	Achchangulam	GPS(2)	NA	TWT,TWU,CW,UW, TW/B	CD,OD,ND,OKD	TP,MPC	GBS,PBS	BTPR,GKR,WBM,AWR,F	NA	PSDU,PSAU,PSCU,PSALU	SHG
3.	Alangulam	GPS,GMS	NA	TWT	OD,ND, OKD	TP,MPC	GBS	BTPR,GKR,WBM,AWR,F	NA	PSDU,PSAU, PSALU	SHG
4.	Anaiyur (Part)	GPS(6),PPS,GMS(2),PMS,GSS,PS S, PSSS	PHSC,M&CWC	TWT,TWU,CW,UW,HP,TW/B	CD,OD,ND,OPDU	TP,PCO,MPC,IC,PCF	GBS,PBS,A/MA,T,V	BTPR,GKR,WBM,AWR,F	COB,ACS	PSDU,PSAU,PSCU,PSALU	SHG
5.	Arasiyarpatti	GPS(3),PPS	PHC,PHSC,M&CWC,TBC,D,VH,FWC	TWT,TWU,TW/B	CD,OD,ND,OPDU	TP,MPC	GBS,PBS,A/MA,SH	BTPR,GKR,WBM,AWR,F	NA	PSDU,PSAU,PSCU,PSALU	SHG
6.	Athikulam Sengulam	GPS(3),GMS	PHSC, VH	TWT,TWU,UW, TW/B	CD,OD,ND,OPDU	TP,PCO,MPC	GBS,PBS,A/MA,SH	BTPR,GKR,WBM,AWR,F	COB,ACS	PSDU,PSAU,PSCU,PSALU	SHG
7.	Deyvendri	NA	NA	TWT,TWU,CW, TW/B	CD,OD,ND,OPDU,OKD	TP,PCO,MPC,PCF	GBS,RS,A/MA,SH	BTPR,GKR,WBM,AWR,F	NA	PSDU,PSAU,PSCU,PSALU	SHG
8.	Duraiswamipuram	GPS(4),PPS(4),GMS(2),PMS,GS S	PHSC, VH	TWT,TWU,UW,HP,TW/B	CD,OD,ND,OPDU	TP,PCO,MPC	GBS,PBS	BTPR,GKR,AWR,F	CB,COB,ACS	PSDU,PSAU,PSCU,PSALU	SHG
9.	Edirkottai	GPS(2),PPS(2),PMS	PHSC	TWT,TWU,CW	CD,OD,ND,OPDU	TP,PCO,MPC,IC	GBS,PBS,A/MA,T,V	BTPR,WBM,AWR,F	COB,ACS	PSDU,PSAU,PSCU,PSALU	SHG

Draft EIA/EMP for Nathikudi Rough stone and Gravel Quarry Cluster with new proposed area of 1.29.0 Ha, While total cluster area is 20.34 Ha located in Nathikudi Village, Vembakkottai Taluk, Virudhunagar District, Tamil Nadu.

Lessee: Thiru. K. Sugas (Lease Area: 1.29.0 Ha)

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SN	Villages	Education	Medical	Water	Sanitation	Communication	Transportation	Road	Bank	Power	SHG
10.	Gopalapuram	GPS(2), GMS	NA	TWT,TWU	CD,OD,ND,OP DU,OKD	TP,PCO,MPC	GBS,PBS,A/MA	BTPR,GKR,WBM,AWR,F	CB	PSDU,PSAU,PSALU	SHG
11.	Injar	GPS(6),PPS,GMS,PMS,GSS,PSS	PHSC,M&CWC	TWT,TWU,HP,TW/B	CD,OD,ND,OP DU,OPDC	TP,PCO,MPC	GBS,PBS,A/MA,V	BTPR,AWR,F	COB	PSDU,PSAU,PSCU,PSALU	SHG
12.	Kangaraseval	GPS,PPS,GMS	NA	TWT,TWU,HP,TW/B,S	CD,OD,ND,OP DU	TP, MPC,IC	GBS, A/MA,T,V	BTPR,GKR,WBM,AWR,F	NA	PSDU,PSAU,PSCU,PSALU	SHG
13.	Keelrajakularaman	GPS(8),GMS(4),GSS(2),GSSS	PHC,PHSC,M&CWC,TBC,D,VH,FWC	TWT,TWU,UW,HP,TW/B	CD,OD,ND,OP DU	TP,PCO,MPC	GBS,PBS,A/MA,T,V	BTPR,GKR,WBM,AWR,F	COB,ACS	PSDU,PSAU,PSCU,PSALU	SHG
14.	Kongalapuram	GPS	NA	TW/B	CD,OD,ND,OP DU,OKD	TP,PCO,MPC	GBS,PBS, SH	BTPR,GKR,WBM,AWR,F	NA	PSDU,PSAU,PSCU,PSALU	SHG
15.	Kongankulam	PPS, PMS	PHSC	TWT,TWU,HP,TW/B,R/C	CD,OD,ND,OP DU,OKD	TP,PCO,MPC	GBS,PBS,A/MA,V	BTPR,GKR,AWR,F	ACS	PSDU,PSAU,PSCU,PSALU	SHG
16.	Kothankulam	GPS(2),PPS,GMS(2)	PHSC	TWT,TWU,CW,HP,TW/B	CD,OD,ND,OP DU	TP,PCO,MPC	GBS,PBS,A/MA,V	BTPR,GKR,WBM,AWR,F	NA	PSDU,PSAU,PSCU,PSALU	SHG
17.	Kundayiruppu	GPS(3),PPS(2),GMS	PHSC(3)	TWT,TWU,CW,UW,HP,TW/B	CD,OD,ND,OP DU	TP,PCO,MPC	GBS	BTPR,AWR,F	ACS	PSDU,PSAU,PSCU,PSALU	SHG

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Lessee: Thiru. K. Sujan (Lease Area: 1.29.0 Ha)

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SN	Villages	Education	Medical	Water	Sanitation	Communication	Transportation	Road	Bank	Power	SHG
18.	Kuruchiyarpatti	PPS	NA	TWT,TWU,TW/B	CD,OD,ND,OPDU	TP,PCO,MPC,IC	GBS,PBS,A/MA,T	BTPR,GKR,WBM,AWR,F	COB,ACS	PSDU,PSAU,PSCU,PSALU	SHG
19.	Lakshmiapuram	GPS(4),PPS(2)	PHSC	TWT,TWU,CW,HP,TW/B	CD,OD,ND,OPDU,OKD	TP,PCO,MPC,PCF	GBS,PBS,A/MA,T,V	BTPR,AWR,F	ACS	PSDU,PSAU,PSCU,PSALU	SHG
20.	Maili	GPS(7),PPS,GMS,GSS	PHSC, VH	TWT,TWU,CW,HP,TW/B	CD,OD,ND,OPDU,OKD	TP,PCO,MPC	GBS,PBS,A/MA,V,SH	BTPR,WBM,AWR,F	ACS	PSDU,PSAU,PSCU,PSALU	SHG
21.	Maraneri	GPS(3),PPS(2),GMS,PMS(2),PSS(2),PSSS(2)	PHC,PHSC,M&CWC,TBC,D,VH,FWC	TWT,TWU,CW,HP,TW/B	CD,OD,ND,OPDU,OKD,OPDC	TP,PCO,MPC	PBS,A/MA,V	BTPR,GKR,AWR,F	CB,ACS	PSDU,PSAU,PSCU,PSALU	SHG
22.	Melarakulam (Part)	GPS(7),PPS(7),GMS(2),PMS,GSS(2),PSS,GSSS(2)	PHC,PHSC(3),M&CWC,TBC,D,VH,FWC	TWT,TWU,CW,HP,TW/B,S	CD,OD,ND,OPDU,OKD	TP,PCO,MPC,PCF	GBS,PBS,A/MA,T,V,SH	BTPR,GKR,WBM,AWR,F	CB,COB,ACS	PSDU,PSAU,PSCU,PSALU	SHG
23.	Mullikulam	GPS(2)	NA	TWT,TWU,CW,HP,TW/B	OD,ND,OPDU,OKD	TP, MPC	A/MA	BTPR,GKR,AWR,F	NA	PSDU,PSAU,PSCU,PSALU	SHG
24.	Muthuvenkatarapuram	GPS(2)	NA	TWT,TWU,CW,UW,HP,TW/B	CD,OD,ND,OPDU,OKD	TP,PCO,MPC	GBS,PBS,A/MA,T,V	BTPR,GKR,AWR,F	NA	PSDU,PSAU,PSCU,PSALU	SHG

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Lessee: Thiru. K. Sujan (Lease Area: 1.29.0 Ha)

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SN	Villages	Education	Medical	Water	Sanitation	Communication	Transportation	Road	Bank	Power	SHG
25.	Nachchiyarkovil	GPS(2),PPS,GMS,PMS,GSS, GSSS	PHSC	TWT,TWU,CW,HP,TW/B,T/P/L	CD,OD,ND,OPDU,OKD	TP,PCO,MPC	GBS,PBS,A/MA,T,SH	BTPR,GKR,WBM,AWR,F	ACS	PSDU,PSAU,PSCU,PSALU	SHG
26.	Nadukkudi	GPS(3),PPS(2),GMS	PHSC	TWT,TWU,HP,TW/B,S	CD,OD,ND,OPDU	TP,PCO,MPC	GBS,PBS,A/MA,V	BTPR,GKR,AWR,F	COB,ACS	PSDU,PSAU,PSCU,PSALU	SHG
27.	Nallingaperi	GPS	NA	TWT,TWU,HP,TW/B,S	ND	TP,PCO,MPC	GBS,PBS,A/MA,V	BTPR,GKR,WBM,AWR,F	NA	PSDU,PSAU,PSCU,PSALU	SHG
28.	Pillaiyarkulam	GPS(2),PPS,GMS, GSS	PHSC	TWT, TW/B	OD,ND,OKD	TP,PCO,MPC	GBS,PB	BTPR,GKR,WBM,AWR,F	NA	PSDU,PSAU,PSCU,PSALU	SHG
29.	Reghunathapuram	GPS,PPS,GMS,GSS,GS SS	NA	TWT,TWU,CW,HP,TW/B	CD,OD,ND,OPDU,OKD	TP, MPC	GBS,PBS,A/MA,V	BTPR,GKR,WBM,AWR,F	ACS	PSDU,PSAU,PSCU,PSALU	SHG
30.	Sholapuram	GPS(4),PPS(6),GMS(2),PMS(2),PSS(2)	PHC(2),PHSC(2),M&CWC(2),TBC(2),D(2),VH(2),FWC(2)	TWT,TWU,HP,TW/B	CD,OD,ND,OPDU,OKD	TP,PCO,MPC	GBS,PBS,A/MA,T,V,SH	BTPR,GKR,WBM,AWR,F	CB,ACS	PSDU,PSAU,PSCU,PSALU	SHG
31.	Srivilliputtur	GPS(2),GMS(2),GSS(2),GSSS(2)	PHSC	TWT,TWU,CW,UW, TW/B	CD,OD,ND,OPDU,OKD	TP,PCO,MPC,IC,PCF	GBS,PBS,A/MA,T,V,NH,SH	BTPR,GKR,WBM,AWR,F	COB,ACS	PSDU,PSAU,PSCU,PSALU	SHG

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Lessee: Thiru. K. Sugas (Lease Area: 1.29.0 Ha)

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SN	Villages	Education	Medical	Water	Sanitation	Communication	Transportation	Road	Bank	Power	SHG
32.	Tadagannai Managaseri	GPS(4), GMS,GSS	PHC,PHSC ,M&CWC, TBC,D, FWC	TWT,TWU, TW/B	CD,OD,ND,OP DU,OKD	TP,PCO,MPC	NA	BTPR,GK R,WBM,A WR,F	NA	PSDU,PSA U,PSCU,PS ALU	SHG
33.	Thilakulam	GPS	NA	TWT,TWU, TW/B	CD,OD,ND,OP DU	TP, MPC	GBS,PBS, SH	BTPR,GK R,WBM,A WR,F	NA	PSDU,PSA U,PSCU,PS ALU	NA
34.	Vadagarai	GPS(2), GMS,GSS	PHSC,M& CWC	TWU,TW/B	CD,OD,ND,OP DU,OKD	TP,PCO,MPC	GBS,PBS	BTPR,GK R, AWR,F	COB,A CS	PSDU,PSA U, PSALU	SHG
35.	Vadakkusrivilliputhur	GPS	NA	TWT,TW/B	CD,OD,ND,OP DU,OKD	TP,PCO,MPC,IC ,PCF	GBS,A/MA,T,V,S H	BTPR, AWR,F	CB, COB,A CS	PSDU,PSA U,PSCU,PS ALU	SHG
36.	Varagunaramapuram	GPS(2)	PHSC	TWT,TWU, HP,TW/B	OD,ND,OPDU, OKD	TP,PCO,MPC	GBS,PBS	BTPR, WBM,AWR, F	NA	PSDU,PSA U,PSCU,PS ALU	SHG
37.	Vendurayapuram	GPS(3), GMS	NA	TWT,TWU,C W,UW,HP,TW /B	CD,OD,ND,OP DU	TP, MPC	GBS	BTPR,GK R,WBM,A WR,F	CB,ACS	PSDU,PSA U,PSCU,PS ALU	SHG
38.	Viluppanur	GPS(6),PP S(3),GMS,P MS(2),GSS(2),PSS(2), GSSS(2),PS SS(2), PEC,PASDC	PHSC	TWT,TWU, UW,HP	CD,OD,ND,OP DU,OKD	TP,PCO,MPC	GBS,PBS,A/MA,T ,V,NH	BTPR,GK R,WBM,A WR,F	CB, COB,A CS	PSDU,PSA U,PSCU,PS ALU	SHG

