

DRAFT ENVIRONMENTAL IMPACT ASSESSMENT & ENVIRONMENT MANAGEMENT PLAN

FOR OBTAINING

Environmental Clearance under EIA Notification – 2006

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

**“B1” CATEGORY– MINOR MINERAL — NON-FOREST LAND-PATTA LAND-FRESH
QUARRY**

LEASE PERIOD-5 YEARS

CLUSTER EXTENT – 5.43.5 Ha

(2 Proposed Quarries+ 1 Existing Quarry)

THIRU. A. SUBRAMANIAM ROUGH STONE AND GRAVEL QUARRY

PROJECT PROPONENT	PROPOSED PROJECT	PROPOSED PRODUCTION
Thiru. A. Subramaniam S/o.Agatheeswaran Gounder No.9/98, veerappagoundanur, Palarpathy Post, Kinathukadavu Taluk, Coimbatore District – 642 109	Extent: 1.21.50 ha S.F. Nos: 834/2(Part) Sokkanur Village, Kinathukadavu Taluk, Coimbatore District	Rough Stone= 1,24,456 m³ Gravel = 17,174 m³ Peak Production = 34,641 m³ Proposed Depth= 37m bgl
ToR obtained vide File No. 11525 TOR Identification No. TO24B0108TN5781225N Dated:11.01.2025		
Environmental Consultant GEO EXPLORATION AND MINING SOLUTIONS Old No. 260-B, New No. 17, Advaitha Ashram Road, Alagapuram, Salem – 636 004, Tamil Nadu, India Accredited for sector 1 Cat ‘A’, sector 31 & 38 Cat ‘B’ Certificate No : NABET/EIA/2225/RA 0276 Phone: 0427-2431989, Email: ifthiahmed@gmail.com, geothangam@gmail.com Web: www.gemssalem.com	  Laboratory GLOBAL LAB AND CONSULTANCY SERVICES Approved by ISO:9001:2015, NABL, FSSAI, Experts in QHSE S.F No:92/3A2, Geetha Nagar, Alagapuram Pudur, Salem-636016.	
Baseline Monitoring Period March – May 2025		
JUNE 2025		

UNDERTAKING

I, A.Subramaniam given undertaking that this EIA & EMP report prepared for our Rough stone and Gravel quarry situated in S.F. No 834/2(Part) over an extent of 1.21.50 Ha in Sokkanur Village, Kinathukadavu Taluk and Coimbatore District based on the ToR issued by the State Level Environmental Impact Assessment Authority (SEIAA), Tamil Nadu vide File No.11525 TOR Identification No. TO24B0108TN5781225N Dated: 11.01.2025

I hereby assured that the Data's submitted and information given by me is true and correct to the best of my knowledge.

Signature of the Project Proponent



Thiru. A.Subramaniam

Place: Coimbatore

Dated:

DECLARATION

I Dr. M. Ifthikhar Ahmed – EIA Co Ordinator declare that the EIA & EMP report for the Rough stone and Gravel quarry in S.F. No 834/2(Part) an extent of 1.21.50 Ha in Sokkanur Village, Kinathukadavu Taluk and Coimbatore District has been prepared by Geo Exploration and Mining Solutions, Salem, Tamil Nadu.

The Data's provided in the EIA report are true and correct to the best of my knowledge.

Signature of the EIA Co-ordinator



Dr. M. Ifthikhar Ahmed

Managing Partner

M/s. Geo Exploration and Mining Solutions

Place : Salem

Dated :

- ❖ For easy representation of Proposed and Existing Quarries in the Cluster are given unique codes and identifies and studied in this EIA EMP Report.

*PROPOSED QUARRIES				
CODE	Name of the Owner	S.F. Nos	Extent	Status
P1	Thiru.A.Subramaniam	834/2(Part), Sokkanur	1.21.5 ha	File No.11525TOR Identification No. TO24B0108TN5903516N Dated:23.10.2024
P2	Thiru. K.Mahalingam	816(P), 818, 819/1, 822/1(P), 822/2A(P), 824/1A	3.01.0 ha	Application is in Process
Total			4.22.5 ha	
*EXISTING QUARRY				
CODE	Name of the Owner	S.F. No	Extent	Status
E-1	N.K.Ravikumar	860/1D(P) & 893/1	1.21.0 ha	29.10.2021 – 28.10.2026
TOTAL			1.21.0 ha	
EXPIRED QUARRIES				
CODE	Name of the Owner	S.F. No	Extent	Status
EX-1	Thiru.S.Kavitha	859/3A1	1.09.0 ha	22.01.2019 – 21.01.2024
EX-2	Thiru.A.Subramaniam	894	1.01.5 ha	25.01.2019 – 24.01.2024
ABANDONED QUARRY				
Nil				
TOTAL CLUSTER EXTENT*			5.43.5 Ha	

Cluster area is calculated as per MoEF & CC Notification – S.O. 2269 (E) Dated: 01.07.2016

As per above notification S.O.2269(E) dated : 01.07.2016 in para (b) in Appendix XI, - (ii)(5): The lease not operative for three years or more and leases which have got environmental clearance as on 15th January, 2016 shall not be counted for calculating the area of cluster, but shall be included in the Environment Management Plan and the Regional Environmental Management Plan.

TERMS OF REFERENCE (ToR) COMPLIANCE

Thiru. A. Subramaniam Rough Stone & Gravel Quarry

File No.11525 TOR Identification No. TO24B0108TN5781225N Dated:11.01.2025

SEIAA SPECIFIC CONDITIONS		
1	The PP shall furnish No Objection Certificate from Director, Agricultural Department as the proposed area is surrounded by agricultural fields.	Noted and Agreed
SITE SPECIFIC		
1	The PP shall furnish the details on no. of trees to be removed for the proposed quarrying activity and the compensatory planting proposed for the same in the EIA Report.	Noted and agreed There is no trees with the proposed area and the PP has planted around 610 tress along the boundaries of the project area.
2	A Cluster Management Committee (CMC) shall be constituted including all the mines in the cluster as Committee Members for the effective management of the mining operation in the cluster through systematic & scientific approach with appointment of statutory personnel, appropriate environmental monitoring, good maintenance of haul roads and village/panchayat roads, authorized blasting operation etc. The PP shall submit the following details in the form of an Affidavit during the EIA appraisal: (i) Copy of the agreement forming CMC. (ii) The Organisation chart of the Committee with defining the role of the members (iii) The 'Standard Operating Procedures' (SoP) executing the planned activities.	Noted and agreed PP agreed to frame a cluster management committee, copy of (CMC) affidavit will be submitted during the appraisal meeting.
3	The proponent shall furnish photographs of adequate fencing, garland drainage built with siltation tank & green belt along the periphery including replantation of existing trees; maintaining the safety distance between the adjacent quarries & water bodies nearby provided as per the approved mining plan.	Noted and agreed. Greenbelt development and Fencing photographs furnished in chapter 2. The Barbed Wire fencing has been erected all around the boundary. No trees within the project site, hence transplantation not required.
5	The Proponent shall carry out Bio diversity study as a part of EIA study and the same shall be included in the Report.	Noted and agreed Biodiversity study has been carried out by Functional Area Expert by the NABET accredited consultant. The detailed study is given in the Chapter No.3
6	The PP shall prepare the EMP for the entire project life of mine and also furnish the sworn affidavit stating to abide the EMP for the entire life of mine.	Noted and agreed EMP for the entire life the mine, furnished in chapter 10.
2.SEAC STANDARD CONDITIONS		
1	In the case of existing/operating mines, a letter obtained from the concerned AD (Mines) shall be submitted and it shall include the following: (i) Original pit dimension (ii) Quantity achieved Vs EC Approved Quantity (iii) Balance Quantity as per Mineable Reserve calculated. (iv) Mined out Depth as on date Vs EC Permitted depth (v) Details of illegal/illicit mining (vi) Violation in the quarry during the past working. (vii) Quantity of material mined out outside the mine lease area (viii) Condition of Safety zone/benches (ix) Revised/Modified Mining Plan showing the benches of not exceeding 6 m height and ultimate	Not applicable, It is a fresh lease application.

	depth of not exceeding 50m.	
2	Details of habitations around the proposed mining area and latest VAO certificate regarding the location of habitations within 300m radius from the periphery of the site.	Noted & agreed. The PP obtained VAO Certificate regarding the location of habitations within 300m radius from the periphery of the site and enclosed with as annexure.
3	The proponent is requested to carry out a survey and enumerate on the structures located within the radius of (i) 50 m, (ii) 100 m, (iii) 200 m and (iv) 300 m (v) 500m shall be enumerated with details such as dwelling houses with number of occupants, whether it belongs to the owner (or) not, places of worship, industries, factories, sheds, etc with indicating the owner of the building, nature of construction, age of the building, number of residents, their profession and income, etc.	Noted and agreed The structure study has been carried out within the radius of 300m. There is no habitation within the radius of 300m from the project site the details of the structures is given in the EIA report, Chapter No. III
4	The PP shall submit a detailed hydrological report indicating the impact of proposed quarrying operations on the waterbodies like lake, water tanks, etc are located within 1 km of the proposed quarry.	Noted and agreed The hydro-geological study was conducted to evaluate the possible impact on the ground water table. No significant impacts are anticipated on the water bodies around the project area. Details are discussed under Chapter No. 3
5	The Proponent shall carry out Bio diversity study through reputed Institution and the same shall be included in EIA Report.	Noted and agreed Biodiversity study has been carried out by Functional Area Expert by the NABET accredited consultant. The detailed study is given in the Chapter No.3
6	The DFO letter stating that the proximity distance of Reserve Forests, Protected Areas, Sanctuaries, Tiger reserve etc., up to a radius of 25 km from the proposed site.	Noted and agreed DFO letter will be submitted along with the Final EIA/EMP report
7	In the case of proposed lease in an existing (or old) quarry where the benches are not formed (or) partially formed as per the approved Mining Plan, the Project Proponent (PP) shall the PP shall carry out the scientific studies to assess the slope stability of the working benches to be constructed and existing quarry wall, by involving any one of the reputed Research and Academic Institutions CSIR-Central Institute of Mining & Fuel Research / Dhanbad, NIRM/Bangalore, Division of Geotechnical Engineering-IIT-Madras, NIT-Dept of Mining Engg, Surathkal, and Anna University Chennai-CEG Campus. The PP shall submit a copy of the aforesaid report indicating the stability status of the quarry wall and possible mitigation measures during the time of appraisal for obtaining the EC.	Noted and agreed Proponent requested as will be carrying the slope stability Plan after commencement of quarrying operation and ensure that the reports will be submitted along with HYCR.
8	However, in case of the fresh/virgin quarries, the Proponent shall submit a conceptual 'Slope Stability Plan' for the proposed quarry during the appraisal while obtaining the EC, when the depth of the working is extended beyond 30 m below ground level.	Noted and agreed Proponent requested as will be carrying the slope stability Plan after commencement of quarrying operation and ensure that the reports will be submitted along with HYCR.
9	The PP shall furnish the affidavit stating that the blasting operation in the proposed quarry is carried out by the statutory competent person as per the MMR 1961 such as blaster, mining mate, mine foreman, II/I Class mines manager appointed by the proponent.	Noted and agreed Proponent given affidavit stating that the blasting will be carried out under the supervision of Competent person.
10	The PP shall present a conceptual design for carrying out only controlled blasting operation involving line drilling and muffle blasting in the proposed quarry such that the blast-induced ground vibrations are	Noted and agreed

	controlled as well as no fly rock travel beyond 30 m from the blast site.	
11	The EIA Coordinators shall obtain and furnish the details of quarry/quarries operated by the proponent in the past, either in the same location or elsewhere in the State with video and photographic evidences	Noted and agreed. There is one quarry operated by the Project Proponent Name: A.Subramaniam S.F.No – 894(Part) Extent – 1.01.5 Ha Lease Period – 25.01.2019 – 24.01.2024
12	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,	Noted and agreed
13	What was the period of the operation and stoppage of the earlier mines with last work permit issued by the AD/DD mines?	Noted and agreed.
14	Quantity of minerals mined out. · Highest production achieved in any one year · Detail of approved depth of mining. · Actual depth of the mining achieved earlier. · Name of the person already mined in that leases area. · If EC and CTO already obtained, the copy of the same shall be submitted. · Whether the mining was carried out as per the approved mine plan (or EC if issued) with stipulated benches.	Noted and agreed
15	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).	Noted and agreed Satellite imagery of the project area along with boundary coordinates is given in the Chapter No 2, Figure No.2.2, Page No.11. Geomorphology of the area is given in Chapter No 2, Figure No.2.10, Page No.23 Land use pattern of the project area is tabulated in the Chapter No.2. Table no 2.4, Pg.No.18
16	The PP shall carry out Drone video survey covering the cluster, green belt, fencing, etc.,	Noted and agreed. PP carried out the drone video survey and will be submitted during the appraisal while obtaining the EC.
17	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.	Noted and agreed The area has been fenced and plantation activities carried out within the project site.
18	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.	Noted and agreed The details of mineral reserves have been provided in Chapter No 1, Mineable reserves– 1,24,456 m ³ Peak Production – 34,641 m ³ Depth – 37m bgl
19	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 the 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.	Noted and agreed. The PP provided Organization chart indicating the appointment of various statutory officials and other competent persons to be appointed as per the provisions of the Mines Act'1952 and the MMR, 1961

20	The Project Proponent shall conduct the hydro-geological study considering the contour map of the water table detailing the number of groundwater 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. Necessary data and documentation in this regard may be provided.	Noted and agreed The hydro-geological study was conducted to evaluate the possible impact on the ground water table. No significant impacts are anticipated on the water bodies around the project area. Details are discussed under Chapter No. 3,
21	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	Noted and agreed Baseline Data were collected for One Season (Pre-Monsoon) March – May 2025 as per CPCB Notification and MoEF & CC Guidelines. Details in Chapter No. 3
22	The Proponent shall carry out the Cumulative impact study due to mining operations carried out in the quarry specifically with reference to the specific environment in terms of soil health, biodiversity, air pollution, water pollution, climate change and flood control & health impacts. Accordingly, the Environment Management plan should be prepared keeping the concerned quarry and the surrounding habitations in the mind.	Noted and agreed The Cumulative impact study due to mining operations is explained in chapter - 7
23	Rain water harvesting management with recharging details along with water balance (both monsoon & non-monsoon) be submitted.	Noted and agreed
24	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.	Noted and agreed Land use and land cover of the study area is discussed in Chapter No. 3. Land use plan of the project area showing pre-operational, operational and post-operational phases are discussed in Chapter No. 2
25	Details of the land for storage of Overburden/Waste Dumps (or) Rejects outside the mine lease, such as extent of land area, distance from mine lease, its land use, R&R issues, if any, should be provided.	Not applicable.
26	Proximity to Areas declared as 'Critically Polluted' (or) the Project areas which attracts the court restrictions for mining operations, should also be indicated and where so required, clearance certifications from the prescribed Authorities, such as the TNPCB (or) Dept. of Geology and Mining should be secured and furnished to the effect that the proposed mining activities could be considered.	Not Applicable. Project area / Study area is not declared in 'Critically Polluted' Area and does not come under 'Aravalli Range.
27	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.	Noted and agreed Part of the working pit will be allowed to collect rain water during the spell of rain will be used for greenbelt development and dust suppression. The Mine Closure Plan is prepared for converting the excavated pit into rain water harvesting structure and serve as water reservoir for the project village during draught season.

28	Impact on local transport infrastructure due to the Project should be indicated.	Noted and agreed Transportation details mentioned in Chapter -2
29	A tree survey study shall be carried out (nos., name of the species, age, diameter etc.,) both within the mining lease applied area & 300m buffer zone and its management during mining activity.	Noted and agreed Details of the trees in the buffer zone given in Chapter No.3&4
30	A detailed mine closure plan for the proposed project shall be included in EIA/EMP report which should be site-specific	Noted and agreed After the completion of mining operation, the part of the quarried-out land will be utilized as temporary storage reservoir. The details are given in the Chapter No.4
31	As a part of the study of flora and fauna around the vicinity of the proposed site, the EIA coordinator shall strive to educate the local students on the importance of preserving local flora and fauna by involving them in the study, wherever possible	Noted and agreed Details are given in the Chapter No.3
32	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-I in consultation with the DFO, State Agriculture University. The plant species with dense/moderate canopy of native origin should be chosen. Species of small/medium/tall trees alternating with shrubs should be planted in a mixed manner.	Noted and agreed Noted & agreed. It is proposed to plant a 610 nos of trees in the 7.5m safety barrier and village roads.
33	Taller/one-year-old Saplings raised in appropriate size of bags, preferably eco-friendly bags should be planted as per the advice of local forest authorities/botanist/Horticulturist with regard to site specific choices. The proponent shall earmark the greenbelt area with GPS coordinates all along the boundary of the project site with at least 3 meters wide and in between blocks in an organized manner	Noted and agreed No trees within the project site. it is proposed to plant 610 Nos of Trees in the safety barrier and Village roads.
34	A Disaster Management Plan shall be prepared and included in the EIA/EMP Report for the complete life of the proposed quarry (or) till the end of the lease period	Noted and agreed Disaster management Plan details in Chapter-7
35	A Risk Assessment and management Plan shall be prepared and included in the EIA/EMP Report for the complete life of the proposed quarry (or) till the end of the lease period	Noted and agreed A Risk Assessment and management Plan Chapter- 7
36	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.	Noted and agreed Occupational Health impacts chapter- 10
37	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.	Noted and agreed No Public Health Implications anticipated due to this project. Details of CER are discussed under Chapter 8
38	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	Noted and agreed It is explained in Chapter -3

	dimensions may be given with time frames for implementation.	
39	Details of litigation pending against the project, if any, with direction /order passed by any Court of Law against the Project should be given.	Noted and agreed No, Litigation against the project
40	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.	Noted and agreed Chapter-8 discussed about benefits of projects.
41	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.	Noted and agreed.
42	The PP shall prepare the EMP for the entire life of mine and also furnish the sworn affidavit stating to abide the EMP for the entire life of mine.	Noted and agreed The EMP prepared for the life of the mine and discussed in chapter 10.
43	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 Conditions besides attracting penal provisions in the Environment (Protection) Act, 1986.	Noted & agreed.
SEIAA STANDARD CONDITIONS		
Cluster Management Committee		
1	Cluster Management Committee shall be framed which must include all the proponents in the cluster as members including the existing as well as proposed quarry.	Noted and agreed Cluster management committee has been formed with mutual agreement with the proponents including Proposed quarry at present are framed.
2	The members must coordinate among themselves for the effective implementation of EMP as committed including Green Belt Development, Water sprinkling, tree plantation, blasting etc.,	Noted and agreed As per the committee agreement proponents will coordinates for the Greenbelt development, Water sprinkling and tree plantation activities combined.
3	The List of members of the committee formed shall be submitted to AD/Mines before the execution of mining lease and the same shall be updated every year to the AD/Mines.	Noted and agreed The formation of committee with list of members has been submitted to the AD mines office, Coimbatore and the same will be update in every year.
4	Detailed Operational Plan must be submitted which must include the blasting frequency with respect to the nearby quarry situated in the cluster, the usage of haul roads by the individual quarry in the form of route map and network.	Noted and agreed As per the committee agreement the blasting frequency will be discussed and carryout by the Mines Manager appointed by the proponents and the same will be updated in the committee minutes. Transport details in chapter-2
5	The committee shall deliberate on risk & emergency management plan, fire safety & evacuation plan and sustainable development goals pertaining to the cluster in a holistic manner especially during natural calamities like intense rain and the mitigation measures considering the inundation of the cluster and evacuation plan.	Noted and agreed Details discussed in chapter 7 of Draft EIA report
6	The Cluster Management Committee shall form Environmental Policy to practice sustainable mining in a scientific and systematic manner in accordance with the law. The role played by the committee in implementing the environmental policy devised shall be given in detail in the EIA Report.	Noted and agreed Details discussed in chapter-6 of Draft EIA report

7	The committee shall furnish action plan regarding the restoration strategy with respect to the individual quarry falling under the cluster in a holistic manner.	Noted & agreed
8	The committee shall deliberate on the health of the workers/staff involved in the mining as well as the health of the public in the vicinity.	Noted and agreed Details discussed in chapter 10.
Agriculture & Agro-Biodiversity		
9	Impact on surrounding agricultural fields around the proposed mining Area.	Noted and agreed Detailed discussed in chapter 4.
10	Impact on soil flora & vegetation around the project site.	Detailed discussed in chapter 4.
11	Details of type of vegetation including no. of trees & shrubs within the proposed mining area and. If so, transplantation of such vegetation all along the boundary of the proposed mining area shall committed mentioned in EMP.	Noted and agreed
12	The Environmental Impact Assessment should study the agro-biodiversity, agro-forestry, horticultural plantations, the natural ecosystem, the soil micro flora, fauna and soil seed banks and suggest measures to maintain the natural Ecosystem.	Details in Chapter 3
13	Action should specifically suggest for sustainable management of the area and restoration of ecosystem for flow of goods and services.	Noted & agreed
14	The project proponent shall study and furnish the impact of project on plantations in adjoining patta lands, Horticulture, Agriculture and livestock	Noted and agreed The project area is dry barren land no agriculture activities carried out.
Forests		
15	The project proponent shall detailed study on impact of mining on Reserve forests and free ranging wildlife	Noted and agreed. Nearest Reserve Forest is Boluvampatti RF – 8 km – NW
16	The Environmental Impact Assessment should study impact on forest, vegetation, endemic, vulnerable and endangered indigenous flora and fauna.	Noted and agreed The area is surrounded by Barren land. Details of flora and fauna studies given in the Chapter No.3.
17	The Environmental Impact Assessment should study impact on standing trees and the existing trees should be numbered and action suggested for protection	No major trees within the project area.
18	The Environmental Impact Assessment should study impact on protected areas, Reserve Forests, National Parks, Corridors and Wildlife pathways, near project site	Noted & agreed. Indira Gandhi (Aanamalai) Wildlife Sanctuary - 28.5 km-SW
Water Environment		
19	Hydro-geological study considering the contour map of the water table detailing the number of ground water pumping & open wells, and surface water bodies such as rivers, tanks, canals, ponds etc. within 1 km (radius) so as to assess the impacts on the nearby waterbodies due to mining activity. Based on actual monitored data, it may clearly be shown whether working will intersect groundwater. Necessary data and documentation in this regard may be provided, covering the entire mine lease period	Noted and agreed There are 9 open wells and 9 bore wells within the radius of 1km from the project area, Hydrogeological study has been conducted by the resistivity method
20	Erosion Control measures	Noted & agreed
21	Detailed study shall be carried out in regard to impact of mining around the proposed mine lease area on the nearby Villages, Water-bodies/ Rivers, & any ecological fragile areas.	Details in Chapter 2

22	The project proponent shall study impact on fish habitats and the food WEB/ food chain in the water body and Reservoir	Details in Chapter 2 and 4 impact of bio diversity
23	The project proponent shall study and furnish the details on potential fragmentation impact on natural environment, by the activities.	Noted & agreed
24	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.	Noted & agreed. Detailed under Chapter 3.
25	The Terms of Reference should specifically study impact on soil health, soil erosion, the soil physical, chemical components and microbial components	Details in Chapter 3 Soil environment.
26	The Environmental Impact Assessment should study on wetlands, water bodies, rivers streams, lakes and farmer sites	Details in Chapter 3 Water environment.
27	The EIA shall include the impact of mining activity on the following: a) Hydrothermal/Geothermal effect due to destruction in the Environment. b) Bio-geochemical processes and its foot prints including environmental stress. c) Sediment geochemistry in the surface streams.	Noted and agreed There are 9 open wells and 9 bore wells within the radius of 1km from the project area, Hydrogeological study has been conducted by the resistivity method
Energy		
28	The measures taken to control Noise, Air, Water, Dust Control and steps adopted to efficiently utilise the Energy shall be furnished.	Noted and agreed Details in Chapter 3 environmental monitoring details.
Climate Change		
29	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 agreed Details of carbon emission and mitigation activities are given in the Chapter No.4
30	The Environmental Impact Assessment should study impact on climate change, temperature rise, pollution and above soil & below soil carbon stock, soil health and physical, chemical & biological soil features	Noted and agreed Details in Chapter-3 for meteorological and climate/weather data representation of graphs.
31	Impact of mining on pollution leading to GHGs emissions and the impact of the same on the local livelihood.	Noted and agreed Details of GHGs emissions and mitigation activities are given in the Chapter No.4
Mine Closure Plan		
32	Detailed Mine Closure Plan covering the entire mine lease period as per precise area communication order issued.	Details in Chapter 2 mine closure plan
EMP		
33	Detailed Environment Management Plan along with adaptation, mitigation & remedial strategies covering the entire mine lease period as per precise area communication order issued and the scope for achieving SDGs	Detailed under Chapter 10
34	The Environmental Impact Assessment should hold detailed study on EMP with budget for Green belt development and mine closure plan including disaster management plan.	Details in Green belt development in chapter 4
Risk Assessment		
35	To furnish risk assessment and management plan including anticipated vulnerabilities during operational and post operational phases of Mining.	Detailed under Chapter 7

Disaster Management Plan		
36	To furnish disaster management plan and disaster mitigation measures in regard to all aspects to avoid/reduce vulnerability to hazards & to cope with disaster/untoward accidents in & around the proposed mine lease area due to the proposed method of mining activity & its related activities covering the entire mine lease period as per precise area communication order issued.	Details in Study 7.3 Disaster Management Plan in Chapter -7
Others		
37	The project proponent shall furnish VAO certificate with reference to 300m radius regard to approved habitations, schools, Archaeological sites, Structures, railway lines, roads, water bodies such as streams, odai, vaari, canal, channel, river, lake pond, tank etc.	Noted & agreed. Detailed under Chapter 4
38	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 agreed
39	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	Details of carbon emission and mitigation activities are given in the Chapter No.4

STANDARD TERMS OF REFERENCE		
1	Year-wise production details since 1994 should be given, clearly stating the highest production achieved in any one year prior to 1994. It may also be categorically informed whether there had been any increase in production after the EIA Notification 1994 came into force, w.r.t. the highest production achieved prior to 1994.	Not applicable. This is not a violation category project. This proposal falls under B1 Category
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 applied land for quarrying is a Patta Land. Document is enclosed along with Approved Mining Plan as Annexure Volume 1.
3	All documents including approved mine plan, EIA and Public Hearing should be compatible with one another in terms of the mine lease area, production levels, waste generation and its management, mining technology etc. and should be in the name of the lessee.	Noted & agreed.
4	All corner coordinates of the mine lease area, superimposed on a High-Resolution Imagery/toposheet, topographic sheet, geomorphology and geology of the area should be provided. Such an Imagery of the proposed area should clearly show the land use and other ecological features of the study area (core and buffer zone).	Map showing – Project area is with adjacent quarries details is enclosed in Figure No1.1 Project area boundary coordinates superimposed on Toposheet – Figure No. 1.1A Toposheet of the project area covering 10km radius – Figure No. 1.2 Geology map of the project area covering 10km radius - Figure No. 2.11
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.	Map showing – Geology map of the project area covering 10km radius - Figure No. 2.11 Geomorphological features are incorporated in the Toposheet map covering 10km radius around the project area Figure No. 2.12

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 was inspected by the officers of Department of Geology along with revenue officials and found that the land is fit for quarrying under the policy of State Government.
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.	The proponent has framed their Environmental Policy and the same is discussed in the Chapter No 10.1.
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 opencast quarrying operation proposed to operate in Mechanized method. The rough stone formation is a hard, compact and homogeneous body. The height and width of the bench will be maintained as 5m with 90° bench angles. Quarrying activities will be carried out under the supervision of Competent Persons like Mines Manager, Mines Foreman and Mining Mate. Necessary permissions will be obtained from DGMS after obtaining Environmental Clearance.
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.	Noted & agreed. The study area considered for this study is 10 km radius and all data contained in the EIA report such as waste generation etc., is 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 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 and land cover of the study area is discussed in Chapter No. 3. Land use plan of the project area showing pre-operational, operational and post-operational phases are discussed in Chapter No. 2, Table No 2.3
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	Not Applicable. There is no waste anticipated during this quarry operation. The entire quarried out rough stone will be transported to the needy customers. No Dumps is proposed outside the lease area.
12	A Certificate from the Competent Authority in the State Forest Department should be provided, confirming the involvement of forest land, if any, in the project area. In the event of any contrary claim by the Project Proponent regarding the status of forests, the site may be inspected by the State Forest Department along with the Regional Office of the Ministry to ascertain the status of forests, based on which, the Certificate in this regard as mentioned above be issued. In all such cases, it would be desirable for representative of the State Forest Department to assist the Expert Appraisal Committees.	Not Applicable. There is no Forest Land involved in the proposed project area. The proposed project area is a Patta land. Approved Mining Plan is enclosed as Annexure Volume 1.

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. The proposed project area does not involve any Forest Land.
14	Implementation status of recognition of forest rights under the Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 should be indicated.	Not Applicable. The project doesn't attract Recognition of Forest Rights Act, 2006.
15	The vegetation in the RF / PF areas in the study area, with necessary details, should be given.	No Reserve Forest within the Study 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.	Not Applicable. There are No National Parks, Biosphere Reserves, Wildlife Corridors, and Tiger/Elephant Reserves within 10 km Radius from the periphery of the project area.
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. There are no National Parks, Biosphere Reserves, Wildlife Corridors, and Tiger/Elephant Reserves within 10 km Radius from the periphery of the project area.
18	A detailed biological study of the study area [core zone and buffer zone (10 KM radius of the periphery of the mine lease)] shall be carried out. Details of flora and fauna, endangered, endemic and RET Species duly authenticated, separately for core and buffer zone should be furnished based on such primary field survey, clearly indicating the Schedule of the fauna present. In case of any scheduled-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.	Detailed biological study of the study area [core zone and buffer zone (10 km radius of the periphery of the mine lease)] was carried out and discussed under Chapter No. 3. 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.
19	Proximity to Areas declared as 'Critically Polluted' or the Project areas likely to come under the 'Aravalli Range', (attracting court restrictions for mining operations), should also be indicated and where so required, clearance certifications from the prescribed Authorities, such as the SPCB or State Mining Department should be secured and furnished to the effect that the proposed mining activities could be considered.	Not Applicable. Project area / Study area is not declared in 'Critically Polluted' Area and does not come under 'Aravalli Range'.
20	Similarly, for coastal Projects, A CRZ map duly authenticated by one of the authorized agencies demarcating LTL, HTL, CRZ area, location of the mine lease w.r.t CRZ, coastal features such as mangroves, if any, should be furnished. (Note: The Mining Projects falling under CRZ would also need to obtain approval of the concerned Coastal Zone Management Authority).	Not Applicable. The project doesn't attract The C. R. Z. Notification, 2018.
21	R&R Plan/compensation details for the Project Affected People (PAP) should be furnished. While	Not Applicable.

	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 are no approved habitations within a radius of 300 meters. Therefore, R&R Plan / Compensation details for the Project Affected People (PAP) is not anticipated and Not Applicable for this project.
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 silica, should be given.	Baseline Data were collected for winter Season March – May 2025 as per CPCB Notification and MoEF & CC Guidelines. Details in Chapter No. 3.
23	Air quality modelling should be carried out for prediction of impact of the project on the air quality of the area. It should also take into account the impact of movement of vehicles for transportation of mineral. The details of the model used and input parameters used for modelling should be provided. The air quality contours may be shown on a location map clearly indicating the location of the site, location of sensitive receptors, if any, and the habitation. The wind roses showing pre-dominant wind direction may also be indicated on the map.	Air Quality Modelling for prediction of incremental GLC's of pollutant was carried out using AERMOD Model. Details in Chapter No. 4,
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.	Total Water Requirement for this project is given in the chapter No 2, Table No 2.13.
25	Necessary clearance from the Competent Authority for drawl of requisite quantity of water for the Project should be provided.	Water for dust suppression, greenbelt development and domestic use will be obtained from accumulated rainwater/seepage water in mine pits. Drinking water will be sourced from the approved water vendors, No 2, Table No 2.13.
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.	The rain water collected in the pits after spell of rain will be used for greenbelt development and dust suppression.
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 Studies and Mitigation Measures of Water Quality discussed in Chapter No. 4.
28	Based on actual monitored data, it may clearly be shown whether working will intersect groundwater. Necessary data and documentation in this regard may be provided. In case the working will intersect	The ground water table is at 86-88m below ground level.

	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.	The ultimate depth of this projects is 37m from the general ground profile.
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.	Highest elevation of the project area is 268m AMSL Ultimate depth of the mine is 37m Bgl Water level in the area is 68 - 73 m BGL
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.	Progressive greenbelt development plan has been prepared and discussed along with Recommended Species details are given in the Chapter 4, Table No.4.9
31	A time bound Progressive Greenbelt Development Plan shall be prepared in a tabular form (indicating the linear and quantitative coverage, plant species and time frame) and submitted, keeping in mind, the same will have to be executed up front on commencement of the Project. Phase-wise plan of plantation and compensatory afforestation should be charted clearly indicating the area to be covered under plantation and the species to be planted. The details of plantation already done should be given. The plant species selected for green belt should have greater ecological value and should be of good utility value to the local population with emphasis on local and native species and the species which are tolerant to pollution.	Traffic density survey was carried out to analyse the impact of Transportation in the study area as per IRC guidelines 1961 and it is inferred that there is no much significant impact due to the proposed transportation from the project area. Details in Chapter 2.
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.	Infrastructure & other facilities will be provided to the Mine Workers after the grant of quarry lease and the same has been discussed in the Chapter No.2. .
33	Details of the onsite shelter and facilities to be provided to the mine workers should be included in the EIA Report.	Discussed in chapter No 2.
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.	Details in Chapter 10.
35	Occupational Health impacts of the Project should be anticipated and the proposed preventive measures spelt out in detail. Details of pre-placement medical examination and periodical medical examination schedules should be incorporated in the EMP. The project specific occupational health mitigation measures with required facilities proposed in the mining area may be detailed.	Details in Chapter 10.
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.	Details in Chapter 4,

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.	Environment Management Plan Chapter 10.
38	Detailed environmental management plan (EMP) to mitigate the environmental impacts which, should inter-alia include the impacts of change of land use, loss of agricultural and grazing land, if any, occupational health impacts besides other impacts specific to the proposed Project.	The outcome of public hearing will be updated in the final EIA/EMP report
39	Public Hearing points raised and commitment of the Project Proponent on the same along with time bound Action Plan with budgetary provisions to implement the same should be provided and also incorporated in the final EIA/EMP Report of the Project.	No litigation is pending in any court against this 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.	The proposed capital cost for Environmental Monitoring Programme is Rs 3,80,000/- and the recurring cost is Rs 76,000/- per annum. Details in Chapter 6.
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.	Details in Chapter 10.
42	A Disaster management Plan shall be prepared and included in the EIA/EMP Report.	Details in Chapter 7.
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.	Details in Chapter.8.
44	Besides the above, the below mentioned general points are also to be followed: -	
A	Executive Summary of the EIA/EMP Report	Encloses as separate volume
B	All documents to be properly referenced with index and continuous page numbering.	All the documents are 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.	List of Tables and source of the data collected are given properly.
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	Baseline monitoring reports are enclosed with mining plan
E	Where the documents provided are in a language other than English, an English translation should be provided.	Not Applicable.
F	The Questionnaire for environmental appraisal of mining projects as devised earlier by the Ministry shall also be filled and submitted.	Will be enclosed along with Final EIA /EMP Report.
G	While preparing the EIA report, the instructions for the Proponents and instructions for the Consultants issued by MoEF & CC vide O.M. No. J-11013/41/2006-IA. II(I) Dated: 4th August, 2009, which are available on the website of this Ministry, should be followed.	Instructions issued by MoEF & CC O.M. No. J-11013/41/2006-IA. II (I) Dated: 4th August, 2009 are 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	Noted & agreed.

	entail conducting the PH again with the revised documentation	
I	As per the circular no. J-11011/618/2010-IA. II(I) Dated: 30.5.2012, certified report of the status of compliance of the conditions stipulated in the environment clearance for the existing operations of the project, should be obtained from the Regional Office of Ministry of Environment, Forest and Climate Change, as may be applicable.	Not applicable.
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.	Surface Plan – Figure No. 2.2. Geological Plan – Figure No 2.9. Working Plan – Figure No 2.9. Closure Plan – Figure No.2.10.

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1. INTRODUCTION

1.0 PREAMBLE

Project History

The project proponent Thiru. A.Subramaniam has applied for Rough stone and Gravel quarry over an extent of 1.21.50 Ha in S.F.Nos. 834/2(Part) Sokkanur Village, Kinathukadavu Taluk & Coimbatore District.

- The proponent applied for Rough Stone and Gravel Quarry Lease Dated: 18.04.2023
- Precise Area Communication Letter was issued by the District Collector, Coimbatore R.C. No: 449/Mines/2023, Dated: 03.10.2024
- The Mining Plan was prepared by Recognized Qualified Person and approved by Assistant Director, Geology and Mining, Coimbatore District, vide R.C.No: 449/Mines/2023, Dated: 30.10.2024
- 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/508194/2024 Dated: 26.11.2024
- The proposal was placed in 523rd SEAC meeting held on 27.12.2024 and the committee recommended for issue of ToR.
- The proposal was considered in 787th SEIAA meeting held on 08.01.2025 and issued ToR vide File No.11525 TOR Identification No. TO24B0108TN5781225N Dated:11.01.2025
- As per the EIA Notification, 2006 and subsequent amendments and OM The proposal falls in the B1 Category (Cluster quarries – 2 proposals, 1 Existing quarry forming Cluster Category {Total Extent of the Cluster is 5.43.5 Ha}- Cluster area calculated as per MoEF & CC Notification S.O. 2269(E) Dated 1st July 2016).

Based on the ToR Baseline Monitoring study has been carried out for one season (Post Monsoon) i.e., **March – May 2025** 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) to minimize those adverse impacts.

Environmental Impact Assessment (EIA) study is a process, used to identify the Environmental, Social and Economic impacts of a project prior to decision-making. EIA systematically examines both beneficial and adverse consequences of the proposed project and ensure that these impacts are considered during the project designing.

1.1 PURPOSE OF THE REPORT

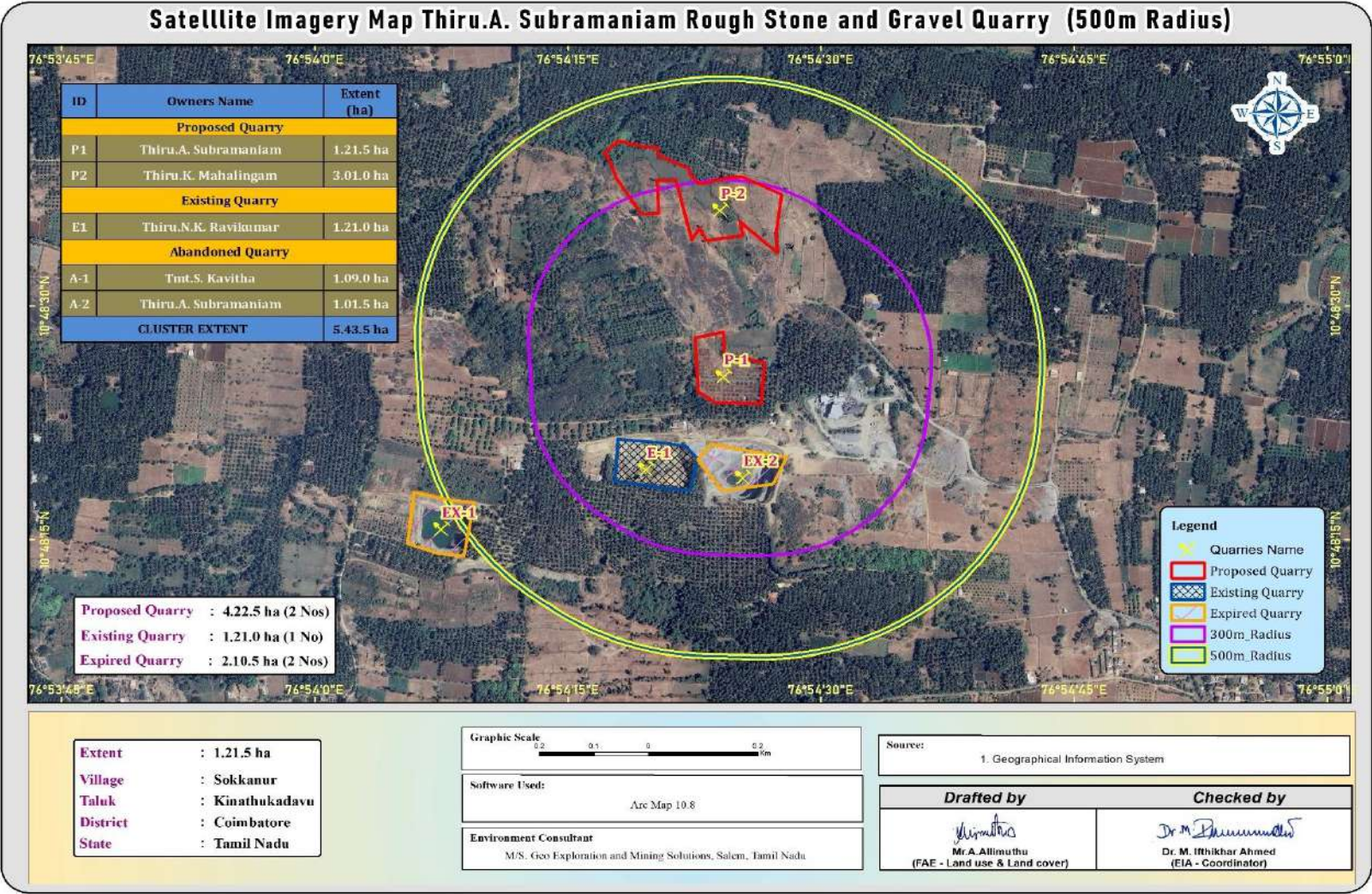
The Ministry of Environment and Forests, Govt. of India, through its EIA notification S.O. 1533(E) of 14th September 2006 and its subsequent amendments as per Gazette Notification S.O. 1889 of 20th April 2022, Mining Projects are classified under two categories i.e. A (> 250 Ha) and B ($\leq$ 250 Ha), and Schematic Presentation of Requirements on Environmental Clearance of Minor Minerals including cluster situation in Appendix-XI.

Now, as per Order Dated: 04.09.2018 & 13.09.2018 passed by Hon'ble National Green Tribunal, New Delhi in O.A. No. 173 of 2018 & O.A. No. 186 of 2016 and MoEF & CC Office Memorandum F. No. L-11011/175/2018-IA-II (M) Dated: 12.12.2018 clarified the requirement for EIA, EMP and therefore, Public Consultation for all areas from 5 to 25 ha falling in Category B1 and appraised by SEAC/ SEIAA as well as for cluster situation.

The proposed projects are categorized under category “B1” Activity 1(a) (mining lease area in cluster situation) and will be considered at SEIAA – TN after conducting Public Hearing and Submission of EIA/EMP Report for Grant of Environmental Clearance.

“Draft EIA report prepared on the basis of ToR Issued for carrying out public hearing for the grant of Environmental Clearance from SEIAA, Tamil Nadu”

FIGURE 1.1 SATELLITE IMAGERY CLUSTER QUARRIES



1.2 IDENTIFICATION OF PROJECT AND PROJECT PROPONENT

1.2.1 Identification of Project

TABLE 1.1: SALIENT FEATURES OF THE PROPOSED PROJECT

Name of the Project	Thiru.A.Subramaniam Rough Stone and Gravel Quarry
S.F. No.	834/2 (Part)
Extent	1.21.50 ha
Land Type	Patta Land
Village Taluk and District	Sokkanur Village, Kinathukadavu Taluk, Coimbatore District

Source: Approved Mining Plan

1.2.2 Identification of Project PropONENT

TABLE 1.2: DETAILS OF PROJECT PROPONENT

Name of the Project PropONENT	Thiru. A. Subramaniam
Address	S/o. Agatheeswaran Gounder, No. 9/98, Veerappagoundanur, Palarpathy Post, Kinathukadavu Taluk, Coimbatore District, Tamil Nadu state – 642 109.
Mobile	+91 9447881598
Status	Proprietor

Source: Approved Mining Plan.

1.3 BRIEF DESCRIPTION OF THE PROJECT

1.3.1 Nature and Size of the Project

The quarrying operation is proposed to be carried out by Opencast Mechanized Mining method with 5.0m bench height and 5.0m bench width by deploying Jack Hammer for Drilling & Slurry Explosive during blasting. Hydraulic Excavator and tippers are used for Loading and transportation. Rock Breakers are deployed to avoid secondary blasting.

TABLE 1.3: BRIEF DESCRIPTION OF THE PROJECT

Name of the Quarry	Thiru. A. Subramaniam Rough stone and Gravel quarry	
Land Ownership	It is a Own Patta land,	
SF No & Area (Ha)	834/2 (Part) & 1.21.50 ha	
Village,Taluk & District	Sokkanur Village, Kinathukadavu Taluk, Coimbatore District.	
Toposheet No	58 B/13	
Latitude between	10°48'23.73"N to 10°48'28.30"N	
Longitude between	76°54'22.54"E to 76°54'26.67"E	
Highest Elevation	268m AMSL	
Proposed Depth of Mining	37m (2m Gravel + 35m Rough Stone) below the ground level	
Geological Resources	Rough Stone in m ³	Gravel m ³
	4,28,730 m³	25,492 m³
Mineable Reserves	Rough Stone in m ³	Gravel m ³
	1,24,456 m³	17,174 m³
Year wise Production	Rough Stone in m ³	Gravel m ³
	1,24,456 m³	17,174 m³
Ultimate Pit Dimension	XY-AB - 100m (L) x 73m (W) x 37m (D) bgl X1Y1-CD - 33m (L) x 39m (W) x 15m (D) bgl	
Water Level in the surrounds area	68 m – 73m bgl	
Method of Mining	Opencast Mechanized Mining Method involving drilling and blasting	
Topography	The lease applied area is exhibits undulated topography. The area has gentle sloping towards Northern side. The altitude of the area is 268m (max) above Mean Sea level. The area is covered by 2m thickness of Gravel formation. Massive Charnockite which is clearly inferred from the existing quarry pits.	
Machinery proposed	Jack Hammer	4 Nos
	Compressor	1 Nos

	Excavator with Bucket and Rock Breaker	1 No
	Tipper	2 Nos
	Water Sprinkling Tanker	1 Nos
Blasting Method	Controlled Blasting Method by shot hole drilling and small dia of 25mm slurry explosive are proposed to be used for shattering and heaving effect for removal and winning of Rough Stone. No deep hole drilling is proposed.	
Proposed Manpower Deployment	25 Nos	
Project Cost	Rs. 36,73,000/-	
EMP cost	Rs. 3,80,000/-	
CER Cost	Rs. 5,00,000/-	
Nearby Water Bodies	Vari	70m SE
	Kuttai	100m North
	Odai	400m NW
	Kumitipathi Stream	3.7km NW
	Walayar Reservoir	6km NW
Greenbelt Development Plan	It is proposed to plant 610 Nos of trees in the safety barrier and village road.	
Proposed Water Requirement	2.5 KLD	
Nearest Habitation	780m SouthEast	

Source: Approved Mining Plan

1.3.2 Location of the Project

- The proposed quarry projects fall in Sokkanur Village, Kinathukadavu Taluk and Coimbatore District.
- The project is located about 17 km Southwest of Coimbatore, 12 km west of Kinathukadavu and 2.5 km West side of Sokkanur Village.

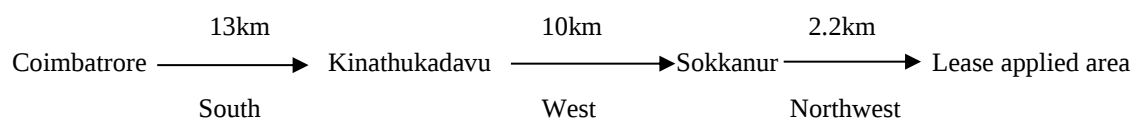
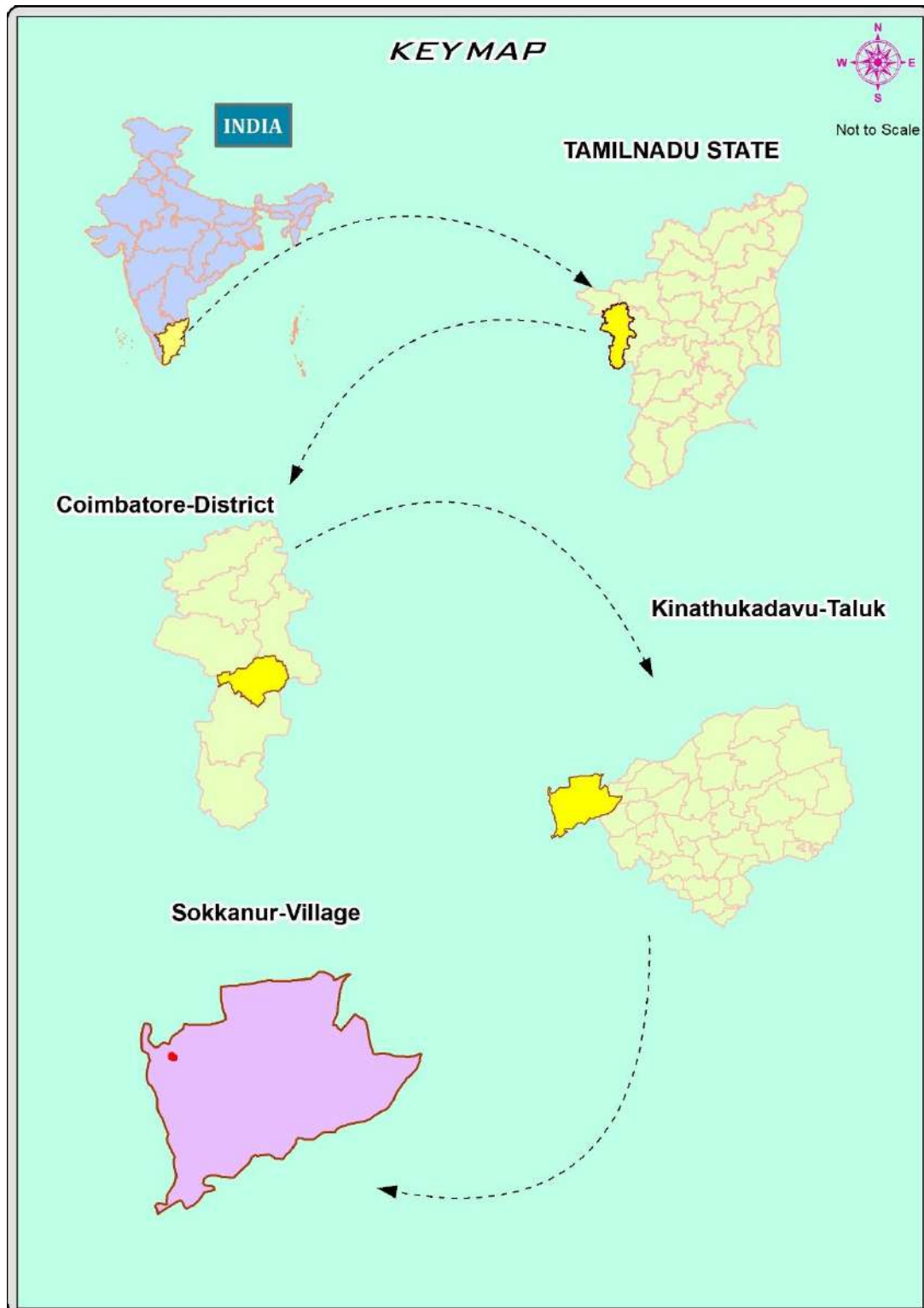


FIGURE 1.2 KEY MAP SHOWING THE LOCATION OF THE CLUSTER SITE



Source: Survey of India Toposheet 58-B/13

FIGURE 1.3: TOPOSHEET MAP OF THE STUDY AREA 10 KM RADIUS

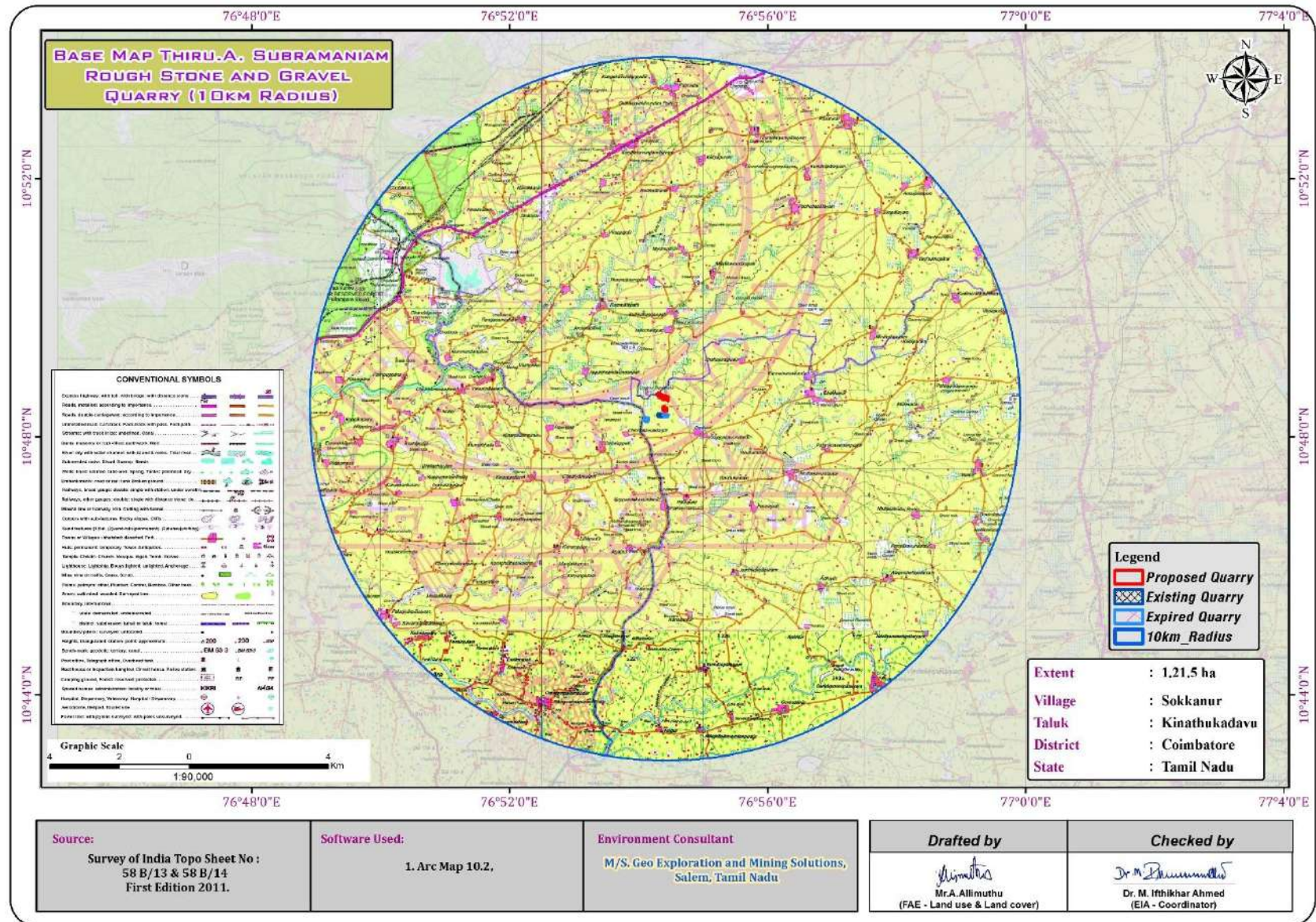
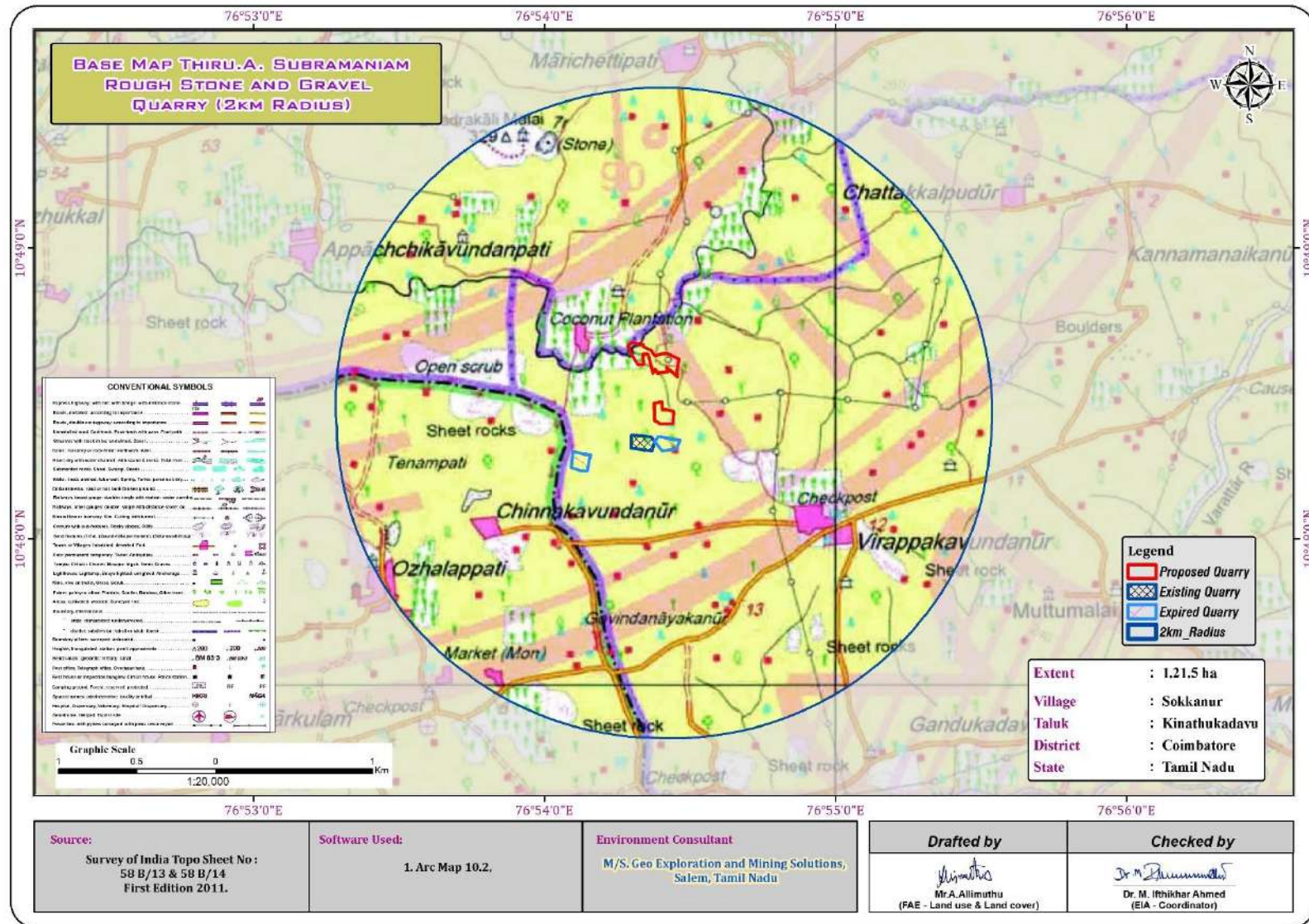


FIGURE 1.3A: TOPOSHEET MAP OF THE STUDY AREA 2KM RADIUS



Source: Survey of India Toposheet 58-B/13

1.4 ENVIRONMENTAL CLEARANCE

The Environmental Clearance process for the project will comprise of four stages. These stages in sequential order are given below: -

- Screening,
- Scoping
- Public consultation &
- Appraisal

SCREENING –

- The proponent applied for Rough Stone and Gravel Quarry Lease Dated: 18.04.2023
- Precise Area Communication Letter was issued by the District Collector, Coimbatore R.C. No: 449/Mines/2023, Dated: 03.10.2023
- The Mining Plan was prepared by Recognized Qualified Person and approved by Assistant Director, Geology and Mining, Coimbatore District, vide R.C. No: 449/Mines/2023, Dated: 30.10.2023
- 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/508194/2024 Dated: 26.11.2024

SCOPING

- The proposal was placed in 523rd SEAC meeting held on 27.12.2024 and the committee recommended for issue of ToR.
- The proposal was considered in 787th SEIAA meeting held on 08.01.2025 and issued ToR vide File No.11525 TOR Identification No. TO24B0108TN5781225N Dated:11.01.2025

PUBLIC CONSULTATION –

Application to The Member Secretary of the Tamil Nadu Pollution Control Board (TNPCCB) to conduct Public Hearing in a systematic, time bound and transparent manner ensuring widest possible public participation at the project site or in its close proximity in the district was submitted.

APPRAISAL –

- Appraisal is the detailed scrutiny by the State Expert Appraisal Committee (SEAC) of the application and other documents like the final EIA & EMP Report, outcome of the Public Consultations including Public Hearing Proceedings, submitted by the proponent to the regulatory authority concerned for grant of environmental clearance.
- The report has been prepared using the following references:
- Guidance Manual of Environmental Impact Assessment for Mining of Minerals, Ministry of Environment and Forests, 2010
- EIA Notification, 14th September, 2006
- File No. 11525 TOR Identification No. TO24B0108TN5781225N Dated:11.01.2025
- Approved Mining Plan

1.5 TERMS OF REFERENCE (ToR)

Compliance to ToR issued vide –

- File No. 11525 TOR Identification No. TO24B0108TN5781225N Dated:11.01.2025

1.6 POST ENVIRONMENT CLEARANCE MONITORING

The project proponent shall submit a half-yearly compliance report in respect of stipulated Environmental Clearance terms and conditions to MoEF & CC Regional Office & SEIAA after grant of EC on 1st June and 1st December of each calendar year as per MoEF & CC Notification S.O. 5845 (E) Dated: 26.11.2018.

1.7 GENERIC STRUCTURE OF EIA DOCUMENT

The overall contents of the EIA report follow the list of contents prescribed in the EIA Notification 2006 and the “Environmental Impact Assessment Guidance Manual for Mining of Minerals” published by MoEF & CC.

1.8 THE SCOPE OF THE STUDY

The main scope of the EIA study is to quantify the cumulative impact in the study area due to cluster quarries and formulate the effective mitigation measures for individual leases. A detailed account of the emission sources, emissions control equipment, background Air quality levels, Meteorological measurements, Dispersion model and all other aspects of pollution like effluent discharge, Dust generation etc., have been discussed in this report. The baseline monitoring study has been carried out during the Post monsoon season (October to December 2024) for various environmental components so as to assess the anticipated impacts of the cluster quarry projects on the environment and suggest suitable mitigation measures for likely adverse impacts due to the proposed project.

TABLE 1.4: ENVIRONMENT ATTRIBUTES

Sl.No.	Attributes	Parameters	Source and Frequency
1	Ambient Air Quality	PM ₁₀ , PM _{2.5} , SO ₂ , NO ₂	Continuous 24-hourly samples twice a week for three months at 7 locations (2 Core & 5 Buffer)
2	Meteorology	Wind speed and direction, temperature, relative humidity and rainfall	Near project site continuous for three months with hourly recording and from secondary sources of IMD station
3	Water quality	Physical, Chemical and Bacteriological parameters	Grab samples were collected at 6 locations – 1 Surface water and 5 Ground water samples; once during study period.
4	Ecology	Existing terrestrial and aquatic flora and fauna within 10 km radius circle.	Limited primary survey and secondary data was collected from the Forest department.
5	Noise levels	Noise levels in dB(A)	7 locations – data monitored once for 24 hours during EIA study
6	Soil Characteristics	Physical and Chemical Parameters	Once at 6 locations during study period
7	Land use	Existing land use for different categories	Based on Survey of India topographical sheet and satellite imagery and primary survey.
8	Socio-Economic Aspects	Socio-economic and demographic characteristics, worker characteristics	Based on primary survey and secondary sources data like census of India 2011.
9	Hydrology	Drainage pattern of the area, nature of streams, aquifer characteristics, recharge and discharge areas	Based on data collected from secondary sources as well as hydro-geology study report prepared.
10	Risk assessment and Disaster Management Plan	Identify areas where disaster can occur by fires and explosions and release of toxic substances	Based on the findings of Risk analysis done for the risk associated with mining.

Source: Field Monitoring Data

1.8.1 Regulatory Compliance & Applicable Laws/Regulations for Proposed Quarry

- Application for Quarrying Lease as per Tamil Nadu Minor Mineral Concession Rules, 1959
- Obtained Precise Area Communication Letter as per Tamil Nadu Minor Mineral Concession Rules, 1959 for Preparation of Mining Plan and obtaining Environmental Clearance
- The Mining Plan has been approved under Rule 41 & 42 as amended of Tamil Nadu Minor Mineral Concession Rules, 1959
- File No. 11525 TOR Identification No. TO24B0108TN5781225N Dated:11.01.2025

2. PROJECT DESCRIPTION

2.0 GENERAL

The Proposed Rough Stone Quarry requires Environmental Clearance. There are 2 proposed and 1 existing quarries forming a cluster; calculated as per MoEF & CC Notification S.O. 2269(E) Dated 1st July 2016 and the total extent of cluster is 5.43.5 ha

As the extent of cluster are 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.

2.1 DESCRIPTION OF THE PROJECT

The proposed projects are site specific and there is no additional area required for this project. There is no effluent generation/discharge from this proposed project. 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 LOCATION OF THE PROJECT

- The proposed quarry project area is located in Sokkanur village, Kinathukadavu taluk, Coimbatore District
- The project is located about 17 km Southwest of Coimbatore, 12 km west of Kinathukadavu and 2.5 km West side of Sokkanur Village..
- The proposed area falls in the Survey of India Topo sheet No. 58-B/13
- The Latitude between of **10°48'23.73"N to 10°48'28.30"N** The Longitude between of **76°54'22.54"E to 76°54'26.67"E** on WGS 1984 Datum.
- The project does not fall within 10 km radius of any Eco – sensitive zone, National Park, Tiger Reserve, Elephant Corridor and Biosphere Reserves.

TABLE 2.1: SITE CONNECTIVITY

Nearest Roadway	National Highway (NH-544) Salem - Kochin Road – 7.15 km-NE State Highway (SH-26) K.G.Chavadi - Velanthavalam – 4.5 km-NW
Nearest Village	Veerappagoundanur – 930m SE
Nearest Town	Kinathukadavu – 12 km – East
Nearest Railway Station	Kinathukadavu Railway station – 12 Km – East
Nearest Airport	Coimbatore – 29 km – Northeast
Seaport	Kochi- 116 km – South West

Source: Survey of India Toposheet

The project area is bounded by 7 corners the corners are designated as 1- 7 clock wise from the South west corner. The coordinates for all the corners is given below.

TABLE 2.2: BOUNDARY CO-ORDINATES OF PROJECT

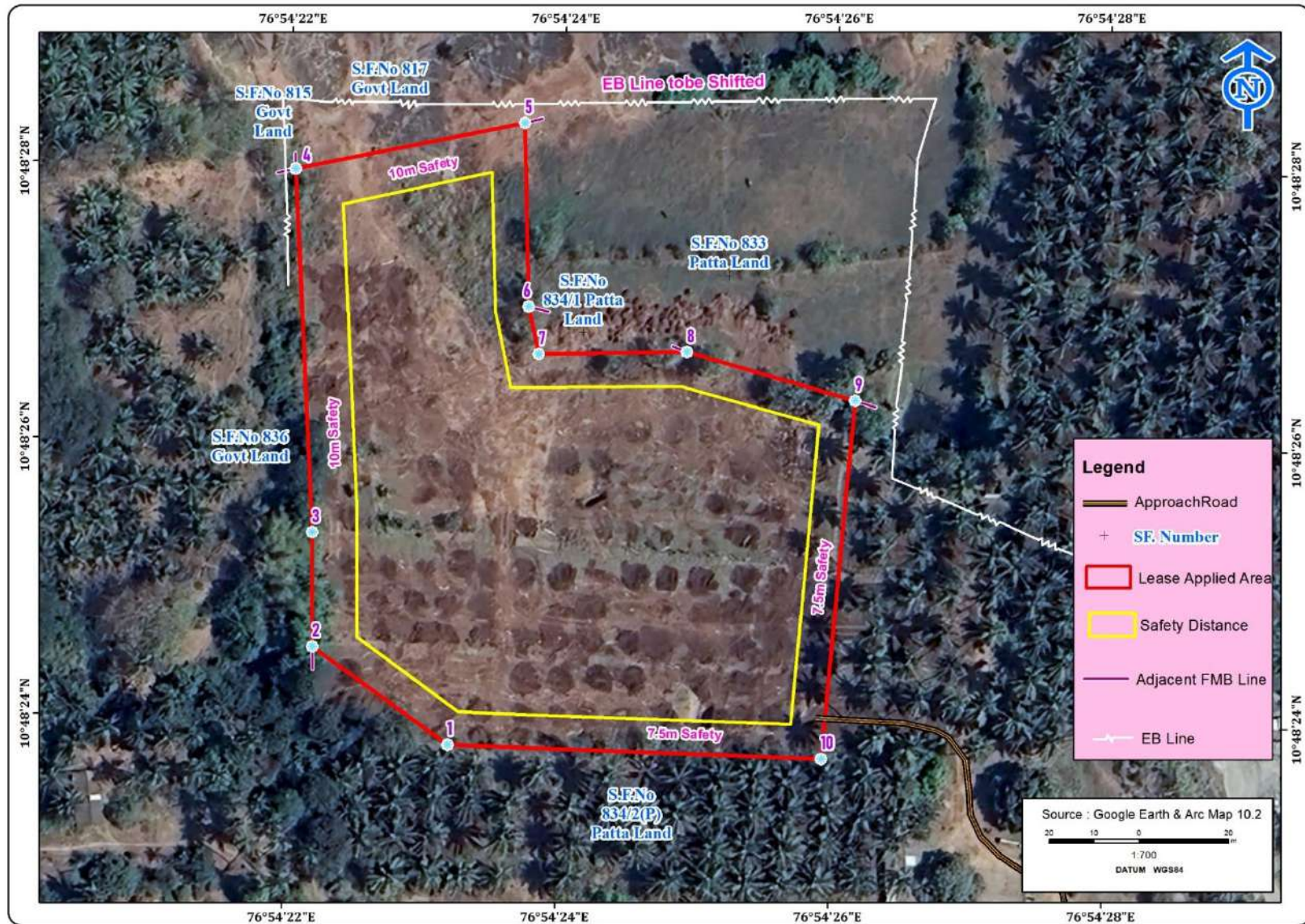
Corner Nos.	Latitude	Longitude
1	10 ⁰ 48'23.79"N	76 ⁰ 54'23.71"E
2	10 ⁰ 48'24.49"N	76 ⁰ 54'22.71"E
3	10 ⁰ 48'25.32"N	76 ⁰ 54'22.70"E
4	10 ⁰ 48'27.95"N	76 ⁰ 54'22.54"E
5	10 ⁰ 48'28.30"N	76 ⁰ 54'24.22"E
6	10 ⁰ 48'26.97"N	76 ⁰ 54'24.27"E
7	10 ⁰ 48'26.63"N	76 ⁰ 54'24.34"E
8	10 ⁰ 48'26.66"N	76 ⁰ 54'25.43"E
9	10 ⁰ 48'26.32"N	76 ⁰ 54'26.67"E
10	10 ⁰ 48'23.73"N	76 ⁰ 54'26.45"E

Source: Approved Mining Plan

FIGURE 2.1: PHOTOGRAPHS OF THE PROJECT SITE



FIGURE 2.2: GOOGLE IMAGE OF THE PROJECT AREA



Source: Google Earth Imagery

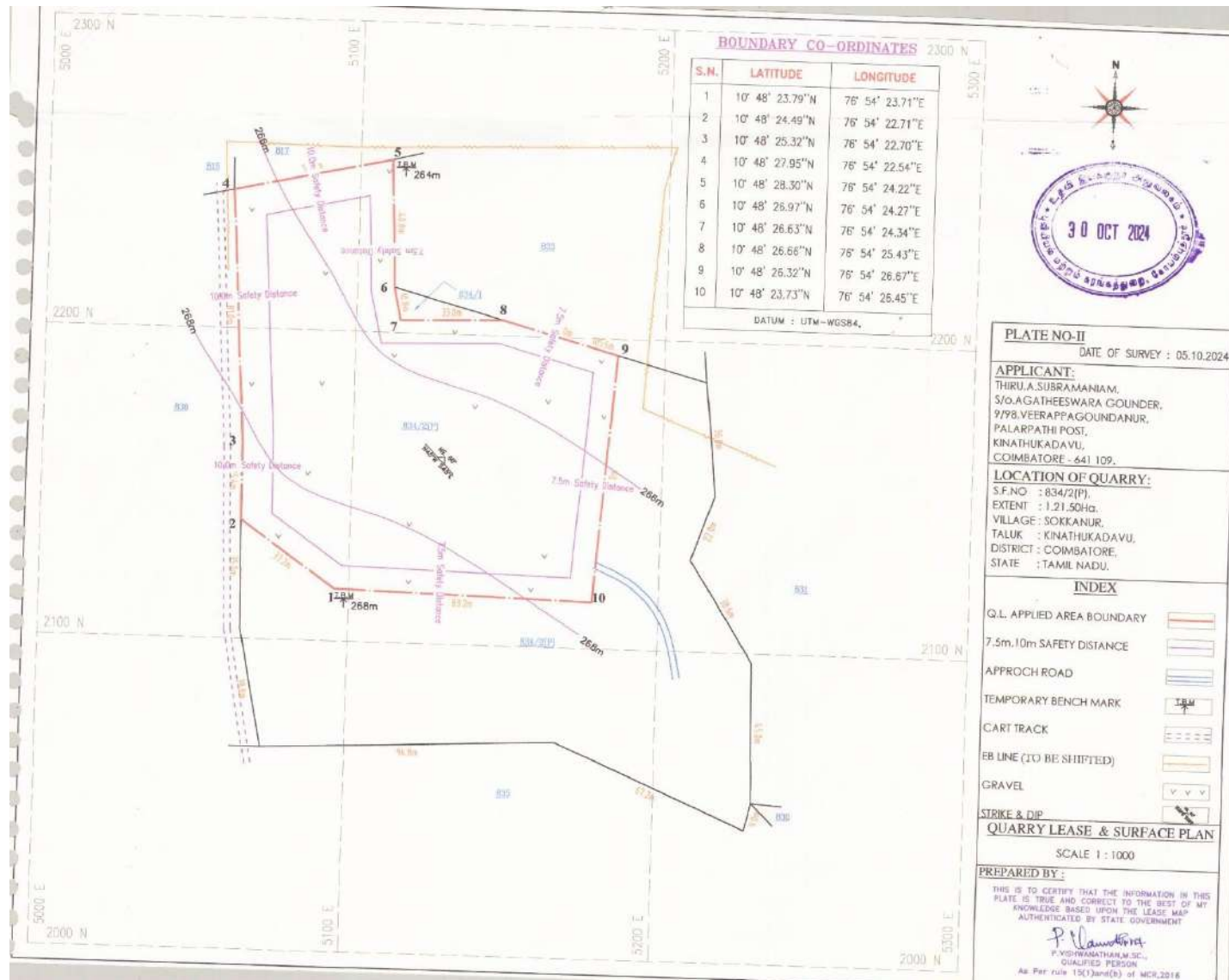
FIGURE 2.3: QUARRY LEASE PLAN / SURFACE PLAN

FIGURE 2.4: VILLAGE MAP SUPERIMPOSED ON GOOGLE EARTH IMAGE

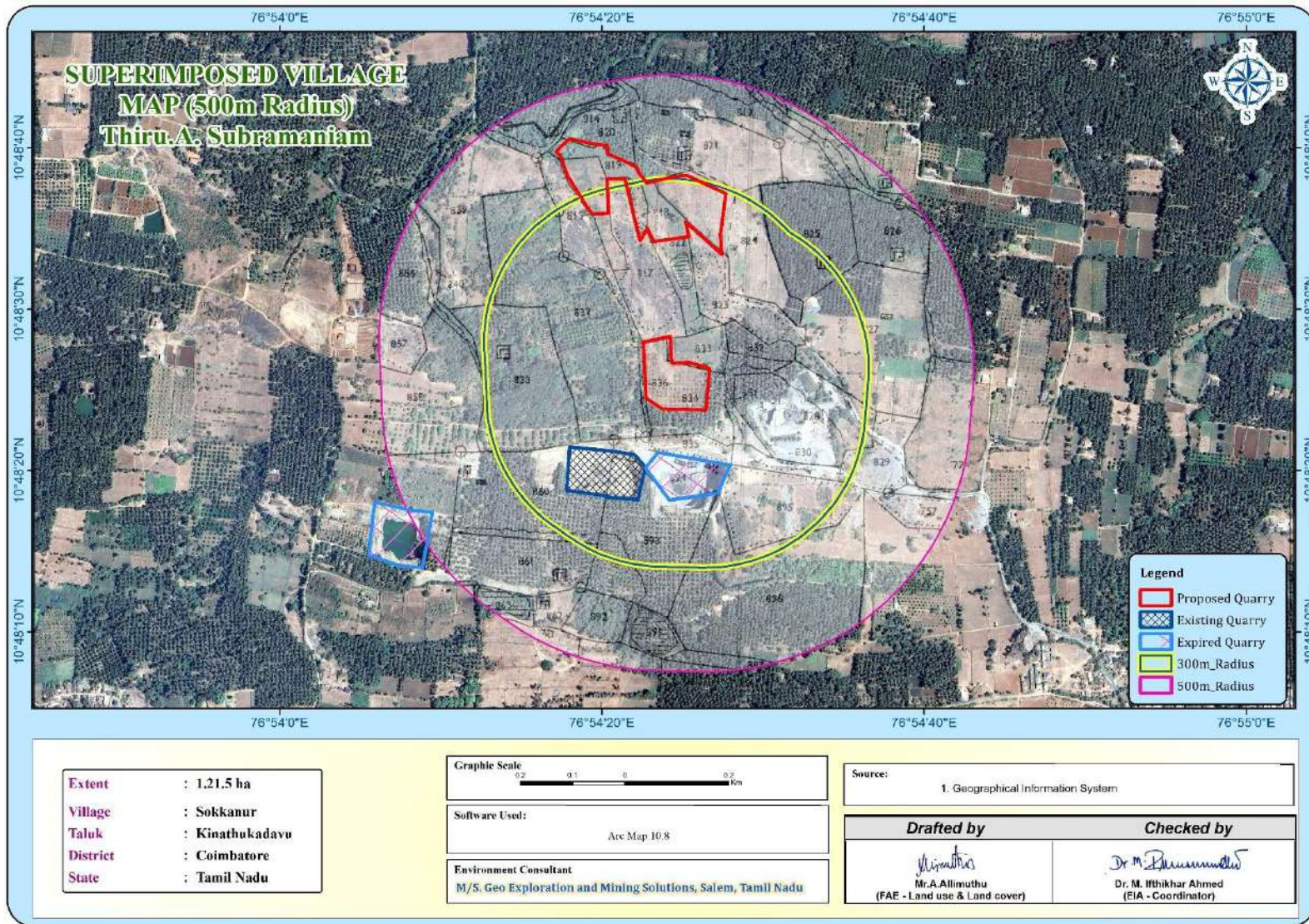


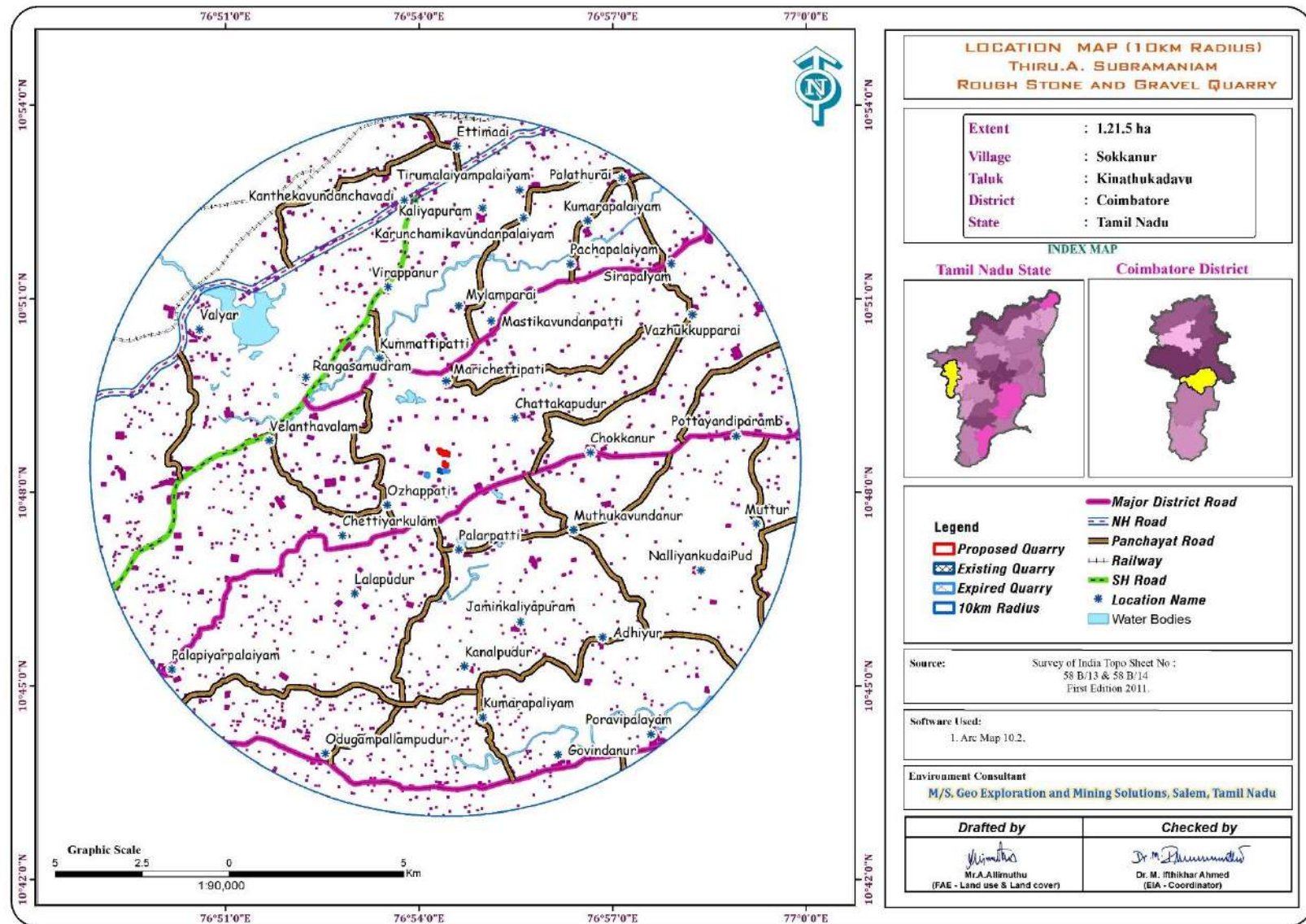
FIGURE 2.5: IMAGE SHOWING SURFACE FEATURES AROUND 10 KM RADIUS

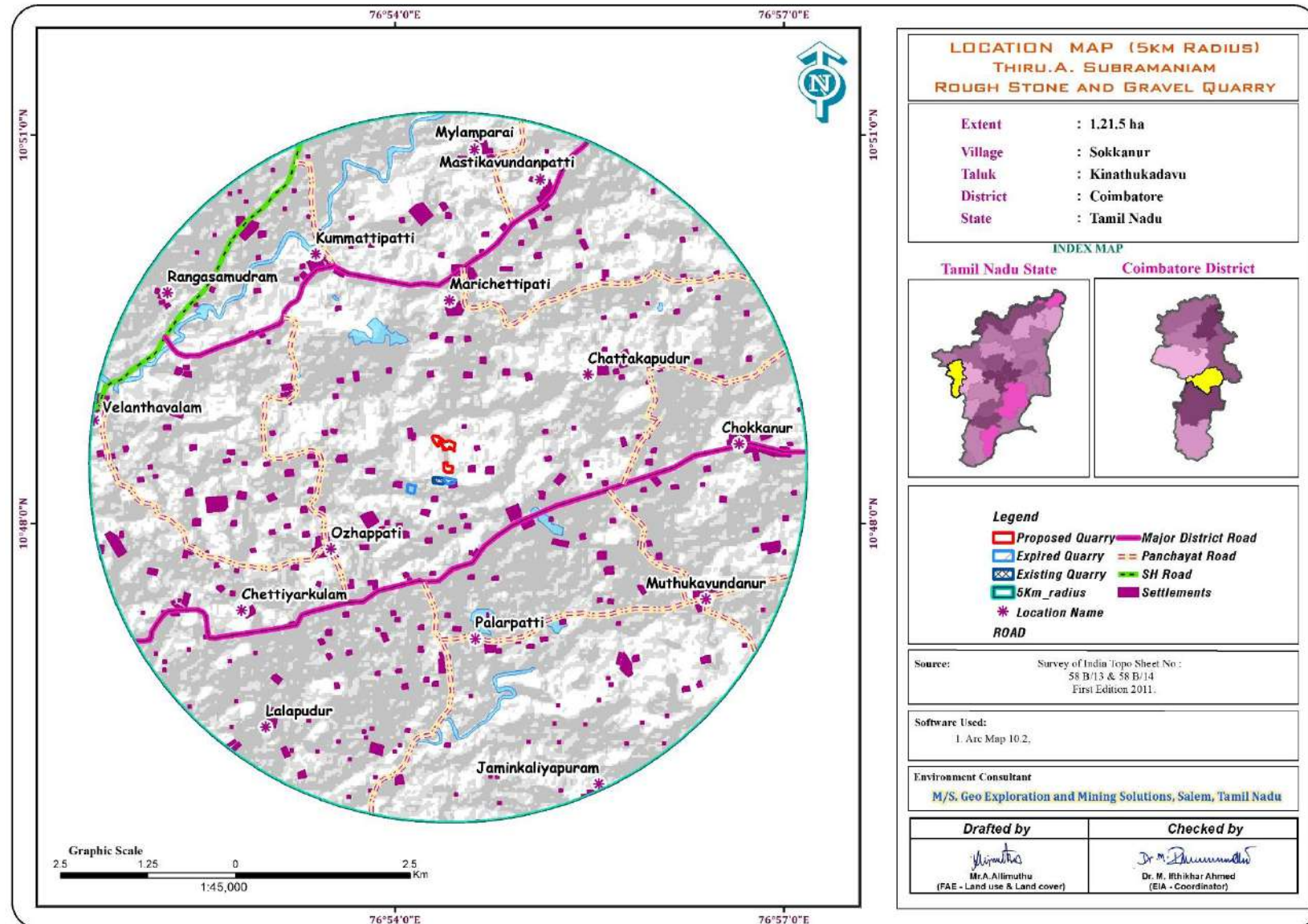
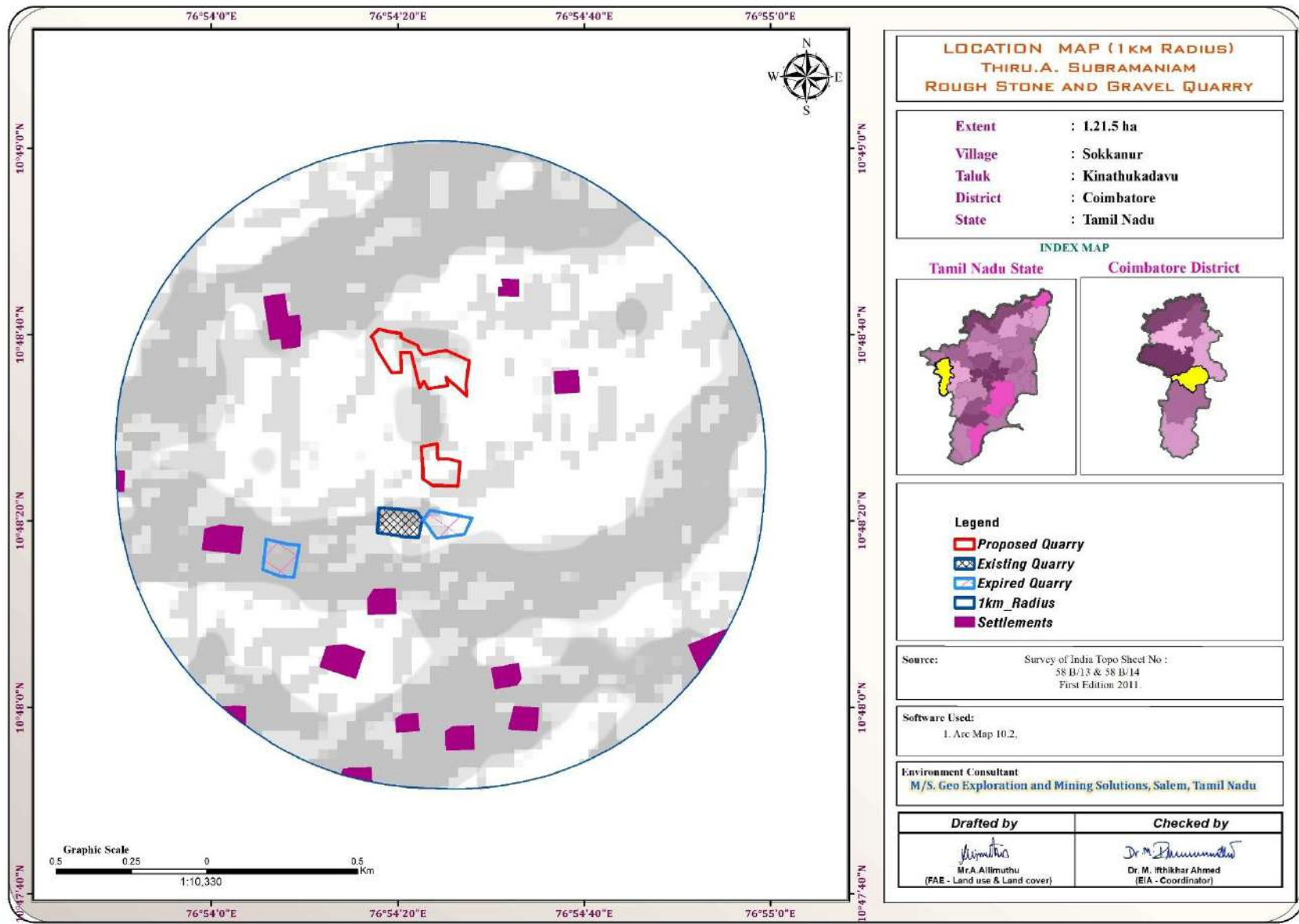
FIGURE 2.6: IMAGE SHOWING SURFACE FEATURES AROUND 5KM RADIUS

FIGURE 2.7: IMAGE SHOWING SURFACE FEATURES AROUND 1 KM RADIUS

2.2.1 Project Area

- The Rough Stone and Gravel quarry is proposed to operate by opencast mechanized method of mining and the project is site specific
- There is no beneficiation or processing proposed inside the project area
- There is no forest land involved in the proposed projects and is devoid of major vegetation and trees.