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Abbreviations:

EDUCATION	MEDICAL FACILITY	WATER	TRANSPORTATION	SANITATION	COMMUNICATION
GPS: Govt. Primary School	AH: Allopathic Hospital	TWT: Tap Water Treated	GBS: Govt. Bus Service PBS: Private Bus Service	OD: Open Drainage	MPC: Mobile Phone Coverage
PPS: Private Primary School	PHC: Primary Health Centre	TWU; Tap Water Untreated	A/MA: Auto/Modified Autos	OPDC: Open Pucca Drainage Covered	IP: Internet Cafes / Common Service Centre
GMS: Govt. Middle School	PHSC: Primary Health Sub Centre	CW; Covered Well	V:Van CPR: Cycle-pulled Rickshaws	OPDU: Open Pucca Drainage Uncovered	PCF: Private Courier Facility
PMS: Private Middle School	M&CWC: Maternity And Child Welfare Centre	UW: Uncovered Well	T:Taxi Trc: Tractor	ND: No Drainage	TP: Telephone
GSS: Govt. Secondary 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
PSS: Private Secondary School	D: Dispensary	R/C: River/Canal	ROAD	BANK	POWER
GSS: Govt. Senior Secondary School	VH: Veterinary Hospital	T/P/L: Tank/Pond/Lake	BTTPR: Black Topped pakka Road	CB: Commercial Bank	PSDU: Power Supply for Domestic use
PSS: Private Senior Secondary School	MHC: Mobile Health clinic				
PEC: Private Engineering College	NA: Not Applicable	TWB: Tube Wells/Borehole	GKR: Gravel (kuchha) Road	COB: Co Operative Bank	PSAU: Power Supply Agriculture use
PASDC: Private Arts and Science Degree College	SHG: SELF HELP GROUP	OHT: Over Head Tank	AWR: All Weather Road	ACS: Agriculture Credit Society	PSCU: Power Supply For Commercial Use

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EDUCATION	MEDICAL FACILITY	WATER	TRANSPORTATION	SANITATION	COMMUNICATION
DC: Degree College			F:Foothpath		PSALU: Power Supply For All Users

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3.14.6 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.

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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 either 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, school teachers, 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 Virudhunagar at a distance within 10 km respectively from the project site.
- (b) **Medical Facilities:** In the study area list of villages with Twenty-Four (24) government health services available and Fourteen (14) villages lacking medical facilities Table 3.23 is given in. Hospitals and other better medical facilities were available at Virudhunagar.
- (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.

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- (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 Coconut, sugarcane, paddy banana, turmeric maize, and onion.
- (l) **Language:** The official language of Tamil Nadu is Tamil. The most widely spoken language within the study area is Tamil, English and Hindi.
- (m) **Migration:** During survey it was found that local population were migrating maximum towards the Virudhunagar 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. Virudhunagar 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.

3.14.7 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.

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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 3.27.**

Table 3.27: Summary of Economic Attributes in Study Area

Demographic Parameters	Details
Total Worker	79286 (150.64%)
Marginal Worker	7694(4.91)
Non Worker	71754 (45.83)
Main Worker	71592 (45.73%)
Cultivators	5532 (3.5%)
Agriculture	15738 (10.05%)
Household	1645 (1.05%)
Others	48686 (31.09%)

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

3.14.8 Health Status

Diarrhea / Cholera, Malaria, Cough, 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 respiratory infection in the region.

3.14.9 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.

3.14.10 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.

3.14.11 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.

3.14.12 Basic Amenities

A better network of physical infrastructure facilities (well-built roads, rail links, irrigation, power and telecommunication, information technology, market-network, and social

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infrastructure support, viz. health and education, water and sanitation, veterinary services, and co-operative) is essential for development of the rural economy.

A review of infrastructure facilities available in the area has been given based on field survey. In this study the villages which fall within 10 km radius around the site has been covered. Infrastructure facilities available in the area are presented below.

All basic amenities Education (higher education, colleges, universities, medical college, Transport facilities, Railway station, Bus station area are all available in the district headquarters Virudhunagar).

3.14.13 Recommendation and Suggestion

- Awareness program should be conducted to make the population aware to get education and a better livelihood.
- Health care centre and ambulance facility can be provided to the population to get easy and accessible medical facilities.
- Vocational training programme can be organized to make the people self - employed, particularly for women and unemployed youth.
- Based on 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.

3.14.14 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 ~~shod~~ 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.

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Chapter 4: Anticipated Environmental Impacts and Mitigation Measures

**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 PM₁₀ due to mining and allied activities was predicted using the above-mentioned models and the resultant concentration of PM₁₀ 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 NO_x 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.

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4.3.1.2 Meteorological data

The meteorological data for the monitoring date, i.e., 01/10/2022 to 31/12/2022 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.

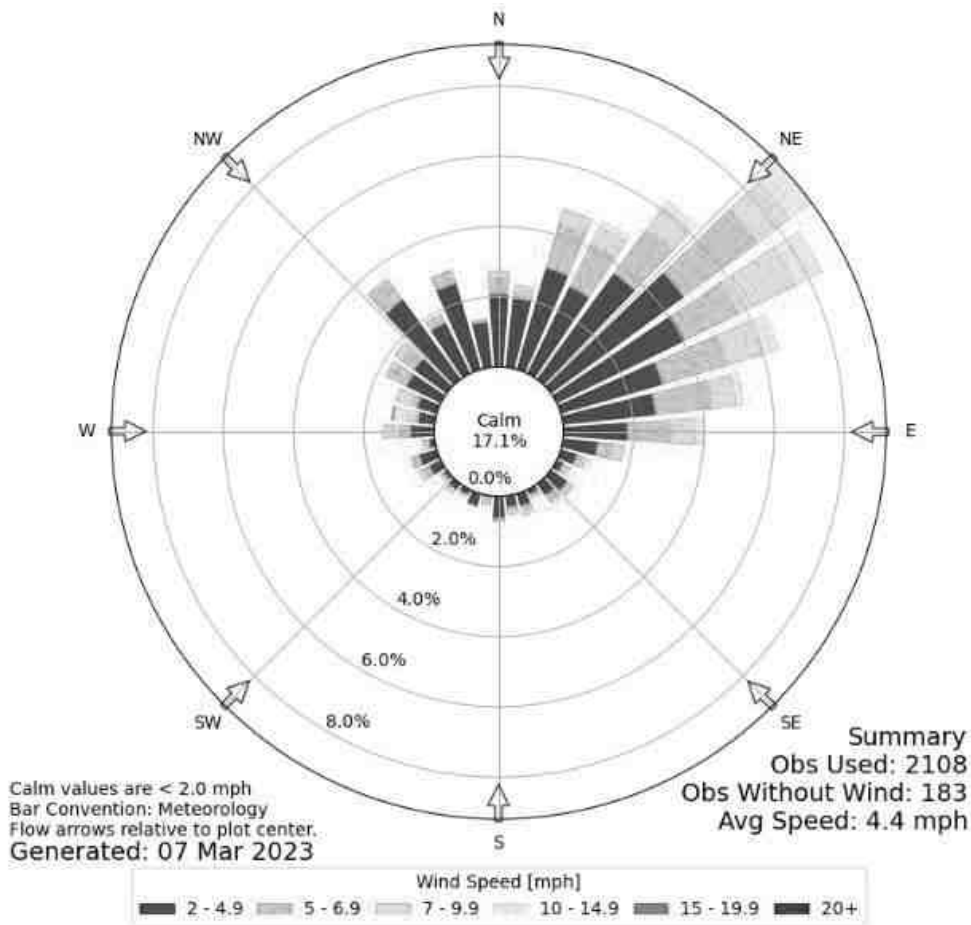


FIGURE 4.1: WINDROSE DIAGRAM OF THE PROJECT SITE OCTOBER 2022 TO DECEMBER 2022

Site weather summary for Oct 2022 -Dec 2022	
Average Temperature (°C)	25.2
Predominant Wind direction from	SW
Relative Humidity (%)	76
Average Wind speed (m/h)	4.4

4.3.1 EMISSION CALCULATIONS FROM MINING AREA

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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, Envitran 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:

$$EF_{PM10} \text{ (kg/hr)} = 0.34 \times S^{1.5}(\%) / M^{1.4}(\%)$$

Where,

EF_{PM10} (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:

$$EF_{PM10} \text{ (kg/hr)} = 0.34 [0.119 / M^{0.9}]$$

Where,

EF_{PM10} (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.

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$$E = k \cdot (1.7)^s \cdot (s/12)^S \cdot (W/2.7)^{0.7} \cdot (w/4)^{0.5} \cdot (365-p/365) \text{ g/VKT}$$

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 4.4** 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 9.8 µg/m³ , 5.3 µg/m³ , 3.8 µg/m³ and 4.5 µg/m³ respectively and has been shown in Table 4.1

TABLE 4.1: MAXIMUM GROUND LEVEL CONCENTRATION

S.No.	Pollutants	Max. GLC observed, (µg/m ³)	Distance and Direction
1	PM ₁₀	9.8	1000, SW
2	PM _{2.5}	5.3	1000, SW
3	SO ₂	3.8	1000, SW
4	NO ₂	4.5	1000, SW

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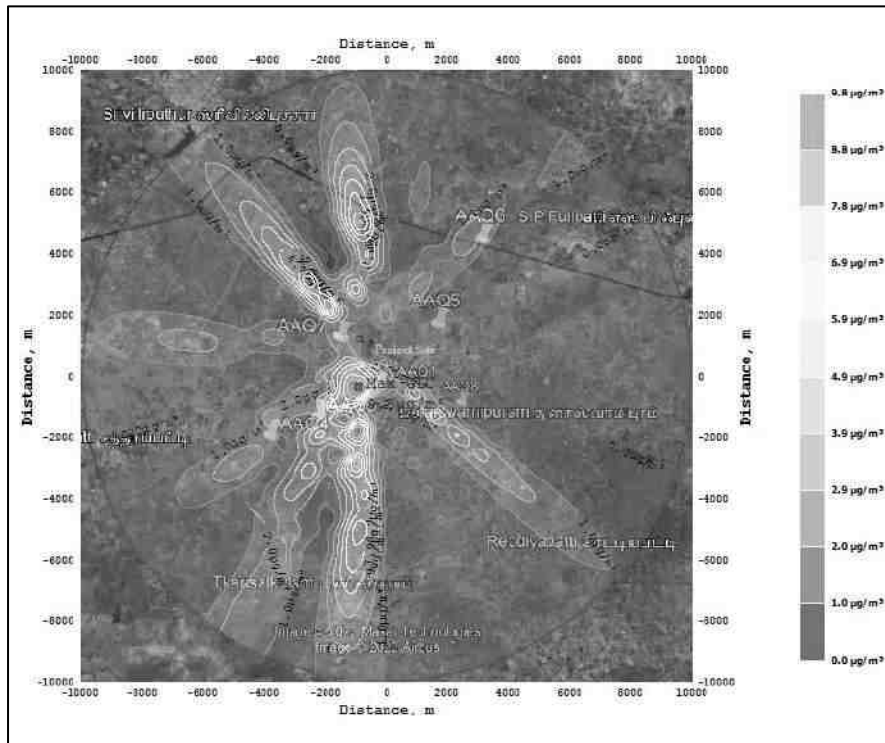