TABLE 2.3: LAND USE PATTERN OF THE PROPOSED PROJECT – CORE ZONE

Description	Present area (Ha)	Area at the end of this quarrying period (Ha)
Area under Quarry	Nil	0.85.00
Infrastructure	Nil	0.01.00
Roads	Nil	0.01.00
Green Belt	Nil	0.34.50
Unutilized Area	1.21.50	Nil
Grand Total	1.21.50	1.21.50

Source: Approved Mining Plan

2.2.2 Size or Magnitude of Operation

TABLE 2.4: OPERATIONAL DETAILS FOR PROPOSED PROJECT

PARTICULARS	DETAILS	
	Rough Stone (5Year Plan period)	Gravel in m ³
Geological Resources	4,28,730	25,492
Mineable Reserves	1,24,456	17,174
Production for five-year plan period	1,24,456	17,174
Mining Plan Period	5 years	
Number of Working Days	300 days	
Production per day	82	19
No of Lorry loads (12m ³ per load)	7	1
Total Depth of Mining	37m (2m Gravel + 35m Rough Stone) bgl	

Source: Mining plan

2.3 GEOLOGY

2.3.1 Regional Geology

Coimbatore district of Tamil Nadu forms a part of southern Granulitic terrain and is predominantly occupied by crystalline rocks of Archaean to late Proterozoic age. Regionally, the rocks can be grouped under five categories namely –

- I. Charnockite Group represented by Charnockite, Pyroxene Granulite and Magnetite Quartzite,
- II. Peninsular Gneissic Complex (II) comprising hornblende-biotite gneiss,
- III. Basic intrusive include Pyroxinite/Dunite
- IV. Younger intrusive comprising, Nepheline-Syenite, Pink Granite, Pegmatite and Quartz veins and
- V. Quaternary sediments of Kankar and soil.

Stratigraphy of the area –

Age	Group	Lithology
Holocene		Block cotton soil/clay±gypsum
Cenozoic		Kankar/calc-tufa
Neoproterozoic	Acid intrusives	Quartz veins Pegmatite Pink Granite
	Sivamalai syenite Complex	Nepheline-syenite
	Chalk Hills (Basic Intrusives)	Pyroxenite/Dunite
Archaean – Palaeoproterozoic	Peninsular Gneissic Complex (II) PGC (II)	Pink Granite Gneiss Hornblende Biotite gneiss
Archaean	Charnockite Group	Charnockite (Unclassified) Pyroxene Granulite Banded Magnetite Quartzite

Geologically, the district is covered by rocks belonging to Archean age comprising the khondalite group, Charnockite Group, migmatite group, Sathayamangalam group, Bhavani Group and Alkali complex of Proterozoic age and Recent to Late Pleistocene rocks of Cainozoic age.

The Charnockite Group of rocks consisting of Charnockite, pyroxene granulites and associated magnetite quartzite, the Knodalite Group comprising gametiferous – sillimanite gneiss, calc-granulite, crystalline limestone, sillimanite quartzites and associated migmatitic gneisses. The rocks are restricted to the central and southern portions of the district, especially around Sulur, Madukkarai and Pollachi taluks.

The fissile hornblende gneisses (Peninsular gneiss – younger phase) of Bhavani Group with enclaves of schistose, micaceous and amphibolitic rocks, fuchsitge – kyanite quartzites, ferruginous quartzite (Sathayamangalam Group) intruded by a number of ultramafic and basic rocks and granites are seen in the Northern portions of the district especially around Mettupalayam and Northern areas of Coimbatore. The granites are Proterozoic age and occupy the Western end and Eastern Part of the District as separate bodies and are recognized as Maruthamalai Granite and Punjapuliampatti Granites respectively. The quaternary alluvium is seen in the Western areas of Coimbatore town. The alluvium is more than 30m thick in the Chinnathadagam valley northwest of Coimbatore and in the Siruvani valley west of Coimbatore.

Source: District Survey Report for Minor Minerals Coimbatore District – May 2019

(<https://www.tnmines.tn.gov.in/pdf/dsr/9.pdf>)

2.3.2 Local Geology: -

The study area follows the regional trend and mainly comprises of Hard Rock Formation as a homogeneous formation / Batholith formation of Charnockite. All the project areas are plain terrain, all the project areas are covered with gravel formation of 1m-2m thickness; Massive Charnockite formation is found after 1m-2m gravel formation which is clearly inferred from the nearby existing quarry pit.

Peninsular gneiss forms the oldest rock formation in which the massive formation of Charnockite lies over with rich accumulation of recent quaternary formation. On regional scale of the Charnockite body is N30°E – S 30° W with dipping towards NE 60°.

2.3.3 Hydrogeology

Coimbatore District is underlain by crystalline metamorphic complex in the western parts of district and sedimentary tract in eastern side. An area of 4551 Sq.km is covered by crystalline rocks (63%) and 2671 Sq.km is covered by sediments (37%). The general geological sequence of formation is given below:

Quaternary - Laterites, Sands and Clays

Tertiary - Sandstone, Gravels and Clays

Cretaceous - Limestone, Calcareous Sandstone and Clay unconformity.

Archaean - Charnockites, Gneisses, Granites, Dolerites and Pegmatite

- The major part of the area is covered by metamorphic crystalline rocks of charnockite, granitic gneiss of Archaean age intruded by dolerite dykes and pegmatite veins. These rocks are highly metamorphosed and have been subjected to very severe folding, crushing and faulting.
- Ground Water occurs under the phreatic condition and wherever there are deep seated fractures, it occurs under semi-confined to confined conditions.
- Occurrence of Ground Water in hard rock depends upon the intensity and depth of weathering, fractures and fissures present in the rocks.
- Granites and gneisses yield moderately compared to the yield in Charnockites.
- Depth of well in hard rock generally ranges between 8 and 15m below ground level.
- Generally, yield in open wells ranges from 30 to 250m³ /day and in bore well between 260 and 430m³ /day. The weathered thickness varies from 2.5 m to 42m in general there are 3 to 5 fracture zones within 100 m and 1 to 4 fracture zones between 100 and 200 m.

The Cretaceous formation is represented by Arenaceous Lime stone, Calcareous sand - stone and marl.

The Tertiary formation is argillaceous comprising of Silty clay stones, argillaceous Lime stone.

The Quaternary deposits represented by the river deposits of Ponnaiyar and Varahanadhi spread over as patches in Tirupur District. The alluvium consists of unconsolidated sands, gravelly sands, clays and clayey sands. The thickness of the sands ranges between 15 and 25 m in the alluvial formation which also form potential aquifers. In some areas, sand stone of tertiary formation are the potential groundwater reservoirs.

Aquifer Systems:

Occurrence and storage of groundwater depend upon three factors viz., Geology, Topography and rainfall in the form of precipitation. Apart from Geology, wide variation in topographic profile and intensity of rainfall constitutes the prime factors of groundwater recharge. Aquifers are part of the more complex hydro geological system and the behaviour of the entire system cannot be interpreted easily. In hard rock terrain the occurrence of Ground Water is limited to top weathered, fissured and fractured zone which extends to maximum 30 m on an average it is about 10-15 m in Coimbatore District.

In Sedimentary formations, the presence of primary inter granular porosity enhances the transmitting capacity of groundwater where the yield will be appreciable. The sedimentary area which occupies the eastern part of the district along the coastal tract is more favourable for groundwater recharge. Ground Water occurs both in semi confined and confined conditions. A brief description of occurrence of groundwater in each formation is furnished below.

Alluvial Formations

In the river alluvium groundwater occurs under water table condition. The maximum thickness is 37 m and the average thickness of the aquifer is approximately 12 m. These formations are porous and permeable which have good water bearing zones.

Hard Rock Formations

Groundwater occurs under water table conditions but the intensity of weathering, joint, fracture and its development is much less in other type of rocks when compared to gneissic formation. The groundwater potential is low, when compared with the gneissic formations.

Granitic Gneiss

Groundwater occurs under water table conditions in weathered, jointed and fractural formations. The pore space developed in the weathered mantle acts as shallow granular aquifers and forms the potential water bearing and yielding zones water table is shallow in canal and tank irrigation regions and it is somewhat deeper in other regions.

Charnockite

Groundwater occurs under water table conditions but the intensity of weathering, joint, fracture and its development is much less when compared to gneissic formations. The groundwater potential is low, when compared with the gneissic formations.

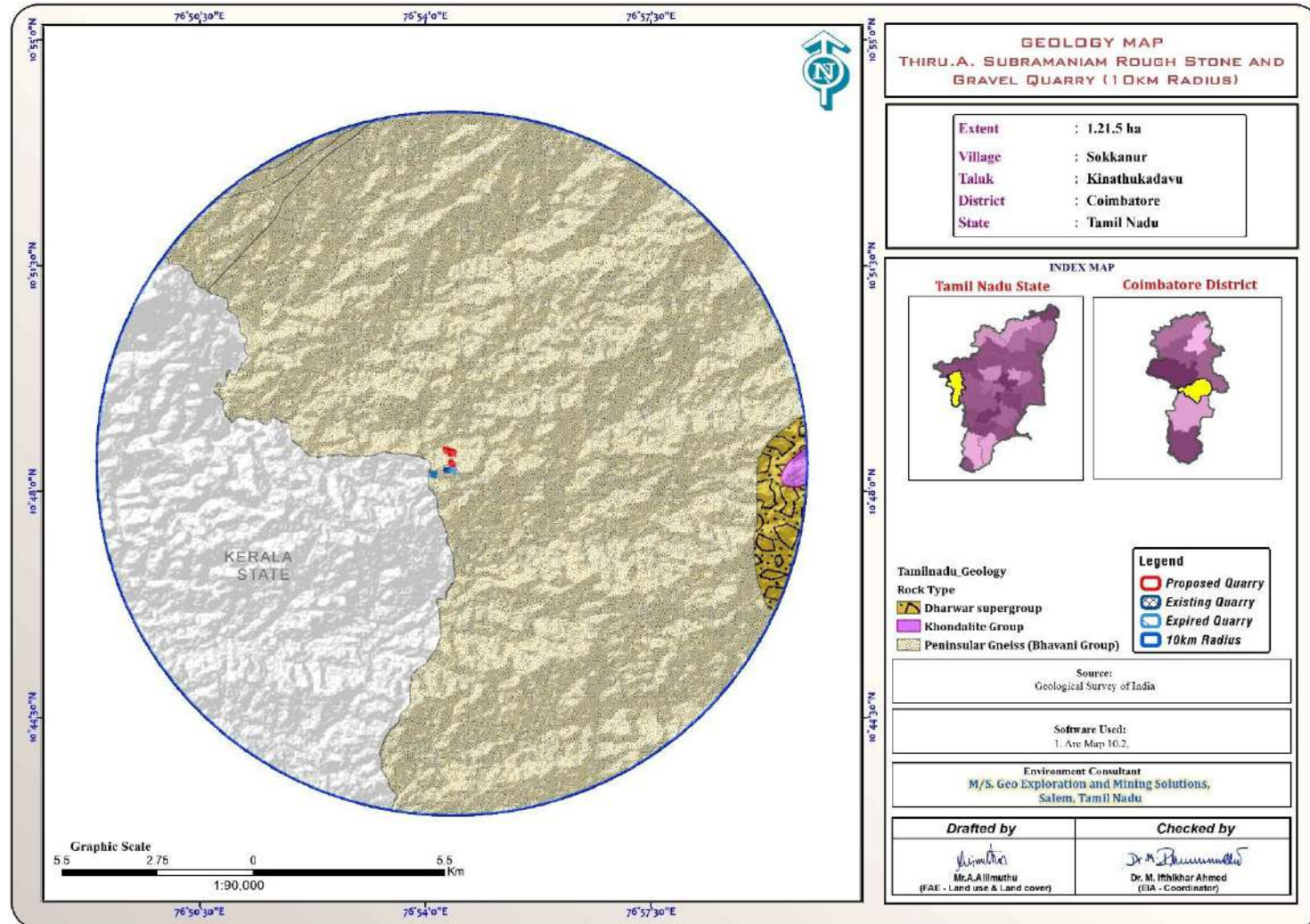
Aquifer Parameters

The thickness of aquifer in this district is highly erratic and varies between 15m to 40m below ground level. The intergranular Porosity is essentially dependent on the intensity and degree of weathering and fracture development in the bed rock. As discussed earlier deep weathering has developed in Gneissic formations and moderate weathering in charnockite formations. The range of aquifer parameters in hard rock and sedimentary formations are given below:

TABLE 2.5: RANGE OF AQUIFER PARAMETERS

Type of Aquifer	Water Table conditions in hard rock areas
Aquifer parameters yield	50 to 300 Lpm
Transmissivity (T)	1.49 to 164.18 m ² /day
Permeability (K)	0.25 to 26.75 m/day
Depth of water level	7m to 25m

Source: <http://nwm.gov.in/sites/default/files/Notes%20on%20Coimbatore%20District.pdf> and <https://www.twadboard.tn.gov.in/content/coimbatore>

FIGURE 2.8: REGIONAL GEOLOGY MAP

From the above map it is inferred that the cluster quarries fall in the hard rock terrain (Peninsular Gneiss)

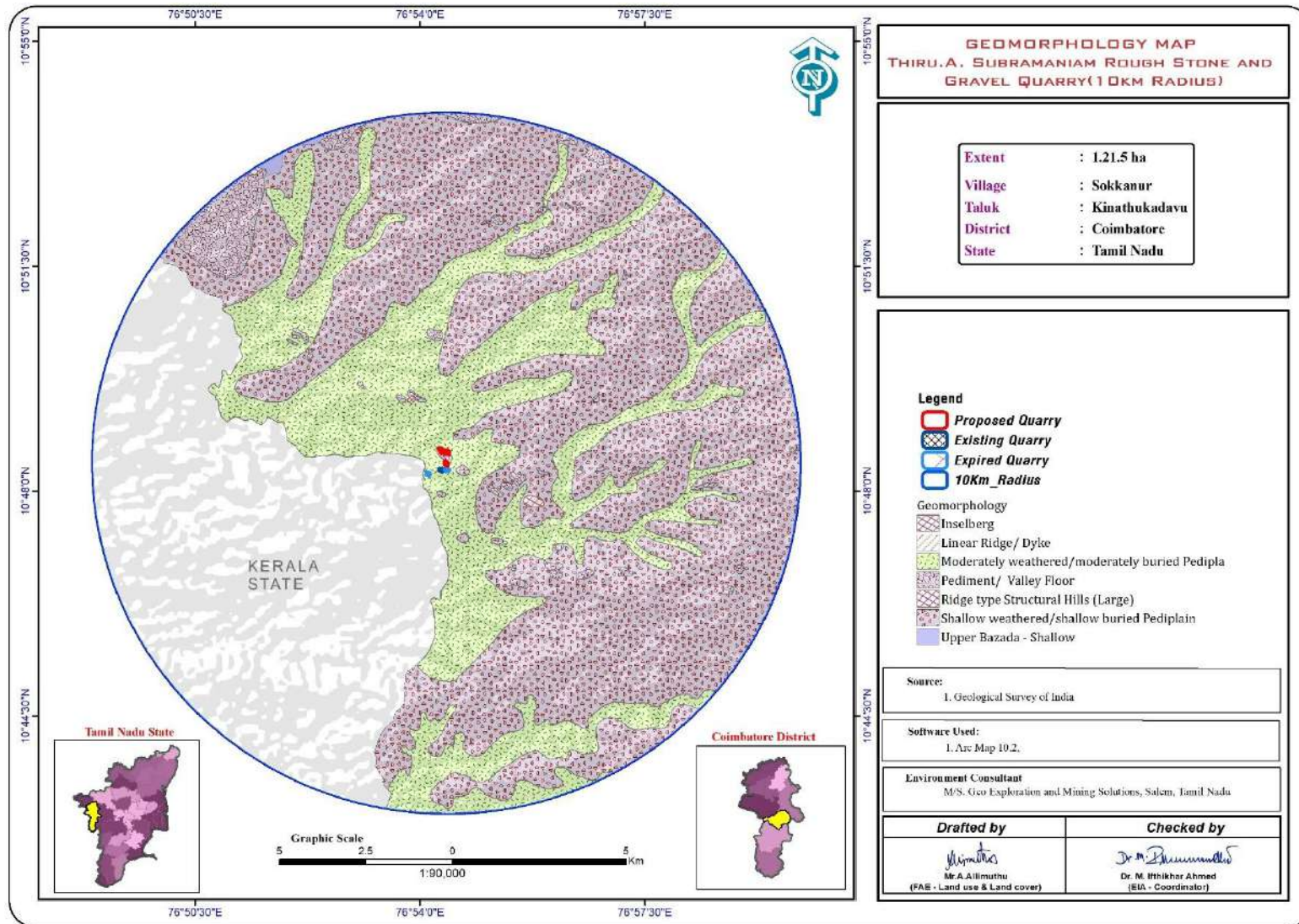
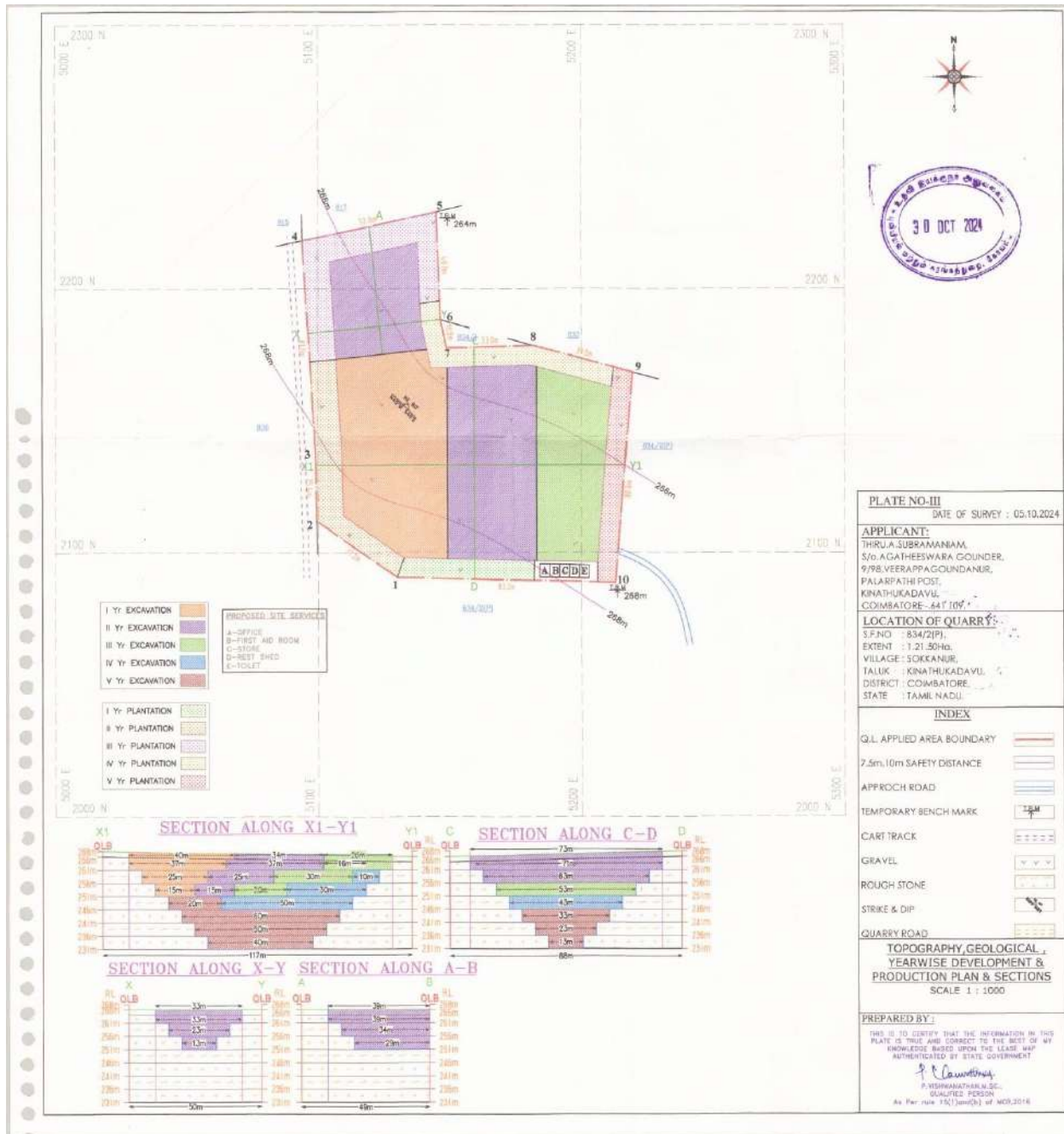
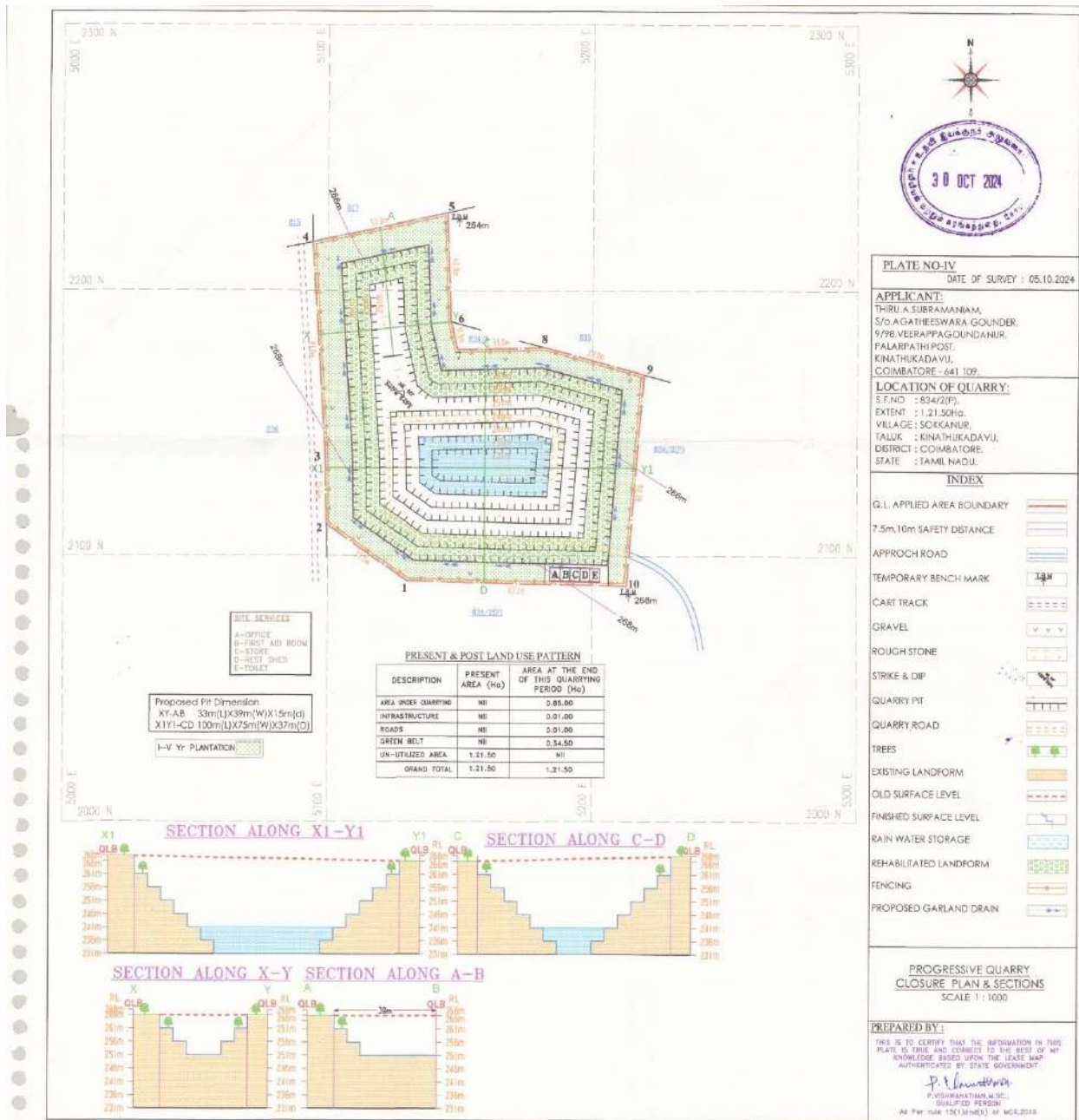
FIGURE 2.9: GEOMORPHOLOGY MAP

FIGURE 2.10: TOPOGRAPHY, GEOLOGICAL, YEAR-WISE DEVELOPMENT PRODUCTION PLAN AND SECTIONS



Source: Approved Mining Plan

FIGURE 2.11: CLOSURE PLAN AND SECTIONS

Source: Approved Mining Plan

2.4 RESOURCES AND RESERVES

The Resources and Reserves of Rough Stone and Gravel were calculated based on Cross-Section Method by plotting sections to cover the maximum lease area for the proposed project.

Based on the availability of Geological Resources the Mineable Reserves are calculated by considering excavation system of bench formation and leaving essential safety distance of 7.5 m (Safety Barrier all around the applied area) and safety distance as per precise area communication letter and deducting the locked up reserves during bench formation (Also called as Bench Loss) and the Mineable Reserves is calculated considering there is no waste / overburden / side burden (100% Recovery Anticipated) for all the proposed projects.

TABLE 2.6: AVAILABLE GEOLOGICAL RESOURCES OF PROPOSED PROJECT

Description	Rough Stone	Gravel
Geological Resource in m ³	4,28,730	25,492
Mineable Resource in m ³	1,24,456	17,174

Source: Approved Mining Plan

The Gravel has been removed during the previous lease period.

TABLE 2.7: YEAR-WISE PRODUCTION PLAN

Year	Rough Stone (m ³)	Gravel (m ³)
I	24,985	5,840
II	34,641	7,538
III	20,430	3,796
IV	21,850	-
V	22,550	-
Total	1,24,456	17,174

Source: Approved Mining Plan

Disposal of Waste

There is no waste anticipated in these Rough Stone quarrying operation. The entire quarried out materials will be utilized (100%). Top layer of Gravel formation will be removed and sold to needy customers directly.

Conceptual Mining Plan/ Final Mine Closure Plan

The ultimate pit size is designed based on certain practical parameters such as economical depth of mining, safety zones, permissible area, etc.,

TABLE 2.8: ULTIMATE PIT DIMENSION

PROPOSAL			
Pit	Length (Max) (m)	Width (Max) (m)	Depth (Max)
XY-AB	100	73	37 m bgl
X1Y1-CD	33	39	15 m bgl

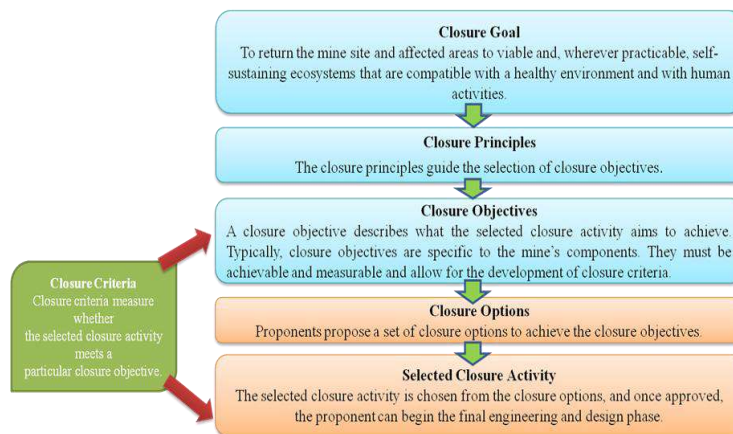
Source: Approved Mining Plan

- At the end of life of mine, the excavated mine pit / void will facilitate to collect the rainwater and the pit will act as temporary reservoir.

- 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.

Closure Objectives –

- Access to be limited, for the safety of humans and wildlife.
- The open pit mine workings and pit boundary are physically and geo-technically stable.
- Discharge of contaminated drainage has been minimized and controlled.
- Original or desired new surface drainage patterns have been established.
- Fishy culture activities will be carried out in the mine pit after the closure



Closure Planning & Options Considerations in Mine Design –

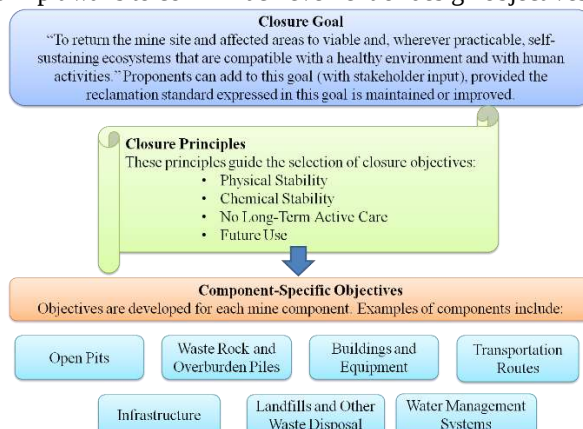
- The closure of mine is well planned at the initial stage of planning & design consideration by the internal and external stake holders
- Construction of 2m height bund all along the mine pit boundary and ensure its stability all time & construction of garland drain along the natural slope to avoid sliding and collection of soil to the pit & surface runoff during rainfall
- After complete exploitation of mineral, the lowest bench foot wall side will be maintained as plain surface without any sump pits to avoid any accidents
- All the sharp edges will be dressed to smoother face before the closure of mine and ensure no loose debris on hanging wall side
- There is a canal about 100m on Western side of the cluster project area. This river canal will not be hindered by any of mine closure activities
- The project proponent as a part of social responsibilities assures to supply the stored mine pit water to the nearby villages after effective treatment process as per the standards of TNPCB & TWAD
- Native species will be planted in 3 row patterns on the boundary barriers and 1st bench, a full-time sentry will be appointed at the gate to prevent inherent entry of public & cattle.
- The access road to the quarry will be cut-off immediately after the closure
- The layout design shall be prepared and get approved from Department of Geology and Mining.
- The proponent is instructed to construct as per the layout approved

- Physical and chemical stability of structures left in place at the site, the natural rehabilitation of a biologically diverse, stable environment, the ultimate land use is optimized and is compatible with the surrounding area and the requirements of the local community, and taking the needs of the local community into account and minimizing the socio-economic impact of closure
- There will be a positive change in the environmental and ecology due to the mine closure.

Post-Closure Monitoring –

The purpose of post-closure monitoring with respect to open pit mine workings is to ensure the attainment of closure objectives.

- Monitor physical and geotechnical stability of remnant pit walls.
- Monitor the ground regime in pit walls to confirm achievement of design objectives.



- Monitor water level in pit to confirm closure objectives regarding fish, fish habitat, and wildlife safety are being achieved
- Sample water quality and quantity at controlled pit discharge points
- Identify and test unanticipated areas where water management is an issue
- Inspect integrity of barriers such as berms & fences
- Monitor wildlife interactions with barriers to determine effectiveness
- Inspect aquatic habitat in flooded pits where applicable
- Monitor dust levels

TABLE 2.9: MINE CLOSURE BUDGET

ACTIVITY		YEAR					RATE	COST (Rs.)
		I	II	III	IV	V		
Plantation under safety zone	Nos.	650					@200 Rs Per sapling	1,30,000/-
	Cost	1,30,000						
Wire Fencing (In Mtrs) 470		1,41,000	-	-	-	-	@300 Rs Per Meter	1,41,000/-
Garland drain (In Mtrs) 420 Mtrs		1,26,000	-	-	-	-	@300 Rs Per Meter	1,26,000/-
TOTAL								3,97,000/-

Source: Mining plan

2.5 METHOD OF MINING

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. However, as far as the quarrying of Rough Stone is

concerned, observance of the provisions of Regulation 106 (2) (b) as above is seldom possible due to various inherent petro genetic factors coupled with mining difficulties. Hence it is proposed to obtain relaxation to the provisions of the above regulation from the Director of Mines Safety for which necessary provision is available with the Regulation 106 (2) (b) of MMR-1961, under Mine Act – 1952.

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.

2.5.1 Drilling & Blasting Parameters

Drilling & Blasting will be carried out as per parameters given below: -

Spacing	–	1.2m
Burden	–	1.0 m
Depth of hole	–	1.5 m
Charge per hole	–	0.50 – 0.75kg
Powder factor	–	6.0 tonnes/kg
Diameter of hole	–	32 mm

Type of Explosives to be used –

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

Storage of Explosives –

No proposal for storage of explosives within the project area, the project proponent have made agreement with authorized explosives agencies for carrying out blasting activities and competent person as per DGMS guidelines will be employed for safety and supervision of overall quarrying activities.

The explosives will be sourced from the blasting agency on daily basis and the blasting will be carried out under the supervision of competent qualified Blaster and it will be ensured that there shall be no balance of explosive stock; any balance stock will be taken back by the supplier.

2.5.2 Extent of Mechanization

TABLE 2.10 PROPOSED MACHINERY DEPLOYMENT

S.NO.	TYPE	NOS	SIZE/CAPACITY	MOTIVE POWER
1	Jack hammer with inbuilt dust collector unit	4	1.2m to 2.0m	Compressed air
2	Compressor	1	400psi	Diesel Drive
3	Excavator with Bucket / Rock Breaker	1	300 HP	Diesel Drive
4	Tipper	2	20 Tonnes	Diesel Drive
5	Water Sprinkling Tanker	1	3,000 litres	Diesel Drive

Source: Approved Mining Plan

2.6 GENERAL FEATURES

2.6.1 Existing Infrastructures

Infrastructures like Mine office, Temporary Rest shelters for workers, Latrine and Urinal Facilities will be constructed as per the Mine Rule after the grant of quarry lease in all the proposed quarries.

2.6.2 Drainage Pattern

Drainage pattern is the pattern formed by the streams, rivers, and lakes in a particular drainage basin over time that reveals characteristics of the kind of rocks and geological structures in a landscape. They are governed by the topography of the land, whether a particular region is dominated by hard or soft rocks, and the gradient of the land.

Dendritic drainage pattern is one of the most common type that develop in areas where the rock (or unconsolidated material) beneath the stream has no particular fabric or structure and can be easily eroded equally in all directions.

There are no streams, canals or water bodies crossing within the project area. The drainage pattern of the area is dendritic – sub dendritic.

2.6.3 Traffic Density

The traffic survey conducted based on the transportation route of material, the Rough Stone is proposed to be transported mainly through Kinathukadavu District Road

Traffic density measurements were performed at two locations

1. Approach Road
2. Kinathukadavu District Road

Traffic density measurement were made 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 either direction for counting the traffic. At the end of each hour, fresh counting and recording was undertaken.

TABLE.2.11: TRAFFIC SURVEY LOCATIONS

Station Code	Road Name	Distance and Direction	Type of Road
TS1	Approach Road	530m - SE	Approach Road
TS2	Kinathukadavu District Road	1.2 km-SE	Kinathukadavu District Road

Source: On-site monitoring by GEMS FAE & TM

TABLE 2.12: EXISTING TRAFFIC VOLUME

Station code	HMV		LMV		2/3 Wheelers		Total PCU
	No	PCU	No	PCU	No	PCU	
TS1	55	165	180	180	178	89	434
TS2	75	225	210	210	210	105	540

Source: On-site monitoring by GEMS FAE & TM

* PCU conversion factor: HMV (Trucks and Bus) = 3, LMV (Car, Jeep and Auto) = 1 and 2/3 Wheelers = 0.5

TABLE 2.13: ROUGH STONE & GRAVEL HOURLY TRANSPORTATION REQUIREMENT

Transportation of Rough Stone & Gravel per day		
Capacity of trucks	No. of Trips per day Cumulatively	Volume in PCU
10 tonnes	8	80

Source: Data analysed from Approved Mining Plan

FIGURE.2.12: MINERAL TRANSPORTATION ROUTE MAP**TABLE 2.14: SUMMARY OF TRAFFIC VOLUME**

Route	Existing Traffic volume in PCU	Incremental traffic due to the project	Total traffic volume	Hourly Capacity in PCU as per IRC – 1960 guidelines
Approach Road	434	71	505	1200
Kinathukadavu District Road	540	71	611	1200

Source: On-site monitoring analysis summary by GEMS FAE & TM

- Due to these projects the existing traffic volume will not exceed
- As per the IRC 1960 this existing village road can handle 1,200 PCU in hour and Major district road can handle 1500 PCU in hour hence there will not be any conjunction due to this proposed transportation.

2.6.4 Mineral Beneficiation and Processing

There is no proposal for the mineral processing or ore beneficiation in any of the proposed project.

2.7 PROJECT REQUIREMENT

2.7.1 Water Source & Requirement

Detail of water requirements in KLD as given below:

TABLE 2.15: WATER REQUIREMENT FOR THE PROJECT

*Purpose	Quantity	Source
Dust Suppression	1.0 KLD	From Existing bore wells from nearby area
Green Belt development	1.0 KLD	From Existing bore wells from nearby area
Sanitation & Drinking	0.5 KLD	From existing, bore wells and drinking water will be sourced from Approved water vendors.
Total	2.5 KLD	

Source: Prefeasibility report

* Drinking water will be sourced from Approved Water Vendors

2.7.2 Power and Other Infrastructure Requirement

The project is not required power supply for the mining operations. Machineries will be operated by the source of Diesel. The quarrying activity is proposed during day time only (General Shift 8 AM – 5 PM, Lunch Break 1 PM – 2 PM). Electricity for use in office and other internal infrastructure will be obtained from TNEB.

No workshops are proposed inside the project area hence there will not be any process effluent generation from the project area. Domestic effluent from the mine office will be discharged to septic tank and soak pit. There is no toxic effluent expected to generate in the form of solid, liquid or gaseous form hence there is no requirement of waste treatment plant.

2.7.3 Fuel Requirement

High speed Diesel (HSD) will be used for mining machineries. Diesel will be brought from nearby Fuel Stations.

Gravel:

Per hour Excavator will consume	=	10 liters / hour
Per hour Excavator will excavate	=	60m ³ of Gravel
Gravel quantity	=	17174/60 = 286hours
Diesel consume	=	286hours x 10 liters
Total diesel consumption	=	2860Liters of HSD will be utilized for Gravel

Rough stone:

Per hour Excavator will consume	=	16 liters / hour
Per hour Excavator will excavate	=	20m ³ of Rough stone
Rough stone quantity	=	1,24,456/20 = 6222hours
Diesel consume	=	6222hours x 16 liters
Total diesel consumption	=	99,552 Liters of HSD will be utilized for Rough stone
Total diesel consumption	=	1,02,412 Liters of HSD will be utilized for entire project life.

2.7.4 Project Cost

Proposed Project Cost is Rs.36,73,000/- Corporate Environmental Responsibility Cost is Rs 5,00,000/-

2.8 EMPLOYMENT REQUIREMENT:

The following manpower's are proposed in the mining plan to carry out the day-to-day quarrying activities, the same employment is maintaining aimed at the proposed production target and also to comply with the statutory provisions of The Metalliferous mine's regulations, 1961.

TABLE 2.16: PROPOSED MANPOWER DEPLOYMENT

Particulars	Workers	Numbers
A) Supervisory Category	Mine Manager	1
	Geologist	1
B) Skilled Labour	Mine Foreman	1

	Blaster/Mate	1
	Excavator-Operator	1
	Water Sprinkler Driver	2
	Jack Hammer Drillers	1
	Tipper Drivers	8
C) Unskilled	Security	1
	Labour & Helper	4
	Co-operator and Cleaner	4
	Total	25

Source: Approved Mining Plan

2.9 PROJECT IMPLEMENTATION SCHEDULE

The commercial operation will commence after the grant of Environmental Clearance. CTO will be obtained from the Tamil Nadu State Pollution Control Board. The conditions imposed during the Environmental Clearance will be compiled before the start of mining operation.

TABLE 2.17: EXPECTED TIME SCHEDULE

Sl.No.	Particulars	Time Schedule (In Month)					Remarks if any
		1 st	2 nd	3 rd	4 th	5 th	
1	Environmental Clearance						
2	Consent to Operate						Production Start Period
Time line may vary; subjected to rules and regulations /& other unforeseen circumstances							

Source: Anticipated based on Timelines framed in EIA Notification & CPCB Guidelines.

3. DESCRIPTION OF ENVIRONMENT

3.0 GENERAL

This chapter presents a regional background to the baseline data at the very onset, which will help in better appreciation of micro-level field data, generated on several environmental and ecological attributes of the study area. The baseline status of the project environment is described section wise for better understanding of the broad-spectrum conditions. The baseline environment quality represents the background environmental scenario of various environmental components such as Land, Water, Air, Noise, Biological and Socio-economic status of the study area. Field monitoring studies to evaluate the base line status of the project site were carried out covering March – May 2025 with CPCB guidelines. Environmental data has been collected with reference to cluster quarries by Global Lab and Consultancy Services, – An accredited by ISO:9001:2015 (NABL) Laboratory for the below attributes –

- ❖ Land
- ❖ Water
- ❖ Air
- ❖ Noise
- ❖ Biological
- ❖ Socio-economic status

Study Area

An area of 10 km radius (aerial distance) from the periphery of the cluster is considered for EIA study. The data collection has been used to understand the existing environment scenario around the cluster against which the potential impacts of the project can be assessed. The study area has been divided into two zones viz **core zone** and **buffer zone** where core zone is considered as cluster and buffer zone taken as 10km radius from the periphery of the Cluster. Both Core zone and Buffer zone is taken as the study area.