FIGURE 4.2: ISOPLETH OF MAXIMUM PREDICTED 24 HOURLY GROUND – LEVEL CONCENTRATIONS FOR PM10

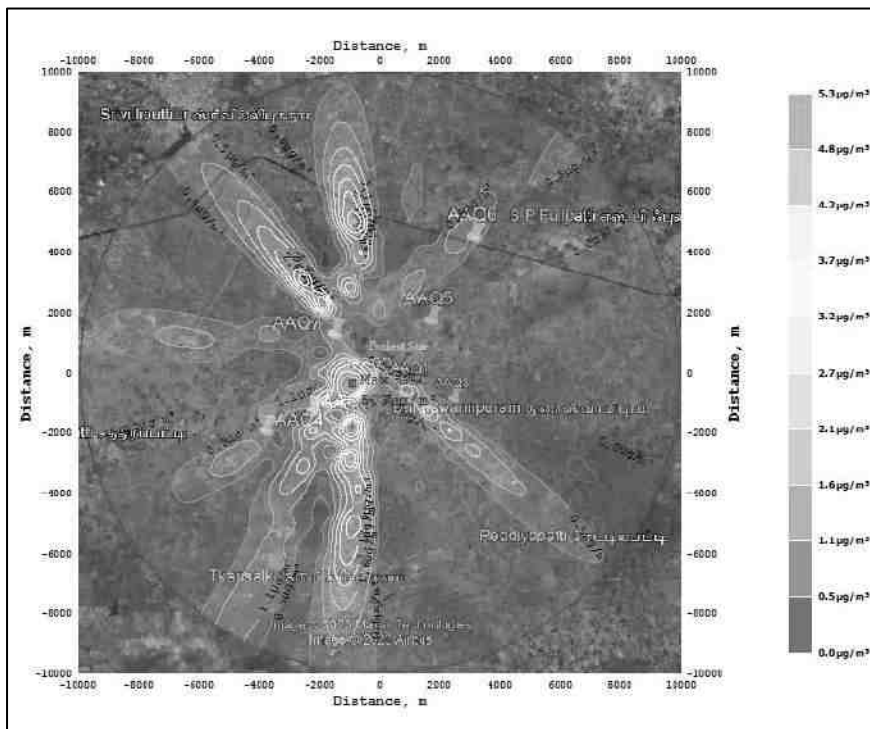


FIGURE 4.3: ISOPLETH OF MAXIMUM PREDICTED 24 HOURLY GROUND – LEVEL CONCENTRATIONS FOR PM 2.5

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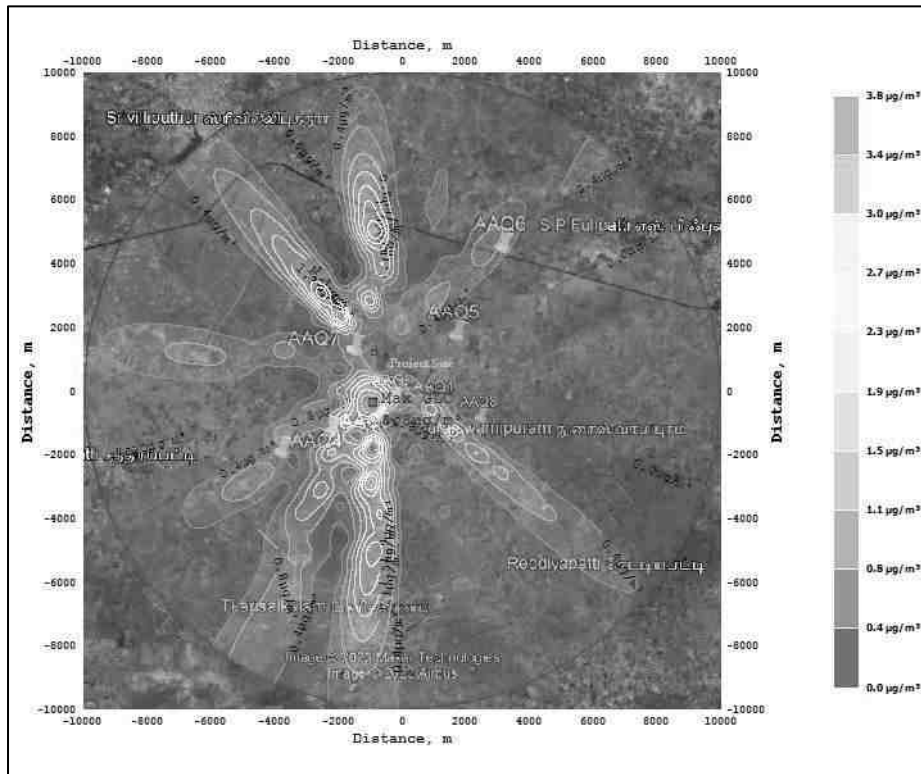


FIGURE 4.4: ISOPLETH OF MAXIMUM PREDICTED 24 HOURLY GROUND – LEVEL CONCENTRATIONS FOR SO₂

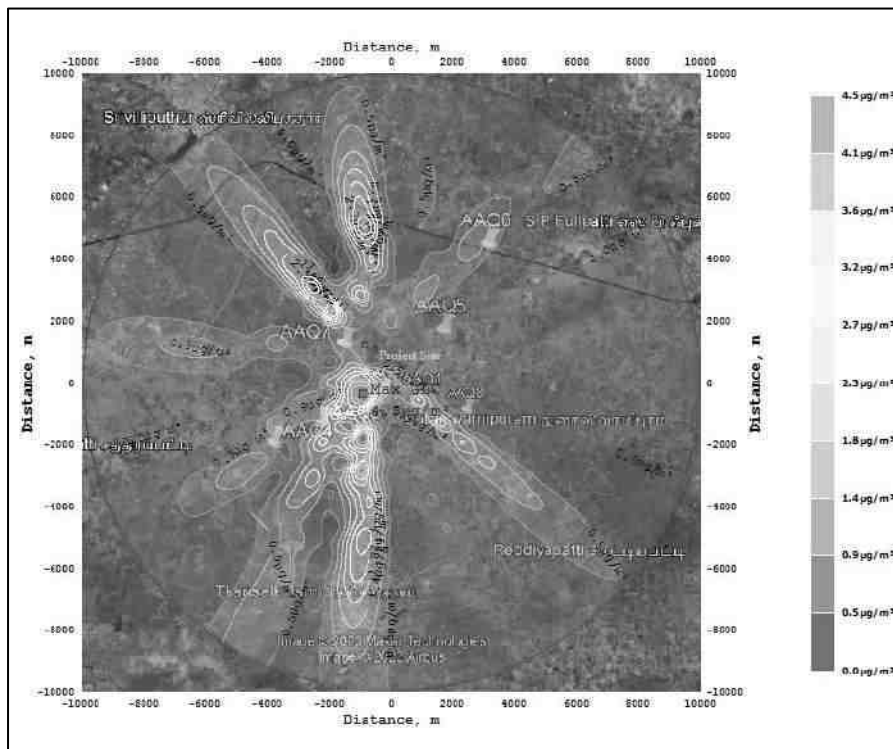


FIGURE 4.5: ISOPLETH OF MAXIMUM PREDICTED 24 HOURLY GROUND – LEVEL CONCENTRATIONS FOR NO₂

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4.3.2 RESULTANT IMPACT

The resultant impact due to construction activities (excavation and crushing) on the ambient air quality for PM₁₀, PM_{2.5}, SO₂ and NO₂ 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/m ³)			PM _{2.5} (µg/m ³)			SO ₂ (µg/m ³)			NO ₂ (µg/m ³)		
		Inc	Max	Total	Inc	Max	Total	Inc	Max	Total	Inc	Max	Total
1	AAQ-1	2	79.14	81.14	1	46.58	47.58	0.5	15.44	15.94	1	33.84	34.84
2	AAQ-2	3.2	71.27	74.47	1.1	40.09	41.19	0.8	18.68	19.48	1.9	32.6	34.5
3	AAQ-3	2	68.53	70.53	1	37.6	38.6	0.8	16.06	16.86	1.9	33.08	34.98
4	AAQ-4	1	67.94	68.94	0.5	37.24	37.74	0.1	16.3	16.4	0.9	35.81	36.71
5	AAQ-5	0	70.91	70.91	0	41.28	41.28	0	17.49	17.49	0	34.5	34.5
6	AAQ-6	1	72.46	73.46	0.5	41.17	41.67	0.4	17.25	17.65	0.5	34.15	34.65
7	AAQ-7	1	72.34	73.34	0.5	41.17	41.67	0.4	13.8	14.2	0.9	32.84	33.74
8	AAQ-8	1	73.63	74.63	0.5	41.93	42.43	0.4	14.1	14.5	0.5	33.45	33.95
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 PM_{2.5}) 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.

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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 has to 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

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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

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Equipment's	Expected Noise Levels dB(A)
Drilling	80-90
Shovel	75-85
Tippers (2)	65-75
Compressor	75-85

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:

Lp₁& Lp₂ are sound levels at points located at distances r₁& r₂ 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.

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

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 4.4 PREDICTED NOISE INCREMENTAL VALUE

Equipment with Highest Noise Level	Location ID	Background Value (Day) dB(A)	Incremental Value dB(A)	Total Predicted dB(A)	Residential Area Standards dB(A)
Drilling 90 dB(A)	N2 Nadukkudi, 0.63 Km	48.4	29.1	48.5	55
Shovel 85 dB(A)		48.4	24.1	48.4	
Tipper 75 dB(A)		48.4	14.1	48.4	
Compressor		48.4	24.1	48.4	

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Equipment with Highest Noise Level	Location ID	Background Value (Day) dB(A)	Incremental Value dB(A)	Total Predicted dB(A)	Residential Area Standards dB(A)
85 dB(A)					
Excavator 102 dB(A)		48.4	41.1	49.1	

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 Nathikudi -0.68 Km - South. The ground vibrations at Nathikudi Village due to the blasting in Rough stone Mines are calculated using the empirical equation: It is proposed to use about 21 Kg /day 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

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TABLE 4.5: ESTIMATED PEAK PARTICLE VELOCITY FOR EXPLOSIVE CHARGE

Distance from blasting site, m	Quantity of Explosive/Blast, Kg	PPV, mm/s
100	21	20.3
150	21	8.5
200	21	3.5
250	21	2.1
300	21	1.5
350	21	1.1
400	21	0.9
450	21	0.7
500	21	0.6
550	21	0.5
600	21	0.5
650	21	0.9
700	21	0.8
750	21	0.7

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

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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.

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- 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 a seasonal stream or nallah flowing 0.9km in S from 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 65m in summer pre monsoon season and 60m 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 will be 22 m.

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.

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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.

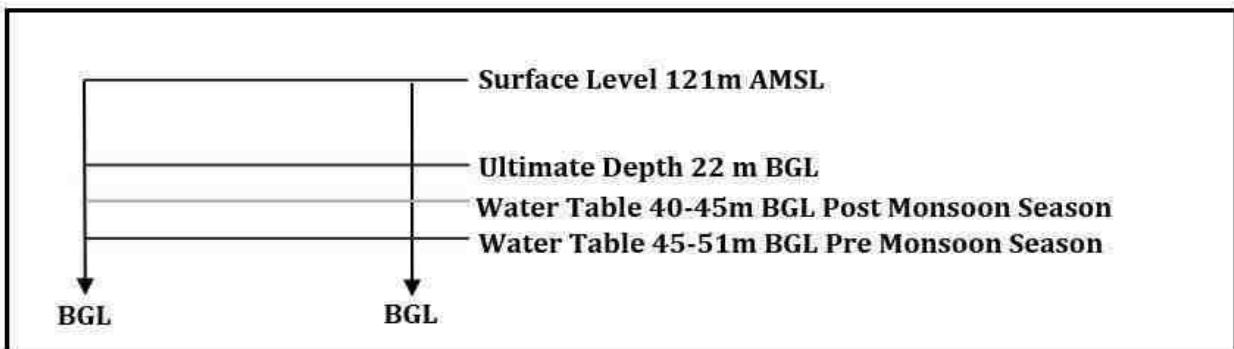


FIGURE 4.6: SCHEMATIC DIAGRAM OF MINE WORKINGS W.R.T. GROUND WATER TABLE

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.

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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 of 20.34.0 Ha. 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 patta Land for which LOI issued by Assistant Director, Department of Geology and Mining, Virudhunagar 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: LAND USE OF LEASE AREA

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Sr. No.	Activity	Area in Ha	
		Present	End of Plan Period (10 Yrs)
	Area under quarrying	Nil	0.82.5
	Infrastructure	Nil	0.01.0
	Roads	Nil	0.02.0
	Green Belt	Nil	0.29.1
	Unutilized Area	1.29.0	0.14.4
Total		1.29.0	1.29.0

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

The overburden is in the form of Gravel formation. 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 The overburden is in the form of Gravel formation. The Gravel will be directly loaded into tippers for the filling and levelling of low lying areas, this will be done only after obtaining permission and paying necessary seigniorage fee to the Government

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

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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 Nathikudi Village~ 0.68 Km S, there will not be any impact on the human settlement in the area. The operation of the Rough stone & Gravel 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 15 nos. of persons 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 Virudhunagar 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 (15 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.