Study Period

The baseline study was conducted during the **Pre Monsoon Season** i.e., (March – May 2025)

Study Methodology

- The project area was surveyed in detail with the help of Total Station and the boundary pillars were picked up with the help of GPS. The boundary coordinates were superimposed on the satellite imagery to understand the relief of the area, besides Land use pattern of the area was studied through the Bhuvan (ISRO).
- Soil samples were collected and analysed for relevant physio-chemical characteristics, exchangeable Cations, nutrients & micro nutrients etc., in order to assess the impact due to mining activities and to recommend saplings for Greenbelt development.
- Ground water samples were collected during the study period from the existing bore wells, while surface water was collected from ponds in the buffer zone. The samples were analysed for parameters necessary to determine water quality (based on IS: 10500:2012 criteria) and those which are relevant from the point of view of environmental impact of the proposed mines.
- An onsite meteorological station was setup in cluster area, to collect data about wind speed, wind direction, temperature, relative humidity, rainfall and general weather conditions were recorded throughout the study period.
- In order to assess the Ambient Air Quality (AAQ), samples of ambient air were collected by installation of Respiratory Dust Samplers (RDS) for Fugitive dust, PM₁₀ and SO₂, NO_x with gaseous attachments & Fine Dust Samplers (FDS) for PM_{2.5} and other parameters as per NAAQ norms and analysed for primary air pollutants to work out the existing status of air quality.
- The Noise level measurements were also made at various locations in different intervals of time with the help of sound level meter to establish the baseline noise levels in the impact zone.
- Baseline biological studies were carried out to assess the ecology of the study area to study the existing flora and fauna pattern of the area.

- Socio-Economic survey was conducted at village and household level in the study area to understand the present socio-economic conditions and assess the extent of impact due to the proposed mining project. The sampling methodologies for the various environmental parameters required for the study, frequency of sampling, method of samples analysis, etc., are given below Table 3.1.

TABLE 3.1: MONITORING ATTRIBUTES AND FREQUENCY OF MONITORING

Attribute	Parameters	Frequency of Monitoring	No. of Locations	Protocol
Land-use Land cover	Land-use Pattern within 10 km radius of the study area	Data's from census handbook 2011 and from the satellite imagery	Study Area	Satellite Imagery Primary Survey
*Soil	Physio-Chemical Characteristics	Once during the study period	6 (1 core & 5 buffer zone)	IS 2720 Agriculture Handbook - Indian Council of Agriculture Research, New Delhi
*Water Quality	Physical, Chemical and Bacteriological Parameters	Once during the study period	6 (1 surface water & 5 ground water)	IS 10500& CPCB Standards
Meteorology	Wind Speed Wind Direction Temperature Cloud cover Dry bulb temperature Rainfall	1 Hourly Continuous Mechanical/Auto matic Weather Station	1	Site specific primary data& Secondary Data from IMD Station
*Ambient Air Quality	PM10 PM2.5 SO2 NOX Fugitive Dust	24 hourly twice a week (March – May 2025)	7 (2 core & 5 buffer)	IS 5182 Part 1-23 National Ambient Air Quality Standards, CPCB
*Noise Levels	Ambient Noise	Hourly observation for 24 Hours per location	7 (2 core & 5 buffer zone)	IS 9989 As per CPCB Guidelines
Ecology	Existing Flora and Fauna	Through field visit during the study period	Study Area	Primary Survey by Quadrante & Transect Study Secondary Data – Forest Working Plan
Socio Economic Aspects	Socio-Economic Characteristics, Population Statistics and Existing Infrastructure in the study area	Site Visit & Census Handbook, 2011	Study Area	Primary Survey, census handbook & need based assessments.

Source: On-site monitoring/sampling by Global Lab and Consultancy Services in association with GEMS

* All monitoring and testing have been carried out as per the Guidelines of CPCB and MoEF & CC.

3.1 LAND ENVIRONMENT

The main objective of this section is to provide a baseline status of the study area covering 10km radius around the proposed mine site so that temporal changes due to the mining activities on the surroundings can be assessed in future.

3.1.1 Land Use/ Land Cover

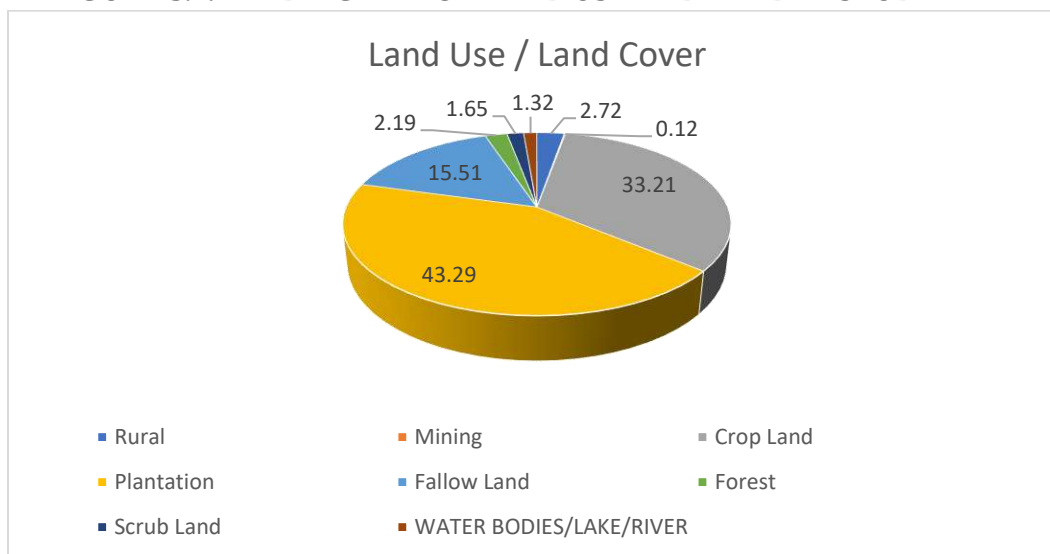
A visual interpretation technique has been adopted for land use classification based on the keys suggested in the chapter – V of the guidelines issued by NNRMS Bangalore & Level III classification with 1:50,000 scale for the preparation of land use mapping. Land use pattern of the area was studied through LISS III imagery of Bhuvan (ISRO). The 10 km radius map of study area was taken for analysis of Land use cover.

TABLE 3.2: LAND USE / LAND COVER TABLE 10 Km RADIUS

S.No	CLASSIFICATION	AREA_HA	AREA_%
BUILTUP			
1	Rural	865.88	2.72
2	Mining	37.63	0.12
AGRICULTURAL LAND			
3	Crop Land	10587.91	33.21
4	Plantation	13799.51	43.29
5	Fallow Land	4942.97	15.51
FOREST			
6	Forest	698.06	2.19
BARREN/WASTE LANDS			
7	Scrub Land	525.38	1.65
WETLANDS/ WATER BODIES			
8	WATER BODIES/LAKE/RIVER	421.27	1.32
TOTAL		31878.61	100.00

Source: Survey of India Toposheet and Landsat Satellite Imagery

FIGURE 3.1: PIE DIAGRAM OF LAND USE AND LAND IN STUDY AREA



Source: Table 3.2

From the above table, pie diagram and land use map it is inferred that the majority of the land in the study area is Crop land, Plantation & Fallow land 92.91 % followed by Built-up Lands – 2.72%, Scrub & Forest land – 3.85 %, and Water bodies 1.32%.

The total mining area within the study area is 37.63 ha i.e., 0.12%. The cluster area of 5.43.5 ha contributes about 6.92% of the total mining area within the study area. This small percentage of Mining Activities shall not have any significant impact on the environment.

3.1.2 Topography

All the proposed project area is plain terrain, covered with gravel and weathered formation of 2 to 4m thickness; Massive Charnockite formation is found after 2 to 4m gravel and weathered formation which is clearly inferred from the existing quarry pits.

3.1.3 Drainage Pattern of the Area

Drainage pattern are created by stream erosion over time that reveals characteristics of the kind of rocks and geological structures in a landscape region drained by streams.

Drainage pattern is the pattern formed by the streams, rivers, and lakes in a particular drainage basin. They are governed by the topography of the land, whether a particular region is dominated by hard or soft rocks, and the gradient of the land.

Dendritic patterns, which are by far the most common, develop in areas where the rock (or unconsolidated material) beneath the stream has no particular fabric or structure and can be eroded equally easily in all directions.

There are no streams, canals or water bodies crossing within the project area. The drainage pattern of the area is dendritic – sub dendritic.

3.1.4 Seismic Sensitivity

The proposed project site falls in the seismic Zone II, low damage risk zone as per BMTPC, Vulnerability Atlas of Seismic zone of India IS: 1893 – 2002. The project area falls in the hard rock terrain on the peninsular shield of south India which is highly stable.

(Source: https://moes.gov.in/writereaddata/files/LS_EN_20032020_385.pdf)

3.1.5 Environmental Features in the Study Area

There is no Wildlife Sanctuaries, National Park and Archaeological monuments within project area. No Protected and Reserved Forest area is involved in the project area. Therefore, there will be no need to acquisition/diversion of forest land. The details related to the environment sensitivity around the proposed mine lease area i.e. 10 km radius, are given in the below Table 3.3.

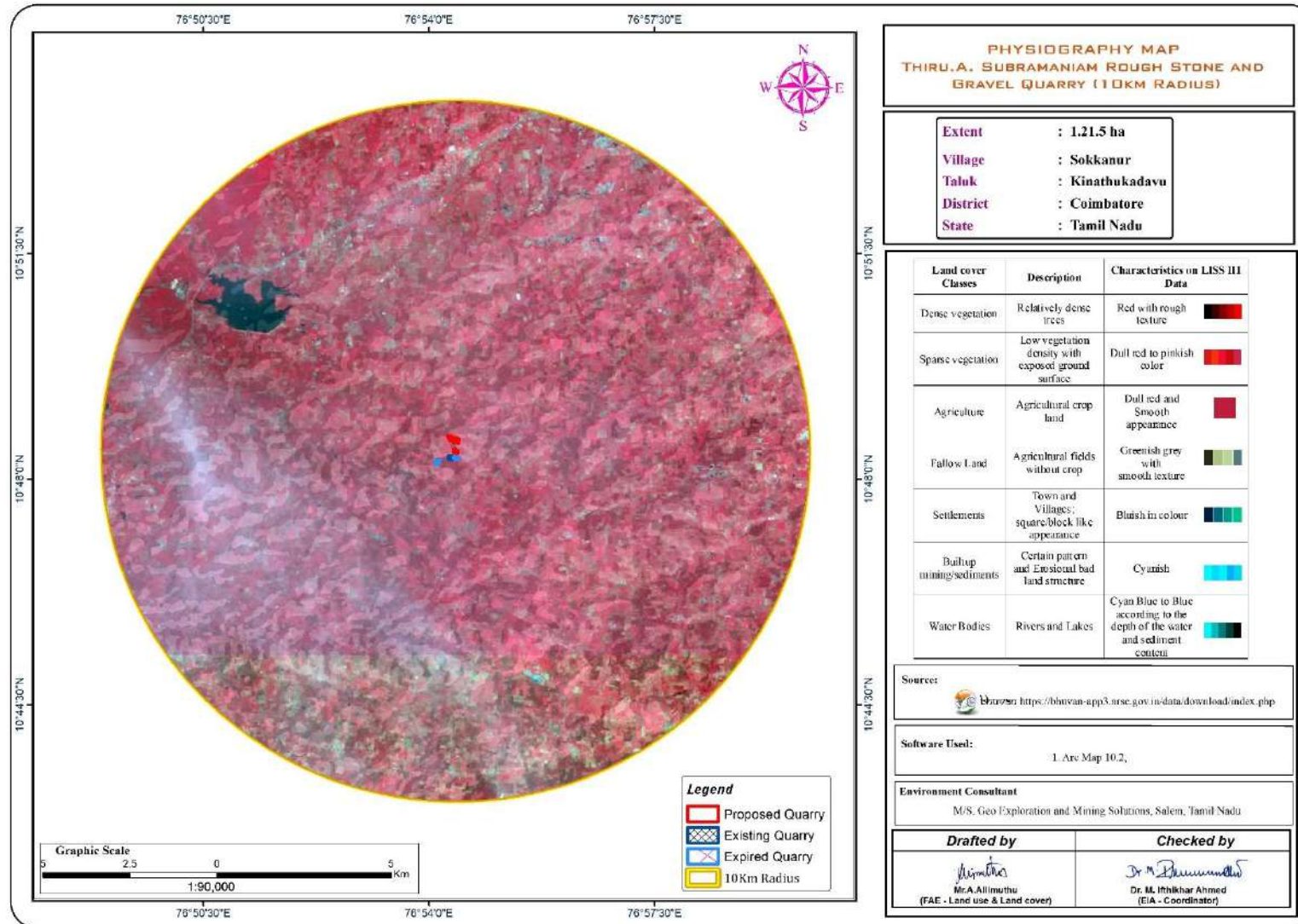
FIGURE 3.2: PHYSIOGRAPHIC MAP OF LISSIII IMAGE AROUNDS 10KM RADIUS

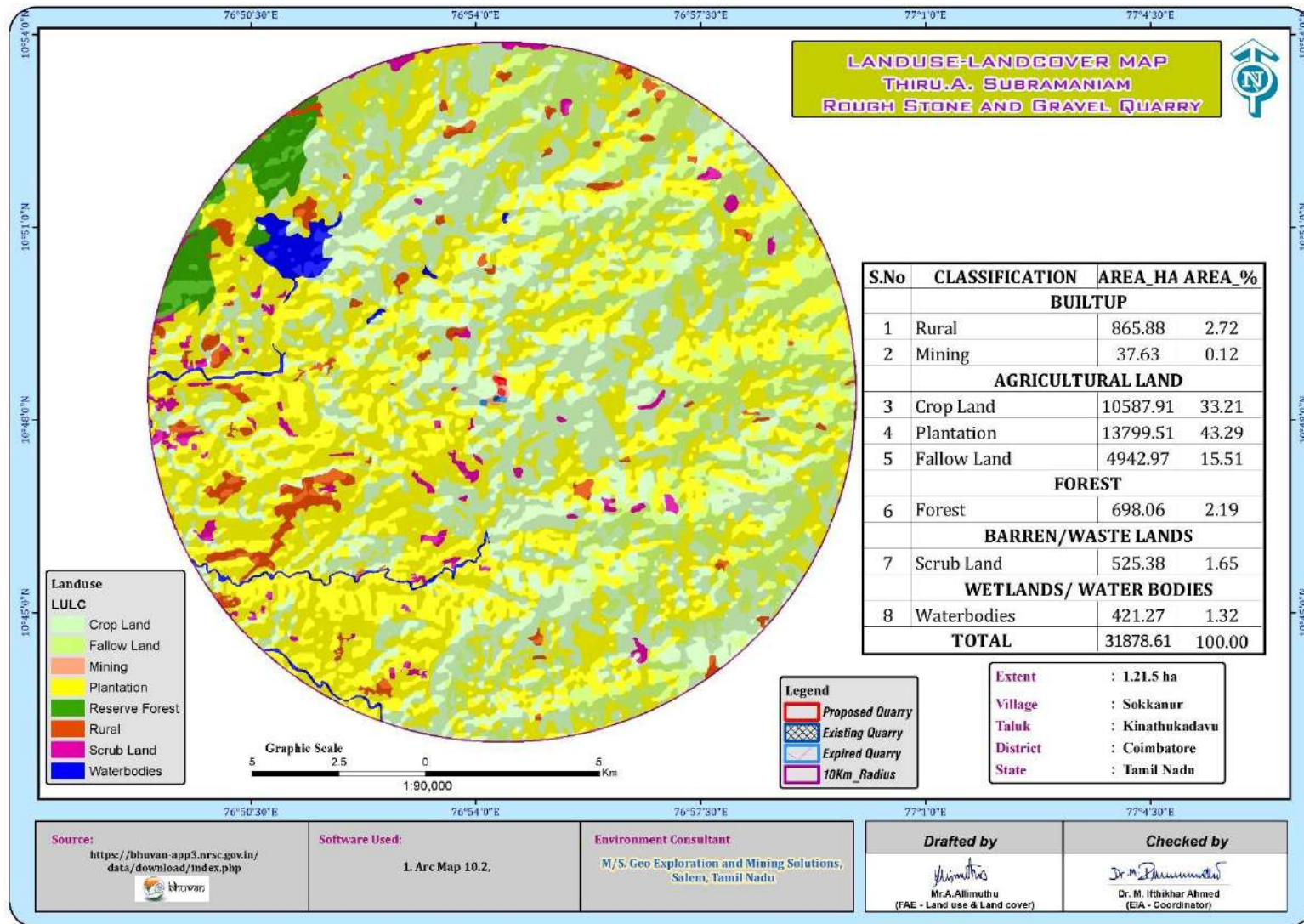
FIGURE 3.2-A: LAND USE LAND COVER MAP 10KM RADIUS

TABLE 3.3: DETAILS OF ENVIRONMENT SENSITIVITY AROUND THE CLUSTER

Sl.No	Sensitive Ecological Features	Name	Arial Distance in km from Cluster
1	National Park / Wild life Sanctuaries	Indira Gandhi (Aanamalai) Wildlife Sanctuary	28.5 km-SW
2	Reserve Forest	Boluvampatti R.F	8.0 km NW
3	Tiger Reserve/ Elephant Reserve/ Biosphere Reserve	None	Nil within 10Km Radius
4	Critically Polluted Areas	None	Nil within 10km Radius
5	Mangroves	None	Nil within 10km Radius
6	Mountains/Hills	None	Nil within 10km Radius
7	Notified Archaeological Sites	None	Nil within 10km Radius
8	Industries/ Thermal Power Plants	None	Nil within 10km Radius
9	Defence Installation	Sulur Air force Station	36 km NE

Source: Survey of India Toposheet

TABLE 3.4: NEARBY WATER BODIES FROM THE PROPOSED PROJECT SITE

Sl.No	NAME	DISTANCE & DIRECTION
1	Vari	70m SE
2	Kuttai	100m North
3	Odai	400m NW
4	Kumitipathi Stream	3.7km NW
5	Walayar Reservoir	6km NW

Source: Village Cadastral Map and Field Survey

3.1.6 Soil Environment

Soil quality of the study area is one of the important components of the land environment. The composite soil samples were collected from the study area and analysed for different parameters. The locations of the monitoring sites are detailed in Table 3.5 and Figure 3.3.

The objective of the soil sampling is -

To determine the baseline soil characteristics of the study area; study the impact of proposed activity on soil characteristics and study the impact on soil more importantly agriculture production point of view.

TABLE 3.5: SOIL SAMPLING LOCATIONS

S. No	Location Code	Monitoring Locations	Distance & Direction	Coordinates
1	S-1	Core Zone	Project Area	10°48'26.32"N 76°54'25.39"E
2	S-2	Near Existing Quarry	170m SW	10°48'21.70"N 76°54'17.31"E
3	S-3	Pichanur	4.2km NW	10°50'12.08"N 76°52'48.45"E
4	S-4	Kanal Pudur	5.6km South	10°45'18.70"N 76°54'36.88"E
5	S-5	Muthugoundanur	3.8km SE	10°47'24.76"N 76°56'17.32"E
6	S-6	Kannamanayakkanur	4.5km NE	10°49'7.89"N 76°56'45.86"E

Source: On-site monitoring/sampling by Global Lab and Consultancy Services in association with GEMS

Methodology –

For studying soil quality, sampling locations were selected to assess the existing soil conditions in and around the project site representing various land use conditions. The samples were collected by auger boring into the soil up to 90-cm depth. Six (6) locations were selected for soil sampling on the basis of soil types, vegetative cover, industrial & residential activities including infrastructure facilities, which would accord an overall idea of the soil characteristics. The samples were analysed for physical and chemical characteristics. The samples were sent to laboratory for analysis. The samples were filled in Polythene bags, coded and sent to laboratory for analysis and the details of methodology in respect are given in below Table 3.6.

TABLE 3.6: METHODOLOGY OF SAMPLING COLLECTION

Particulars	Details
Frequency	One grab sample from each station-once during the study period
Methodology	Composite grab samples of the topsoil were collected from 3 depths, and mixed to provide a representative sample for analysis. They were stored in airtight Polythene bags and analysed at the laboratory.

Source: On-site monitoring/sampling by Global Lab and Consultancy Services in association with GEMS

Soil Testing Result –

The samples were analysed as per the standard methods prescribed in “Soil Chemical Analysis (M.L. Jackson, 1967) & Department of Agriculture, Cooperation & Farmers Welfare, Ministry of Agriculture & Farmers Welfare, Government of India”. The important properties analysed for soil are bulk density, porosity, infiltration rate, pH and Organic matter, kjeldahi Nitrogen, Phosphorous and Potassium. The standard classifications of soil is presented below in Figure 3.4 and the physico-chemical characteristics of the soil & Test Results in Table 3.7.

FIGURE 3.3: SOIL SAMPLING LOCATIONS AROUND 10 KM RADIUS

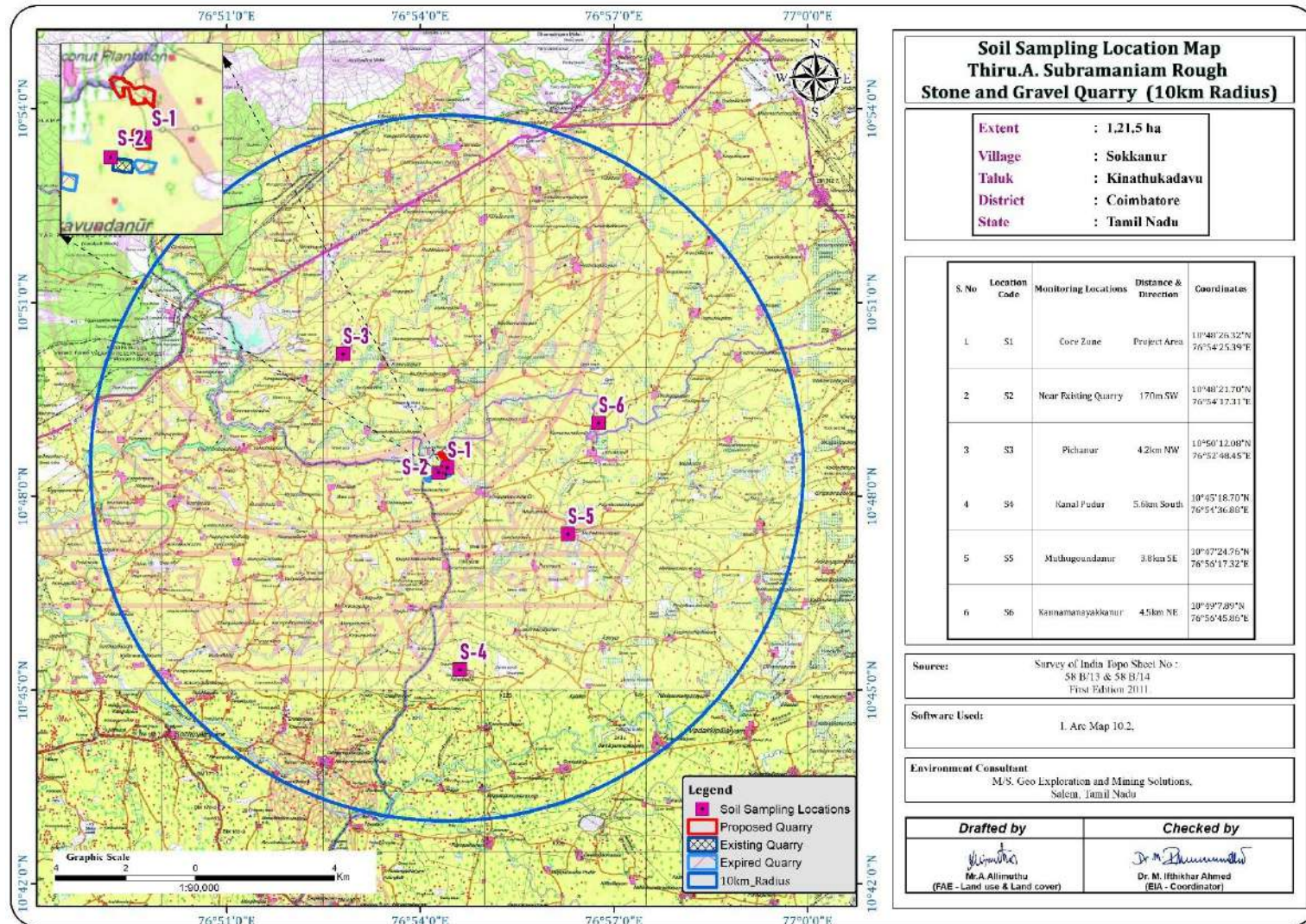


FIGURE 3.4: SOIL MAP

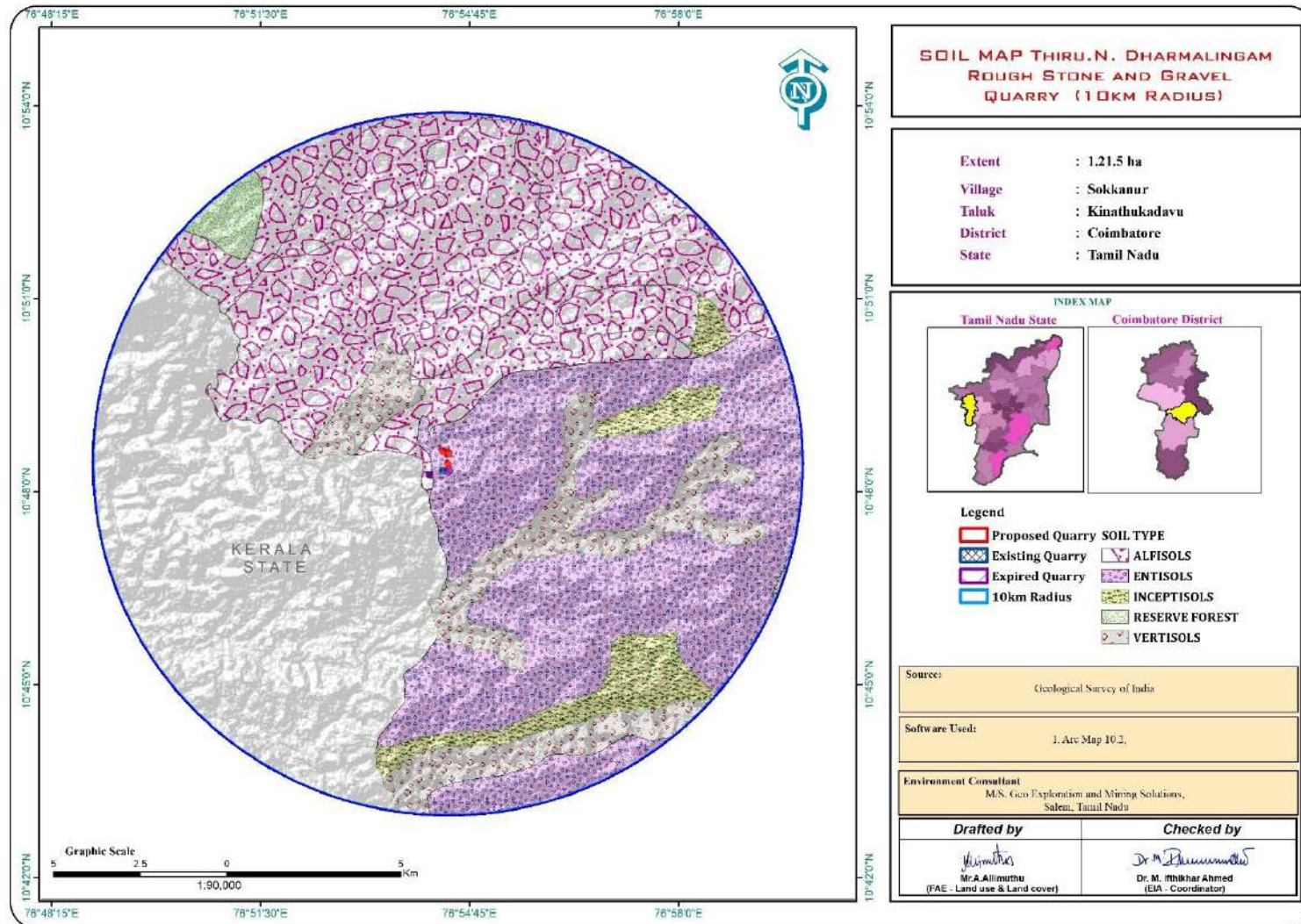


TABLE 3.7: SOIL QUALITY OF THE STUDY AREA

Parameter		Units	S-1 Core Zone	S-2 Near Existing Quarry	S-3 Pichanur	S-4 Kanalpudur	S-5 Muthugoundanu r	S-6 Kannamanayakk anur
1	Available Nitrogen as N	kg/ha	476.7	376	639.7	401.4	451.6	506
2	Available Phosphorous(as P)	mg/kg	24.1	19.5	17.8	15.6	16.6	17
3	Boron	mg/kg	5.0	7.5	12.3	8.0	6.6	7.3
4	Bulk Density	g/cc	1.05	1.12	1.15	1.09	1.12	1.06
5	Cadmium	mg/kg	2.0	5.0	5.0	4.3	6.0	4.8
6	Cation Exchange Capacity	meq/100g	39.6	40	37	44	39	45
7	Chlorides (as Cl-) in saturation extract	meq/l	4.6	5.7	4.5	5.2	3.8	5.8
8	Chromium	mg/kg	6.5	22.6	20.8	9.0	8.6	17.8
9	Copper	mg/kg	4.0	2.6	6.8	BDL (DL:0.5)	4.8	0.75
10	Exchangeable Calcium (as Ca)	meq/100g	2.7	2.4	2.3	1.7	2.0	1.6
11	Exchangeable Magnesium (as Mg)	meq/100g	2.1	2.2	2.5	2.1	1.8	1.9
12	Iron	mg/kg	36.25	48.8	67.2	40.5	24	71.8
13	Lead	mg/kg	1.0	0.72	1.4	1.5	4.5	2.8
14	Manganese	mg/kg	5.75	4.8	6.8	5.0	10.2	9.5
15	Organic Carbon	%	0.64	0.6	0.59	0.74	0.7	1.2
16	Organic Matter	%	1.1	1.03	1.02	1.3	1.21	2.07
17	pH Value	-	7.68	8.02	7.64	7.38	7.96	7.82
18	Soluble Potassium (as K) in saturation extract	mg/100g	1.34	1.4	0.87	1.34	1.34	1.2
19	Specific Electrical Conductivity	µS/cm	486	516	412	396	536	604
20	Sulphate (as SO4)	mg/100g	6.8	2.78	5.8	2.5	5.0	4.2
21	Texture : Clay	%	27.60	26.35	25.46	26.10	25.23	25.45
22	Texture : Sand	%	37.00	35.75	35.32	35.00	36.85	39.93
23	Texture : Silt	%	35.40	37.90	39.22	38.90	37.92	34.63
24	Water Holding Capacity	%	47.2	42	43	38	41	42
25	Zinc	mg/kg	10.5	7.7	19.6	8.0	20.2	12

Source: Sampling Results by Global Lab and Consultancy Services

Interpretation & Conclusion

Physical Characteristics –

The physical properties of the soil samples were examined for texture, bulk density, porosity and water holding capacity. The soil texture found in the study area is Clay to Sandy Loam Soil and Bulk Density of Soils in the study area varied between 1.05 – 1.15 g/cc. The Water Holding Capacity of the soil samples is found to be medium i.e. ranging from 38 – 47.2 %.

Chemical Characteristics –

- The nature of soil is slightly alkaline to strongly alkaline with pH range 7.38 – 8.02
- The available Nitrogen content range between 376 – 639.7 kg/ha
- The available Phosphorus content range between 15.6 – 24.1 mg/kg
- The available Potassium range between 0.87 – 1.34 mg/100g

3.2 WATER ENVIRONMENT

The water resources, both surface and groundwater play a significant role in the development of the area. The purpose of this study is to assess the water quality characteristics for critical parameters and evaluate the impacts on agricultural productivity, domestic community usage, recreational resources and aesthetics in the vicinity. The water samples were collected and transported as per the norms in pre-treated sampling cans to laboratory for analysis.

3.2.1 Surface Water Resources:

Walayar Lake is the major surface water body in the study area and the rainfall over the area is moderate, the rainwater storage in open wells and trenches are in practice over the area and the stored water acts as source of drinking water for few months after rainy season.

3.2.2 Ground Water Resources:

Groundwater occurs in all the crystalline formations of oldest Achaeans and Recent Alluvium. The occurrence and behaviour of groundwater are controlled by rainfall, topography, geomorphology, geology, structures etc.

Ground water occurring in phreatic conditions in weathered and fractured gneiss rock formation. The weathering is controlled by the intensity of weathering and fracturing. Dug wells as wells as bore wells are more common ground water abstraction structures in the area. The diameter of the dug well is in the range of 7 to 10 m and depth of dug wells range from 7.2 to 13 m bgl. The dug wells yield up to 1 lps in summer months and few wells remains dry. The yield is adequate for irrigation for one or two crops in monsoon period.

3.2.3 Methodology

Reconnaissance survey was undertaken and monitoring locations were finalized based on;

- Drainage pattern;
- Location of Residential areas representing different activities/likely impact areas; and
- Likely areas, which can represent baseline conditions

One (1) surface water and Five (5) ground water samples were collected from the study area and were analysed for physio-chemical, heavy metals and bacteriological parameters in order to assess the effect of mining and other activities on surface and ground water. The samples were analysed as per the procedures specified by CPCB, IS-10500:2012 and 'Standard methods for the Examination of Water and Wastewater' published by American Public Health Association (APHA). The water sampling locations are given in Table 3.8 and shown as Figure 3.5.

TABLE 3.8: WATER SAMPLING LOCATIONS

S.NO	CODE	LOCATIONS	DISTANCE & DIRECTION	COORDINATES
SURFACE WATER				
1	SW-1	Walayar Lake	6km NW	10°50'32.67"N 76°51'42.88"E
GROUND WATER				
2	WW-1	Near Project Area	380m East	10°48'27.59"N 76°54'39.42"E
3	WW-2	Kanal Pudur	5.5km South	10°45'23.86"N 76°54'36.78"E
4	WW-3	Sokkanur	5.2km East	10°48'32.73"N 76°57'18.44"E
5	BW-1	Near Project Area	480m West	10°48'29.71"N 76°54'7.02"E
6	BW-2	Muthugoundanur	3.8km SE	10°47'24.40"N 76°56'17.91"E

Source: On-site monitoring/sampling by Global Lab and Consultancy Services in association with GEMS

FIGURE 3.5: WATER SAMPLING LOCATIONS AROUND 10 KM RADIUS

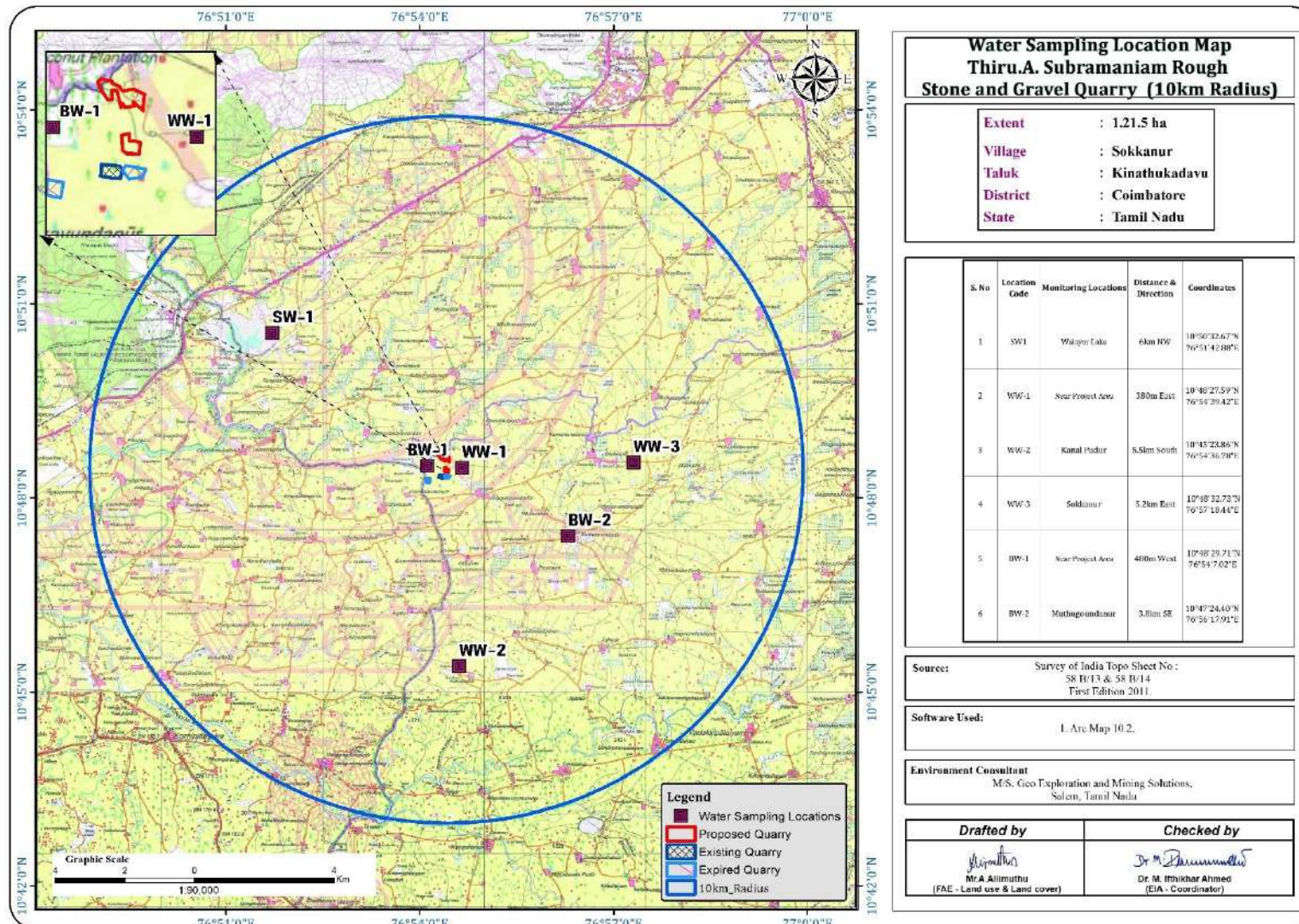


TABLE 3.9: GROUND WATER SAMPLING RESULTS

S.NO	Parameter	Units	WW-1 Near project area	WW-2 Goundanpalayam	WW-3 Near Project area	BW-1 Sunkarakanpalayam	BW-2 Pethikuttai
1	Aluminium	mg/l	BDL(DL: 0.01)	BDL(DL: 0.01)	0.024	BDL(DL: 0.01)	BDL(DL: 0.01)
2	Ammoniacal Nitrogen as NH ₃ -N	mg/l	BDL(DL: 1.0)	BDL(DL: 1.0)	BDL(DL: 1.0)	BDL(DL: 1.0)	BDL(DL: 1.0)
3	Arsenic as As	mg/l	BDL(DL: 0.002)	BDL(DL: 0.002)	BDL(DL: 0.002)	BDL(DL: 0.002)	BDL(DL: 0.002)
4	Barium as Ba	mg/l	BDL(DL: 0.1)	BDL(DL: 0.01)	BDL(DL: 0.01)	BDL(DL: 0.01)	BDL(DL: 0.01)
5	Boron as B	mg/l	BDL(DL: 0.1)	BDL(DL: 1.0)	BDL(DL: 0.1)	BDL(DL: 0.1)	BDL(DL: 0.1)
6	Cadmium as Cd	mg/l	BDL(DL: 0.01)	BDL(DL: 0.01)	BDL(DL: 0.01)	BDL(DL: 0.01)	BDL(DL: 0.01)
7	Calcium as Ca	mg/l	120	92	124	120	80
8	Chloride as Cl ⁻	mg/l	140	245	160	380	130
9	Chromium as Cr	mg/l	BDL(DL: 0.01)	BDL(DL: 0.01)	BDL(DL: 0.01)	BDL(DL: 0.01)	BDL(DL: 0.1)
10	Color	CU	< 1	< 1	< 1	< 1	< 1
11	Copper as Cu	mg/l	BDL(DL: 0.01)	BDL(DL: 0.01)	BDL(DL: 0.01)	BDL(DL: 0.01)	BDL(DL: 0.01)
12	Cyanide as CN	mg/l	BDL(DL: 0.02)	BDL(DL: 0.02)	BDL(DL: 0.02)	BDL(DL: 0.02)	BDL(DL: 0.02)
13	Electrical Conductivity (EC)	µS/cm	1678	1516	1806	2234	1174
14	Fluoride as F ⁻	mg/l	0.3	0.35	0.36	0.31	0.4
15	Free Residual Chlorine as Cl ₂	mg/l	BDL(DL: 1.0)	BDL(DL: 1.0)	BDL(DL: 1.0)	BDL(DL: 1.0)	BDL(DL: 1.0)
16	Iron as Fe	mg/l	0.29	0.22	BDL(DL: 0.1)	0.2	0.13
17	Lead as Pb	mg/l	BDL(DL: 0.01)	BDL(DL: 0.01)	BDL(DL: 0.01)	BDL(DL: 0.01)	BDL(DL: 0.01)
18	Magnesium as Mg	mg/l	68	56	75	73	41
19	Manganese as Mn	mg/l	BDL(DL: 0.1)	BDL(DL: 0.1)	BDL(DL: 0.1)	BDL(DL: 0.1)	BDL(DL: 0.1)
20	Mercury as Hg	mg/l	BDL(DL: 0.002)	BDL(DL: 0.002)	BDL(DL: 0.002)	BDL(DL: 0.002)	BDL(DL: 0.002)
21	Molybdenum as Mo	mg/l	BDL(DL: 0.01)	BDL(DL: 0.01)	BDL(DL: 0.01)	BDL(DL: 0.01)	BDL(DL: 0.01)
22	Nitrate as NO ₃	mg/l	BDL(DL: 2.0)	BDL(DL: 2.0)	BDL(DL: 2.0)	BDL(DL: 2.0)	BDL(DL: 2.0)
23	Odor	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
24	pH	-	7.38	7.63	7.26	7.54	7.78
25	Phenols	mg/l	BDL(DL: 0.1)	BDL(DL: 0.1)	BDL(DL: 0.1)	BDL(DL: 0.1)	BDL(DL: 0.1)
26	Selenium as Se	mg/l	BDL(DL: 0.005)	BDL(DL: 0.005)	BDL(DL: 0.005)	BDL(DL: 0.005)	BDL(DL: 0.005)
27	Sulphate as SO ₄	mg/l	189	79	101	53	59
28	Sulphide as S (Iodometric Method)	mg/l	BDL(DL: 1.0)	BDL(DL: 1.0)	BDL(DL: 1.0)	BDL(DL: 1.0)	BDL(DL: 1.0)
29	Total Alkalinity as CaCO ₃	mg/l	450	370	550	650	290
30	Total Dissolved Solids (TDS)	mg/l	1082	984	1172	1450	760
31	Total Hardness as CaCO ₃	mg/l	580	460	620	600	370
32	Total Suspended Solids (TSS)	mg/l	BDL(DL: 2.0)	BDL(DL: 2.0)	BDL(DL: 2.0)	BDL(DL: 2.0)	BDL(DL: 2.0)
33	Turbidity	NTU	< 1	< 1	< 1	< 1	< 1
34	Zinc as Zn	mg/l	BDL(DL: 0.01)	BDL(DL: 0.01)	BDL(DL: 0.01)	BDL(DL: 0.01)	BDL(DL: 0.01)
35	Escherichia coli	MPN/100ml	Absent	Absent	Absent	Absent	Absent
36	Total Coliforms	MPN/100ml	Present	Present	Present	Present	Present

* IS: 10500:2012-Drinking Water Standards; # within the permissible limit as per the WHO Standard. The water can be used for drinking purpose in the absence of alternate sources. Note: SW- Surface water, GW – Ground water

TABLE 3.10: SURFACE WATER SAMPLING RESULTS

Sl. No.	Parameter	Unit	RESULT
			SW1 (Bavanisagar)
1	Aluminium	mg/l	0.014
2	Ammoniacal Nitrogen as NH ₃ -N	mg/l	BDL(DL: 1.0)
3	Arsenic as As	mg/l	BDL(DL: 0.002)
4	Barium as Ba	mg/l	0.09
5	Biochemical Oxygen Demand (BOD) at 27°C for 3 Days	mg/l	BDL(DL: 2.0)
6	Boron as B	mg/l	BDL(DL: 0.1)
7	Cadmium as Cd	mg/l	BDL(DL: 0.01)
8	Calcium as Ca	mg/l	184
9	Chemical Oxygen Demand (COD)	mg/l	BDL(DL: 10.0)
10	Chloride as Cl ⁻	mg/l	320
11	Chromium as Cr	mg/l	BDL(DL: 0.01)
12	Color	CU	5.0
13	Copper as Cu	mg/l	BDL(DL: 0.01)
14	Cyanide as CN	mg/l	BDL(DL: 0.02)
15	Dissolved Oxygen (DO)	mg/l	4.8
16	Electrical Conductivity	µS/cm	2665
17	Fluoride as F ⁻	mg/l	0.23
18	Free Residual Chlorine as Cl ₂	mg/l	BDL(DL: 1.0)
19	Iron as Fe	mg/l	0.29
20	Lead as Pb	mg/l	BDL(DL: 0.01)
21	Magnesium as Mg	mg/l	112
22	Manganese as Mn	mg/l	BDL(DL: 0.1)
23	Mercury as Hg	mg/l	BDL(DL: 0.002)
24	Molybdenum as Mo	mg/l	BDL(DL: 0.01)
25	Nitrate as NO ₃	mg/l	BDL(DL: 2.0)
26	Odor	-	Agreeable
27	pH	-	8.12
28	Phenols	mg/l	BDL(DL: 0.1)
29	Selenium as Se	mg/l	BDL(DL: 0.005)
30	Sulphate as SO ₄	mg/l	146
31	Sulphide as S (Iodometric Method)	mg/l	BDL(DL: 1.0)
32	Total Alkalinity as CaCO ₃	mg/l	810
33	Total Dissolved Solids (TDS)	mg/l	1732
34	Total Hardness as CaCO ₃	mg/l	920
35	Total Suspended Solids	mg/l	14
36	Turbidity	NTU	10
37	Zinc as Zn	mg/l	BDL(DL: 0.01)
38	Escherichia coli	MPN/100ml	Absent
39	Total Coliforms	MPN/100ml	Absent
			0.014

3.2.4 Interpretation & Conclusion

Surface Water

PH:

The pH value of surface water is about 8.12 while turbidity found within the standards (Optimal pH range for sustainable aquatic life is 6.5 to 8.5 pH).