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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
		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

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

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

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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 life saving 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 Nathikudi Village~ 0.68 Km, S 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,

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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

MDR - Sattur - Thiruvencatapuram Road – 2.26 km S direction.

The total production from cluster is **72165** m³ of Rough stone & **15652** m³ 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. 10-11 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 locations at confluence of MDR - Sattur - Thiruvencatapuram Road – 2.26 km S 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 MDR - Sattur - Thiruvencatapuram Road – 2.26 km S 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	
MDR - Sattur - Thiruvencatapuram Road	Sattur	Thiruvencatapuram	2.26 km S 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 4.11** and PCU is calculated in **Table 4.11**. At the end of each hour, fresh counting and recording was undertaken.

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FIGURE 4.7: ROAD CONNECTIVITY MAP WITH FOR TRAFFIC MONITORING
TABLE 4.11: TRAFFIC VOLUME COUNT SURVEY (HOURLY)

Vehicle Distribution	No. of Vehicles/Day		Total Number of Vehicle in PCU/Day		
	Towards Sattur	Towards Thiruvencatapuram	Equivalent Factor	Towards Sattur	Towards Thiruvencatapuram
Two Wheelers	76	78	0.5	38	39
Three Wheelers	28	29	1	28	29
Cars	62	56	1	62	56
Bus	21	22	3	63	66
Tractor	15	18	4	60	72
Trucks	18	22	3	54	66
TOTAL	220	225		305	328

TABLE 4.12: EXISTING TRAFFIC SCENARIO AND LOS

Road	Total (Volume PCU/Hour)	V in	C (Capacity in PCU/Hour.)	Existing V/C Ratio	LOS
Nachipalayam Road	633		1200	0.53	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

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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

Maximum Production of Mine in plan period	87,817 m ³ 72,165 m ³ Rough Stone 15,652 m ³ Gravel
Average Production per year	17,563.4
No. of working days	300 per year
Extraction and Transportation of mineral	58.55/day
Working hours per day	8
Dumpers Capacity	16m ³
Frequency of trucks/Dumpers deployed/day	4 trips per day approx..
PCU for per Dumper is 3 Hence Increased PCU will	12

TABLE 4.13: MODIFIED TRAFFIC SCENARIO AND LOS

Road	Increased Volume in PCU/Hour	Volume (V)	Capacity (C)	Modified V/C Ratio	LOS
Nachipalayam Road	12	633+12=645	1200	0.54	C

Not much impact on local transport. The LOS value from the proposed mining project will not change; the performance will be 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.

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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.

STUDY OF IMPACT ON AGRICULTURE

- Mining pits, poor rehabilitation and mining have caused a loss of agricultural land resulting in reduced crop yields and poor living standards.
- Dust & smoke from equipment can affect on agriculture productivity.
- Dust from mining activities & blasting can also affect on crops of nearby area.
- 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.

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

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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

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Lessee: Thiru. K. Sujan (Lease Area: 1.29.0 Ha)

Chapter 4: Anticipated Environmental Impacts and Mitigation Measures

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	No. of tress proposed to be planted	Survival %	Area to be covered sq.m.	Name of the species	No. of trees expected to be grown
I	700	80%	2910	Neem, Pongamia Pinnata, Casuarina, etc.,	560

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.	<i>Aegle marmelos</i>	Bael	Pollution Tolerant Plants Automobile
2.	<i>Albizia lebbeck</i>	Shirish ke phool	
3.	<i>Butea frondosa</i>	Palash	
4.	<i>Alstonia scholaris</i>	Saptaparna	Best dust filtering capacity Plants
5.	<i>Ailanthus excelsa</i>	Adu Ghoda Neem	
6.	<i>Ficus benghalensis</i>	Banyan	
7.	<i>Ficus religiosa</i>	Peepal	
8.	<i>Cassia fistula</i>	Amalatas	Exhaust pollution Control Plants
9.	<i>Delonix regia</i>	Gulmohar	
10.	<i>Phyllanthus emblica</i>	Amla	Medicinal value Plants
11.	<i>Terminalia cattapa</i>	Jungali Badam	
12.	<i>Azadiracta indica</i>	Neem	
13.	<i>Tectona grandis</i>	Sagwan	Economic value Plants
14.	<i>Pongamia pinnata</i>	Karanj	
15.	<i>Shorea robusta</i>	Sal	
16.	<i>Cymbopagon martini</i>	Gandhabel	Soil Conservation Plants
17.	<i>Ziziphus jujube</i>	Bada Bare	Fruit bearing Plants
18.	<i>Psidium guava</i>	Amrud	
19.	<i>Syzygium cumini</i>	Jamun	
20.	<i>Mangifera indica</i>	Mango	
21.	<i>Dalbergiasisso</i>	Seesam	Nitrogen Assimilation Plants

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Lessee: Thiru. K. Sujan (Lease Area: 1.29.0 Ha)

Chapter 4: Anticipated Environmental Impacts and Mitigation Measures

Sr. No.	Plant species	Common Hindi Name	Purpose of plantation of species
22.	<i>Cassia siamea</i>	Kassod	
23.	<i>Polyalthia longifolia</i>	Devdaru	Aesthetic beautification Plants

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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.

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Chapter 6: Environmental Monitoring Programme

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**.

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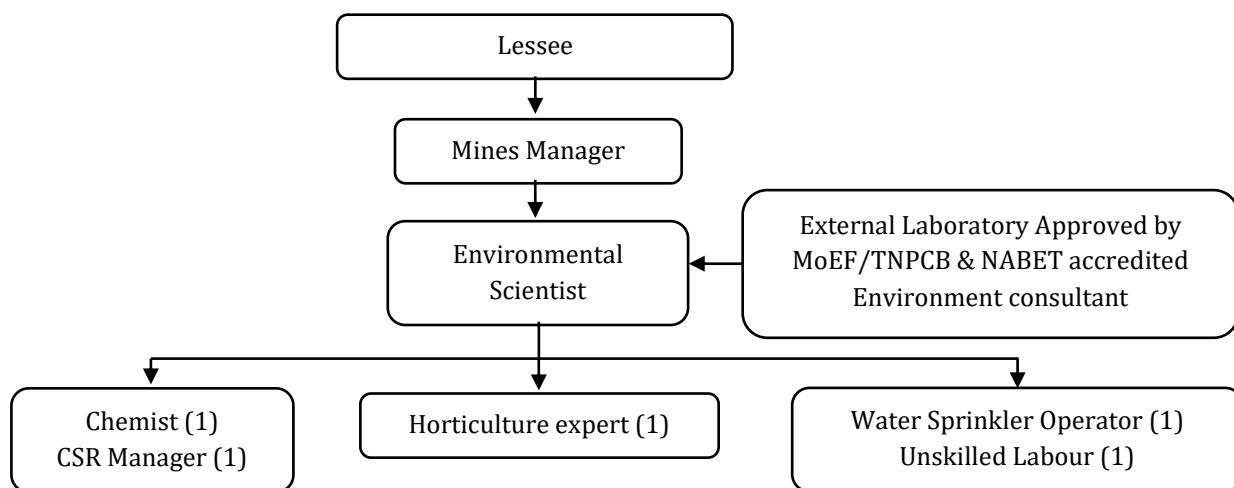


FIGURE 6.1: ORGANIZATION CHART OF ENVIRONMENTAL MANAGEMENT CELL (EMC)

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

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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.

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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 eight 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 .

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S. No.	Environment Attributes	Location	Monitoring		Parameters
			Duration	Frequency	
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 VI**.

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

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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

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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.

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- 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

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Chapter 7: Additional Studies

CHAPTER 7: ADDITIONAL STUDIES

7.1 PUBLIC CONSULTATION

Draft EIA/EMP for Proposed Rough stone Mine in an area of 1.29.0 Ha, located in Survey Nos. S.F.No. 902/1, 903/1, Nathikudi Village, Vembakkottai Taluk, Virudhunagar 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;

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- 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

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 sequelae 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).

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- 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 (37.3°C or extra) want to live at home. They must additionally stay home (or earn a living from home) if 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 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 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, SpO₂ < 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

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- The plan must deal with a way to preserve your commercial enterprise running although a 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.

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- 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

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(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 centres
 - 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.

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- 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

TABLE 7.1: Cluster Details

Code	Name of the lessee	S.F.Nos	Extent Area (Ha)	Period of lease
Proposed				
P1.	Thiru. K. Sukan	Nathikudi, Vembakottai	902/1, 903/1 (1.29.0)	KV1/485/2019. 18.09.2021.
P2	S.Soundararajan	Nathikudi, Vembakottai	915/3, 916/4B, 916/4C2, 916/7B (2.88.0)	KV1/726/2021, 20.09.2021
P3	Ranjith Blue Metals	Nathikudi, Vembakottai	968/5, 969, 971/2 (2.72.0)	KV1/130/2021 15.02.2021
Existing				
E1.	G.Guruvammal	Nathikudi, Vembakottai	903/2 (1.35.0)	KV1/705/2012, dated: 04.08.2017 23.08.2017 to 22.08.2022

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Code	Name of the lessee	S.F.Nos	Extent Area (Ha)	Period of lease
E2	M/s.Ranjith Blue Metals	Nathikudi, Vembakottai	899/1B2, 901/2A, 901/1A2A (1.60.0)	KV1/738/2017, dated: 27.03.2018 02.04.2018 to 01.04.2023
E3	P.Jeyaraman	Nathikudi, Vembakottai	916/4C1, 916/7A, 920/1A1, 920/1A3 (2.97.50)	KV1/424/2018 dated: 29.01.2019 01.02 2019 to 31.01.2024
E4	S.Soundararajan	Nathikudi, Vembakottai	922/2, 922/3, 922/4 (2.92.0)	KV1/10050/2017. Dated:10.06.2019 18.10.2019 to 17.10.2024
E5	R.Vishnuprasath	Nathikudi, Vembakottai	886/10, 886/1A1, 886/4 (3.47.0)	KV1/825/2017 dated: 01.02.2019 08.02.2019 to 07.02.2024
Abandoned				
A1	M.Pandi	Nathikudi, Vembakottai	924 (0.53.5)	KV1/1525/2010, dated: 12.01.2011 25.01.2011 to 24.01.2016
A2	L.Gayathri	Nathikudi, Vembakottai	919/2B (0.60.0)	KV1/794/2012, dated: 12.09.2013 23.09.2013 to 22.09.2018
Total Extent			20.34.0	

TABLE 7.2: SALIENT FEATURES OF PROPOSAL "P1"

Name of the Mine	Thiru. K. Sukan	
Survey Nos	S.F.No. 902/1, 903/1	
Land Type	Patta land	
Extent	1.29.0 Ha	
Mining Plan Period / Lease Period	5Years/5Years	
Ultimate Pit Dimension	118 m (L) x 82m (W) x 22m (D) BGL	
Latitude between	09°25'58.57"N to 09°26'05.73"N	
Longitude between	77°41'05.80"E to 77°41'10.25"E	
Highest Elevation	121 m	
Machinery Proposed	Jack Hammer	2
	Compressor	1

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	Excavator bucket & Rock breaker attached	1
	Tippers (20 tonnes Capacity)	1
Proposed Blasting Method	Controlled Blasting Method	
Manpower Proposed	15 Nos	
Total Project Cost	Rs.80,29,000/-	

Source: Approved Mining Plan

TABLE 7.3 SALIENT FEATURES OF PROPOSAL “P2”

Name of the Mine	S.Soundararajan
Survey Nos	915/3, 916/4B, 916/4C2, 916/7B
Land Type	Patta Land
Extent	2.88.0 ha

TABLE 7.4: SALIENT FEATURES OF PROPOSAL “P3”

Name of the Mine	Ranjith Blue Metals
Survey Nos	968/5, 969, 971/2
Land Type	It is a Patta land
Extent	2.72.0 ha

TABLE 7.5: SALIENT FEATURES OF PROPOSAL “E1”

Name of the Mine	G.Guruvammal
Survey Nos	903/2
Land Type	Patta Land
Extent	1.35.0 ha
Rough stone Quantity	19374.25 m ³
Gravel Quantity	--

TABLE 7.6: SALIENT FEATURES OF PROPOSAL “E2”

Name of the Mine	M/s. Ranjith Blue Metals
Survey Nos	899/1B2, 901/2A. 901/1A2A
Land Type	Patta Land
Extent	1.60.0 ha
Rough stone Quantity	125303 m ³
Gravel Quantity	16934 m ³

TABLE 7.7: SALIENT FEATURES OF PROPOSAL “E3”

Name of the Mine	P.Jeyaraman
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Survey Nos	916/4C1, 916/7A 920/1A1, 920/1A3
Land Type	Patta Land
Extent	2.97.50 ha
Rough stone Quantity	290900 m ³
Gravel Quantity	51990 m ³

TABLE 7.8: SALIENT FEATURES OF PROPOSAL "E4"

Name of the Mine	S.Soundararajan
Survey Nos	922/2, 922/3, 922/4
Land Type	Patta Land
Extent	2.92.0 ha
Rough stone Quantity	197250 m ³
Gravel Quantity	72450 m ³

TABLE 7.9: SALIENT FEATURES OF PROPOSAL "E5"

Name of the Mine	R.Vishnuprasath
Survey Nos	886/10, 886/1A1, 886/4
Land Type	Patta Land
Extent	3.47.0 ha
Rough stone Quantity	124785 m ³
Gravel Quantity	112948 m ³

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 7.10: PREDICTED AIR INCREMENTAL VALUE

S.No.	Locations	PM ₁₀ (µg/m ³)			PM _{2.5} (µg/m ³)			SO ₂ (µg/m ³)			NO ₂ (µg/m ³)		
		Inc	Max	Total	Inc	Max	Total	Inc	Max	Total	Inc	Max	Total
1	AAQ-1	2	79.14	81.14	1	46.58	47.58	0.5	15.44	15.94	1	33.84	34.84
2	AAQ-2	3.2	71.27	74.47	1.1	40.09	41.19	0.8	18.68	19.48	1.9	32.6	34.5
3	AAQ-3	2	68.53	70.53	1	37.6	38.6	0.8	16.06	16.86	1.9	33.08	34.98
4	AAQ-4	1	67.94	68.94	0.5	37.24	37.74	0.1	16.3	16.4	0.9	35.81	36.71
5	AAQ-5	0	70.91	70.91	0	41.28	41.28	0	17.49	17.49	0	34.5	34.5

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6	AAQ-6	1	72.46	73.46	0.5	41.17	41.67	0.4	17.25	17.65	0.5	34.15	34.65
7	AAQ-7	1	72.34	73.34	0.5	41.17	41.67	0.4	13.8	14.2	0.9	32.84	33.74
8	AAQ-8	1	73.63	74.63	0.5	41.93	42.43	0.4	14.1	14.5	0.5	33.45	33.95
NAAQS ($\mu\text{g}/\text{m}^3$)			100		60		80		80				

TABLE 7.11: MAXIMUM GROUND LEVEL CONCENTRATION

Pollutants	Max. GLC observed, ($\mu\text{g}/\text{m}^3$)	Distance and Direction
PM ₁₀	9.8	1000, SW
PM _{2.5}	5.3	1000, SW
SO ₂	3.8	1000, SW
NO ₂	4.5	1000, SW

TABLE 7.12: PREDICTED NOISE INCREMENTAL VALUE

Equipment with Highest Noise Level	Location ID	Background Value (Day) dB(A)	Incremental Value dB(A)	Total Predicted dB(A)	Residential Area Standards dB(A)
Drilling 90 dB(A)	N2 Nadukkudi, 0.63 Km	48.4	29.1	48.5	55
Shovel 85 dB(A)		48.4	24.1	48.4	
Tipper 75 dB(A)		48.4	14.1	48.4	
Compressor 85 dB(A)		48.4	24.1	48.4	
Excavator 102 dB(A)		48.4	41.1	49.1	

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 7.13: ESTIMATED PEAK PARTICLE VELOCITY FOR EXPLOSIVE CHARGE FROM PROPOSED MINES

Distance from blasting site, m	Quantity of Explosive/Blast, Kg	PPV, mm/s
100	21	20.3
150	21	8.5
200	21	3.5

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Distance from blasting site, m	Quantity of Explosive/Blast, Kg	PPV, mm/s
250	21	2.1
300	21	1.5
350	21	1.1
400	21	0.9
450	21	0.7
500	21	0.6
550	21	0.5
600	21	0.5
650	21	0.9
700	21	0.8
750	21	0.7

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

The nearest habitation from cluster is Nathikudi -0.68m - South. 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 7.14: SOCIO ECONOMIC BENEFITS

	Project Cost in Rs.	CER @ 2% in Rs.
P1	80,29,000	5,00,000

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 is Rs. 5,00,000/-.

TABLE 7.15: EMPLOYMENT BENEFITS

	Direct Employment	Indirect Employment
P1	15	40

Greenbelt Development -

TABLE 7.16: GREENBELT DEVELOPMENT BENEFITS FROM 3MINES

CODE	No of Trees proposed to be planted	Survival %	Area Covered Sq.m	Name of the Species	No. of Trees expected to be grown
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P1	700	80%	2910	Neem, Pungan, Casuarinas and other regional trees	560
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Based on the Proposed Mining Plans its anticipated that there shall growth of native species of Neem, Casuarina, Pungan etc in the Cluster at a rate of 700 Trees Planted over a period of 5 Years with Survival Rate of 80% and expected growth is around 560 Trees over an area of 2910 Sq.m.

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CHAPTER 8: PROJECT BENEFITS

8.1 NEED BASED ASSESSMENT

Socio-economic survey conducted in the villages located within 10 km radius of the Rough stone Mine area 1.29.0 Ha, located in S.F.No. 902/1, 903/1, Nathikudi Village, Vembakkottai Taluk, Virudhunagar District, Tamil Nadu, brings out that 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 15 nos. 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.

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Chapter 8: Project Benefits

TABLE 8.1: CER COST

Project Cost in Rs.	CER in Rs.
80,29,000	5,00,000/-

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.

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Chapter 9: Environmental Cost Benefit Analysis

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.

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Chapter 10: Environmental Management Plan (EMP)

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.

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Chapter 10: Environmental Management Plan (EMP)

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

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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

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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 65m in summer season and 60m 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

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Lessee: Thiru. K. Sujan (Lease Area: 1.29.0 Ha)

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recharging ground water table of the area. The cluster has potential to harvest rain water to the tune of about 2575 m³/annum 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 area of 0.29.1 Ha.

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

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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**

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TABLE 10.1: BUDGET FOR IMPLEMENTATION OF EMP

	Mitigation Measure	Provision for Implementation	Capital	Recurring
Air Environment	Compaction, gradation and drainage on both sides for Haulage Road	Rental Dozer & drainage construction on haul road @ Rs. 10,000/- per hectare; and yearly maintenance @ Rs. 10,000/- per hectare	12900	12900
	Fixed Water Sprinkling Arrangements + Water sprinkling by own water tankers	Fixed Sprinkler Installation and New Water Tanker Cost for Capital; and Water Sprinkling (thrice a day) Cost for recurring	200000	25000
	Air Quality will be regularly monitored as per norms within ML area & nearby Reserve forest with necessary permission	Yearly Compliance as per CPCB norms	0	20000
	Muffle blasting - To control fly rocks during blasting	Blasting face will be covered with sand bags / steel mesh / old tyres / used conveyor belts	0	0
	Wet drilling procedure / latest eco-friendly drill machine with separate dust extractor unit	Dust extractor @ Rs. 25,000/- per unit deployed as capital & @ Rs. 2500 per unit recurring cost for maintenance	25000	2500
	No overloading of trucks/tippers/tractors	Manual Monitoring through Security guard	0	5000
	Stone carrying trucks will be covered by tarpaulin	Monitoring if trucks will be covered by tarpaulin	0	10000
	Enforcing speed limits of 20 km/hr within ML area	Installation of Speed Governors @ Rs. 5000/- per Tipper/Dumper deployed	5000	0

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	Regular monitoring of exhaust fumes as per RTO norms	Monitoring of Exhaust Fumes by Manual Labour	0	5000
	Regular sweeping and maintenance of approach roads for at least about 200 m from ML Area	Provision for 2 labours @ Rs.10,000/labour (Contractual) per Hectare	0	12900
	Installing wheel wash system near gate of quarry	Installation + Maintenance + Supervision	40000	10000
Noise Environment	Source of noise will be during operation of transportation vehicles, HEMM for this proper maintenance will be done at regular intervals.	Provision made in Operating Cost	0	0
	Oiling & greasing of Transport vehicles and HEMM at regular interval will be done	Provision made in Operating Cost	0	0
	Adequate silencers will be provided in all the diesel engines of vehicles.	Provision made in Operating Cost	0	0
	It will be ensured that all transportation vehicles carry a fitness certificate.	Provision made in Operating Cost	0	0
	Safety tools and implements that are required will be kept adequately near blasting site at the time of charging.	Provision made in OHS part	0	0
	Line Drilling all along the boundary to reduce the PPV from blasting activity and implementing controlled blasting.	Provision made in Operating Cost	0	0
	Proper warning system before blasting will be adopted and clearance of the area before blasting will be ensured.	Blowing Whistle by Mining Mate / Blaster / Compentent Person	0	0
	Provision for Portable blaster shed	Installation of Portable blasting shelter	50000	2000

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	NONEL Blasting will be practiced to control Ground vibration and fly rocks	Rs. 30/- per 6 Tonnes of Blasted Material	0	360825
Water Environment	Water management	Provision for garland drain @ Rs. 10,000/- per Hectare with maintenance of Rs. 5,000/- per annum	12900	5000
Waste Management	Waste management (Spent Oil, Grease etc.,)	Provision for domestic waste collection and disposal through authorized agency	1000	5000
		Installation of dust bins	5000	2000
	Bio toilets will be made available outside mine lease on the land of owner itself	Provision made in Operating Cost	0	0
Implementation of EC, Mining Plan & DGMS Condition	Size 6' X 5' with blue background and white letters as mentioned in MoM Appendix II by the SEAC TN	Fixed Display Board at the Quarry Entrance as permanent structure mentioning Environmental Conditions	7000	1000
	Workers will be provided with Personal Protective Equipment's	Provision of PPE @ Rs. 4000/- per employee with recurring based on wear and tear (say, @ Rs. 1000/- per employee)	60000	15000
	Health check up for workers will be provisioned	IME & PME Health check up @ Rs. 1000/- per employee	0	15000
	First aid facility will be provided	Provision of 2 Kits per Hectare @ Rs. 2000/-	0	2580
	Mine will have safety precaution signages, boards.	Provision for signages and boards made	10000	2000

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	Barbed Wire Fencing to quarry area will be provisioned.	Per Hectare fencing Cost @ Rs. 2,00,000/- with Maintenance of Rs 10,000/- per annum	200000	10000
	No parking will be provided on the transport routes. Separate provision on the south side of the hill will be made for vehicles /HEMMs. Flaggers will be deployed for traffic management	Parking area with shelter and flags @ Rs. 50,000/- per hectare project and Rs. 10,000/- as maintenance cost	64500	10000
	Installation of CCTV cameras in the mines and mine entrance	Camera 4 Nos, DVR, Monitor with internet facility	2000	5000
	Implementation as per Mining Plan and ensure safe quarry working	Mines Manager (1 st Class / 2 nd Class / Mine Foreman) under regulation 34 / 34 (6) of MMR, 1961 and Mining Mate under regulation 116 of MMR,1961 @ 40,000/- for Manager & @ 25,000/- for Foreman / Mate	0	360000
Green Belt Development	Green belt development - 500 trees per one hectare (200 Inside Lease Area & 300 Outside Lease Area)	Site clearance, preparation of land, digging of pits / trenches, soil amendments, transplantation of saplings @ 200 per plant (capital) for plantation inside the lease area and @ 30 per plant maintenance (recurring)	51600	7740
		Avenue Plantation @ 300 per plant (capital) for plantation outside the lease area and @ 30 per plant maintenance (recurring)	116100	11610

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EMP for 5 Years					
Year 1	Year 2	Year 3	Year 4	Year 5	Total
Rs. 1781055	Rs. 963958	Rs. 1012156	Rs. 1062763	Rs. 1115902	Rs. 59,00,000

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.

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Chapter 11: Summary & Conclusion

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 Nathikudi Rough Stone Quarries Cluster consisting of 3 Proposed and 5 Existing Quarry with total extent of Cluster of 20.34.0 Ha in Nathikudi Village, Vembakottai Taluk, Virudhunagar 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.8987/ ToR-1131/2022, dated 25.03.2022.

The Baseline Monitoring study has been carried out during the period of October 2022 to December 2022 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 PROJECT PROPONENT

Name of the Project	Thiru. K. Sukan Rough stone and Gravel quarry
S.F. No.	S.F.No. 902/1, 903/1,
Extent	1.29.0 Ha
Land Type	Patta Land
Village Taluk and District	Nathikudi Village, Vembakottai Taluk, Virudhunagar District, Tamil Nadu.

TABLE 11.2: QUARRY DETAILS WITHIN 500 M RADIUS

Code	Name of the lessee	S.F.Nos	Extent Area (Ha)	Period of lease
Proposed				
P1.	Thiru. K. Sukan	Nathikudi, Vembakotta i	902/1, 903/1 (1.29.0)	KV1/485/2019. 18.09.2021.