Total Dissolved Solids:

Total Dissolved Solids 1732 mg/l, the TDS mainly composed of carbonates, bicarbonates, Chlorides, phosphates and nitrates of calcium, magnesium, sodium and other organic matter.

Other parameters:

Chloride content is 320 mg/l, Nitrates BDL (DL: 2.0)mg/l, while sulphates varied from 146 mg/l.

Ground Water

The pH of the water samples collected ranged from 7.26 – 7.78 and within the acceptable limit of 6.5 to 8.5. pH, Sulphates and Chlorides of water samples from all the sources are within the limits as per the Standard. On Turbidity, the water samples meet the requirement. The Total Dissolved Solids were found in the range of 760–1450 mg/l in all samples. The Total hardness varied between 370 - 620 mg/l for all samples.

On Microbiological parameters, the water samples from all the locations meet the requirement. The parameters thus analysed were compared with IS 10500:2012 and are well within the prescribed limits.

3.2.5 Hydrology and Hydrogeological studies

The district is underlain by hard rock formation fissured and fractured crystalline rocks constitute the important aquifer systems in the district. Geophysical prospecting was carried out in that area by SSRMP-80 Instrument by qualified Geo physicist with the help of IGIS software and it was inferred that the low resistance encountered at the depth between 70-65m. The maximum depth proposed out of proposed projects is 37m BGL. Hence 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 these proposed projects.

During the rainy season there is a possibility of collection of seepage water from the subsurface levels which will be collected and stored in the mine sump pits and will be used for dust suppression and greenbelt development and during the end of the life of the mine this collected water will act as a temporary reservoir.

TABLE 3.11: PRE-MONSOON WATER LEVEL OF OPEN WELLS 1 KM RADIUS

Station Code	Water Level in Meters bgl			Latitude	Longitude
	Mar 2025	Apr 2025	May 2025		
OW1	11.5	12.3	12.9	10° 48' 27.5733" N	76° 54' 39.5377" E
OW2	11.8	12.6	13.2	10° 48' 34.4015" N	76° 55' 00.9282" E
OW3	11.7	12.5	13.1	10° 48' 12.6357" N	76° 54' 45.6977" E
OW5	11.4	12.2	12.8	10° 48' 12.5461" N	76° 54' 10.4475" E
OW4	11.2	12	12.6	10° 47' 41.9323" N	76° 54' 06.2829" E
OW6	12	12.8	13.4	10° 48' 18.9252" N	76° 53' 32.6279" E
OW7	12.1	12.9	13.5	10° 48' 43.4175" N	76° 54' 07.1579" E
OW8	11.3	12.1	12.7	10° 49' 03.0941" N	76° 53' 54.1470" E
OW9	11.9	12.7	13.3	10° 48' 49.0935" N	76° 54' 58.1115" E

Source: Onsite monitoring data

TABLE 3.12: PRE-MONSOON WATER LEVEL OF BOREWELLS 1 KM RADIUS

Station Code	Water Level in Meters bgl			Latitude	Longitude
	Mar 2025	Apr 2025	May 2025		
BW1	72.2	73	73.4	10° 48' 29.5856" N	76° 54' 07.0637" E
BW2	71.6	72.4	72.8	10° 48' 43.9578" N	76° 53' 43.6493" E
BW3	70.7	71.5	71.9	10° 48' 53.0722" N	76° 54' 14.4043" E
BW4	72	72.8	73.2	10° 49' 12.4368" N	76° 54' 24.0582" E
BW5	71.3	72.1	72.5	10° 48' 34.1025" N	76° 54' 45.5636" E
BW6	71.2	72	72.4	10° 48' 23.3742" N	76° 55' 00.8725" E
BW7	71.9	72.7	73.1	10° 48' 01.6491" N	76° 54' 25.2066" E
BW8	70.6	71.4	71.8	10° 47' 57.7811" N	76° 54' 03.6341" E
BW9	71.4	72.2	72.6	10° 48' 11.9572" N	76° 53' 32.7179" E

Source: Onsite monitoring data

FIGURE 3.6: OPEN WELL CONTOUR MAP – MARCH 2025

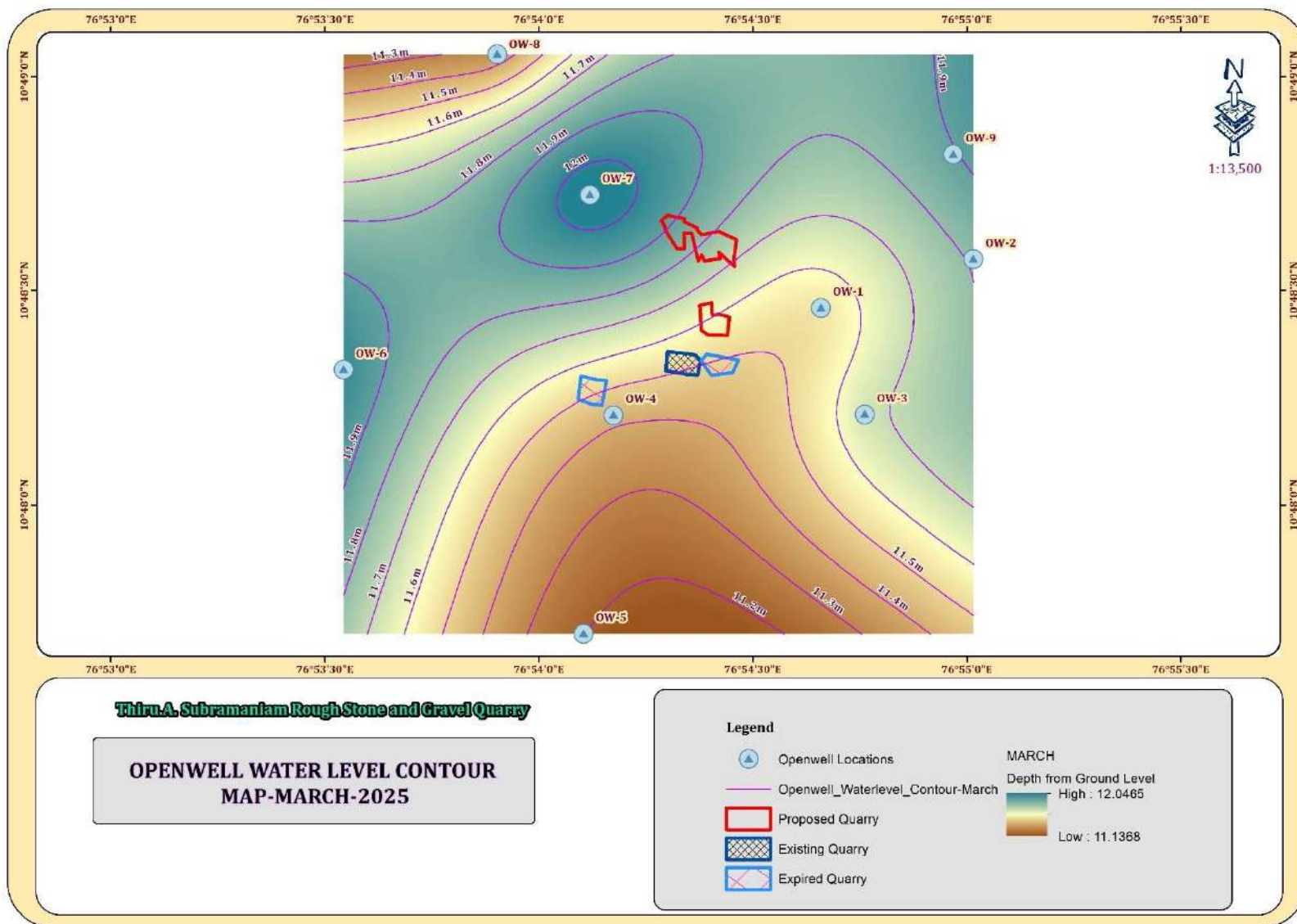


FIGURE 3.7: OPEN WELL CONTOUR MAP – APRIL 2025

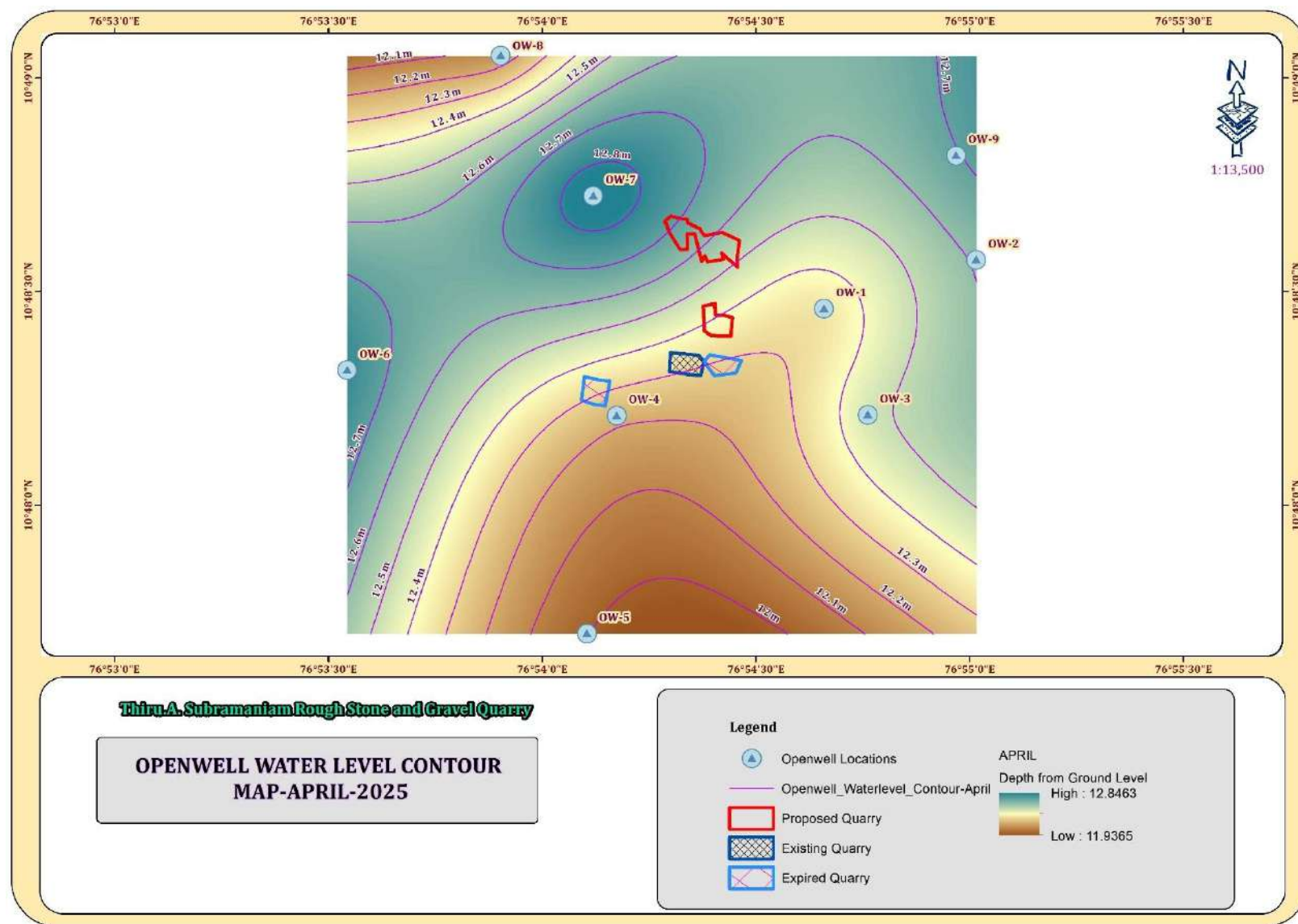


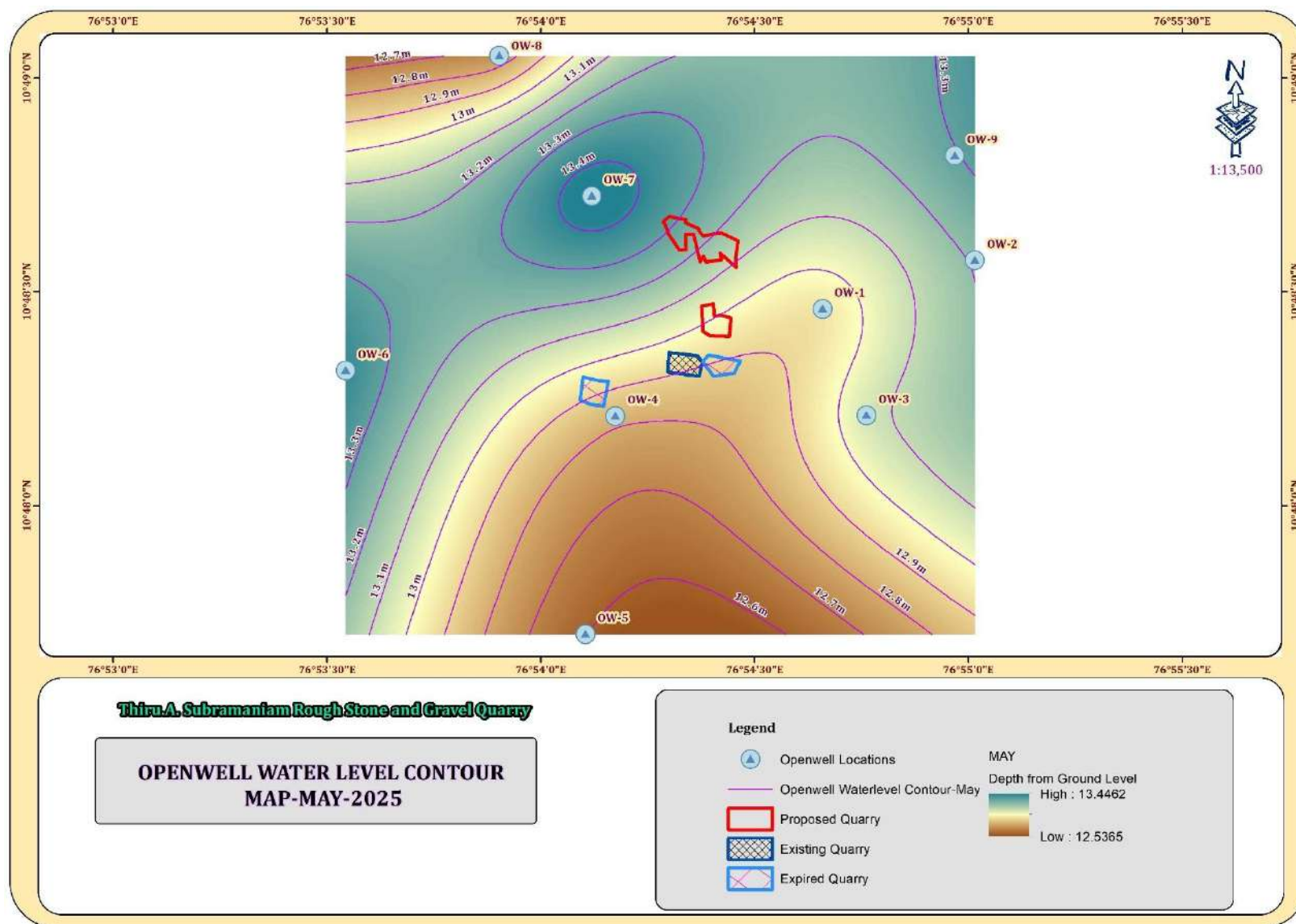
FIGURE 3.8: OPEN WELL CONTOUR MAP – MAY 2025

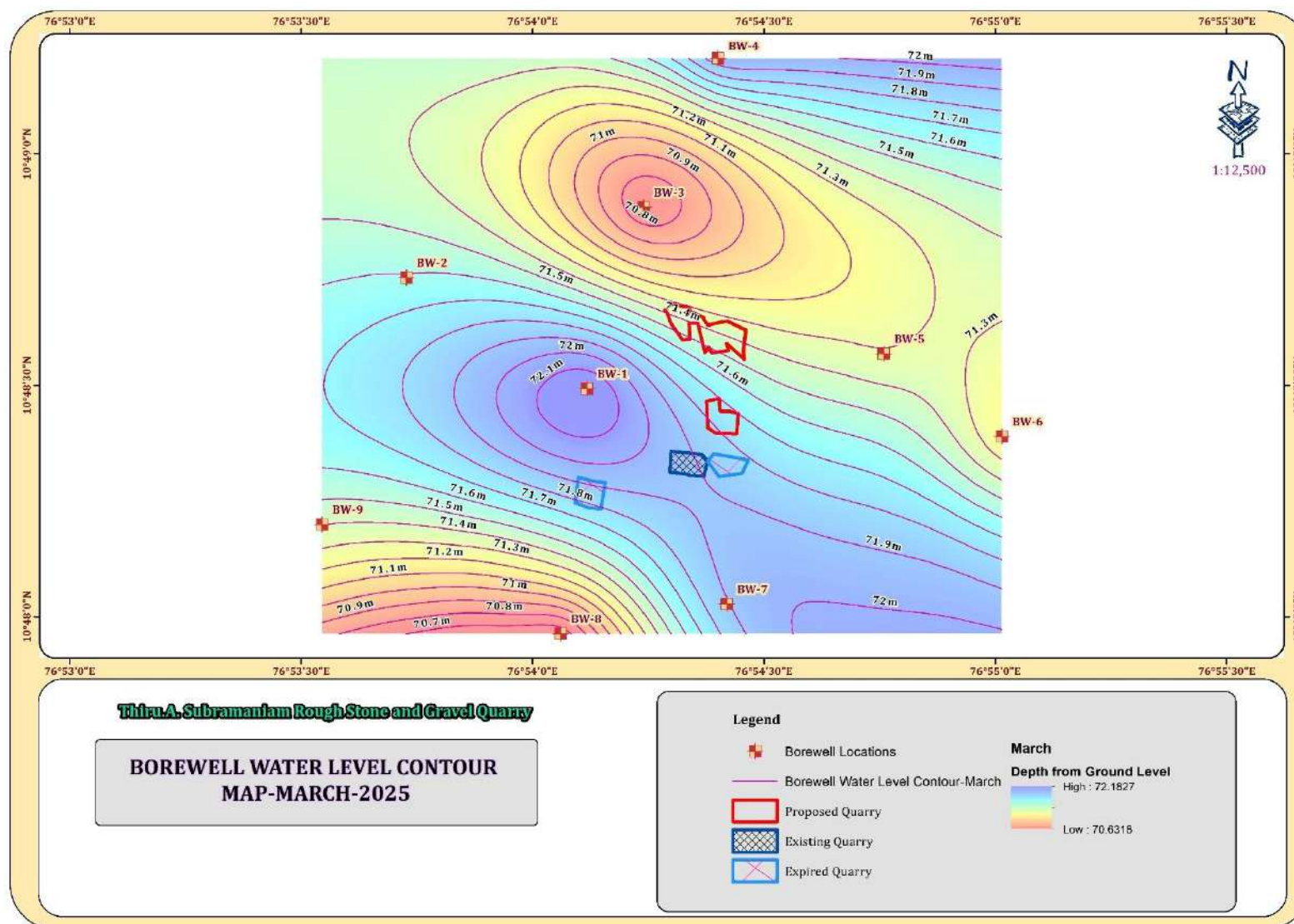
FIGURE 3.9: BOREWELL CONTOUR MAP – MARCH 2025

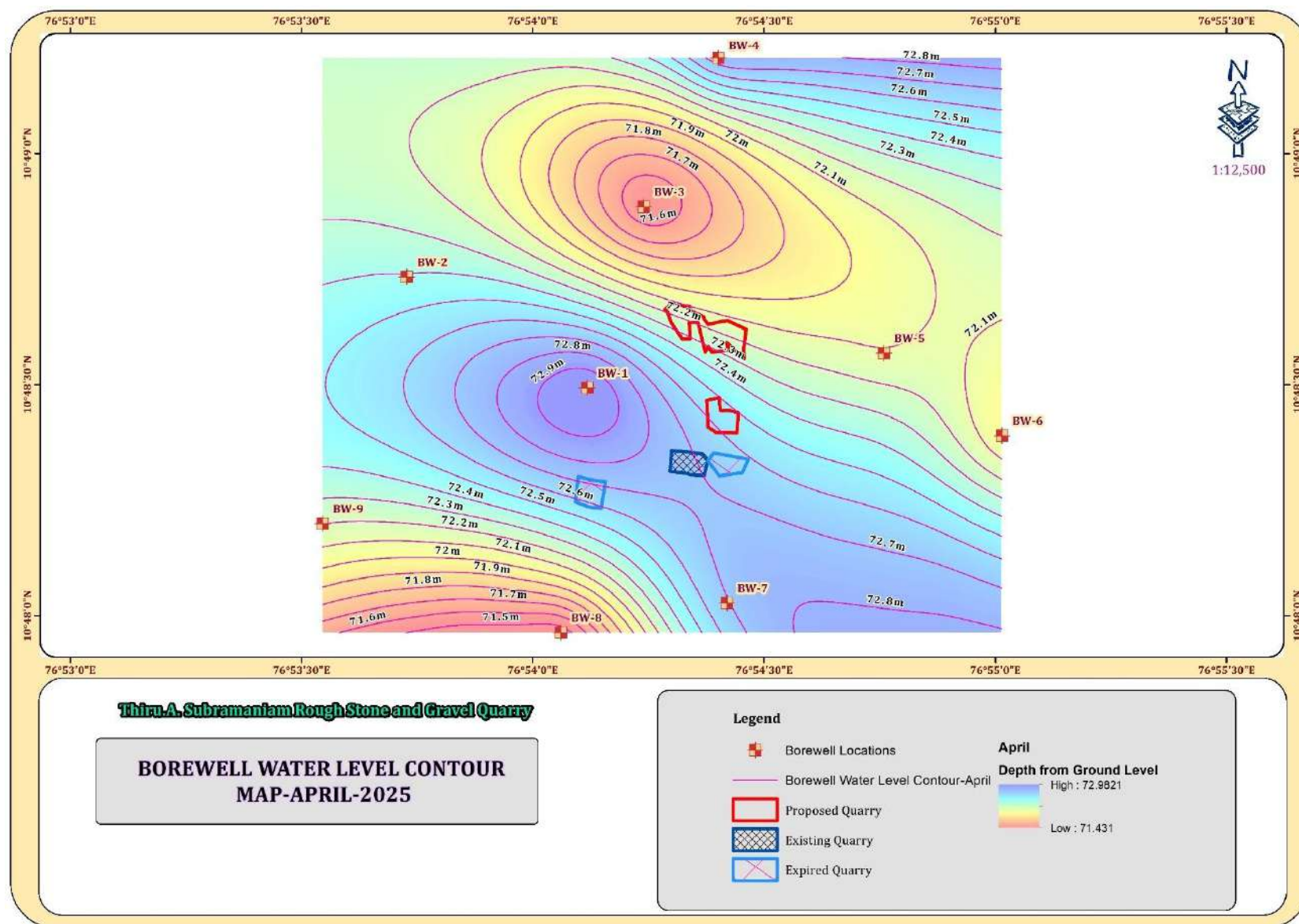
FIGURE 3.10: BOREWELL CONTOUR MAP – APRIL 2025

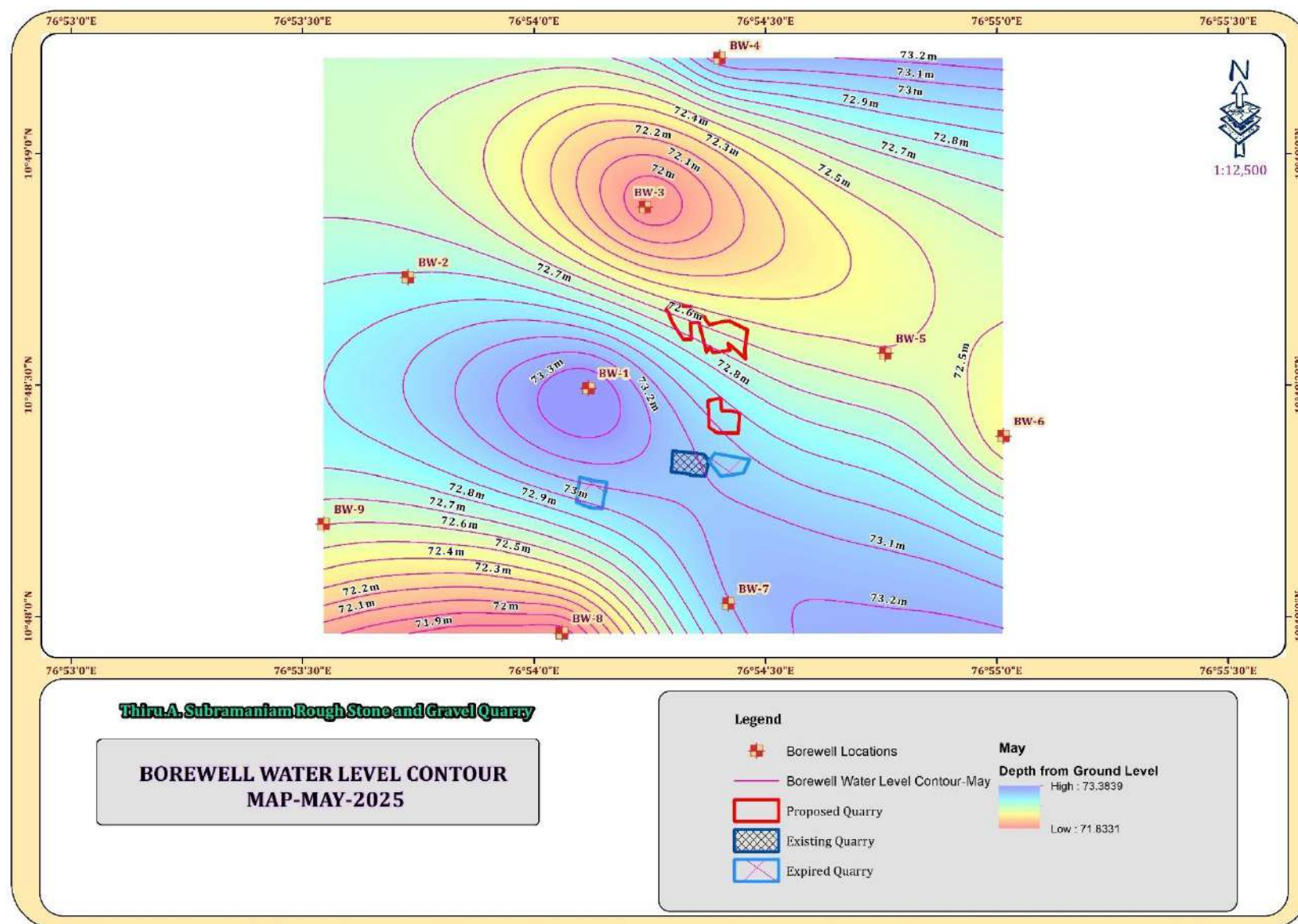
FIGURE 3.11: BOREWELL CONTOUR MAP – MAY 2025

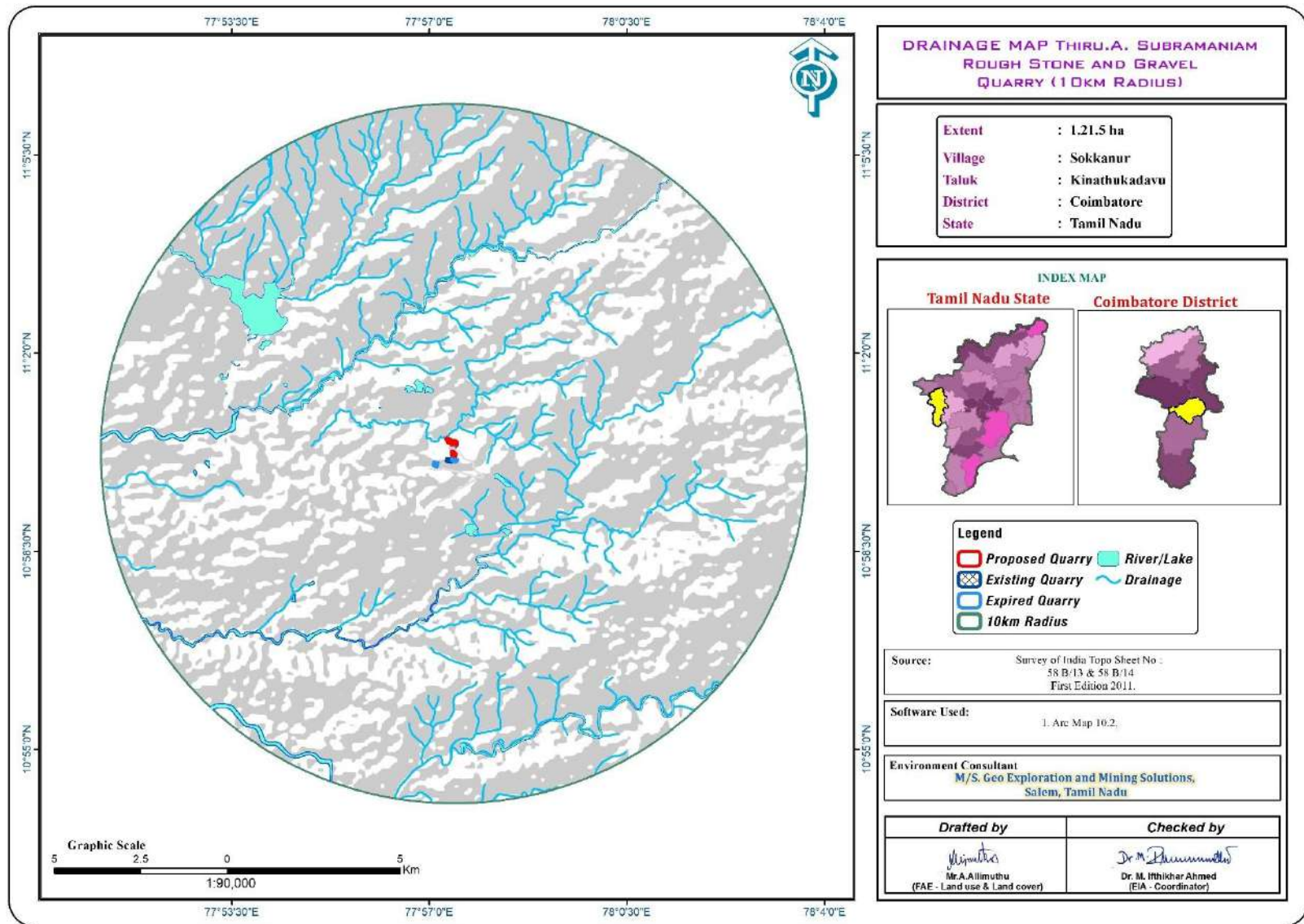
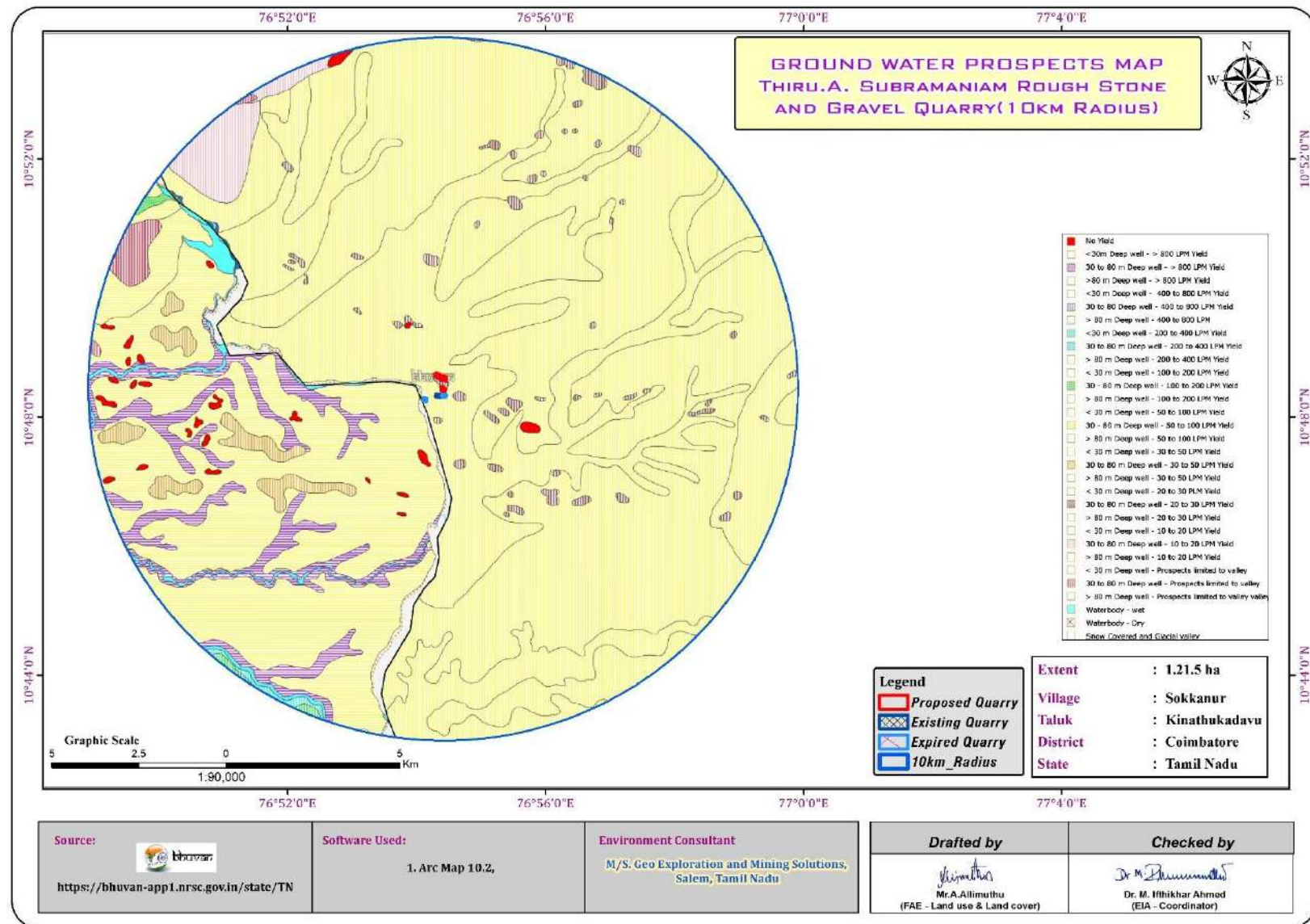
FIGURE 3.12: DRAINAGE MAP AROUND 10 KM RADIUS FROM PROJECT SITE

FIGURE 3.13: GROUND WATER PROSPECT MAP



3.2.5.1 Methodology and Data Acquisition

Electric Resistivity Method is well established for delineating lateral as well vertical discontinuities in the resistive structure of the Earth's subsurface. The present study makes use of vertical electric sounding (VES) to delineate the Vertical Resistivity structure at depth. Schlumberger electrode set up was employed for making sounding measurements. Since it is least influenced by lateral in homogeneities and is capable of providing higher depth of investigation. This is 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.

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

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

ρ_r = Resistivity of Rocks

ρ_w = Resistivity of water in pores of rock

F = Formation Factor

$\emptyset$ = Fractional pore volume

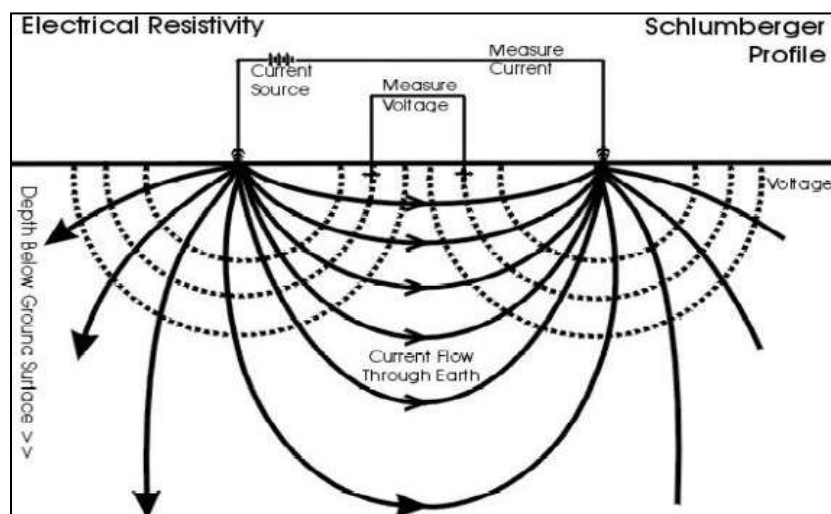
A = Constants with values ranging from 0.5 to 2.5

3.2.5.2 Survey Layout

The layout for a resistivity survey depends on the choice of the current and potential electrode arrangement, which is called electrode array. Here the present study is considered with Schlumberger 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 – AT. 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 $[1, (1+2)/2, (1+2+3)/3 \dots (1+2+\dots+16/16)]$ 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.

RESISTIVITY SURVEY PROFILE



Measurements of ground Resistivity is essentially done by sending a current through two electrodes called current electrodes (C_1 & C_2) and measuring the resulting potential by two other electrodes called potential electrode (P_1 & P_2). The amount of current required to be sent into the ground depends on the contact resistance at the current electrode, the ground resistivity and the depth of interest.

3.2.5.3 Data Presentation

It was inferred that the low resistance encountered at the depth between 70-65 m. The maximum depth proposed out of proposed projects is 37m BGL. Hence 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.

3.2.5.4 Geophysical Data Interpretation

The geophysical data was obtained to study the lateral variations, vertical in homogeneities in the sub – surface with respect to the availability of groundwater. From the interpreted data, it has inferred that the area has moderate groundwater potential in the investigated area. This small quarrying operation will not have any significant impact on the natural water bodies.

3.3 AIR ENVIRONMENT

The existing ambient air quality of the area is important for evaluating the impact of mining activities on the ambient air quality.

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 cluster forms the baseline information. The sources of air pollution in the region are mostly due to vehicular traffic, dust arising from unpaved village road and domestic & agricultural activities. The prime objective of the baseline air quality study was to establish the existing ambient air quality of the study area. These will also be useful for assessing the conformity to standards of the ambient air quality during the operation of proposed projects in cluster.

This section describes the identification of sampling locations, methodology adopted during the monitoring period and sampling frequency.

3.3.1 Meteorology & Climate

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 3 m 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.

Climate –

Coimbatore is 421m above sea level. Coimbatore's climate is classified as tropical. The summers here have a good deal of rainfall, while the winters have very little rain. This location is classified as Aw by Köppen and Geiger. In Coimbatore –

- The average annual temperature is 25.4°C | 77.8°F.
- The annual rainfall here is around 952mm | 37.5 inch.
- The driest month is January with 13mm | 0.5 inch of rainfall. The greatest amount of precipitation occurs in October, with an average of 181mm | 7.1 inch.
- The warmest month of the year is April, with an average temperature of 28.9°C | 84.1°F. The lowest average temperatures in the year occur in December, when it is around 23.2°C | 73.7°F.
- The difference in precipitation between the driest month and the wettest month is 168 mm | 7 inch. The variation in annual temperatures throughout the year is 5.8°C | 42.4°F.

Source: <https://en.climate-data.org/asia/india/tamil-nadu/coimbatore-2788/>

Rainfall –

TABLE 3.13: RAINFALL DATA

Actual Rainfall in mm									Normal Rainfall in mm
2013	2014	2015	2016	2017	2018	2019	2020	2021	
901.0	1221.7	992.9	505.5	873.4	1302.0	1272.4	1585.3	2119.1	1213.2

Source: <https://www.twadboard.tn.gov.in/content/coimbatore>

TABLE 3.14: METEOROLOGICAL DATA RECORDED AT SITE

S.No	Parameters		Mar-2025	Apr-2025	May-2025
1	Temperature (°C)	Max	29.07	28.67	28.82
		Min	24.79	25.62	23.34
		Avg.	26.93	27.14	26.08
2	Relative Humidity (%)	Avg.	60.02	68.91	77.36
3	Wind Speed (m/s)	Max	5.04	3.06	4.14
		Min	1.17	1.01	0.96
		Avg.	3.10	2.03	2.55
4	Cloud Cover (OKTAS)		0-8	0-8	0-8
5	Wind direction		E,ESE	WSW,W	WSW,W

Source: On-site monitoring/sampling by Global Lab and Consultancy Services in association with GEMS

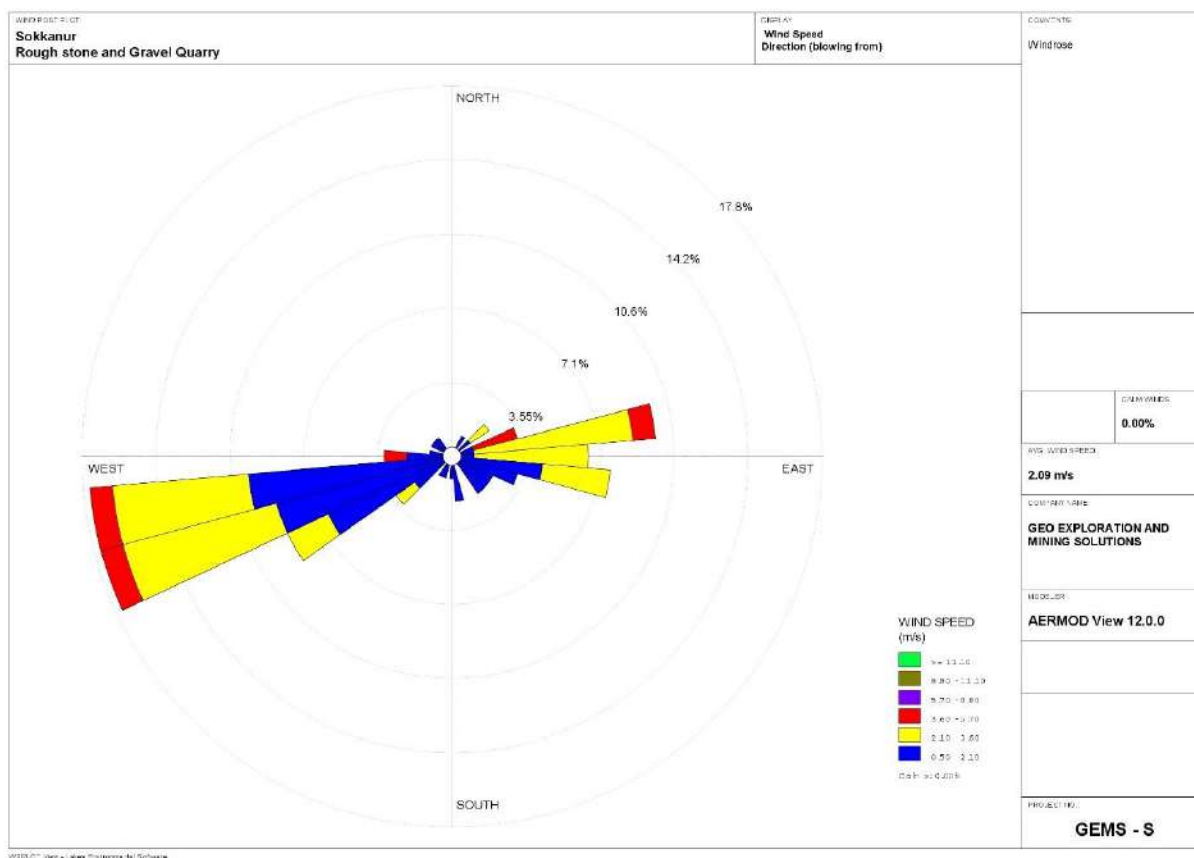
Correlation between Secondary and Primary Data

The meteorological data collected at the site is almost similar to that of secondary data collected from IMD Coimbatore_Agro. A comparison of site data generated during the three months with that of IMD, Coimbatore_Agro reveals the following:

- The average maximum and minimum temperatures of IMD, Coimbatore_Agro showed a higher in respect of on-site data i.e. in Sokkanur village.
- The relative humidity levels were lesser at site as compared to IMD, Coimbatore_Agro.
- The wind speed and direction at site shows similar trend that of IMD, Coimbatore_Agro.

Wind rose diagram of the study site is depicted in Figure. 3.14. Predominant downwind direction of the area during study season is North-East to South West.

FIGURE 3.14: WINDROSE DIAGRAM



In the abstract of collected data wind rose were drawn on presented in figure No.3.14 during the monitoring period in the study area

1. Predominant winds were from – NE, SW
2. Wind velocity readings were recorded between 3.60 – 5.70 m/s
3. Calm conditions prevail of about 0.00 % of the monitoring period
4. Temperature readings ranging from 26.08 to 27.14 °C
5. Relative humidity ranging from 60.02 to 77.36 %
6. The monitoring was carried out continuously for three months. (March – May 2025)

3.3.2 Methodology and Objective

The prime objective of the ambient air quality study is to assess the existing air quality of study area and its conformity to NAAQS. The observed sources of air pollution in the study area are industrial, traffic and domestic activities. The baseline status of the ambient air quality has been established through a scientifically designed ambient air quality monitoring network considering the followings:

- Meteorological condition on synoptic scale;
- Topography of the study area;
- Representatives of regional background air quality for obtaining baseline status;
- Location of residential areas representing different activities;
- Accessibility and power availability; etc

3.3.3 Sampling and Analytical Techniques

TABLE 3.15: METHODOLOGY AND INSTRUMENT USED FOR AAQ ANALYSIS

Parameter	Method	Instrument
PM2.5	Gravimetric Method Beta attenuation Method	Fine Particulate Sampler Make – Thermo Environmental Instruments – TEI 121
PM10	Gravimetric Method Beta attenuation Method	Respirable Dust Sampler Make –Thermo Environmental Instruments – TEI 108
SO ₂	IS-5182 Part II (Improved West & Gaeke method)	Respirable Dust Sampler with gaseous attachment
NO _x	IS-5182 Part II (Jacob & Hochheiser modified method)	Respirable Dust Sampler with gaseous attachment
Free Silica	NIOSH – 7601	Visible Spectrophotometry

Source: Sampling Methodology followed by Global Lab and Consultancy Services & CPCB Notification

TABLE 3.16: NATIONAL AMBIENT AIR QUALITY STANDARDS

Sl.No.	Pollutant	Time Weighted Average	Concentration in ambient air	
			Industrial, Residential, Rural & other areas	Ecologically Sensitive area (Notified by Central Govt.)
1	Sulphur Dioxide (µg/m ³)	Annual Avg.* 24 hours**	50.0 80.0	20.0 80.0
2	Nitrogen Dioxide (µg/m ³)	Annual Avg. 24 hours	40.0 80.0	30.0 80.0
3	Particulate matter (size less than 10µm) PM ₁₀ (µg/m ³)	Annual Avg. 24 hours	60.0 100.0	60.0 100.0
4	Particulate matter (size less than 2.5 µm PM _{2.5} (µg/m ³)	Annual Avg. 24 hours	40.0 60.0	40.0 60.0

Source: NAAQS CPCB Notification No. B-29016/20/90/PCI-I Dated: 18th Nov 2009

*Annual Arithmetic mean of minimum 104 measurements in a year taken twice a Week 24 hourly at uniform interval,

** 24 hourly / 8 hourly or 1 hourly monitored value as applicable shall be complied with 98 % of the time in a year. However, 2% of the time, they may exceed the limits but not on two consecutive days of monitoring.

3.3.4 Frequency & Parameters for Sampling

Ambient air quality monitoring has been carried out with a frequency of two samples per week at Seven (7) locations, adopting a continuous 24 hourly (3 shift of 8-hour) schedule for the period March 2025 – May 2025. The baseline data of ambient air has been generated for PM₁₀, PM_{2.5}, Sulphur Dioxide (SO₂) & Nitrogen Dioxide (NO₂) Monitoring has been carried out as per the CPCB, MoEF guidelines and notifications.

It was ensured that the equipment was placed preferably at a height of at least 3 ± 0.5m above the ground level at each monitoring station, for negating the effects of wind-blown ground dust. The equipment was placed at open space free from trees and vegetation which otherwise act as a sink of pollutants resulting in lower levels in monitoring results.

3.3.5 Ambient Air Quality Monitoring Stations

Seven (7) monitoring stations were set up in the study area as depicted in Figure 3.15 for assessment of the existing ambient air quality. Details of the sampling locations are as per given below.

TABLE 3.17: AMBIENT AIR QUALITY (AAQ) MONITORING LOCATIONS

S. No	Location Code	Monitoring Locations	Distance & Direction	Coordinates
1	AAQ1	Core Zone	Project Area	10°48'27.79"N 76°54'22.88"E
2	AAQ2	Core Zone	Project Area	10°48'23.96"N 76°54'26.21"E
3	AAQ3	Near Existing Quarry	170m SW	10°48'21.40"N 76°54'17.70"E
4	AAQ4	Pichanur	4.2km NW	10°50'10.14"N 76°52'47.94"E
5	AAQ5	Kanal Pudur	5.6km South	10°45'19.47"N 76°54'33.93"E
6	AAQ6	Muthugoundanur	3.8km SE	10°47'26.39"N 76°56'19.14"E
7	AAQ7	Kannamanayakkanur	4.5km NE	10°49'6.89"N 76°56'45.83"E

Source: On-site monitoring/sampling by Global Lab and Consultancy Services in association with GEMS.

FIGURE 3.15: AMBIENT AIR QUALITY LOCATIONS AROUND 10 KM RADIUS

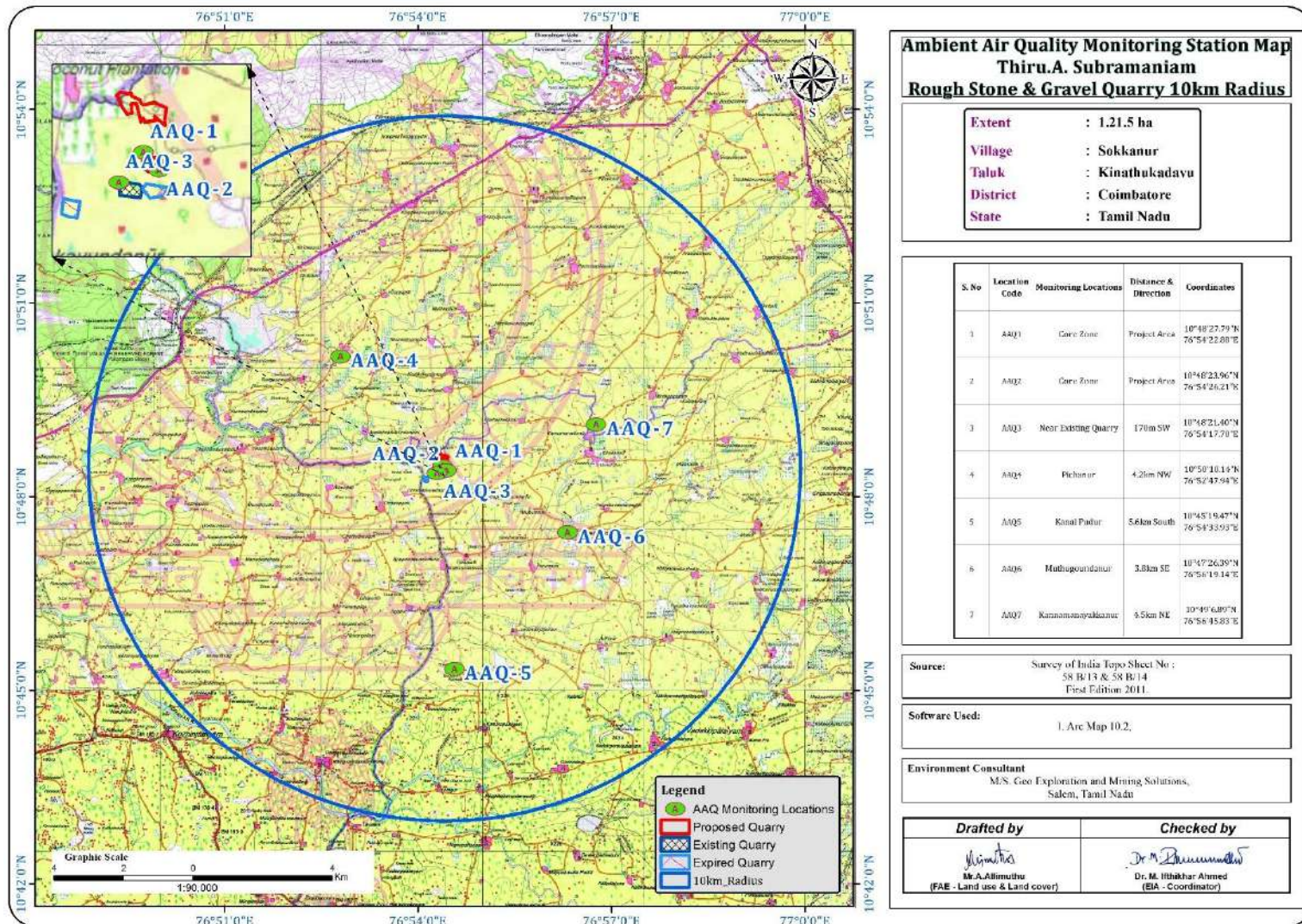


TABLE 3.18: SUMMARY OF AAQ – 1 to AAQ – 7

PM_{2.5}	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7
Arithmetic Mean	20.5	21.0	23.8	24.1	24.3	24.1	23.5
Minimum	19.2	17.3	22.5	19.5	20.8	21.6	20.6
Maximum	22.5	23.7	24.5	25.8	25.8	25.9	25.9
NAAQ Norms	60.0	60.0	60.0	60.0	60.0	60.0	60.0

PM₁₀	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7
Arithmetic Mean	42.0	42.5	45.5	44.6	46.2	45.4	44.5
Minimum	39.2	38.2	44.1	40.6	41.4	41.6	40.9
Maximum	44.5	45.2	46.8	47.0	51.4	48.9	47.8
NAAQ Norms	100.0	100.0	100.0	100.0	100.0	100.0	100.0

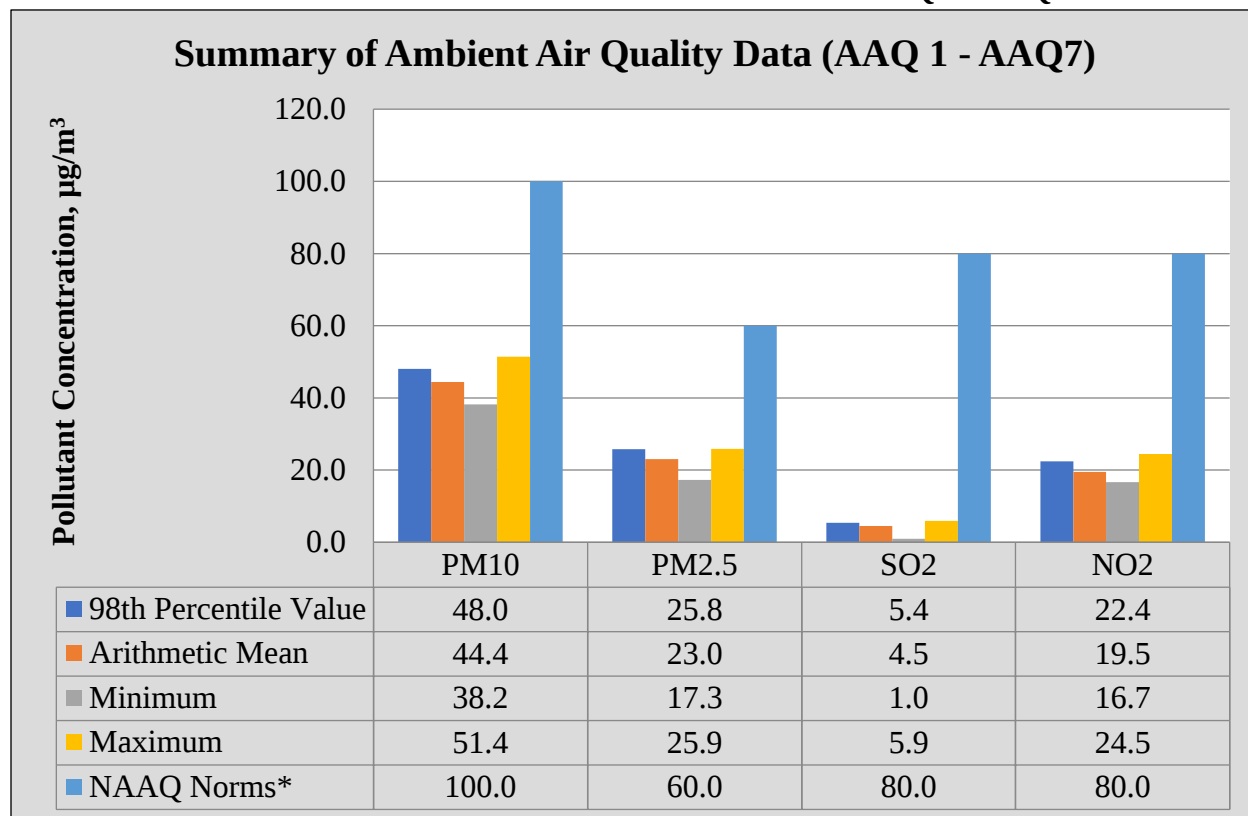
SO₂	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7
Arithmetic Mean	4.3	4.1	4.8	4.4	4.4	4.8	4.7
Minimum	0.0	0.0	4.1	0.0	0.0	4.0	4.0
Maximum	5.2	5.0	5.6	5.1	5.3	5.9	5.3
NAAQ Norms	80.0	80.0	80.0	80.0	80.0	80.0	80.0

NO₂	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7
Arithmetic Mean	19.6	19.6	19.4	19.2	19.5	19.6	19.6
Minimum	17.1	17.0	18.0	17.2	16.7	18.5	18.1
Maximum	22.2	24.5	20.6	21.5	21.5	20.6	20.9
NAAQ Norms	80.0	80.0	80.0	80.0	80.0	80.0	80.0

TABLE 3.28: ABSTRACT OF AMBIENT AIR QUALITY DATA

1	Parameter	PM_{2.5}	PM₁₀	SO₂	NO₂
2	No. of Observations	182	182	182	182
3	10 th Percentile Value	41.2	20.4	4.1	17.8
4	20 th Percentile Value	42.5	21.0	4.2	18.5
5	30 th Percentile Value	43.2	21.9	4.4	18.7
6	40 th Percentile Value	43.9	22.9	4.5	19.2
7	50 th Percentile Value	44.6	23.7	4.6	19.5

8	60 th Percentile Value	45.3	24.1	4.7	19.8
9	70 th Percentile Value	45.9	24.5	4.9	20.1
10	80 th Percentile Value	46.3	24.8	5.0	20.5
11	90 th Percentile Value	47.0	25.2	5.1	20.9
12	95 th Percentile Value	47.5	25.5	5.3	21.5
13	98 th Percentile Value	48.0	25.8	5.4	22.4
14	Arithmetic Mean	44.4	23.0	4.5	19.5
15	Geometric Mean	44.3	23.0	4.4	19.4
16	Standard Deviation	2.3	1.9	0.8	1.3
17	Minimum	38.2	17.3	1.0	16.7
18	Maximum	51.4	25.9	5.9	24.5
19	NAAQ Norms*	100.0	60.0	80.0	80.0
	% Values exceeding Norms*	0.0	0.0	0.0	0.0

FIGURE 3.16: BAR DIAGRAM OF SUMMARY OF AAQ 1 – AAQ 7

Source: Table 3.17 to 3.27

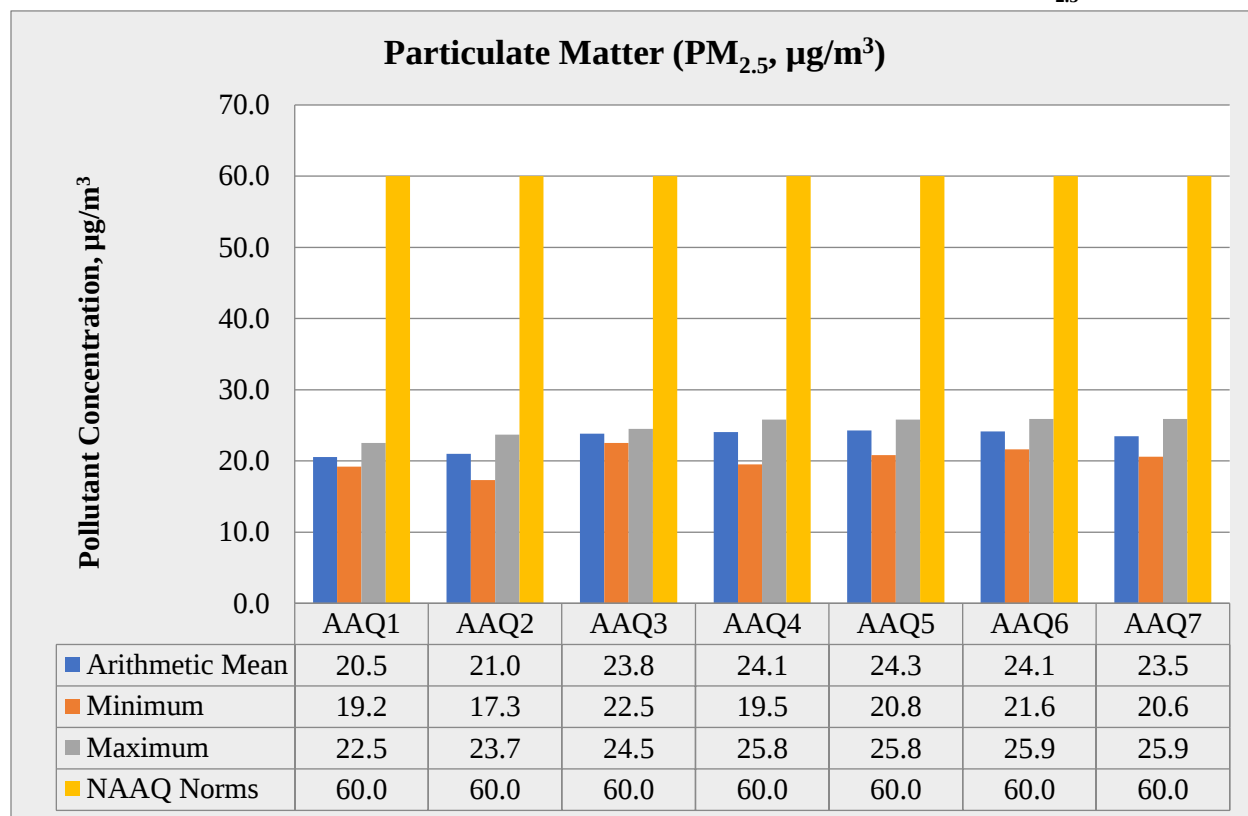
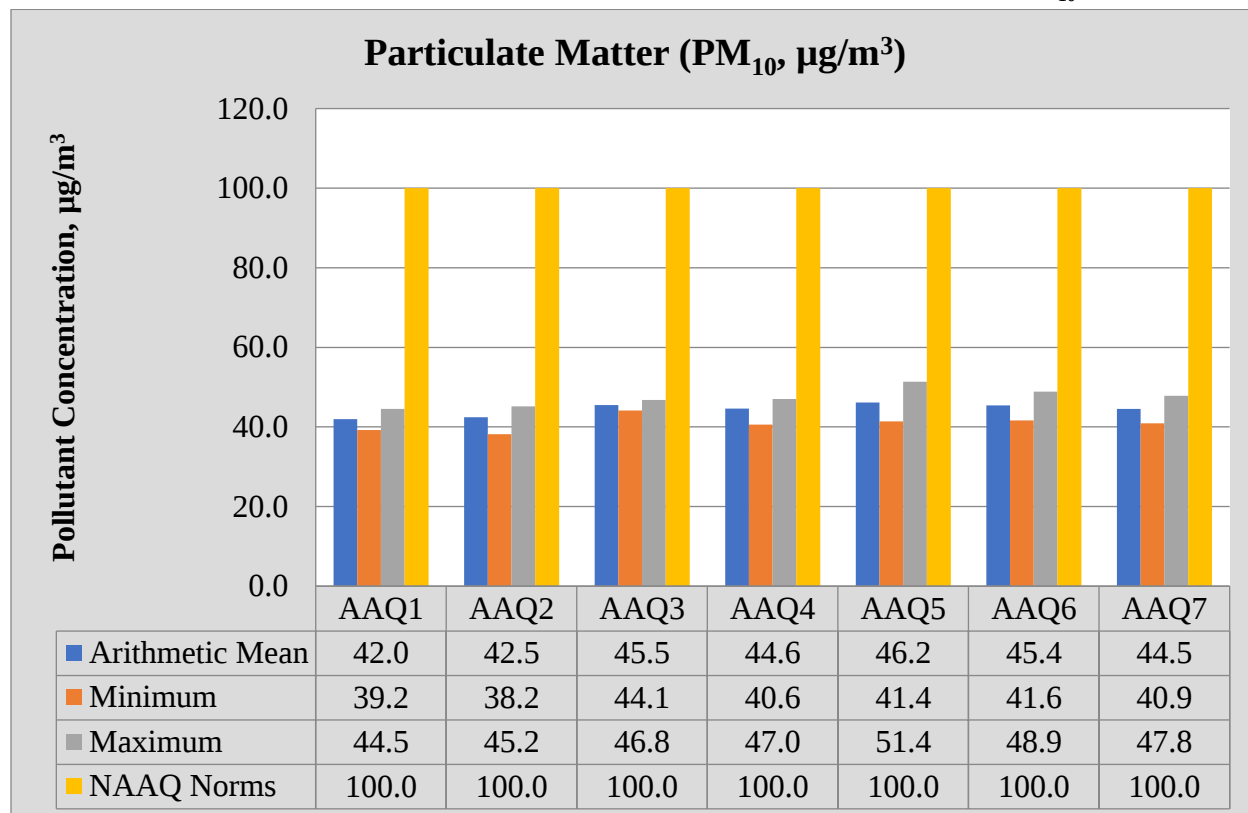
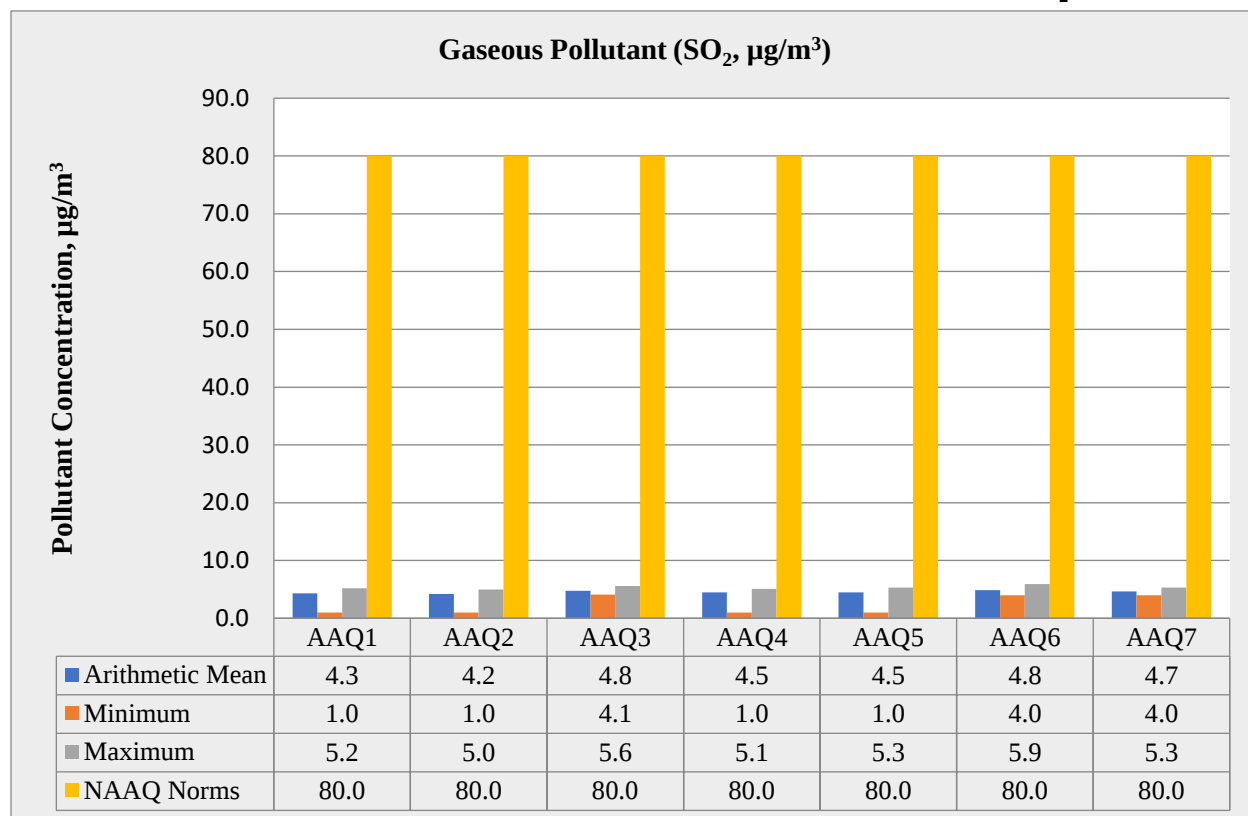
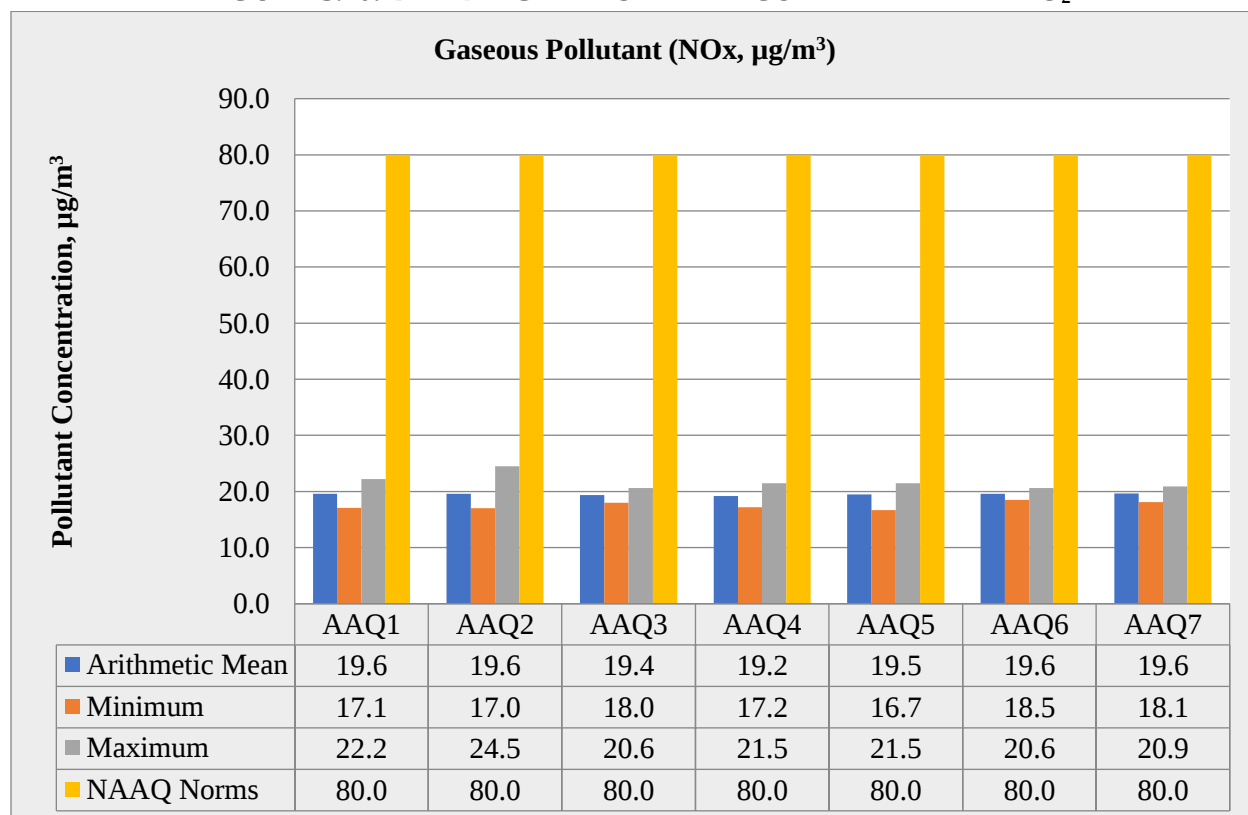
FIGURE 3.17: BAR DIAGRAM OF PARTICULATE MATTER PM_{2.5}**FIGURE 3.18: BAR DIAGRAM OF PARTICULATE MATTER PM₁₀**

FIGURE 3.19: BAR DIAGRAM OF PARTICULATE MATTER SO₂**FIGURE 3.20: BAR DIAGRAM OF PARTICULATE MATTER NO₂**

3.3.6 Interpretations & Conclusion

As per monitoring data, PM₁₀ ranges from 38.2 µg/m³ to 51.4 µg/m³, PM_{2.5} data ranges from 17.3 µg/m³ to 25.9 µg/m³, SO₂ ranges from 1.0 µg/m³ to 5.9 µg/m³ and NO₂ data ranges from 16.7 µg/m³ to 24.5 µg/m³. The concentration levels of the above criteria pollutants were observed to be well within the limits of NAAQS prescribed by CPCB.

3.4 NOISE ENVIRONMENT

The vehicular movement on road and mining activities is the major sources of noise in study area, the environmental assessment of noise from the mining activity and vehicular traffic can be undertaken by taking into consideration various factors like potential damage to hearing, physiological responses, and annoyance and general community responses.

The main objective of noise monitoring in the study area is to establish the baseline noise level and assess the impact of the total noise expected to be generated during the project operations around the project site.

3.4.1 Identification of Sampling Locations

In order to assess the ambient noise levels within the study area, noise monitoring was carried out at Seven (7) locations. The noise level monitoring locations were carried out by covering commercial, residential, rural areas within the radius of 10km. A noise monitoring methodology was chosen such that it best suited the purpose and objectives of the study.

TABLE 3.19: DETAILS OF SURFACE NOISE MONITORING LOCATIONS

S. No	Location Code	Monitoring Locations	Distance & Direction	Coordinates
1	N1	Core Zone	Project Area	10°48'27.97"N 76°54'23.95"E
2	N2	Core Zone	Project Area	10°48'23.91"N 76°54'23.70"E
3	N3	Near Existing Quarry	170m SW	10°48'21.58"N 76°54'18.06"E
4	N4	Pichanur	4.2km NW	10°50'11.18"N 76°52'48.09"E
5	N5	Kanal Pudur	5.6km South	10°45'19.03"N 76°54'35.65"E
6	N6	Muthugoundanur	3.8km SE	10°47'25.66"N 76°56'19.62"E
7	N7	Kannamanayakkanur	4.5km NE	10°49'6.94"N 76°56'45.64"E

Source: On-site monitoring/sampling by Global Lab and Consultancy Services in association with GEMS

3.4.2 Method of Monitoring

Digital Sound Level Meter was used for the study. All reading was taken on the 'A-Weighting' frequency network, at a height of 1.5 meters from ground level. The sound level meter does not give a steady and consistent reading and it is quite difficult to assess the actual sound level over the entire monitoring period. To mitigate this shortcoming, the Continuous Equivalent Sound level, indicated by Leq, is used. Equivalent sound level, 'Leq', can be obtained from variable sound pressure level, 'L', over a time period by using following equation. The equivalent noise level is defined mathematically as,

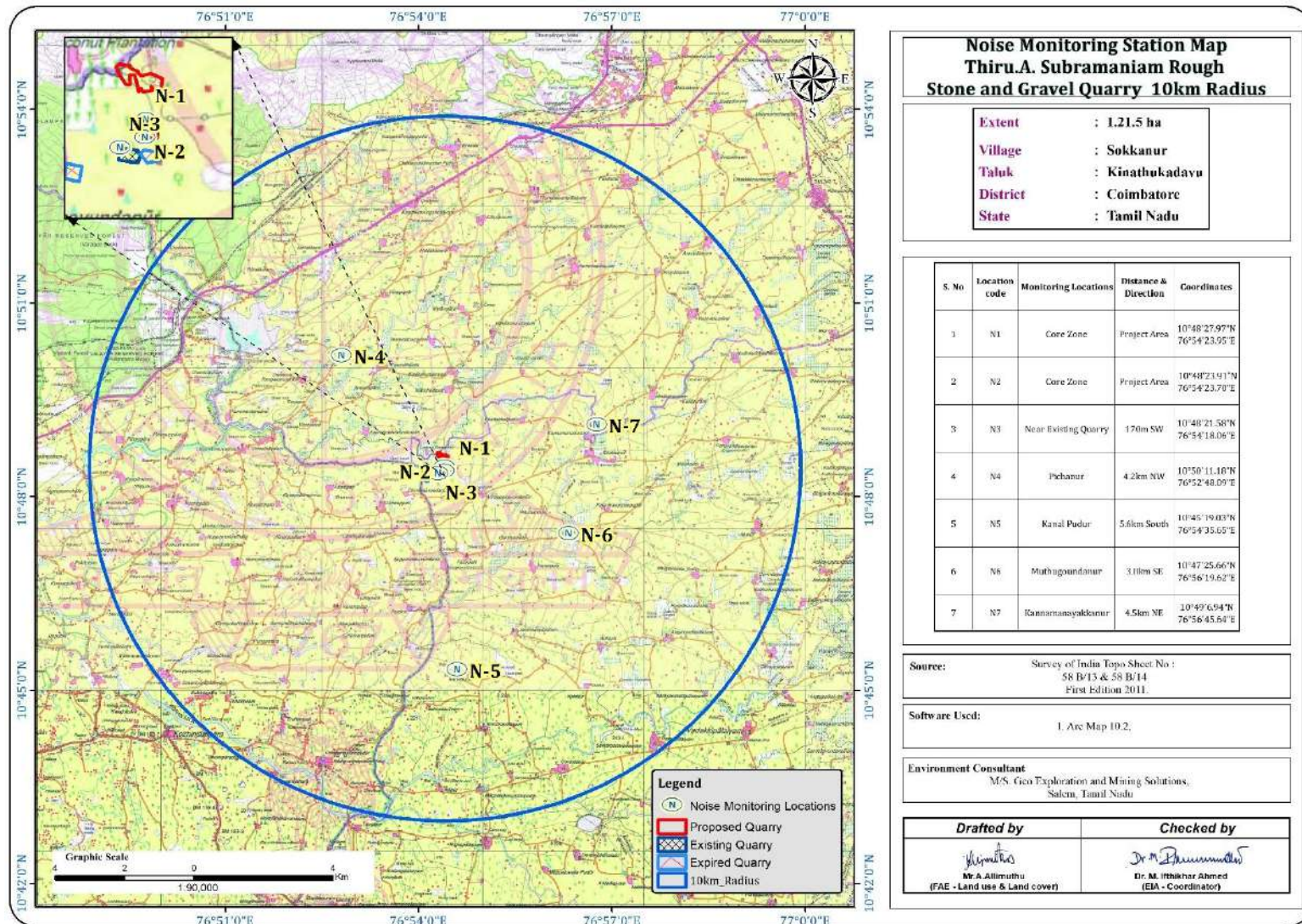
$$Leq = 10 \log L / T \sum (10L_n/10)$$

Where L = Sound pressure level at function of time dB (A)

T = Time interval of observation

Measured noise levels, displayed as a function of time, is useful for describing the acoustical climate of the community. Noise levels recorded at each station with a time interval of about 60 minutes are computed for equivalent noise levels. Equivalent noise level is a single number descriptor for describing time varying noise levels.

FIGURE 3.21: NOISE MONITORING STATIONS AROUND 10 KM RADIUS



3.4.3 Analysis of Ambient Noise Level in the Study Area

The Digital Sound pressure level has been measured by a sound level meter (Model: HTC SL-1352) An analysis of the different Leq data obtained during the study period has been made. Variation was noted during the day-time as well as night-time. The results are presented in below Table 3.32.

Day time: 6:00 hours to 22.00 hours.

Night time: 22:00 hours to 6.00 hours.

TABLE 3.20: AMBIENT NOISE QUALITY RESULT

S. No	Locations	Noise level (dB (A) Leq)		Ambient Noise Standards
		Day Time	Night Time	
1	Core Zone	45.0	34.3	Industrial Day Time- 75 dB (A) Night Time- 70 dB (A)
2	Core Zone	46.0	35.0	
3	Near Existing Quarry	46.8	35.2	Residential Day Time- 55 dB (A) Night Time- 45 dB (A)
4	Pichanur	47.4	35.1	
5	Kanal Pudur	46.3	34.5	
6	Muthugoundanur	47.6	36.8	
7	Kannamanayakkanur	46.0	35.1	

Source: On-site monitoring/sampling by Global Lab and Consultancy Services in association with GEMS

FIGURE 3.22: DAY TIME NOISE LEVELS IN CORE AND BUFFER ZONE

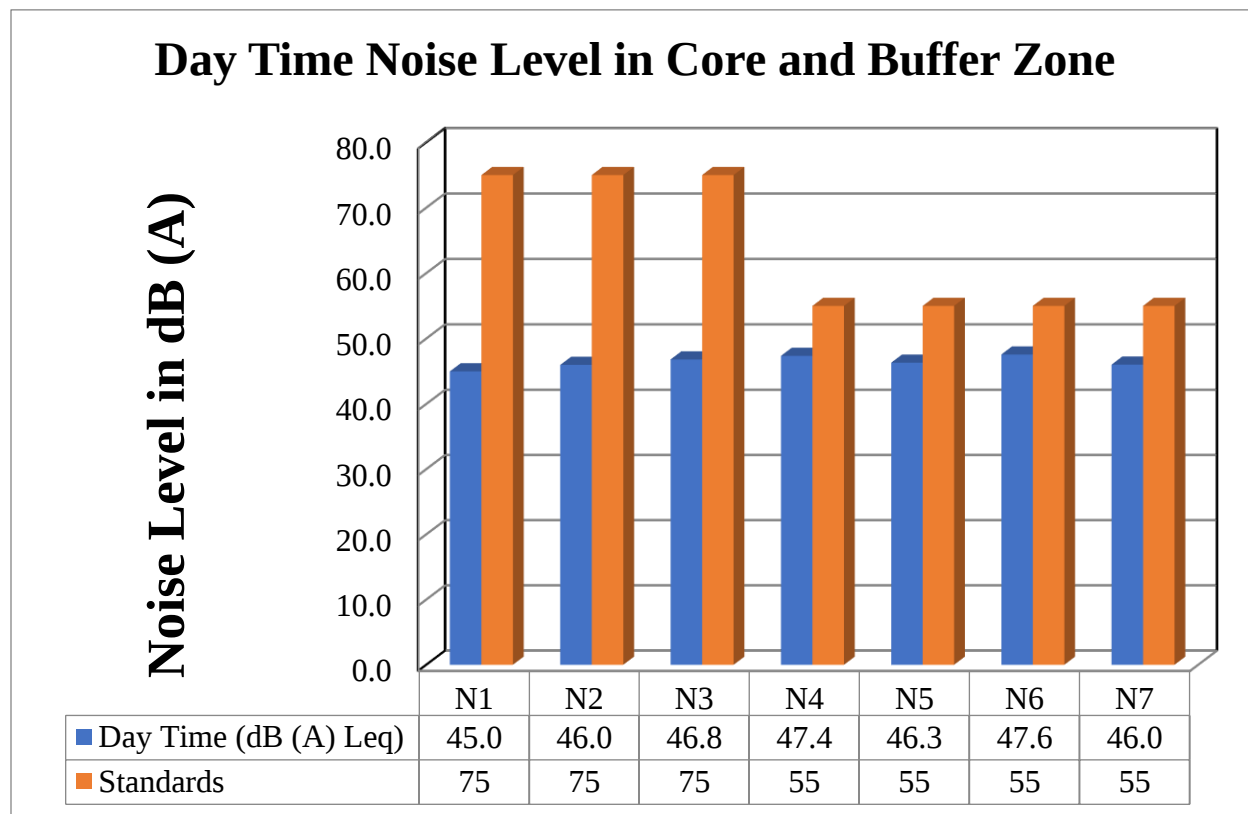
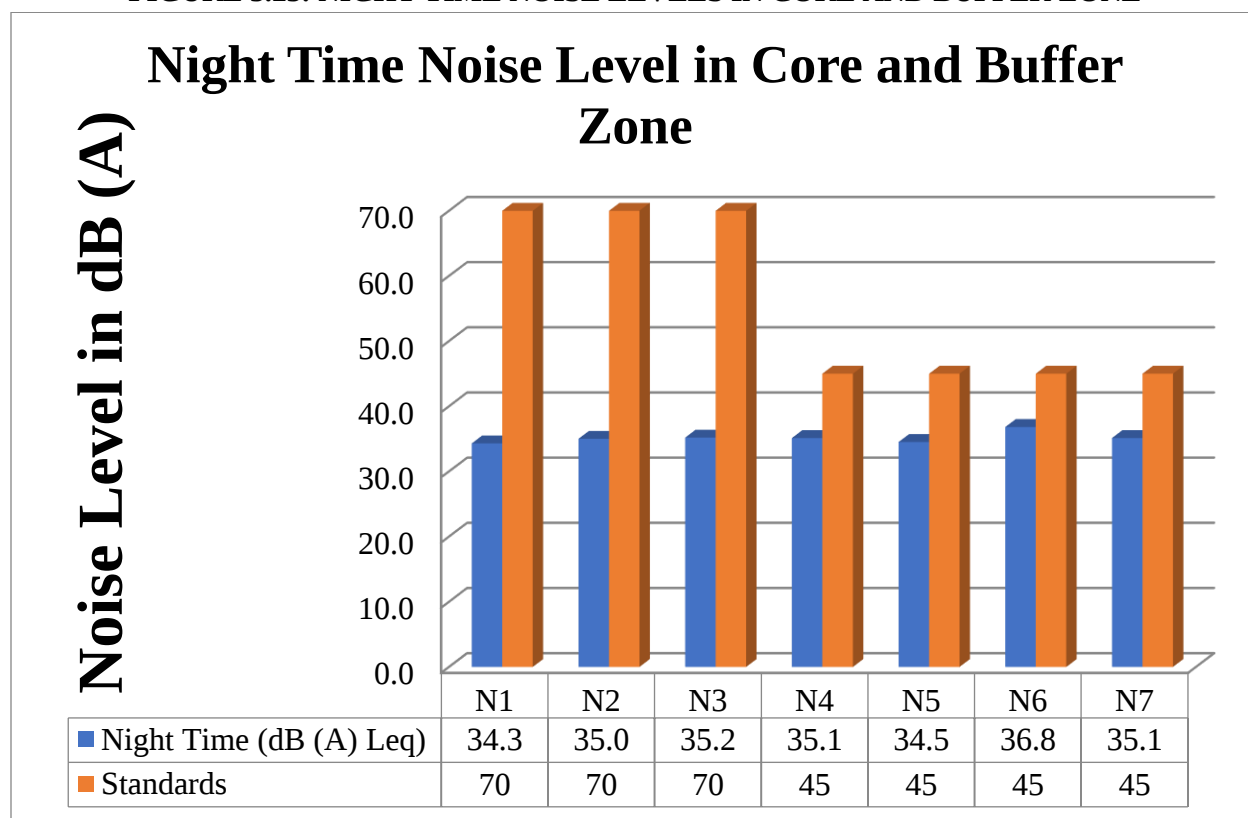


FIGURE 3.23: NIGHT TIME NOISE LEVELS IN CORE AND BUFFER ZONE

3.4.4 Interpretation & Conclusion:

Ambient noise levels were measured at 7 (Seven) locations around the proposed project area. Noise levels recorded in core zone during day time 45.0 – 46.0 dB (A) Leq and during night time 34.3 – 35.0 dB (A) Leq. Noise levels recorded in buffer zone during day time were from 46.0 – 47.6 dB (A) Leq and during night time were from 35.1 – 36.8 dB (A) Leq.