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Code	Name of the lessee	S.F.Nos	Extent Area (Ha)	Period of lease
P2	S.Soundararajan	Nathikudi, Vembakottai	915/3, 916/4B, 916/4C2, 916/7B (2.88.0)	KV1/726/2021, 20.09.2021
P3	Ranjith Blue Metals	Nathikudi, Vembakottai	968/5, 969, 971/2 (2.72.0)	KV1/130/2021 15.02.2021
Existing				
E1.	G.Guruvammal	Nathikudi, Vembakottai	903/2 (1.35.0)	KV1/705/2012, dated: 04.08.2017 23.08.2017 to 22.08.2022
E2	M/s.Ranjith Blue Metals	Nathikudi, Vembakottai	899/1B2, 901/2A, 901/1A2A (1.60.0)	KV1/738/2017, dated: 27.03.2018 02.04.2018 to 01.04.2023
E3	P.Jeyaraman	Nathikudi, Vembakottai	916/4C1, 916/7A, 920/1A1, 920/1A3 (2.97.50)	KV1/424/2018 dated: 29.01.2019 01.02 2019 to 31.01.2024
E4	S.Soundararajan	Nathikudi, Vembakottai	922/2, 922/3, 922/4 (2.92.0)	KV1/10050/2017. Dated:10.06.2019 18.10.2019 to 17.10.2024
E5	R.Vishnuprasath	Nathikudi, Vembakottai	886/10, 886/1A1, 886/4 (3.47.0)	KV1/825/2017 dated: 01.02.2019 08.02.2019 to 07.02.2024
Abandoned				
A1	M.Pandi	Nathikudi, Vembakottai	924 (0.53.5)	KV1/1525/2010, dated: 12.01.2011 25.01.2011 to 24.01.2016
A2	L.Gayathri	Nathikudi, Vembakottai	919/2B (0.60.0)	KV1/794/2012, dated: 12.09.2013 23.09.2013 to 22.09.2018
Total Extent			20.34.0	

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TABLE 11.3: SALIENT FEATURES OF THE PROPOSAL

S. No.	Particulars	Details		
1.	Type of Project	Nathikudi Rough stone and Gravel quarry project		
2.	Mine area applied	1.29.0 Ha		
3.	Project Location	S.F.No. 902/1, 903/1 Nathikudi Village, Vembakottai Taluk, Virudhunagar District, Tamil Nadu.		
4.	Mine Location on WGS 1984 datum	Latitude	Longitude	
		09°25'58.57"N to 09°26'05.73"N	77°41'05.80"E to 77°41'10.25"E	
5.	Topo sheet Number	58 - G/11		
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 flat terrain. The area has gentle sloping towards North eastern side and altitude of the area is 121m above from Mean sea level. The land is not fit for vegetation/ Cultivation. The area is dry barren land.		
8.	Site elevation above Mean Sea Level	121 m (Max)		
9.	Reserves	Description	Rough stone	Gravel in m³
		Geological Reserves	2,58,000 m ³	25,800 m ³
		Mineable	72,165 m ³	15,652 m ³
		Five years plan period As in the approved mining plan	72,165 m ³	15,652 m ³
10.	Lease period	5 years		
11.	Proposed depth of Mining	The ultimate depth of mining is about 22m (2m Gravel + 20m Rough stone)		
12.	Existing Pit Dimension	Nil		
13.	Ultimate Pit Dimension	118 m (L) x 82m (W) x 22m (D) BGL		

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S. No.	Particulars	Details		
14.	Land Use Pattern	Land use pattern Quarry Pits -20% Trees/Agri land - 20% Habitation - 30% Tank & Odai - 20% Roads - 10%		
15.	Climatic Conditions	Rainfall - 820mm/annum • Temperature - 42°C - 23°C		
16.	Ground water level	The Ground water is about 65m - 60m depth below Ground level.		
17.	Seismic zone	Seismically, this area is categorized under Zone-III as per IS-1893 (Part-1)-2002. Hence, seismically the site is High Damage Risk Zone. With MSK scale of VII.		
18.	Nearest State/National Highway	The Nearest National Highway (NH - 744) Kollam - Madurai Road is situated about 9.72 km on the Northwestern side of the lease applied area. The State Highway (SH-183) Sivakasi - Alangulam Road is about 5.4km on the Southeastern side of the lease applied area		
19.	Nearest Railway Station	Srivilliputtur -8.21km - Northwest		
20.	Nearest Air Port	Madurai Airport - 62.86km - Northeast		
21.	Nearest village/major town	Nathikudi :0.68 Km - South		
22.	Nearest Town, city, District Headquarters along with distance in kms.	Virudhunagar : 33.32 Km, Northeast Direction Vembakottai : 14.17 Km, SE Direction		
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	Water bodies	Distance (Km)	Direction
		Red lake	0.63	SE

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S. No.	Particulars	Details		
		Kayalkudi River	0.9	S
		Mamsapuram Pond 2	2.44	SE
		Idayankulam Lake	3.21	SE
		Mamsapuram Pond 1	2.96	SE
		Ettakapatti lake	8.66	SE
		Periyakulam Kanmai	9.97	NW
		Madavaarkulam Temple Pond	9.86	NW
		Sengulam Kanmai	9.86	NW
27.	Reserve Forest within 10Km Radius	Reserve Forest	Distance (Km)	Direction
		Mottamalai R.F.	9.75	NW
28.	Nearest Hospital	Government Primary Health Center – Maraneri – 6.68 km, E		
29.	Details of other quarries for a radius of 500m around the quarry site	The details of the quarries located within the radius of 500m from the proposed project site. Abandoned quarries – 2 Nos (1.13.5Ha) Existing quarries – 5 Nos (12.31.5Ha) Proposed quarry – 3 Nos (6.89.0Ha) the total extent of the existing and proposed quarry within the radius of 500m is 20.34.0 Ha		
30.	Man power	Total Employees proposed for the quarry operation is 15Nos.		
31.	Water requirement & source	Total water requirement for 2.0KLD from water vendors & nearby Bore well.		
32.	Overburden /Waste	The overburden in the form of Gravel is 15,652m³ up to depth for 2m for during this period		
33.	Cost of the project	Project cost = Rs. 80,29,000/-		

11.1.1 STATUTORY DETAILS

PROPOSAL -P1

- The lessee has applied for Rough Stone Quarry Lease Dated: 21.10.2019
- Precise Area Communication Letter was issued by the Assistant Director, Geology and Mining, Virudhunagar District, Rc.No. KV1/485/2019-Mines, Dated: 18.09.2021.

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- The Mining Plan was prepared by Recognized Qualified Person and approved by Assistant Director, Geology and Mining, Virudhunagar District, Rc.No. KV1/485/2019, Dated: 19.11.2021.
- 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/71875/2022 and ToR was granted by SEAC with letter no. SEIAA-TN/F.No.8987/ToR-1131/2022, dated 25.03.2022.

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

Nearest Roadway	The Nearest National Highway (NH - 744) Kollam – Madurai Road is situated about 9.72 km on the Northwestern side of the lease applied area. The State Highway (SH-183) Sivakasi - Alangulam Road is about 5.4km on the Southeastern side of the lease applied area
Nearest Village	Nathikudi :0.68 Km - South
Nearest Town	Virudhunagar : 33.32 Km, Northeast Direction Vembakottai : 14.17 Km, SE Direction
Nearest Railway	Srivilliputtur -8.21km – Northwest
Nearest Airport	Madurai Airport – 62.86km – Northeast

TABLE 11.5: LAND USE PATTERN OF THE LEASE APPLIED AREA

S. No.	Description	Present area (Ha)	Area at the end of this quarrying period (Ha)
1.	Area under quarrying	Nil	0.82.5

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S. No.	Description	Present area (Ha)	Area at the end of this quarrying period (Ha)
2.	Infrastructure	Nil	0.01.0
3.	Roads	Nil	0.02.0
4.	Green Belt	Nil	0.29.1
5.	Unutilized Area	1.29.0	0.14.4
Total		1.29.0	1.29.0

TABLE 11.6: OPERATIONAL DETAILS OF LEASE APPLIED AREA

PARTICULARS	DETAILS	
	Rough stone in m ³	Gravel in m ³
Geological Resources	2,58,000 m ³	25,800 m ³
Available Mineable reserves	72,165 m ³	15,652 m ³
Five years plan period As in the approved mining plan	72,165 m ³	15,652 m ³
Mining Plan Period	5 Years	
Number of Working Days	300 Days	
Production per day in m ³	48 m ³ Rough Stone	
No of Lorry loads (6m ³ per load)	10	
Total Depth of Mining	22m (2m Gravel+ 20m Rough stone)	

TABLE 11.7: YEAR-WISE PRODUCTION PLAN

Year	Rough Stone (m ³)	Gravel (m ³)
I	14440	4368
II	14190	3612
III	19990	7672
IV	11725	-
V	11820	-
TOTAL	72165	15652

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

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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.

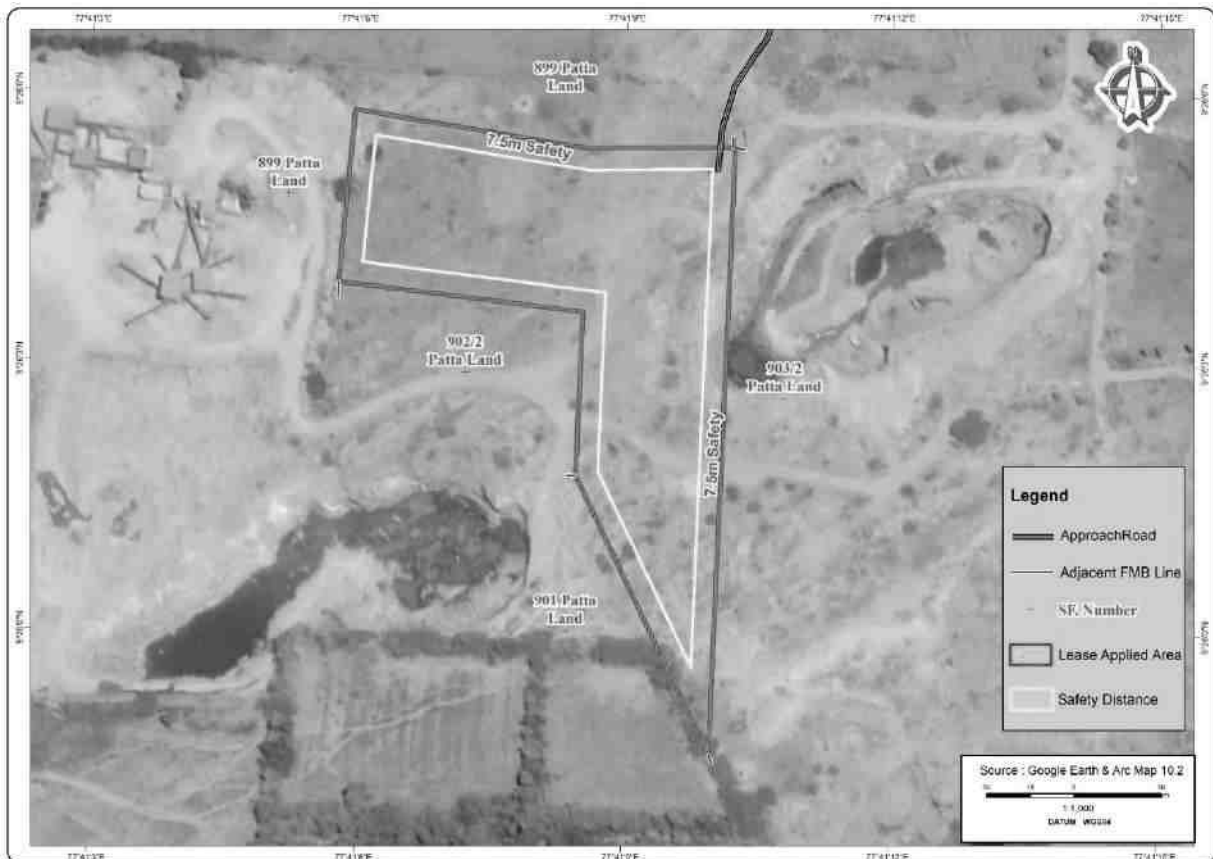


FIGURE 11.1: GOOGLE IMAGE SHOWING APPLIED QUARRY LEASE AREA

TABLE 11.8: PROPOSED MACHINERY DEPLOYMENT

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

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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 11.9: ULTIMATE PIT DIMENSION

PROPOSAL - P1			
Pit	Length (Max) (m)	Width (Max) (m)	Depth (Max)
I	118	82	22

11.3 DESCRIPTION OF THE ENVIRONMENT

Field monitoring studies to evaluate the base line status of the project site were carried out during October to December 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

11.10: 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 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 8 ground water and 1 surface water locations.