Thus, the noise level for Industrial and Residential area meets the requirements of CPCB.

3.5 ECOLOGICAL ENVIRONMENT

Ecology is a branch of science which dealing the relations and interactions between organisms and their environment. An ecological survey of the study area was conducted, particularly with reference to listing of species and assessment of the existing baseline ecological conditions in the study area. The main objective of biological study is to collect the baseline data regarding flora and fauna in the study area. Data has been collected through extensive survey of the area with reference to flora and fauna. Information is also collected from different sources i.e. government departments such as District Forest Office, Government of Tamil Nadu. On the basis of onsite observations as well as forest department records the checklist of flora and fauna was prepared.

3.5.1 Scope of Work

Scope of work for this study includes identification of ecologically sensitive receptors, based on literature survey, field investigations and their mitigation with conservation action plan. The study was carried out in the core as well as buffer zone of the Proposed Rough stone and gravel quarry. The study was carried out systematically and scientifically using primary and secondary data in order to bring out factual information on the ecological conditions of the mine site and 10 km radius study area.

The study involved assessment of general habitat type, vegetation pattern, preparation of inventory of flora and fauna of terrestrial ecosystem within 10 km radius from the boundary of Proposed Mine site. Biological assessment of the site was done to identify ecologically sensitive areas and whether there are any rare, endangered, endemic or threatened (REET) species of flora & fauna in the core area as well its buffer zone to be impacted. The

study also designed to suggest suitable mitigation measures if necessary for protection of wildlife habitats and conservation of REET species if any.

3.5.2.Study area Ecology

The core area extent of 1.21.5Ha of Rough stone and Gravel quarry has an impact on the diversity of flora and fauna of the surrounding area. But present work was carried out on the detailed study of the impacts of the Rough stone and Gravel quarry on the ecology and biodiversity of the core lease area with the proper mitigation and sustainable management plan. The proposed area applied area exhibits undulated topography. The following methods were applied during the baseline study of flora, fauna, and diversity assessment.

3.5.3 Objectives of Biological Studies

The present study was undertaken with the following objectives:

- To study the likely impact of the proposed mining project on the local biodiversity and to suggest mitigation measures, if required, for vulnerable biota.
- Undertake intensive field survey to assess the status of floral & faunal component in different habitats in the core and buffer areas of the project site.
- Identification and listing of flora and fauna which are important as per the Wildlife (Protection) Act 1972 & Schedule Category is listed as per the Wildlife (Protection) Amendment Act 2022.
- Suggest Wildlife conservation (species specific/habitat specific) and management plan for the threatened (critically endangered & endangered species - schedule I) faunal species if any reported within the study area.
- To identify the impacts of mining on agricultural lands and how it affects.
- Proper collection of information about wildlife Sanctuaries/ national parks/ biosphere reserves of the project area.
- Devise management & conservation measures for biodiversity.

3.5.4 Methodology of Sampling

Identification of vegetation in relation to the natural flora and crops was conducted through reconnaissance field surveys and onsite observations in core and buffer zone. The plant species identification was done based on the reference materials and also by examining the morphological characteristics and reproductive materials i.e. flowers, fruits and seeds. Land use pattern in relation to agriculture crop varieties were identified through physical verification of land and interaction with local villagers.

The faunal elements (animal species) of core and buffer zone were identified by direct sightings or indirect evidences viz. pug marks, skeletal remains, scats and droppings etc. (Jayson and Easa 2004). Standard binocular was used for the observations. The authenticity of faunal elements occurrence was confirmed by interaction with the local people. Avifauna identification was done with pictorial descriptions of published literature. Information pertaining to existence of any migratory corridors and paths were obtained from local inhabitants. The status of each faunal element was determined and the Wildlife schedule category was ascertained as per the IUCN-Red Data Book and Indian wildlife (Protection) Amendment Act, 2022.

Plot method is used in the floral documentation in the core and buffer zone. For trees (10x10-m), shrubs (5x5-m) and herbs (1x1-m) plots were taken. Birds and butterflies were mainly focused during faunal assessment, transect method was employed for birds and butterflies. Transect is a path along which one counts and records the occurrence of an individual for study. A straight-line walk covering desired distance, within a time span of one hour to 30 minutes was carried out in the proposed region. Bird species were recorded during the hours of peak activity. 0700 to 1100 Hrs and 1430 to 1730 Hrs (Bibby et al. 2000).

Direct observations and bird calls were used for bird documentation. Same transects were used for counting butterflies. Opportunistic observations were made for Amphibians, reptiles and ordinates. Presence of mammals was recorded by direct and indirect signs. All possible transects were taken for birds and butterflies. Birds and butterflies

were classified into species level. Recorded bird species were identified to species level using standard books (Ali & Ripley 1987, Grimmett et al., 2016).

Sampling

A stratified simple random sampling procedure was employed to obtain a sample from study area. The study area was further stratified in different land use/ecosystems.

Sampling Size

Keeping in mind both random sampling technique and covering all land use patterns for the study following sampling locations were chosen depending up on the area of the proposed site.

Timing of Study

The study was carried out during morning and evening hours, to cover the different activity phases for important species such as time resting, feeding, hunting, and daily movements.

Observations from Sampling

The various observations relating to flora and fauna species are discussed in detail below, in separate sections.

Equipment/ References

- Canon Mark III Camera with 50-500mm lens– Snap shots taken
- Leica Binoculars (8x 20) to spot/identify species
- IUCN Red Data Book – <https://www.iucnredlist.org/species>

Ornithological/Entomological/Herpetological/Mammalian catalogues and pictorial descriptions from various authors and websites are followed for species identification.

Part I Field Sampling Techniques

Transect walk – Birds

Six no transect lines with varying length (100m-300m) and fixed width (2m) were laid which cuts through the core and buffer areas of proposed site. The transect surveys were conducted from 0700 to 1100Hrs and 1430 to 1730Hrs (Bibby et al. 2000). All avifauna found along these transects were recorded for analysing the data. Counts were conducted while there is no heavy rain, mist or strong wind.

Modified Pollard Walk – for Butterflies

The Modified Pollard Walk (Pollard 1977, 1993, Walpole 1999) using fixed width transect walk method were employed to investigate butterfly spatial distribution, diversity and abundance at the different survey sites.

Visual Encounter Survey (VES) - reptiles and amphibians

VES is a time-constrained sampling technique (Campbell and Christman, 1982; Corn and Bury, 1990). It needs a systematic search through an area or habitat for a prescribed time period (Campbell and Christman, 1982). The result of VES is measured against the time spent for search.

VES technique is one of the simplest methods, and an appropriate technique for both inventory and monitoring Herpetofauna (Heyer et al. 1994).

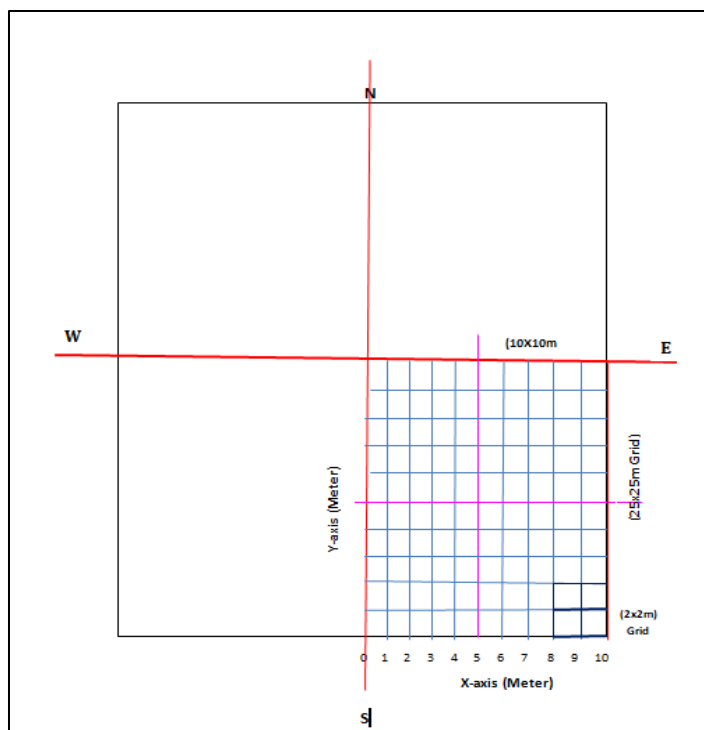
Observational methods- Mammals

For the purpose of recording mammals, we used two different observational techniques: (1) direct observations, and (2) recording of occurrences like holes, markings, scats, hairs, and spines (Menon 2003). For identification confirmations, photographs with a scale reference were used, and locations were recorded using a portable GPS device. Indigenous knowledge particularly that of the locals, was occasionally employed to compile a preliminary list of species and/or aid in the recognition of indicators.

Multiple Stage Quadrat – Vegetation

A variety of habitat or vegetation structure variables were measured using the Multiple Stage Quadrat sampling protocol (Sykes and Horrill 1977). All of those areas were sampled, and the major corners were temporarily delineated with colored ribbons. Each site was identified in the field using a compass and clinometer, and the plot's latitude, longitude, and elevation were recorded using a handheld Global Positioning System (Garmin 12XL).

FIGURE 3.24: A SCHEMATIC DIAGRAM FOR FLORAL RANDOM SAMPLING



Phyto-sociological Survey method

Phyto-sociological parameters, viz., Abundance, Density, Frequency (%) were measured. A total of 10 quadrats were laid down randomly within core area and 40 quadrats were laid down within four quartiles randomly (10/quartile) in buffer area. In core area 10 quadrats were laid randomly to enumerated trees, shrubs, and herbs as per the Following formulae used for calculating the frequency (%), abundance and density of the floral species encountered in the 10 quadrats studied.

Quadrats method

Quadrats of 20 × 20-m were laid down randomly within core and 5-km buffer area; each quadrat was laid to assess the trees (>5 cm GBH) and one, 10 × 10-m sub-quadrat nested within the quadrat for shrubs. The quadrats were laid randomly to cover the area to maximize the sampling efforts and minimize the species homogeneity, such as small stream area, trees in agricultural bunds, tank bunds, farm forestry plantations, wildlife areas, natural forest area, avenue plantations, house backyards, etc. In each quadrat individuals belonging to tree (20×20-m) and shrub (10 × 10-m) were recorded separately and have been identified on the field.

FLORA

The quadrat sampling technique was used for sampling vegetation. Sampling quadrats of the regular shape of dimensions 10 × 10 m, 5 × 5 m, and 1 × 1 m, were nested within each other and were defined as the units for sampling the area and measuring the diversity of trees, Shrubs, and herbs respectively.

Flora in the Core zone of Sokkanur village, Kinathukadavu Taluk, Coimbatore District Rough Stone and gravel quarry

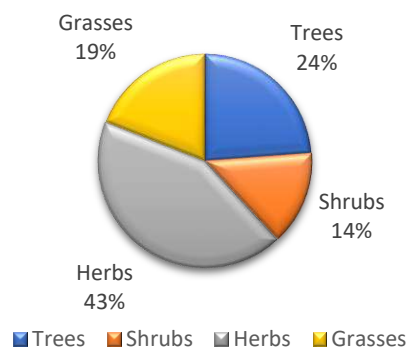
Sl.No	English Name	Vernacular Name	Scientific Name	Family Name
Trees				
1.	Drumstick tree	Murungai Maram	<i>Moringa oleifera</i>	Moringaceae
2.	Asian Palmyra palm	Panai maram	<i>Borassus flabellifer</i>	Arecaceae
3.	Indian mulberry	Nuna maram	<i>Morinda tinctoria</i>	Rubiaceae
4.	Neem or Indian lilac	Vembu maram	<i>Azadirachta indica</i>	Meliaceae
5.	Pongam oiltree	Punga maram	<i>Pongamia pinnata</i>	Fabaceae
Shrubs				
1.	Avaram	Avarai	<i>Senna auriculata</i>	Fabaceae
2.	Devil's trumpet	Umathai	<i>Datura metel</i>	Solanaceae
3.	Milk Weed	Erukku	<i>Calotropis gigantea</i>	Apocynaceae
Herbs				
1.	Common leucas	Thumbai	<i>Leucas aspera</i>	Lamiaceae
2.	Fish poison	Kolinchi	<i>Tephrosia purpurea</i>	Fabaceae
3.	Coat buttons	Thatha poo	<i>Tridax procumbens</i>	Asteraceae
4.	Devil's thorn	Nerunji	<i>Tribulus terrestris</i>	Zygophyllales
5.	Asthma-plant	Amman pacharisi	<i>Euphorbia hirta</i>	Euphorbiaceae
6.	Malabar catmint	Pie Viratti	<i>Anisomeles malabarica</i>	Lamiaceae
7.	Indian Copperleaf	Kuppaimeni	<i>Acalypha indica</i>	Euphorbiaceae
8.	Holy basil	Thulasi	<i>Ocimum tenuiflorum</i>	Lamiaceae
9.	Oval leafed Alysicarpus	moneyworts	<i>Alysicarpus ovalifolius</i>	Fabaceae
Grasses				
1.	Eragrostis	Pullu	<i>Eragrostis ferruginea</i>	Poaceae
2.	Great brome	Thodappam	<i>Bromus diandrus</i>	Poaceae
3.	Indian doab	Arugampul	<i>Cynodon dactylon</i>	Poaceae
4.	Nut grass	Korrai pull	<i>Cyperus rotundus</i>	Cyperaceae

FLORA IN CORE ZONE

Taxonomically a total of 21 species belonging to 13 families have been recorded from the core mining lease area. The proposed area applied area exhibits undulated topography. This land is fit for vegetation and cultivation. Based on the habitat classification of the enumerated plants the majority of species were Herbs 9 followed by Shrubs 3, Trees 5, and Grasses 4. Details of flora with the scientific name were mentioned in Table

No. 3.1. The result of the core zone of flora studies shows that Fabaceae and Poaceae are the main dominating species in the study area mentioned in Table No.3.1 No species found as threatened category.

Fig No. 3.35. Graph Showing % Distribution Of Floral Life Forms (Core Zone)



Azadirachta indica



Calotropis gigantea



Moringa oleifera



Morinda coreia

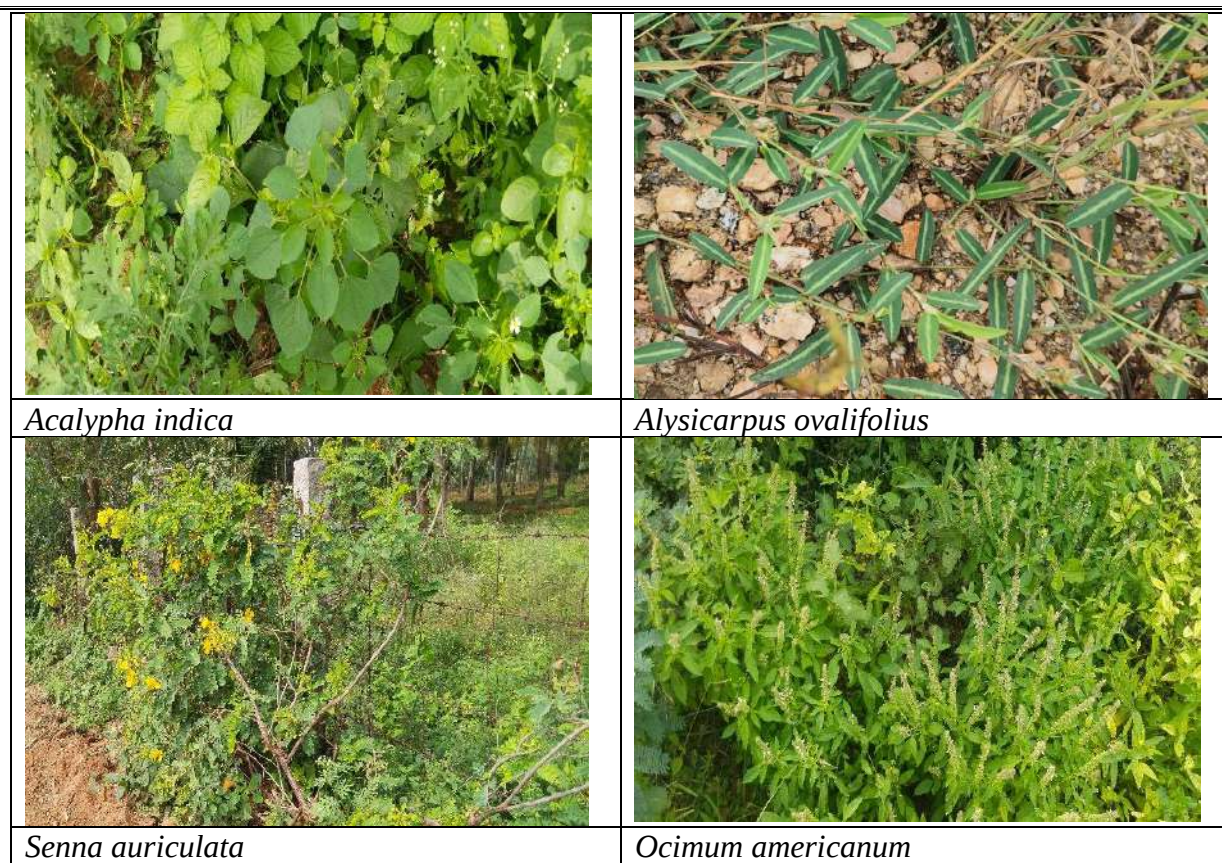


Fig No: 3.1. Flora species observation in the core zone area

Flora in Buffer Zone of Sokkanur village, Kinathukadavu Taluk, Coimbatore District Rough Stone and gravel quarry

SI.No	English Name	Vernacular Name	Scientific Name	Family Name
Trees				
1.	Velvet mesquite	Mullu maram	<i>Prosopis juliflora</i>	Fabaceae
2.	Lemon	Ezhumuchaipalam	<i>Citrus lemon</i>	Rutaceae
3.	Mango	Manga	<i>Mangifera indica</i>	Anacardiaceae
4.	Wild Tamarind	Savundal	<i>Leucaena latisilqua</i>	Mimosaceae
5.	Neem or Indian lilac	Vembu	<i>Azadirachta indica</i>	Meliaceae
6.	Coconut	Thennai maram	<i>Cocos nucifera</i>	Arecaceae
7.	Rain Tree	Mazlhimaram	<i>Samanea saman</i>	Mimosaceae
8.	River tamarind	Soundal maram	<i>Leucaena leucocephala</i>	Fabaceae
9.	Indian siris	Eayal vaagai	<i>Albizia lebbeck</i>	Mimosaceae
10.	Monkey pod tree	Thungumoonchi	<i>Samanea saman</i>	Fabaceae
11.	Indian-almond	Inguti	<i>Terminalia catappa</i>	Combretaceae
12.	Portia tree	Poovarasan	<i>Thespesia Populnea</i>	Malvaceae
13.	Jack fruit	Pala maram	<i>Artocarpusintegrifolia</i>	Moraceae
14.	Bitter Albizia	Unja, Usilai	<i>Albizia amara</i>	Mimosaceae
15.	Velvet mesquite	Mullu maram	<i>Prosopis juliflora</i>	Fabaceae
16.	Yellow Flame	Manjal kondrai	<i>Peltophorum pterocarpum</i>	Caesalpiniaceae
17.	Guava	Koyya	<i>Psidium guajava</i>	Myrtaceae
18.	Cutch tree	Karangali	<i>Acacia chundra</i>	Mimosaceae
19.	Gum arabic tree	Karuvellam	<i>Vachellia nilotica</i>	Fabaceae
20.	Yellow oleander	Ponarali	<i>Cascabela thevetia</i>	Apocynaceae
21.	Teak	Thekku	<i>Tectona grandis</i>	Verbenaceae
22.	Chinese chaste tree	Nochi	<i>Vitex negundo</i>	Verbenaceae
23.	Umbrella thorn	Umbrella thorn	<i>Acacia planifrons</i>	Mimosaceae
24.	Golden shower tree	Sarakonnai	<i>Cassia fistula</i>	Caesalpiniaceae
25.	Asian Palmyra palm	Panai maram	<i>Borassus flabellifer</i>	Arecaceae
26.	Curry tree Plant	Karuveppilai	<i>Murraya koenigii</i>	Rutaceae
27.	Jamun Fruit Plant	Naval maram	<i>Syzygium cumini</i>	Myrtaceae
28.	Indian mulberry	Nuna maram	<i>Morinda tinctoria</i>	Rubiaceae
29.	Drumstick tree	Murunga maram	<i>Moringa oleifera</i>	Moringaceae
30.	Madras thorn	Kudukapuli	<i>Pithecellobium dulce</i>	Fabaceae
31.	Tamarind	Puliyamaram	<i>Tamarindus indica</i>	Legumes

32.	Eucalyptus	Thailam maram	<i>Eucalyptus tereticornis</i>	Myrtaceae
33.	Amati	Agathi keerai	<i>Sesbania grandiflora</i>	Fabaceae
34.	Horsetail She-oak	Savukku maram	<i>Casuarina equisetifolia</i>	Casuarinaceae
35.	Henna	Marudaani	<i>Lawsonia inermis</i>	Lythraceae
36.	Indian gooseberry	Nelli	<i>Phyllanthus emblica</i>	Phyllanthaceae
37.	Peepal	Asoka maram	<i>Ficus religiosa</i>	Legumes
38.	Java olive tree	Kutiraippitukku	<i>Sterculia foetida</i>	Malvaceae
39.	Rosewood	Eeti, Thodagathi, Tawadi	<i>Dalbergia latifolia</i>	Fabaceae
40.	Butter Tree	Kattu illupai	<i>Madhuca indica</i>	Sapotaceae
41.	Conkerberry	Sirukilaa	<i>Carissa spinarum</i>	Apocynaceae
42.	Malayan Cherry	Ten Pazham	<i>Muntingia calabura</i>	Muntingiaceae
43.	Sacred fig	Arasa maram	<i>Ficus religiosa</i>	Moraceae
44.	Jujube Trees	Elantha Pazham	<i>Ziziphus Mauritiana</i>	Rhamnaceae
45.	Papaya	Pappali maram	<i>Carica papaya L</i>	Caricaceae
46.	Ceylon satinwood	Purush, Porasu	<i>Chloroxylon swietenia</i>	Rutaceae
47.	Banana tree	Vazhaimaram	<i>Musa acuminata</i>	Musaceae
48.	Indian-almond	Badam	<i>Terminalia catappa</i>	Combretaceae
49.	Custard apple	Seethapazham	<i>Annona reticulata</i>	Annonaceae
50.	Manilkara zapota	Sapotas	<i>Manilkara zapota</i>	Sapotaceae
51.	Pongamia pinnata	Pungam	<i>Millettia pinnata</i>	Fabaceae
52.	Banyan tree	Alamaram	<i>Ficus benghalensis</i>	Moraceae
Shrubs				
1.	Kangkong	Sarkaraivalli	<i>Ipomeae aquatica</i>	Convolvulaceae
2.	Devil's trumpet	Umathai	<i>Datura metel</i>	Solanaceae
3.	Senna Coffee	Payaveri	<i>Cassia occidentalis</i>	Caesalpiniaceae
4.	Green amaranth	Kuppaikeerai	<i>Amaranthus vividis</i>	Amaranthaceae
5.	Water-hyacinth	Agayathamara	<i>Eichhornia crassipes</i>	Pontederiaceae
6.	Avaram	Avarai	<i>Senna auriculata</i>	Fabaceae
7.	Castor bean	Amanakku	<i>Ricinus communis</i>	Euphorbiaceae
8.	Devil's claw	Thael kodukkukai	<i>Martynia annua</i>	Pedaliaceae
9.	Jungle geranium	Idly Poo	<i>Ixora coccinea</i>	Rubiaceae
10.	Birch-Leaved Cat Tail	Aathaathazhai	<i>Acalypha fruticosa</i>	Euphorbiaceae
11.	Horn of Plenty	Karu Umathai	<i>Datura metel</i>	Solanaceae
12.	Asian Bushbeech	Sirukumalaan	<i>Gmelina asiatica</i>	Verbenaceae
13.	Shoe flower	Chemparuthi	<i>Hibiscus rosa-sinensis</i>	Malvaceae

14.	Indian Oleander	Arali	<i>Nerium indicum</i>	Apocynaceae
15.	Wild jasmine	Kattumalli	<i>Jasminum trichotomum</i>	Oleaceae
16.	Milk Weed	Erukku	<i>Calotropis gigantea</i>	Apocynaceae
17.	Indian mallow	Thuthi	<i>Abutilon indicum</i>	Meliaceae
18.	Mexican prickly poppy	Bramathndu	<i>Argemone mexicana</i>	Papaveraceae
19.	Clustered Morning Glory	Onan kodi	<i>Ipomoea staphylina</i>	Convolvulaceae
20.	Cypress vine	Mayil maanikam	<i>Ipomoea quamoclit</i>	Convolvulaceae
21.	Indian Balm of Gilead	Mulkilluvai	<i>Commiphora berryi</i>	Burseraceae
22.	Malabar catmint	Pei veratti	<i>Anisomeles malabarica</i>	Lamiaceae
23.	Dwarf Heliotrope	Theelkodu	<i>Heliotropium supinum</i>	Boraginaceae
24.	Night shade plan	Sundaika	<i>Solanum torvum</i>	Solanaceae
25.	Touch-me-not	Thottalchinungi	<i>Mimosa pudica</i>	Mimosaceae
26.	Puriging nut	Kattamanakku	<i>Jatropha curcas</i>	Euphorbiaceae
27.	West Indian Lantana	Unni chedi	<i>Lantana camara</i>	Verbenaceae
28.	Rosary pea	Kundumani	<i>Abrus precatorius</i>	Fabaceae
29.	Rough cocklebur	Marlumuttu	<i>Xanthium indicum</i>	Asteraceae
Herbs				
1.	Indian Mercury	Kuppamani	<i>Acalypha indica</i>	Euphorbiaceae
2.	Sessile Joyweed	Ponnankanni	<i>Alternanthera sessilis</i>	Amaranthaceae
3.	Billygoat weed	Pumpillu	<i>Ageratum conyzoides</i>	Asteraceae
4.	Aloe barbadensis	Katrashai	<i>Aloe vera</i>	Asphodelaceae
5.	Madagascar Periwinkle	Nithyakalyani	<i>Catharanthus roseus</i>	Apocynaceae
6.	Spiny amaranth	Mullu keera	<i>Amaranthus spinosus</i>	Amaranthaceae
7.	Indian nettle	Nayuruvi	<i>Achyranthes aspera</i>	Amaranthaceae
8.	Mexican prickly poppy	Mullu umathai	<i>Argemone mexicana</i>	Papaveraceae
9.	Spreading hogweed	Mookkaratti	<i>Boerhavia diffusa</i>	Nyctaginaceae
10.	Bui	Ciru-pulai	<i>Aerva lanata</i>	Amaranthaceae
11.	Carrot grass	Partiniyam	<i>Parthenium hysterophorus</i>	Asteraceae
12.	Carry me seed	Kizhar nelli	<i>Phyllanthus amarus</i>	Phyllanthaceae
13.	Malabar spinach	Pasalaikeera, Paasaangalli	<i>Basella alba</i>	Basellaceae
14.	Yellow elder	Manjarali	<i>Tecoma stans</i>	Apocynaceae
15.	Dwarf morning-glory	Vishnu kiranthi	<i>Evolvulus alsinoides</i>	Convolvulaceae
16.	Datura metel	Oomathai	<i>Datura metel</i>	Solanaceae
17.	Asthma-plant	Amman pacharisi	<i>Euphorbia hirta</i>	Euphorbiaceae
18.	Black-jack	Mukkuthi Asteraceae	<i>Bidens pilosa</i>	Aizoaceae

19.	Red Hogweed	Mukurattai	<i>Boerhavia diffusa</i>	Nyctaginaceae
20.	Green amaranth	Kuppai keerai	<i>Amaranthus viridis</i>	Amaranthaceae
21.	Obscure Morning Glory	Siruthaali	<i>Ipomoea obscura</i>	Convolvulaceae
22.	Cleome viscosa	Nai kadugu	<i>Cleome viscosa</i>	Capparidaceae
23.	Common leucas	Thumbai	<i>Leucas aspera</i>	Lamiaceae
24.	Century plant	Agave	<i>Agave americana</i>	Agavaceae
25.	Fish poison	Kolunchi	<i>Tephrosia purpurea</i>	Papilionaceae
26.	Elephant Climber	Kanvali poo	<i>Argyreia cuneata</i>	Convolvulaceae
27.	Porcupine flower	Shemmuli	<i>Barleria prionitis</i>	Acanthaceae
28.	Holy basil	Thulasi	<i>Ocimum tenuiflorum</i>	Lamiaceae
29.	Eggplant	Kathirikai	<i>Solanum melongena</i>	Solanaceae
30.	European black nightshade	Manathakkali	<i>Solanum nigrum</i>	Solanaceae
31.	Tridax daisy	Thatha poo	<i>Tridax procumbens</i>	Asteraceae
32.	Gale of the wind	Keelaneeli	<i>Phyllanthus niruri</i>	Phyllanthaceae
33.	Malabar catmint	Peymarutti	<i>Anisomeles malabarica</i>	Lamiaceae
Climber/ Creeper				
1.	Ivy gourd	Kovai	<i>Coccinia grandis</i>	Cucurbitaceae
2.	Cucumis maderaspatanus	Musumusukkai	<i>Mukia maderaspatana</i>	Cucurbitaceae
3.	Rosary Pea	Gundumani	<i>Abrus precatorius</i>	Fabaceae
4.	Stemmed vine	Perandai	<i>Cissus quadrangularis</i>	Vitaceae
5.	Pointed gourd	Kovakkai	<i>Trichosanthes dioica</i>	Cucurbitaceae
6.	Wild water lemon	Siruponaikaali	<i>Passiflora foetida</i>	Passifloraceae
7.	Bottle Guard	Sorakkai	<i>Lagenaria siceraria</i>	Cucurbitaceae
8.	Butterfly pea	Sangu poo	<i>Clitoria ternatea</i>	Fabaceae
9.	Shatavari	Thaneervittaan	<i>Asparagus racemosus</i>	Liliaceae
10.	Indian atalantia	Kattu naarangam,	<i>Atalantia monophylla</i>	Rutaceae
11.	Wild bitter	Pavarkai	<i>Momordica charantia</i>	Cucurbitaceae
Grass				
1.	Indian doab	Arugampul	<i>Cynodon dactylon</i>	Poaceae
2.	Giant reed	Elephant grass	<i>Arundo donax</i>	Poaceae
3.	Buffel grass	Erumaipul	<i>Cenchrus ciliaris</i>	Poaceae
4.	Native millet	Umbrella grass	<i>Panicum decompositum</i>	Poaceae
5.	Swollen windmill grass	Kuruthu-pillu	<i>Chloris barbata</i>	Poaceae
6.	Nut grass	Korai	<i>Cyperus rotundus</i>	Poaceae
7.	Great brome	Thodappam	<i>Bromus diandrus</i>	Poaceae

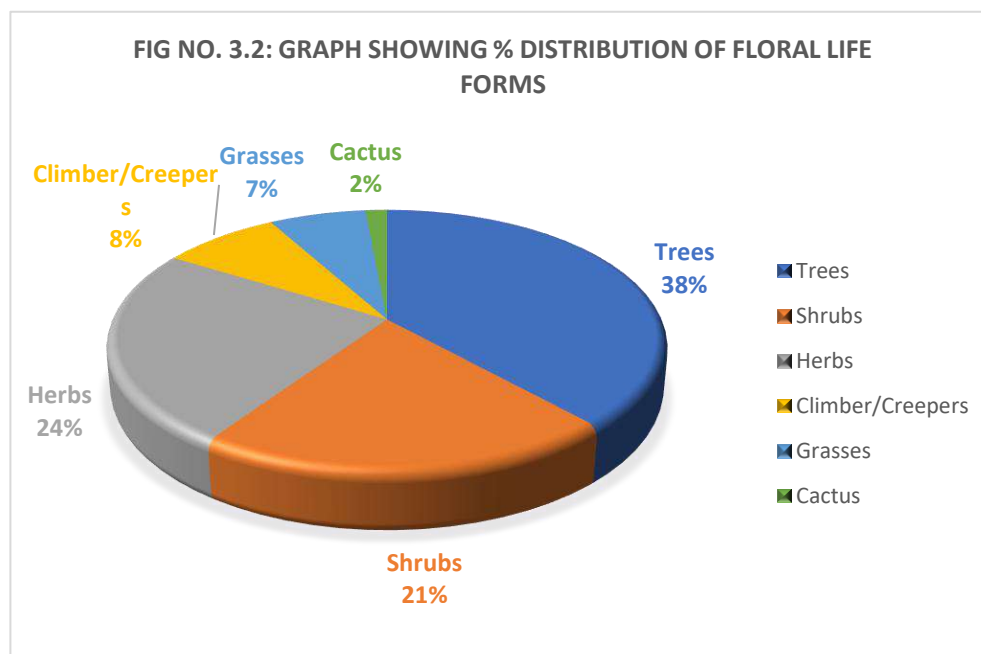
8.	Windmill grass	Chevvarakupul	<i>Chloris truncata</i>	Poaceae
9.	Eragrostis	Pullu	<i>Eragrostis ferruginea</i>	Poaceae
Cactus				
1.	Prickly pear	Sappathikalli	<i>Opuntia dillenii</i>	Cactaceae
2.	Triangular spruge	Chaturakalli	<i>Euphorbia antiquorum</i>	Euphorbiaceae

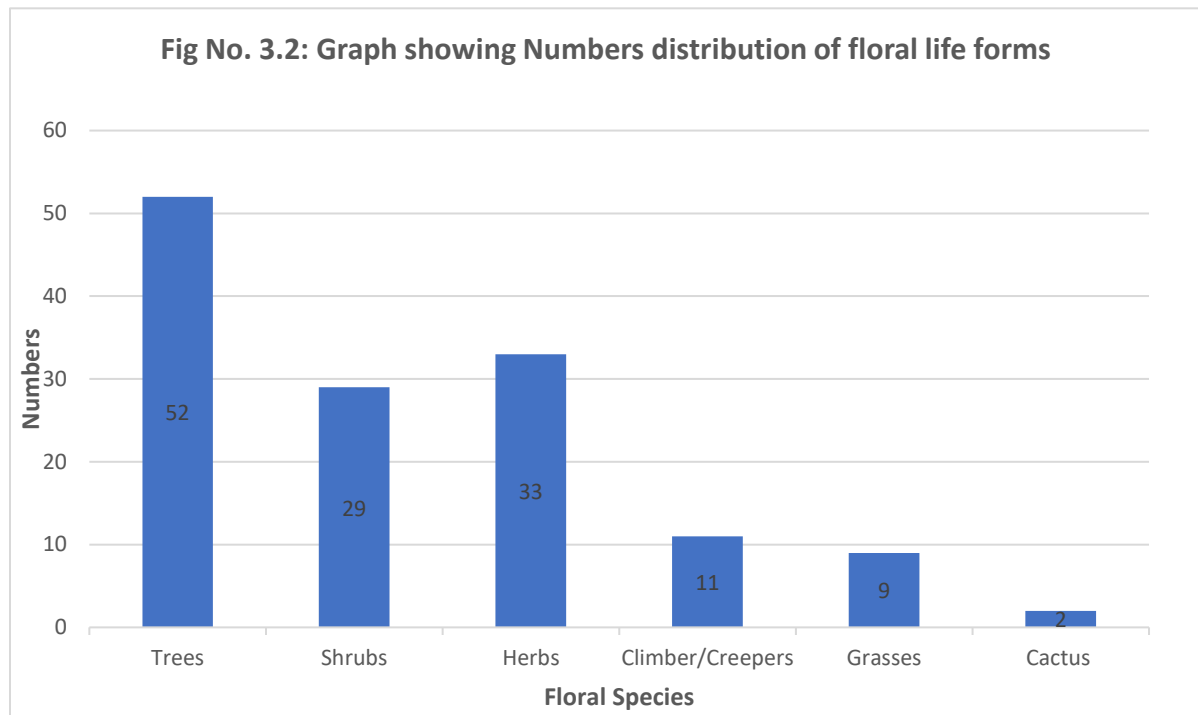
FLORA IN BUFFER ZONE

Similar habitats may be found in the buffer area as well, although there is a wider variety of plants there than in the core zone area. The buffer zone study area contains a total of 136 species that have been recorded from the buffer zone. The floral (136) varieties of them Trees 52, herbs 33, shrubs 29, Climbers 11, Grasses 9, and Cactus 2 were identified. The result of the buffer zone of flora studies shows that Fabaceae and Poaceae, Mimosaceae is the main dominating species in the study area mentioned in Table No.3.2. There are no impacts due to this mining activity. There are no Rare, Endangered, and Threatened Flora species in the mining area and their surrounding study area. Apart from the proposed project area, there is agricultural land. Horticulture and agricultural land are untouched. There are no Rare, Endangered, and Threatened Flora species in the mining area and their surrounding study area. A list of floral species has been prepared based on a primary survey (site observations) and discussion with local people (Secondary data). The total number of different plant life forms under trees, shrubs, herbs, and climbers is shown in Table 3.3 and their % distribution is shown in Figure 3.2.

Number of floral life forms in the Study Area

S. No	Plant Life Form	Number of Species
1	Trees	52
2	Shrubs	29
3	Herbs	33
4	Climber	11
6	Grass	9
7	Cactus	2
Total No. of Species		136



*Opuntia dillenii**Prosopis juliflora**Abutilon indicum**Clitoria ternatea*

	
<i>Leucas aspera</i>	<i>Cenchrus ciliaris</i>
	
<i>Tephrosia purpureae</i>	<i>Calotropis gigantea</i>
	
<i>Cyperus rotundus</i>	<i>Ocimum tenuiflorum</i>
	
<i>Azadirachta indica</i>	<i>Jatropha curcas</i>

*Ziziphus Mauritiana**Tectona grandis**Musa acuminata**Terminalia catappa**Muntingia calabura*

Quadrat method



<i>Pithecellobium dulce</i>	<i>Borassus flabellifer</i>
	
<i>Cassia fistula</i>	<i>Catharanthus roseus</i>
	
<i>Lantana camara</i>	<i>Passiflora foetida</i>
	
<i>Leucaena latisiliqua</i>	<i>Cocos Nucifera</i>

	
<i>Thespesia populnea</i>	<i>Parthenium hysterophorus</i>
	
<i>Sida acuta</i>	<i>Tamarindus indica</i>
	
<i>Canthium coromandelicum</i>	<i>Chromolaena odorata</i>

Flora species observation in the Buffer zone area

The vegetation in the RF / PF areas, ecologically sensitive areas

Bolampatti R.F., is located 8 km on North western side of the area. There are no protected (PF) forests either in the mine lease area or in the buffer zone. Thus, no forest land is involved in any manner. Hence, no certificate from the Forest department is required. There are no protected or ecologically sensitive areas such as National parks or Important Bird Areas (IBAs), or Wetlands or migratory routes of fauna or water bodies or human settlements within the proposed mine lease area. There are no Biosphere reserves or wildlife sanctuaries or National parks or Important Bird Areas (IBAs), or migratory routes of fauna. Thus, the area under study (Mine lease area and the 10 Km buffer zone) is not ecologically sensitive. It is away from the proposed project site.

Thus, no forest land is involved in any manner. Hence, no certificate from the Forest department is required. There are no impacts due to this mining activity. There are neither forests nor forest dwellers nor forest-dependent communities in the mine lease area. There shall be no forest-impacted families (PF) or people (PP). Thus, the rights of Traditional Forest Dwellers will not be compromised on account of the project.

FAUNA

The faunal survey has been carried out as per the methodology cited and listed out Mammals, birds, Reptiles, Amphibians, and Butterflies. All the listed species were compared with Red Data Book and Indian Wildlife Protection Act, 1972 / Indian Wildlife Protection Amendment Act, 2022 . There are no rare, endangered, threatened (RET), and endemic species present in the core area.

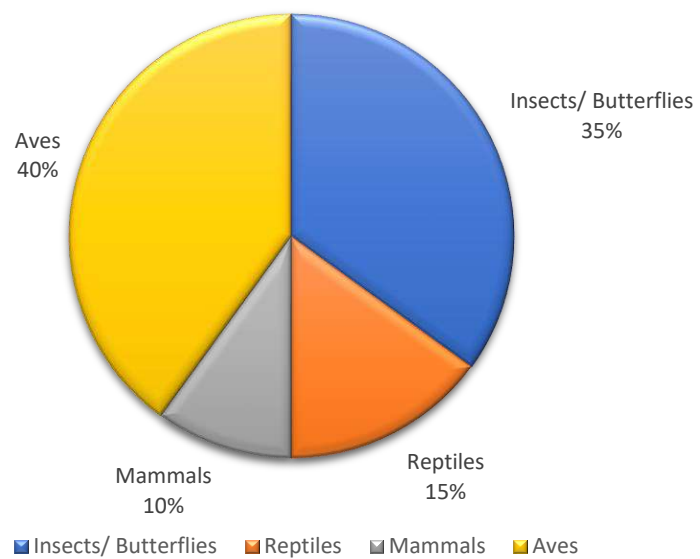
FAUNA IN CORE ZONE

Core Zone: During the study, it was found that the faunal diversity in the core site was limited to Butterflies, insects, and some species of mammals & reptiles among them numbers Insects / Butterflies 7, Reptiles 3, Mammals 2, and Avian 8. The core site has avifauna species like crow, Black drongo, Koel, etc. None of these species are threatened or endemic in the study area and surroundings. There is no Schedule I species and 8 species are under Schedule II species remaining species not listed according to the Indian Wildlife Protection Amendment Act 2022. There are no critically endangered, endangered, vulnerable, and endemic species were observed..

TABLE 3.21: FAUNA IN CORE ZONE

SI. No	Common Name	Scientific Name	Schedule list WLPC, Amendment Act, 2022
Insects/Butterflies			
1.	Common Tiger	<i>Danaus genutia</i>	---
2.	Common rose	<i>Pachliopta aristolochiae</i>	---
3.	Danaid Eggfly	<i>Hypolimnas misippus</i>	Schedule II
4.	Grasshopper	<i>Hieroglyphus sp</i>	----
5.	Dragonfly	<i>Ceratogomphus pictus</i>	---
6.	Common Crow	<i>Euploea core</i>	---
7.	Ant	<i>Camponotus Vicinus</i>	---
Reptiles			
1.	Oriental garden lizard	<i>Calotes versicolor</i>	---
2.	Indian forest skink	<i>Sphenomorphus indicus</i>	---
3.	House lizards	<i>Hemidactylus flaviviridis</i>	---
Mammals			
1.	Indian palm squirrel	<i>Funambulus palmarum</i>	---
2.	Indian Field Mouse	<i>Mus booduga</i>	---
Aves			
1.	Rose-ringed parakeet	<i>Psittacula krameri</i>	Schedule II
2.	Common myna	<i>Acridotheres tristis</i>	Schedule II
3.	House sparrow	<i>Passer domesticus</i>	Schedule II
4.	Indian robin	<i>Copsychus fulicatus</i>	Schedule II
5.	Green Bee Eater	<i>Merops orientalis</i>	Schedule II
6.	Asian Koel	<i>Eudynamis scolopaceus</i>	Schedule II
7.	Black drongo	<i>Dicrurus macrocercus</i>	Schedule II
8.	House crow	<i>Corvus splendens</i>	---

Fig No:3.4. Distribution Of Faunal Communities (Core Zone)



FAUNA IN BUFFER ZONE

As animals, especially vertebrates move from place to place in search of food, shelter, mate or other biological needs, separate lists for core and buffer areas are not feasible however, a separate list of fauna pertaining to core and buffer zone are listed separately. Though there is no reserved forests in the buffer zone. As such there are no chances of occurrence of any rare or endangered or endemic or threatened (REET) species within the core or buffer area.