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S. No.	Attributes	Parameters	Frequency
4	Soil Quality	Physical and Chemical parameters.	Grab samples collected once during study period from 8 locations.
5	Ecology	<ul style="list-style-type: none"> ▸ Existing terrestrial flora and fauna covering Core Zone (1.29.0 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.
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 11.11: LAND ENVIRONMENT

S.No	Level I	Level -II	Area (Km ²)	Percentage (%)
1	Built-up Land	Built-up Land	29.25	9.28
2	Forest	Dense Forest	0.19	0.06
3	Agricultural Land	Plantation	32.02	10.16
		Crops Land	53.87	17.10
4	Waste Land	Scrub/shrub	143.16	45.46
		Bare land	50.52	16.04
5	Water Body	Water Body	2.8	0.88

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S.No	Level I	Level -II	Area (Km ²)	Percentage (%)
6	Others	Mining land	3.05	0.96
Total			314.86	100

The cluster area of 20.34.0 Ha contributes about 0.96% 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 7.25 to 8.52 indicating slightly alkaline soil
- Bulk density of the soil samples varied from 0.95 to 1.8 g/cm³
- Organic matter in the soil samples varied from 1.52 to 1.9 %
- Total Nitrogen in the soil samples varied from 142 to 175.1 mg/kg
- Water Holding Capacity (WHC) in the soil samples varied from 30.5 to 47.4 %.

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 1.52 to 1.9 % indicating moderate organic content in the soil. Overall, the soil quality in the area was found to medium to fair fertile with moderate productivity.

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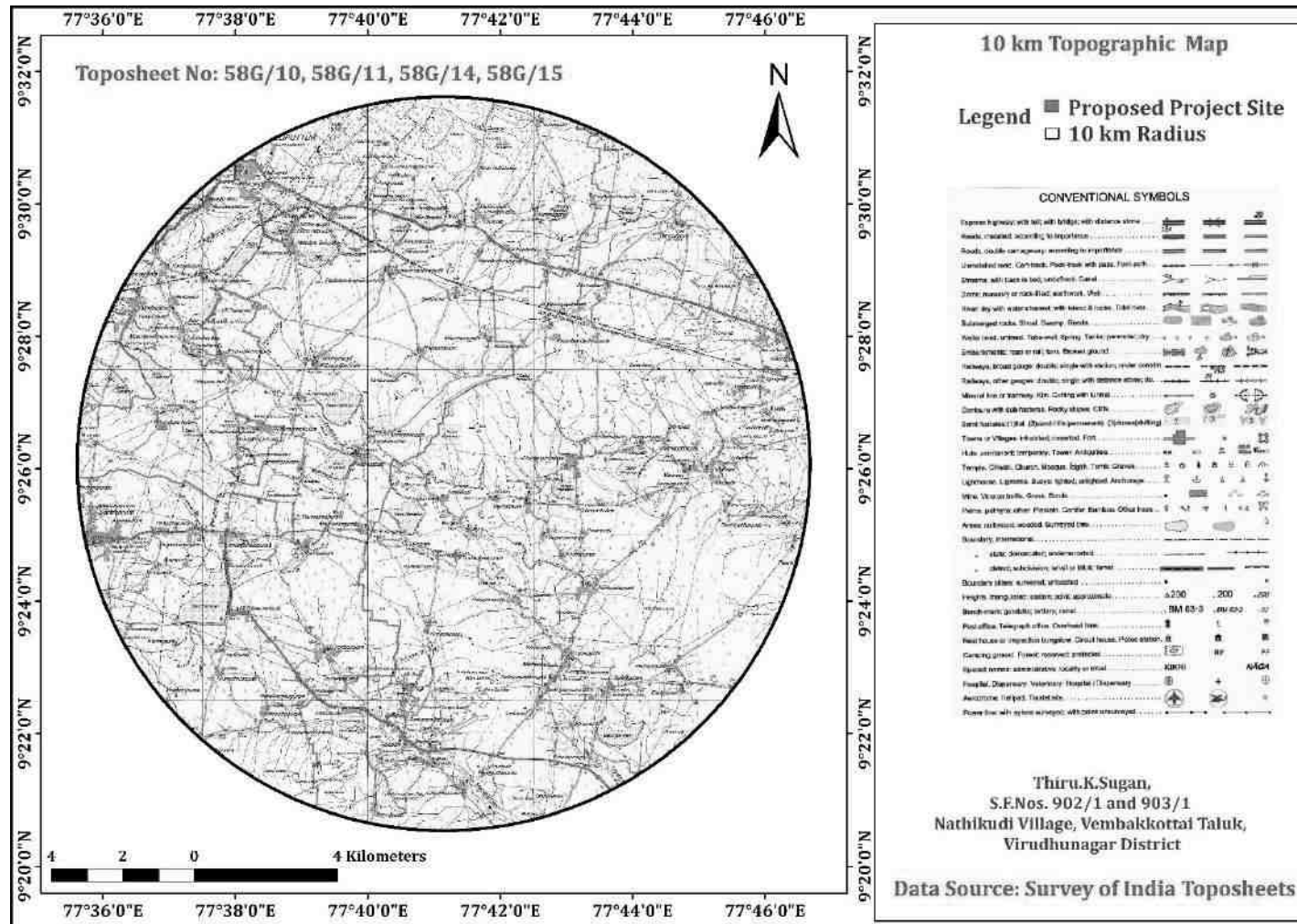


FIGURE 11.2: TOPOSHEET MAP COVERING 10 KM RADIUS

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11.3.2 WATER ENVIRONMENT

Surface Water

The results of the surface water samples analyzed are presented in **Table 3.17** and are compared with the standards.

The pH of the water samples collected is 7.54 and is within the acceptable limit of 6.5 to 8.5. The total dissolved solids were found is 640.6 mg/l in all samples. The total hardness is 272.3 mg/l for all samples collected at 1 location only.

In all samples, iron content is 0.19 mg/l, Nitrate is 4.05 mg/l, fluoride is 0.22 mg/l, chloride is 172.5 mg/l, Sulphate is 78.1 mg/l, alkalinity is 221.6 mg/l, calcium is 90.2 mg/l and magnesium is 48.4 mg/l. The overall surface water quality was found to be good in the village. 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 below and are compared with the standards. The pH of the water samples collected ranged from 6.32 to 7.84 and within the acceptable limit of 6.5 to 8.5. The total dissolved solids were found in the range of 436 to 578 mg/l in all samples. The total hardness varied between 125 to 223 mg/l for all samples collected at 8 locations.

In all samples, iron content is 0.1 to 0.25 mg/l, Nitrate in between 10.7 to 25 mg/l, fluoride varied between 0.15 to 0.23 mg/l, chloride 65 to 105.7 mg/l, Sulphate 17.1 to 26 mg/l, alkalinity 139 to 192 mg/l, calcium 20.6 to 46.1 mg/l and magnesium in between 15.1 to 23 mg/l. The overall ground water quality was found to be good in most of the villages. The levels of heavy metals content were found to be within permissible limits.

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.

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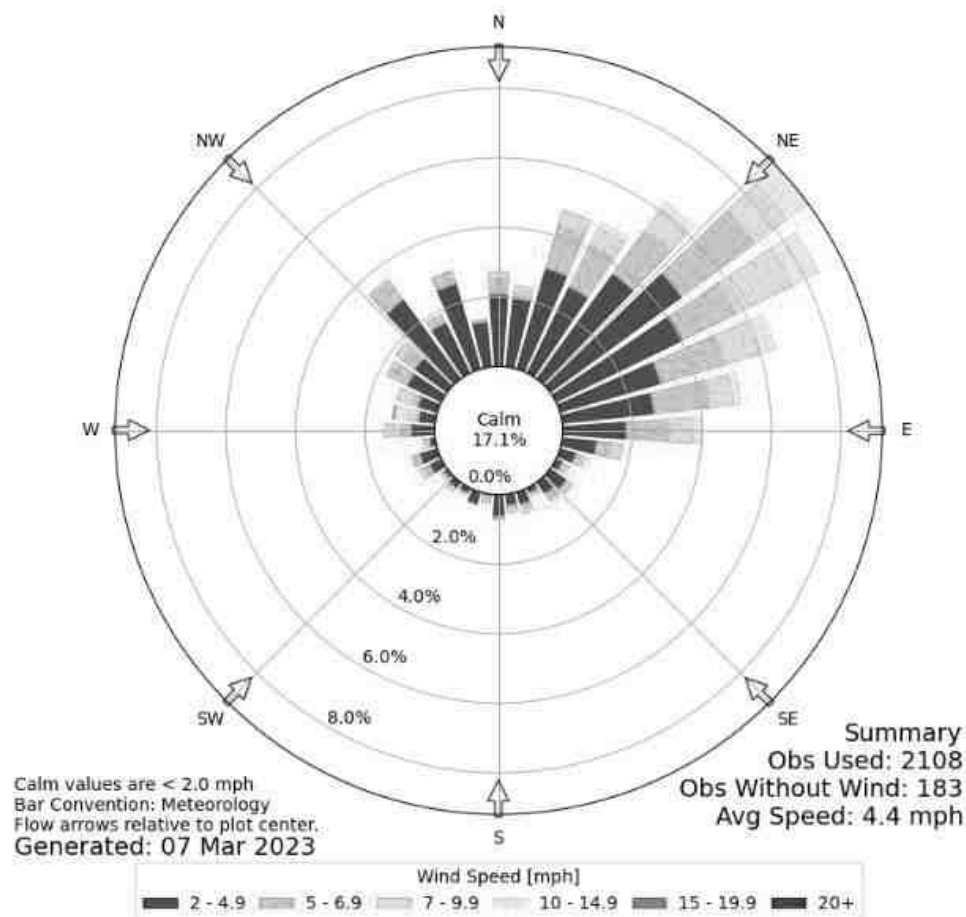


FIGURE 11.3: WIND ROSE DIAGRAM

The results of ambient air quality monitoring for the period (October to December 2022) are presented in the report. Data has been compiled for three months. As per monitoring data, PM₁₀ ranges from 48.42 to 79.14 µg/m³, PM_{2.5} data ranges from 29.39 to 46.58 µg/m³, SO₂ ranges from 8.09 to 18.68 µg/m³ and NO₂ data ranges from 24.87 to 35.81 µg/m³. 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 (Eight) locations around the proposed project area. Noise levels recorded in core zone during day time were from 40.06 to 50.2 dB (A) Leq and during night time were from 31.7 to 42 dB (A) Leq.

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

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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.

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- 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.

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- 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 judiciously 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.

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- 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.

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- 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;

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- 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 through 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 11.12: GREENBELT DEVELOPMENT PLAN

Year	No. of tress proposed to be planted	Survival %	Area to be covered sq.m.	Name of the species	No. of trees expected to be grown
I	700	80%	2910	Neem, Pongamia Pinnata, Casuarina, etc.,	560

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11.4.6 SOCIO ECONOMIC ENVIRONMENT

ANTICIPATED IMPACT

- Employment generation due to the project will provide direct employment for about 15 persons.

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.

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11.6.1 ENVIRONMENTAL MONITORING CELL

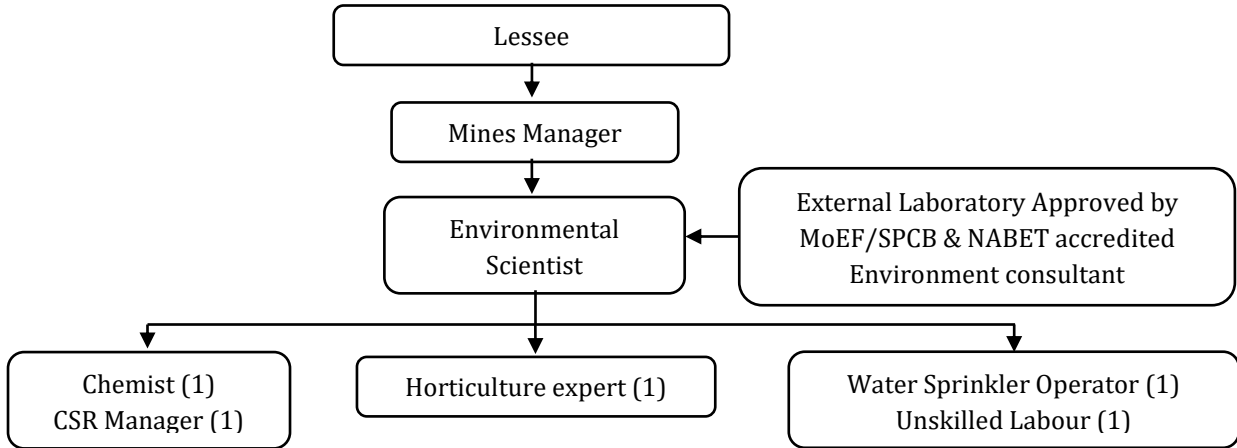


TABLE 11.13: POST ENVIRONMENTAL CLEARANCE MONITORING SCHEDULE

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

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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

Draft EIA/EMP for Nathikudi Rough stone and Gravel Quarry Cluster with new proposed area of 1.29.0 Ha, While total cluster area is 20.34 Ha located in Nathikudi Village, Vembakkottai Taluk, Virudhunagar District, Tamil Nadu.

Lessee: Thiru. K. Sujan (Lease Area: 1.29.0 Ha)

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TABLE 11.14: SALIENT FEATURES OF PROPOSAL "P1"

Name of the Mine	Thiru. K. Sujan	
Survey Nos	S.F.No. 902/1, 903/1	
Land Type	Patta land	
Extent	1.29.0 Ha	
Mining Plan Period / Lease Period	5Years/5Years	
Ultimate Pit Dimension	118 m (L) x 82m (W) x 22m (D) BGL	
Latitude between	09°25'58.57"N to 09°26'05.73"N	
Longitude between	77°41'05.80"E to 77°41'10.25"E	
Highest Elevation	121 m	
Machinery Proposed	Jack Hammer	2
	Compressor	1
	Excavator bucket & Rock breaker attached	1
	Tippers (20 tonnes Capacity)	1
Proposed Blasting Method	Controlled Blasting Method	
Manpower Proposed	15 Nos	
Total Project Cost	Rs. 80,29,000/-	

Source: Approved Mining Plan

TABLE 11.15 SALIENT FEATURES OF PROPOSAL "P2"

Name of the Mine	S.Soundararajan	
Survey Nos	915/3, 916/4B, 916/4C2, 916/7B	
Land Type	Patta Land	
Extent	2.88.0 ha	

TABLE 11.16: SALIENT FEATURES OF PROPOSAL "P3"

Name of the Mine	Ranjith Blue Metals	
Survey Nos	968/5, 969, 971/2	
Land Type	It is a Patta land	
Extent	2.72.0 ha	

TABLE 11.17: SALIENT FEATURES OF PROPOSAL "E1"

Name of the Mine	G.Guruvammal	
Survey Nos	903/2	
Land Type	Patta Land	
Extent	1.35.0 ha	
Rough stone Quantity	19374.25 m ³	

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Lessee: Thiru. K. Sujan (Lease Area: 1.29.0 Ha)

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Gravel Quantity	--
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TABLE 11.18: SALIENT FEATURES OF PROPOSAL "E2"

Name of the Mine	M/s. Ranjith Blue Metals
Survey Nos	899/1B2, 901/2A. 901/1A2A
Land Type	Patta Land
Extent	1.60.0 ha
Rough stone Quantity	125303 m ³
Gravel Quantity	16934 m ³

TABLE 11.19: SALIENT FEATURES OF PROPOSAL "E3"

Name of the Mine	P.Jeyaraman
Survey Nos	916/4C1, 916/7A 920/1A1, 920/1A3
Land Type	Patta Land
Extent	2.97.50 ha
Rough stone Quantity	290900 m ³
Gravel Quantity	51990 m ³

TABLE 11.20: SALIENT FEATURES OF PROPOSAL "E4"

Name of the Mine	S.Soundararajan
Survey Nos	922/2, 922/3, 922/4
Land Type	Patta Land
Extent	2.92.0 ha
Rough stone Quantity	197250 m ³
Gravel Quantity	72450 m ³

TABLE 11.21: SALIENT FEATURES OF PROPOSAL "E5"

Name of the Mine	R.Vishnuprasath
Survey Nos	886/10, 886/1A1, 886/4
Land Type	Patta Land
Extent	3.47.0 ha
Rough stone Quantity	124785 m ³
Gravel Quantity	112948 m ³

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

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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 11.22: PREDICTED AIR INCREMENTAL VALUE

S.No.	Locations	PM ₁₀ (µg/m ³)			PM _{2.5} (µg/m ³)			SO ₂ (µg/m ³)			NO ₂ (µg/m ³)		
		Inc	Max	Total	Inc	Max	Total	Inc	Max	Total	Inc	Max	Total
1	AAQ-1	2	79.14	81.14	1	46.58	47.58	0.5	15.44	15.94	1	33.84	34.84
2	AAQ-2	3.2	71.27	74.47	1.1	40.09	41.19	0.8	18.68	19.48	1.9	32.6	34.5
3	AAQ-3	2	68.53	70.53	1	37.6	38.6	0.8	16.06	16.86	1.9	33.08	34.98
4	AAQ-4	1	67.94	68.94	0.5	37.24	37.74	0.1	16.3	16.4	0.9	35.81	36.71
5	AAQ-5	0	70.91	70.91	0	41.28	41.28	0	17.49	17.49	0	34.5	34.5
6	AAQ-6	1	72.46	73.46	0.5	41.17	41.67	0.4	17.25	17.65	0.5	34.15	34.65
7	AAQ-7	1	72.34	73.34	0.5	41.17	41.67	0.4	13.8	14.2	0.9	32.84	33.74
8	AAQ-8	1	73.63	74.63	0.5	41.93	42.43	0.4	14.1	14.5	0.5	33.45	33.95
NAAQS (µg/m³)		100			60			80			80		

TABLE 11.23: MAXIMUM GROUND LEVEL CONCENTRATION

Pollutants	Max. GLC observed, (µg/m ³)	Distance and Direction
PM ₁₀	9.8	1000, SW
PM _{2.5}	5.3	1000, SW
SO ₂	3.8	1000, SW
NO ₂	4.5	1000, SW

TABLE 11.24: PREDICTED NOISE INCREMENTAL VALUE

Equipment with Highest Noise Level	Location ID	Background Value (Day) dB(A)	Incremental Value dB(A)	Total Predicted dB(A)	Residential Area Standards dB(A)
Drilling 90 dB(A)	N2 Nadukkudi, 0.63 Km	48.4	29.1	48.5	55
Shovel 85 dB(A)		48.4	24.1	48.4	
Tipper 75 dB(A)		48.4	14.1	48.4	
Compressor 85 dB(A)		48.4	24.1	48.4	
Excavator		48.4	41.1	49.1	

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Equipment with Highest Noise Level	Location ID	Background Value (Day) dB(A)	Incremental Value dB(A)	Total Predicted dB(A)	Residential Area Standards dB(A)
102 dB(A)					

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 11.25: ESTIMATED PEAK PARTICLE VELOCITY FOR EXPLOSIVE CHARGE FOR EXISTING AND PROPOSED MINES

Distance from blasting site, m	Quantity of Explosive/Blast, Kg	PPV, mm/s
100	21	20.3
150	21	8.5
200	21	3.5
250	21	2.1
300	21	1.5
350	21	1.1
400	21	0.9
450	21	0.7
500	21	0.6
550	21	0.5
600	21	0.5
650	21	0.9
700	21	0.8
750	21	0.7

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

The nearest habitation from cluster is Nathikudi -0.68Km - South 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 11.26: SOCIO ECONOMIC BENEFITS FROM 3 MINES

	Project Cost in Rs.	CER @ 2% in Rs.
P1	80,29,000	5,00,000

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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 is Rs. 5,00,000/-.

TABLE 11.27: EMPLOYMENT BENEFITS

	Direct Employment	Indirect Employment
P1	15	40

Greenbelt Development -

TABLE 11.28: GREENBELT DEVELOPMENT BENEFITS

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	700	80%	2910	Neem, Pungan, Casuarinas and other regional trees	560

Based on the Proposed Mining Plans its anticipated that there shall growth of native species of Neem, Casuarina, Pungan etc in the Cluster at a rate of 700 Trees Planted over a period of 5 Years with Survival Rate of 80% and expected growth is around 560 Trees over an area of 2910 Sq.m.

11.8 PROJECT BENEFITS

Proposed Project for Quarrying Rough Stone at Nathikudi Village aims to produce 72,165 m³ Rough Stone & 15,652 m³ gravel 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

Draft EIA/EMP for Nathikudi Rough stone and Gravel Quarry Cluster with new proposed area of 1.29.0 Ha, While total cluster area is 20.34 Ha located in Nathikudi Village, Vembakkottai Taluk, Virudhunagar District, Tamil Nadu.

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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

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and around the project site will be improved substantially. Hence, the Prior Environmental Clearance shall be granted at the earliest.

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CHAPTER 12: DISCLOSURE OF CONSULTANTS

Declaration by Experts contributing to the EIA “Nathikudi Rough stone and Gravel Quarry Cluster with new proposed area of 1.29.0 Ha, while total cluster area is 20.34.0 Ha located in Nathikudi Village, Vembakottai Taluk, Virudhunagar District, Tamil Nadu. Lessee: Thiru. K. Sukan (Lease Area: 1.29.0 Ha), **Study Period October to December 2022 (Post -Monsoon Season).**

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:




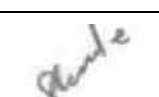
Period of involvement: February 2022 to Till Date

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 2022 to Till Date (Identification & Assessment of Impact, Suggestion Mitigation Measures)	
2.	WP*	Timir Shah	February 2022 to Till Date (Identification & Assessment of Impact, Suggestion Mitigation Measures).	
3.	SHW	Timir Shah	February 2022 to Till Date (Identification & Assessment of Impact, Suggestion Mitigation Measures).	
4.	SE*	Anil Shende	February 2022 to Till Date	

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S. No.	Functional areas	Name of the expert/s	Involvement (Period and task**)	Signature and date
			(Identification & Assessment of Impact, Suggestion Mitigation Measures)	
5.	EB*	Bhaskar Yengal	February 2022 to Till Date (Identification & Assessment of Impact, Suggestion Mitigation Measures)	
6.	HG*	Milind Kundal	February 2022 to Till Date (Identification & Assessment of Impact, Suggestion Mitigation Measures)	
7.	GEO*	Milind Kundal	February 2022 to Till Date (Identification & Assessment of Impact, Suggestion Mitigation Measures)	
8.	LU*	Milind Kundal	February 2022 to Till Date (Identification & Assessment of Impact, Suggestion Mitigation Measures)	
9.	SC*	Bhaskar Yengal	February 2022 to Till Date (Identification & Assessment of Impact, Suggestion Mitigation Measures)	

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

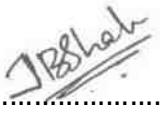
I, Timir Shah, hereby, confirm that the above-mentioned experts prepared the EIA Proposed Rough Stone Quarry at S.F. NO. 902/1, 903/1, Nathikudi Rough stone and Gravel Quarry Cluster with new proposed area of 1.29.0 Ha, While total cluster area is 20.34.0 Ha located in Nathikudi Village, Vembakottai Taluk, Virudhunagar District, Tamil Nadu. Lessee: Thiru. K. Sukan (Lease Area: 1.29.0 Ha). **Study Period October to December 2022 (Post-Monsoon Season)**. 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.

Draft EIA/EMP for Nathikudi Rough stone and Gravel Quarry Cluster with new proposed area of 1.29.0 Ha, While total cluster area is 20.34 Ha located in Nathikudi Village, Vembakkottai Taluk, Virudhunagar District, Tamil Nadu.

Lessee: Thiru. K. Sujan (Lease Area: 1.29.0 Ha)

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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**

National Accreditation Board for Education and Training

Certificate of Accreditation

Enviro Resources, Mumbai

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 –

S.No	Sector Description	Sector (as per)		Cat.
		NABET	MoEFCC	
1	Mining of minerals opencast only	1	1 (a) (i)	B
2	Synthetic organic chemicals industry	21	5 (f)	A
3	Distilleries	22	5 (g)	B
4	Sugar Industry	25	5 (j)	B
5	Airports	29	7 (a)	A
6	Highways,	34	7 (f)	A
7	Building and construction projects	38	8 (a)	B
8	Townships and Area development projects	39	8 (b)	B

Note: Names of approved EIA Coordinators and Functional Area Experts are mentioned in RAAC minutes dated Oct 28, 2022 and supplementary minutes Feb 10, 2023 posted on QCI-NABET website.

The Accreditation shall remain in force subject to continued compliance to the terms and conditions mentioned in QCI-NABET's letter of accreditation bearing no QCI/NABET/ENV/ACO/23/2801 dated March 28, 2023. The accreditation needs to be renewed before the expiry date by Enviro Resources, Mumbai following due process of assessment.



Sr. Director, NABET
Dated: March 28, 2023

Certificate No.
NABET/EIA/2225/RA 0277

Valid up to
July 06, 2025