There are no Sanctuaries, National Parks, Tiger Reserve or Biosphere reserves or Elephant Corridor or other protected areas within 10 km radius of from the core area. It is evident from the available records, reports, and circumstantial evidence that the entire study area including the core and buffer areas were free from any endangered animals. There were no resident birds other than common bird species such as Cattle egret, Asian Koel, House crow, Black drangos, Crows, Rose-ringed Parakeet etc.

The list of bird species recorded during the field survey and literature from the study area are given in Table 3.6. The list of reptilian species recorded during the field survey and literature from the study area is given in Table 3.7. The list of insect species recorded during the field survey and literature from the study area are given in Table 3.9. The list of Butterflies species recorded during the field survey and literature from the study area are given in Table 3.8. It is apparent from the list that none of the species either spotted or reported is included in Schedule I of the Wildlife Protection Act. Similarly, none of them comes under the REET category.

Taxonomically a total of 78 species recorded were from the buffer zone area. Based on habitat classification the majority of species were Insects 5, followed by birds 32, Reptiles 8, Mammals 4, Amphibians 5, and Butterflies 24. There are 34 Schedule II species, according to the Indian Wildlife Protection Amendment Act 2022. A total of 32 species of bird were sighted in the study area. There are no critically endangered, endangered, vulnerable, and endemic species were observed. There are no impacts on nearby fauna species.

Dominant species are mostly birds, butterflies, and insects. There is no Schedule I Species in the study area. There are no critically endangered, endangered, vulnerable, and endemic species were observed.

List of Fauna & Their Conservation Status, Mammals:

SI. No	Common Name	Scientific Name	Schedule list The Wildlife (Protection) Amendment Act, 2022
1.	Brown rat	<i>Rattus norvegicus</i>	---
2.	Indian palm squirrel	<i>Funambulus palmarum</i>	---
3.	Indian hare	<i>Lepus nigricollis</i>	Schedule II
4.	Indian Field Mouse	<i>Mus booduga</i>	---

Listed birds (Primary & Secondary data)

SI. No	Common Name	Scientific Name	Schedule list The Wildlife (Protection) Amendment Act, 2022
1.	Rose-ringed Parakeet	<i>Psittaculakrameria</i>	Schedule II
2.	Common myna	<i>Acridotheres tristis</i>	Schedule II
3.	Tawny pipit	<i>Anthus campestris</i>	Schedule II
4.	Cattle egret	<i>Bubulcus ibis</i>	Schedule II
5.	Indian roller	<i>Coracias benghalensis</i>	Schedule II
6.	Black-crowned night heron	<i>Ncticorax ncticorax</i>	Schedule II
7.	Greater Coucal	<i>Centropus sinensis</i>	Schedule II
8.	Purple sunbird	<i>Cinnyris asiaticus</i>	Schedule II
9.	Yellow browed Bulbul	<i>Acritillas indica</i>	Schedule II
10.	Black-rumped Flameback	<i>Dinopium benghalense</i>	Schedule II
11.	Tree Pipit	<i>Anthus trivialis</i>	Schedule II
12.	Yellow wagtail	<i>Motacilla flava</i>	Schedule II
13.	Spotted owlet	<i>Athene brama</i>	Schedule II
14.	House Sparrow	<i>Passer domesticus</i>	Schedule II
15.	Common HawkCuckoo	<i>Hieroccyx varius</i>	Schedule II
16.	Brown Shrike	<i>Lanius cristatus</i>	Schedule II
17.	Spotted dove	<i>Streptopelia chinensis</i>	Schedule II

18.	Square tailed Black Bulbul	<i>Hypsipetes ganeesa</i>	Schedule II
19.	Asian koel	<i>Eudynamys scolopacea</i>	Schedule II
20.	Common kingfisher	<i>Alcedo atthis</i>	Schedule II
21.	White-thorated kingfisher	<i>Halcyon smyrnensis</i>	Schedule II
22.	Ashy Drongo	<i>Dicrurus leucophaeus</i>	Schedule II
23.	Blue-rock pigeon	<i>Colomba livia</i>	---
24.	House crow	<i>Corvus splendens</i>	---
25.	Large-billed Crow	<i>Corvus macrorhynchos</i>	Schedule II
26.	Black Drongo	<i>Dicrurus macrocercus</i>	Schedule II
27.	Ashy Prinia	<i>Prinia socialis</i>	Schedule II
28.	Red-vented Bulbul	<i>Pycnonotus cafer</i>	Schedule II
29.	Yellow-billed Babbler	<i>Argya affinis</i>	Schedule II
30.	Pale-billed Flowerpecker	<i>Dicaeum erythrorhynchos</i>	Schedule II
31.	Purple-rumped Sunbird	<i>Leptocoma zeylonica</i>	Schedule II
32.	Baya Weaver	<i>Ploceus philippinus</i>	Schedule II

List of Reptiles either spotted or reported from the study area

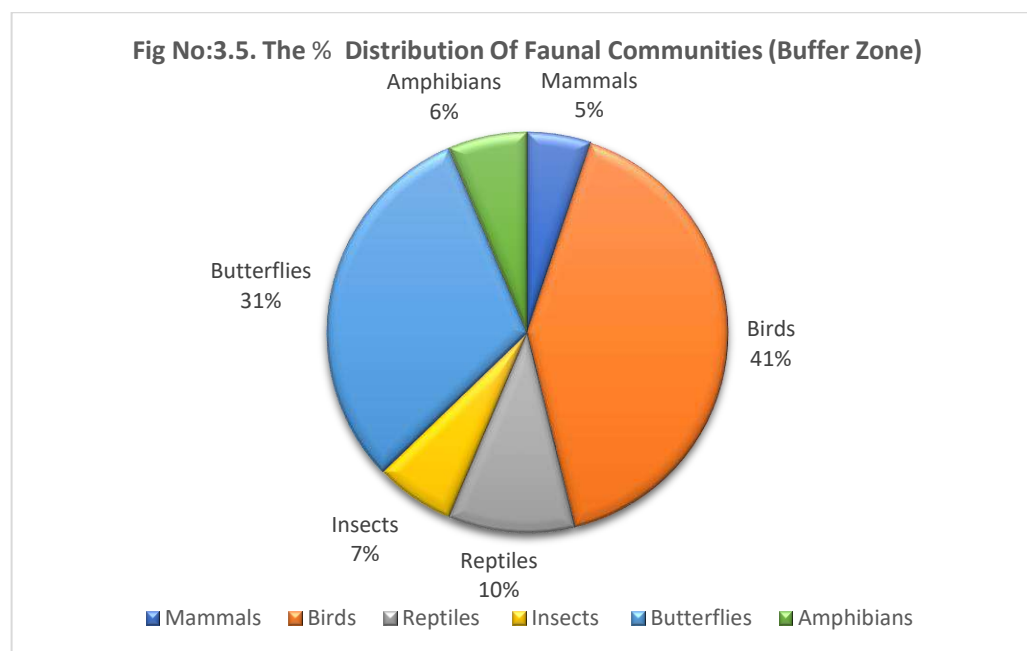
SI. No	Common Name	Scientific Name	Schedule list The Wildlife (Protection) Amendment Act, 2022
1.	Oriental garden lizard	<i>Calotes versicolor</i>	---
2.	Common krait	<i>Bungarus caeruleus</i>	---
3.	House lizards	<i>Hemidactylus flaviviridis</i>	---
4.	Green vine snake	<i>Ahaetulla nasuta</i>	---
5.	Russell's viper	<i>Vipera russelli</i>	---
6.	Common skink	<i>Mabuya carinatus</i>	---
7.	Bornze Grass Skink	<i>Eutropis macularia</i>	---
8.	Keeled / Common Grass Skink	<i>Eutropis carinata</i>	---

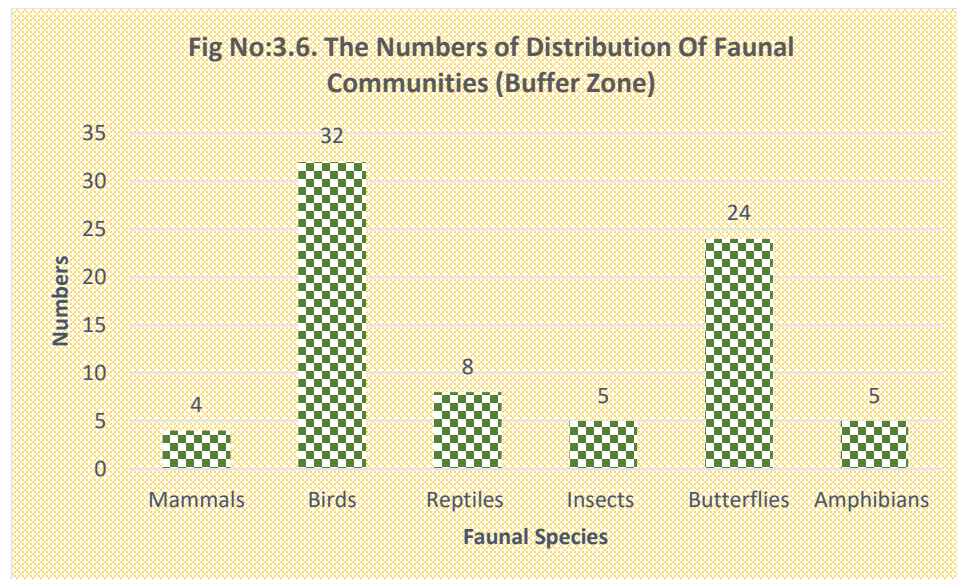
List of Butterflies reported from the study area and Secondary data

SI. No	Common Name	Scientific Name	Schedule
1.	Indian palm bob	<i>Suastus gremius</i>	---
2.	Common Mormon	<i>Papilio polytes</i>	---
3.	Lemon Pansy	<i>Junonia lemonias</i>	---
4.	Common Crow	<i>Euploea core</i>	---
5.	Common rose	<i>Pachliopta aristolochiae</i>	---
6.	Spotless grass yellow	<i>Eurema laeta</i>	---
7.	Common Evening Brown	<i>Melanitis leda</i>	---
8.	Peacock Royal	<i>Tajuria cippus</i>	Schedule II
9.	Common Tiger	<i>Danaus genutia</i>	---
10.	Lime Butterfly	<i>Papilio demoleus</i>	---
11.	Blue Mormon	<i>Papilio polymnestor</i>	---
12.	Danaid Eggfly	<i>Hypolimnas misippus</i>	Schedule II
13.	Great Eggfly	<i>Hypolimnas bolina</i>	---
14.	Common emigrant	<i>Catopsilia pomona</i>	---
15.	Tiny Grass Blue	<i>Zizula hylax</i>	---
16.	Blue Tiger	<i>Tirumala limniace</i>	---
17.	Crimson tip	<i>Colotisdanae</i>	---
18.	Common Indian crow	<i>Euploea core</i>	---
19.	Yellow Pansy	<i>Junonia hierta</i>	---
20.	Chocolate Pansy	<i>Junonia iphita</i>	---
21.	Peacock Pansy	<i>Junonia almana</i>	---
22.	Plain Tiger Butterfly	<i>Danaus chrysippus</i>	---
23.	Pale Grass Blue	<i>Pseudozizeeria maha</i>	---
24.	Common Mime	<i>Papilio clytia</i>	Schedule II

List of insects either spotted or reported from the study area

SI. No	Common Name	Scientific Name	Schedule list WLPAA 2022
1.	Indian honey bee	<i>Apis cerana</i>	---
2.	Termite	<i>Hamitermes silvestri</i>	---
3.	Grasshopper	<i>Hieroglyphus daganensis</i>	---
4.	Ant	<i>Camponotus Vicinus</i>	---
5.	Dragonfly	<i>Ceratogomphus pictus</i>	---





Aquatic Ecology

The study area has canal is situated 3km (SE) away from the proposed project site. But no major drainage system can be found within the study area. No Aquatic diversity is noticed in the core zone area. Aquatic weeds are found to be growing everywhere in 10 km radius area, in every water bog, pond, etc. *Typha angustata* can be found growing all along the drains of villages, small water-logged depressions, and agricultural fields lacking water but containing enough moisture to support its growth. And where water is present, *Eichhornia crassipes* has taken its roots and covers the entire water surface by its sprawl and invasion.

Objectives of Aquatic Studies

- ✓ Generating data through actual field collection in these locations over the study period
- ✓ Consulted with locals to obtain knowledge about aquatic flora and animals.

Macrophytes

The macrophytes observed within the study area are tabulated in Table 3.10.

Description of Macrophytes

S.No	Scientific Name	Common Name	Type
1.	<i>Eichhornia crassipes</i>	Common water hyacinth	Free floating hydrophytes
2.	<i>Typha angustifolia</i>	Lesser Bulrush	Emergent hydrophytes
3.	<i>Hydrilla verticillata</i>	Hydrilla	Submerged hydrophytes
4.	<i>Pistia stratiotes</i>	Water lettuce	Free floating hydrophytes
5.	<i>Cyperus articulatus</i>	Jointed flatsedge	Emergent Hydrophytes
6.	<i>Ipomea aquatica</i>	Water Morning Glory	Marshy amphibious hydrophytes

Aquatic Faunal Diversity

Amphibian species like the common Pond frog, Skipper frog, Indian Pond Frog etc., were sighted near the water bodies located in the study area.

Amphibians Observed/Recorded from the Study Area

SI. No	Common Name	Scientific Name	Schedule list The Wildlife (Protection) Amendment Act, 2022
1.	Indian Burrowing frog	<i>Sphaerotheca breviceps</i>	---
2.	Indian pond frog	<i>Phrynoderma hexadactylum</i>	Schedule II
3.	Asian common Toad	<i>Duttaphrynus melanostictus</i>	---
4.	Indian bull Frog	<i>Hoplobatrachus tigerinu</i>	Schedule II
5.	Paddyfield / Cricket Frog	<i>Limnonectes limnocharis</i>	---

Findings/Results

The assessment was carried out during the Summer season. The inspection day was quite alright with respectable weather. The details of the flora and fauna observed are given below.

Records of threatened species in the area

No threatened species were observed

Endangered Species as per Wildlife (Protection) Act

No Endangered fauna was recorded in the project area.

Endemic Species of the Project areas

No endemic species were observed in the project area.

Migratory species of the Project areas

No migratory fauna observed in project area.

Migratory corridors and Flight paths

No migratory corridors and Flight paths were observed in project area.

Breeding and spawning grounds

No breeding and spawning grounds were earmarked for the wildlife fauna in project area.

There are no critically endangered, endangered, vulnerable and endemic species were observed. As the rainfall in the area is scanty and as no toxic wastes are produced or discharged on account of mining, the proposed mining activity is not going to have any additional and adverse impacts on these RET species. There are no ecologically sensitive areas or protected areas within the 10 Km radius. Hence no specific conservation for conservation of any RET species or Wildlife is envisaged.

There are no National Parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, Ramsar sites, Tiger/Elephant Reserves/(existing as well as proposed) within 10 km of the mine lease area. There are no protected forests within the project area. Hence submission of clearance from the National Board of Wildlife does not arise.

There is no endangered, endemic and RET Species. There is no Schedule I species in study area [core zone and buffer zone (10 km radius of the periphery of the mine lease)] The proposed project is not going to have any direct or indirect adverse impact on the species mentioned above.

Conclusion

The observations and assessment of the overall ecological scenario involve details such as classification of Biogeographic zone, eco-region, habitat types and land cover, distances from natural habitats, vegetation/forest types, and sensitive ecological habitats such as Wetlands sites, Important Bird areas, migration corridors of important wildlife etc. Such baseline information provides better understanding of the situation and overall ecological importance of the area. This baseline information viewed against proposed project activities help in predicting their impacts on the wildlife

and their habitats in the region. Data collected and information gathered from secondary literature on flora, fauna, protected area, natural habitats, and wildlife species etc., and consulted and discussed with local people, from the villages, herders and farmers who inhabit close to the proposed project area.

3.6 SOCIO ECONOMIC ENVIRONMENT

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.

3.6.1 Objectives of the Study

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

- To study the socio-economic status of the people living in the study area of the proposed mining project.
- To assess the impact of the project on Quality of life of the people in the study area.
- To recommend Community Development measures needs to be taken up in the study Area.

3.6.2 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

3.6.3 District Profile

Coimbatore district is divided into 12 taluks. The taluks are further divided into 18 blocks, which further divided into 860 villages. In 2011, Coimbatore had population of 2,464,875 of which male and female were 1,235,889 and 1,228,986 respectively. In 2001 census, Coimbatore had a population of 2,186,125 of which males were 1,095,859 and remaining 1,090,266 were females. Coimbatore District population constituted 3.42 percent of total Maharashtra population. In 2001 census, this figure for Coimbatore District was at 3.50 percent of Maharashtra population.

There was change of 12.75 percent in the population compared to population as per 2001. In the previous census of India 2001, Coimbatore District recorded increase of 7.01 percent to its population compared to 1991.

3.6.4 Study area:

SOKKANUR VILLAGE

Sokkanur is a large village located in Kinathukadavu Taluk of Coimbatore district, Tamil Nadu with total 1776 families residing. The Sokkanur village has population of 6020 of which 2978 are males while 3042 are females as per Population Census 2011.

In Sokkanur village population of children with age 0-6 is 464 which makes up 7.71 % of total population of village. Average Sex Ratio of Sokkanur village is 1021 which is higher than Tamil Nadu state average of 996. Child Sex Ratio for the Sokkanur as per census is 1128, higher than Tamil Nadu average of 943.

Sokkanur village has lower literacy rate compared to Tamil Nadu. In 2011, literacy rate of Sokkanur village was 65.28 % compared to 80.09 % of Tamil Nadu. In Sokkanur Male literacy stands at 74.86 % while female literacy rate was 55.83 %.

As per constitution of India and Panchyat Raaj Act, Sokkanur village is administrated by Sarpanch (Head of Village) who is elected representative of village. Our website, don't have information about schools and hospital in Sokkanur village.

TABLE 3.22: SOKKANUR VILLAGE POPULATION FACTS

Number of Households	1776
Population	6020
Children Population	464
Scheduled Tribes (ST)	339
Scheduled Caste (SC)	1166
Literacy	65.28%
Total Workers	3810
Main Worker	3654
Marginal Worker	156

Source: [Sokkanur Village Population - Pollachi - Coimbatore, Tamil Nadu](#)

DEMOGRAPHICS POPULATION OF VILLAGE SOKKANUR

Total Population	Male Population	Female Population
6020	2978	3042

Sex Ratio of Sokkanur Village -Census 2011

As per the Census Data 2011 there are 1021 Femals per 1000 males out of 6020 total population of village. There are 1128 girls per 1000 boys under 6 years of age in the village.

Literacy of Sokkanur Village

Out of total poplation total 3627 people in Sokkanur Village are literate, among them 2066 are male and 1561 are female in the village. Total literacy rate of of Sokkanur is 65.28%, for male literacy is 74.86% and for female literacy rate is 55.83%.

Worker's profile of Sokkanur Village

Total working population of Sokkanur is 3810 which are either main or marginal workers. Total workers in the village are 3810 out of which 2051 are male and 1759 are female. Total main workers are 3654 out of which female main workers are 2013 and male main workers are 1641. Total marginal workers of village are 156

TABLE 3.23: SOKKANUR VILLAGE CENSUS DATA

Description	Census 2011 Data
Village Name	Sokkanur
Teshil Name	Pollachi
District Name	Coimbatore
State Name	Tamil Nadu
Total Population	6020
Total Area	2309 (Hectares)
Total No of House Holds	1776
Total Male Population	2978
Total Female Population	3042
0-6 Age group Total Population	464
0-6 Age group Male Population	218
0-6 Age group Female Population	246
Total Person Literates	3627
Total Male Literates	2066

Total Female Literates	1561
Total Person Illiterates	2393
Total Male Illiterates	912
Total Female Illiterates	1481
Scheduled Caste Persons	1166
Scheduled Caste Males	584
Scheduled Caste Females	582
Scheduled Tribe Males	165
Scheduled Tribe Females	174

Source: <https://etrace.in/census/village/sokkanur-pollachi-district-coimbatore-tamil-nadu-644484/>

TABLE 3.24: SOKKANUR WORKING POPULATION

	Total	Male	Female
Total Workers	3810	2051	1759
Main Workers	3654	2013	1641
Main Workers Cultivators	925	531	394
Agriculture Labourer	1990	945	1045
Household Industries	46	22	24
Other Workers	693	515	178
Marginal Workers	156	38	118
Non Working Persons	2210	927	1283

Source: <https://etrace.in/census/village/sokkanur-pollachi-district-coimbatore-tamil-nadu-644484/>

TABLE 3.25: POPULATION DATA OF STUDY AREA

Sl.No.	Village Name	No of House Holds	Total Population	Male	Female	Total Literate Population	Male Literate	Female Literate	Total Illiterate Population	Male Illiterate	Female Illiterate
1	Arisippalayam	700	2400	1212	1188	1670	883	787	730	329	401
2	Govindapuram	335	1249	619	630	684	373	311	565	246	319
3	Karunchamigoundenpalayam	95	343	171	172	213	111	102	130	60	70
4	Kuthiraialampalayam	444	1448	685	763	887	483	404	561	202	359
5	Mavuthampathi	818	2843	1442	1401	1870	1057	813	973	385	588
6	Muthur	378	1385	683	702	897	508	389	488	175	313
7	Nachippalayam	878	3008	1517	1491	2019	1105	914	989	412	577
8	Palathurai	767	2727	1346	1381	1906	1033	873	821	313	508
9	Pichanur	1687	6261	3094	3167	4312	2333	1979	1949	761	1188
10	Poravipalayam	1874	6568	3280	3288	4130	2311	1819	2438	969	1469
11	Pottaiyandiporambu	445	1530	764	766	901	502	399	629	262	367
12	Sangarayapuram	255	816	416	400	604	338	266	212	78	134
13	Sokkanur	1776	6020	2978	3042	3627	2066	1561	2393	912	1481
14	Sulakkal	852	2869	1399	1470	1790	971	819	1079	428	651
15	Thambagoundenpalayam	133	482	234	248	374	193	181	108	41	67
16	Vadaputhur	1467	5176	2561	2615	3663	1985	1678	1513	576	937
17	Valukkupparai	1412	4891	2376	2515	3043	1670	1373	1848	706	1142

Source: www.censusindia.gov.in - Tamilnadu Census of India – 2011

TABLE 3.26: WORKERS PROFILE OF STUDY AREA

Sl.No.	Village Name	Total Workers Population	Male Workers	Female Workers	Total Main Workers	Main Workers Male	Main Workers Female	Main Cultivation Workers	Main Agriculture Workers	Main Other Workers	Non-Worker Population
1	Arisippalayam	1126	771	355	974	702	272	117	281	561	1274
2	Govindapuram	768	412	356	768	412	356	369	232	151	481
3	Karunchamigoundenpalayam	182	113	69	152	109	43	57	2	93	161
4	Kuthiraialampalayam	896	473	423	806	441	365	172	437	185	552
5	Mavuthampathi	1603	942	661	1289	777	512	358	551	358	1240
6	Muthur	827	489	338	781	465	316	144	454	177	558
7	Nachippalayam	1803	1047	756	1598	934	664	458	479	642	1205
8	Palathurai	1403	894	509	768	557	211	93	85	579	1324
9	Pichanur	3214	1928	1286	3094	1868	1226	534	1288	1224	3047
10	Poravipalayam	4248	2355	1893	3377	2082	1295	524	1772	983	2320
11	Pottaiyandiporambu	889	518	371	498	321	177	150	106	241	641
12	Sangarayapuram	518	301	217	446	274	172	178	120	144	298
13	Sokkanur	3810	2051	1759	3654	2013	1641	925	1990	693	2210
14	Sulakkal	1724	1001	723	1674	986	688	223	795	624	1145
15	Thambagoundenpalayam	224	142	82	193	134	59	37	20	135	258
16	Vadaputhur	2670	1677	993	2479	1623	856	491	466	1487	2506
17	Valukkupparai	3055	1645	1410	2640	1429	1211	898	1135	570	1836

Source: www.censusindia.gov.in - Tamilnadu Census of India – 2011

TABLE 3.27: COMMUNICATION & TRANSPORT FACILITIES IN THE STUDY AREA

Sl	Village Name	PO	SPO	PTO	T	PCO	MP	IC / CSC	PCF	BS	PBS	RS	NH	SH	MDR	BTR	GR	NWR	FP
1	Arisippalayam	2	1	2	1	2	1	2	2	1	1	2	2	1	2	1	1	2	1
2	Govindapuram	2	2	2	1	1	1	2	2	1	1	2	2	2	1	1	1	2	1
3	Karunchamigoundenpalayam	2	2	2	1	1	1	2	2	1	1	2	2	1	1	1	1	2	1
4	Kuthiraialampalayam	2	2	2	1	2	1	2	2	1	2	2	2	1	2	1	1	2	1
5	Mavuthampathi	2	1	2	1	1	1	2	2	1	2	2	1	1	1	1	1	2	1
6	Muthur	2	1	2	1	1	1	2	2	1	1	2	2	2	1	1	1	2	1
7	Nachippalayam	2	2	2	1	1	1	2	2	1	1	2	2	1	1	1	1	2	1
8	Palathurai	2	1	2	1	1	1	2	2	1	1	2	2	1	1	1	1	2	1
9	Pichanur	2	1	2	1	1	1	2	2	1	1	2	1	1	1	1	1	2	1
10	Poravipalayam	2	1	2	1	1	1	2	2	1	1	2	2	1	1	1	1	2	1
11	Pottaiyandiporambu	2	2	2	1	1	1	2	2	1	2	2	2	1	1	1	1	2	1
12	Sangarayapuram	2	2	2	1	1	1	2	2	2	2	2	2	2	2	1	1	2	1
13	Sokkanur	2	1	2	1	1	1	2	2	1	1	2	2	1	1	1	1	2	1
14	Sulakkal	2	1	2	1	1	1	2	2	1	1	2	2	1	1	1	1	2	1
15	Thambagoundenpalayam	2	2	2	1	1	1	2	2	1	1	2	2	2	2	1	1	2	1
16	Vadaputhur	2	2	2	1	1	1	1	2	1	1	2	2	2	2	1	1	2	1
17	Valukkupparai	2	1	2	1	1	1	1	1	1	1	2	2	2	2	1	1	2	1

Abbreviations: PO - Post Office; MP - Mobile Phone Coverage; RS - Railway Station; GR - Gravel Roads; SPO - Sub Post Office; IC / CSC - Internet Cafe/Common Service Centre; NH - National Highways; NWR - Navigate waterways River; PTO - Post & Telegraph office; PCF - Private Courier Facility; SH - State Highways; FP - Foot path; T- Telephone (Landline); BS - Public Bus Service; MDR - Major District Road; PCO - Public call office / Mobile; PBS - Private Bus Service; BTR - Black Topped (Pucca Roads). Note: 1 - Available within the village 2 - Not available

TABLE 3.28: WATER & DRAINAGE FACILITIES IN THE STUDY AREA

Sl	Village Name	TP	CW	UCW	HP	TW/BH	S	R/C	T/P/L	CD	OD	CT
1	Arisippalayam	1	2	2	2	1	2	1	2	1	1	1
2	Govindapuram	1	1	1	1	1	2	2	2	1	1	2
3	Karunchamigoundenpalayam	1	2	1	1	1	2	2	2	1	1	1
4	Kuthiraiampalayam	1	1	1	1	1	2	2	2	1	1	1
5	Mavuthampathi	1	1	1	1	1	1	1	1	1	1	1
6	Muthur	1	1	1	1	1	2	2	2	1	1	2
7	Nachippalayam	1	1	1	1	1	2	2	2	1	1	1
8	Palathurai	1	1	1	1	1	2	2	2	1	1	1
9	Pichanur	1	1	1	1	1	1	2	2	1	1	2
10	Poravipalayam	1	1	1	2	1	1	2	2	1	1	1
11	Pottaiyandiporambu	1	1	1	2	1	2	2	2	1	1	1
12	Sangarayapuram	1	1	1	1	1	2	2	2	1	1	2
13	Sokkanur	1	1	1	2	1	1	2	2	1	1	2
14	Sulakkal	1	1	1	2	1	1	2	2	1	1	2
15	Thambagoundenpalayam	1	2	2	2	2	2	2	2	1	1	2
16	Vadaputhur	1	1	1	1	1	2	2	2	1	1	1
17	Valukkupparai	1	1	1	1	1	1	2	1	1	1	1

Abbreviations: T - Tap Water; R / C - River / Canal; CW - Covered Well; T/P/L - Tank / Pond / Lake; UCW - Uncovered Well; CD - Covered Drainage; HP - Hand Pump; OD - Open Drainage; TW/BH - Tube / Bore Well; CT - Community Toilet Complex for General public; S - Spring

Note – 1 - Available within the village; 2 - Not available

TABLE 3.29: OTHER FACILITIES IN THE STUDY AREA

Sl	Village Name	ATM	CB	COB	ACS	SHG	PDS	RM	AMS	NC	NC-AC	CC	SF	PL	NPS	APS	BDRO	PS
1	Arisippalayam	2	2	2	2	1	1	2	2	1	1	2	1	1	1	1	1	1
2	Govindapuram	2	2	2	2	1	1	1	2	1	1	2	1	1	1	1	1	1
3	Karunchamigoundenpalayam	2	2	2	2	2	1	2	2	1	1	2	2	2	1	1	1	1
4	Kuthiraialampalayam	2	2	2	1	1	1	2	2	1	1	1	1	1	1	1	1	1
5	Mavuthampathi	2	2	2	2	1	1	2	2	1	1	1	1	1	1	1	1	1
6	Muthur	2	2	2	2	1	1	1	2	1	1	2	2	2	1	1	1	1
7	Nachippalayam	2	1	2	2	1	1	1	2	1	1	2	2	2	1	1	1	1
8	Palathurai	2	2	2	2	1	1	2	1	1	1	1	1	1	1	1	1	1
9	Pichanur	2	2	2	1	1	1	1	2	1	1	1	1	2	1	1	1	1
10	Poravipalayam	2	2	2	1	1	1	1	2	1	1	1	1	2	1	1	1	1
11	Pottaiyandiporambu	2	2	2	2	1	1	2	2	1	1	1	1	1	1	1	1	1
12	Sangarayapuram	2	2	2	2	1	1	1	2	1	1	2	2	2	2	2	1	2
13	Sokkanur	2	1	2	1	1	1	2	2	1	1	1	1	2	1	1	1	1
14	Sulakkal	2	2	2	1	1	1	2	2	1	1	1	1	2	1	1	1	1
15	Thambagoundenpalayam	2	2	2	2	1	2	2	2	1	1	2	2	2	1	1	2	1
16	Vadaputhur	1	2	2	2	1	1	2	2	1	1	1	1	1	1	1	1	1
17	Valukkupparai	2	2	1	1	1	1	2	2	1	1	1	1	2	1	1	1	1

Abbreviations: ATM - Automatic Teller Machine; PDS - Public Distribution System (Shop); CB - Commerical Bank; RM - Regular Market; COB - Co-operative Bank; AMS - Agricultural Market Society; ACS - Agricultural Credit Societies; NC - Nutritional Centres; SHG - Self Help Group; NC-AC - Nutritional Centres - Anganwadi Centre; DBRO - Birth & Death Registration Office; PS - Power Supply
 Note – 1 - Available within the village; 2 - Not available

TABLE 3.30: EDUCATIONAL FACILITIES IN THE STUDY AREA

Sl	Village Name	PPS		PS		MS		SS		SSS		DC		EC		MC		MI		PT		VTS		SSD	
		G	P	G	P	G	P	G	P	G	P	G	P	G	P	G	P	G	P	G	P	G	P	G	P
1	Arisippalayam	1	2	1	2	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	1	2	2	2	2
2	Govindapuram	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
3	Karunchamigoundenpalayam	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
4	Kuthiraialampalayam	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
5	Mavuthampathi	1	2	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	1	2	2	2	2	2	2
6	Muthur	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
7	Nachippalayam	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
8	Palathurai	1	2	1	2	1	2	2	2	2	2	2	2	2	1	2	2	2	2	2	2	2	2	2	2
9	Pichanur	1	2	1	2	1	2	1	2	2	2	2	1	2	1	2	2	2	1	2	1	2	2	2	2
10	Poravipalayam	1	2	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
11	Pottaiyandiporambu	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
12	Sangarayapuram	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
13	Sokkanur	1	2	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
14	Sulakkal	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
15	Thambagoundenpalayam	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
16	Vadaputhur	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
17	Valukkupparai	1	2	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2

Abbreviations: PPS-Pre Primary School; SSS-Senior Secondary School; DC-Degree School; PT-Polytechnic; PS-Primary School; G-Government; EC-Engineering College; VTS-Vocational School /ITI; MS-Middle School; P-Private; MC-Medical College; SSD-Special School For Disabled; SS-Secondary School; MI-Management College/Institute;

Note – 1 - Available within the village; 2 - Not available

TABLE 3.31: MEDICAL FACILITIES IN THE STUDY AREA

Sl. No.	Village Name	CHC	PHC	PHSC	MCW	TBC	HA	HAM	D	VH	MHC	FWC	NGM-I/O
1	Arisippalayam	0	1	1	1	1	0	0	1	0	0	1	a
2	Govindapuram	0	0	0	0	0	0	0	0	0	0	0	b
3	Karunchamigoundenpalayam	0	0	0	0	0	0	0	0	0	0	0	b
4	Kuthiraialampalayam	0	0	0	0	0	0	0	0	0	0	0	b
5	Mavuthampathi	0	0	0	0	0	0	0	0	0	0	0	b
6	Muthur	0	0	0	0	0	0	0	0	0	0	0	b
7	Nachippalayam	0	0	1	0	0	0	0	0	0	0	0	a
8	Palathurai	0	0	1	0	0	0	0	0	0	0	0	b
9	Pichanur	0	0	3	0	0	0	0	0	1	0	0	c
10	Poravipalayam	0	1	1	1	1	0	0	1	1	0	1	b
11	Pottaiyandiporambu	0	0	1	0	0	0	0	0	0	0	0	b
12	Sangarayapuram	0	0	0	0	0	0	0	0	0	0	0	b
13	Sokkanur	0	1	1	1	1	0	0	1	1	0	1	a
14	Sulakkal	0	0	1	0	0	0	0	0	0	0	0	b
15	Thambagoundenpalayam	0	0	0	0	0	0	0	0	0	0	0	b
16	Vadaputhur	0	0	1	0	0	0	0	0	0	0	0	b
17	Valukkupparai	0	0	1	0	0	0	0	0	1	0	0	a

Abbreviations: CHC-Community Health Centre; TBC-TB Clinic; VH- Vetrernity Hospital; PHC-Primary Health Centre; HA-Aallopathic Hospital; FWC-Family Welfare Centre; PHSC-Primary Health Sub Centre; HAM-Alternative Medicine Hospital; MH-Mobile Health Clinic; MCW-Maternity and Child Welfare Centre; D-Dispensary; NGM-I/O-Non Government Medical Facilities In & Out Patient

Note – 1 - Available within the village; 2 - Not available

a-facility available at <5kms

b-facility available at>10kms

Source: www.censusindia.gov.in - Tamilnadu Census of India – 2011

3.6.6 Recommendation and Suggestion

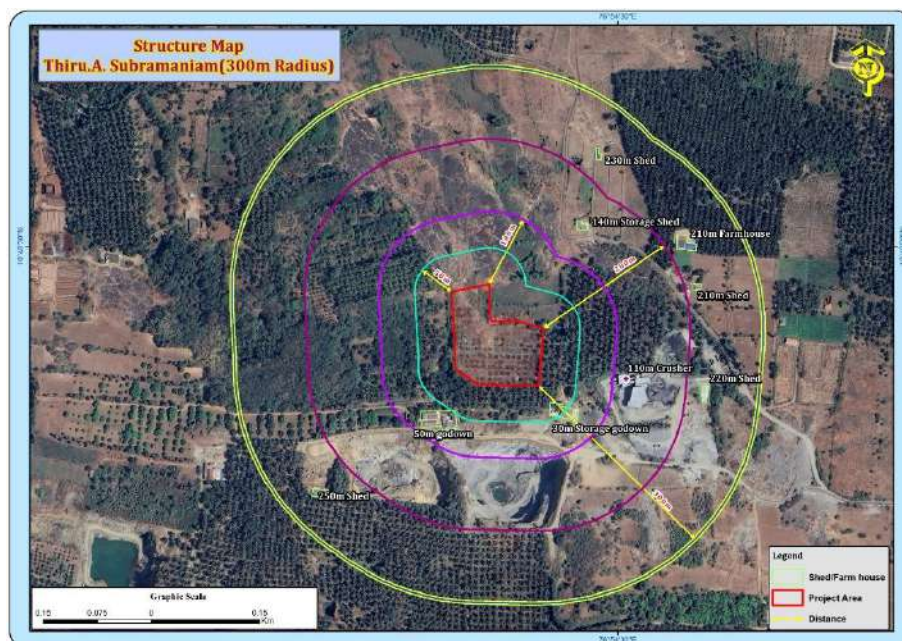
- Awareness program to be conducted to make the population aware to get education and a better livelihood.
- Vocational training programme can be organized to make the people self - employed, particularly for women and unemployed youth.
- On the basis of qualification and skills local community may be preferred. Long term and short-term employments can be generated.
- Health care centre and ambulance facility can be provided to the population to get easy access to medical facilities. Maternity facility should be made available at the place to avoid going to distant 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.

3.6.7 Summary & 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.

3.7 Structure Study



Enumeration of Structure from 0 – 300m Radius						
Structure Numbers	Distance & Direction from the project site	Structure Details and Usage Purpose	Type of Structure Structures (Kutcha/ Brick/ Cement/ RCC/ Framed Structures)	No. of Occupants	Structure belongs to owner (Yes/No)	Remarks
1	30m – South East	Storage Godown	Sheet Structure	Nil	No	Used to store Crusher equipment's and Crusher Materials– No Stay
2	50m – South West	Godown	Sheet Structure	Nil	No	Used for agriculture purpose– No Stay
3	110m – East	Crusher	Framed Structure	3Nos	Yes	Production of M-Sand, P-Sand and Jelly– No Stay
4	140m – North East	Storage Shed	Tiled Structure	Nil	No	Used for agriculture purpose– No Stay
5	210m - East	Shed	Tiled Structure	Nil	No	Used for agriculture purpose– No Stay
6	210m – North East	Farmhouse	Sheet Structure	2Nos	Yes	Own purpose
7	230m – North East	Shed	Sheet Structure	Nil	Yes	Used for agriculture purpose– No Stay
8	250m – South West	Shed	Sheet Structure	Nil	Yes	Used to store Mine Materials– No Stay

4. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

4.0 GENERAL

Environmental impacts both direct and indirect on various environmental attributes due to proposed mining activity will be created in the surrounding environment, during the operational and post-operational phases. The occurrence of mineral deposits, being site specific, their exploitation, often, does not allow for any choice except adoption of eco-friendly operation. The methods are required to be selected in such a manner, so as to maintain environmental equilibrium ensuring sustainable development.

In order 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.

Several scientific techniques and methodologies are available to predict impacts of physical environment. Mathematical models are the best tools to quantitatively describe the cause-and-effect relationships between sources of pollution and different components of environment. In cases where it is not possible to identify and validate a model for a particular situation, predictions have been arrived at based on logical reasoning / consultation / extrapolation.

The following parameters are of significance in the Environmental Impact Assessment and are being discussed in detail

- Land environment
- Soil environment
- Water Environment
- Air Environment
- Noise Environment
- Socio economic environment
- Biological Environment

Based on the baseline environmental status at the project site, the environmental factors that are likely to be affected (Impacts) are identified, quantified and assessed.

4.1 LAND ENVIRONMENT:

4.1.2 Anticipated Impact from Proposed Project

- Permanent or temporary change on land use and land cover.
- Change in Topography: Topography of the ML area will change at the end of the life of the mine.
- Movement of heavy vehicles sometimes cause problems to agricultural land, human habitations due to dust, noise and it also causes traffic hazards.
- Due to degradation of land by pitting the aesthetic environment of the core zone may be affected.
- Earthworks during the rainy season increase the potential for soil erosion and sediment laden water entering the water ways.

If no due care is taken wash off from the exposed working area may choke the water course & can also causes the siltation of water course

4.1.2 Common Mitigation Measures for Proposed Project

- 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 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., 7.5 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.

4.1.3 Soil Environment

The proposed projects area is covered by thin layer of gravel formation and the average thickness is about 1m - 2 m, the excavated gravel will be directly sold to needy customers in open market.

4.1.4 Impact on Soil Environment from Proposed Project

Erosion and Sedimentation (Removal of protective vegetation cover; Exposure of underlying soil horizons that may be less pervious, or more erodible than the surface layers; Reduced capacity of soils to absorb rainfall; Increased energy in storm-water runoff due to concentration and velocity; and Exposure of subsurface materials which are unsuitable for vegetation establishment).

4.1.5 Common Mitigation Measures for Proposed Project

- Run-off diversion – Garland drains will be constructed all around the project boundary to prevent surface flows from entering the quarry works areas. And will be discharged into vegetated natural drainage lines, or as distributed flow across an area stabilised against erosion.
- Sedimentation ponds - Run-off from working areas will be routed towards sedimentation ponds. These trap sediments and reduce suspended sediment loads before runoff is discharged from the quarry site. Sedimentation ponds should be designed based on runoff, retention times, and soil characteristics. There may be a need to provide a series of sedimentation ponds to achieve the desired outcome.
- Retain vegetation – Retain existing or re-plant the vegetation at the site wherever possible.
- Monitoring and maintenance – Weekly monitoring and daily maintenance of erosion control systems so that they perform as specified specially during rainy season.

4.1.6 Waste Dump Management

There is no waste anticipated in this Rough Stone quarrying operation. The entire quarried out materials will be utilized (100%).

4.2 WATER ENVIRONMENT

4.2.1 Anticipated Impact from Proposed Project

- The major sources of water pollution normally associated due to mining and allied operations are:
 - Generation of waste water from vehicle washing.
 - Washouts from surface exposure or working areas
 - Domestic sewage
 - Disturbance to drainage course in the project area
 - Mine Pit water discharge
- Increase in sediment load during monsoon in downstream of lease area
- This being a mining project, there will be no process effluent. Waste from washing of machinery may result in discharge of Oil & grease, suspended solids.
- The sewage from soak pit may percolate to the ground water table and contaminate it.
- Surface drainage may be affected due to Mining
- Abstraction of water may lead to depletion of water table

Detail of water requirements in KLD as given below:**TABLE 4.1: WATER REQUIREMENT**

*Purpose	Quantity	Source
Dust Suppression	1.0 KLD	From Nearby Existing bore well
Green Belt development	1.0 KLD	From Nearby Existing bore well
Domestic purpose	0.5 KLD	Approved water vendors
Total	2.5 KLD	

* Water for drinking purpose will be brought from approved water vendors

Source: Approved Mining Plan Pre-Feasibility Report

4.2.2 Common Mitigation Measures for Proposed Project

- Garland drain, settling tank will be constructed along the proposed mining lease area. The Garland drain will be connected to settling tank and sediments will be trapped in the settling traps and only clear 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 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 system.
- 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 (every 6 month once) 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 (every 6 month once) and analysing the quality of water in open well, bore wells and surface water

4.3 AIR ENVIRONMENT**4.3.1. Anticipated Impact from Proposed Project**

- During mining, at various stages activities such as excavation, drilling, blasting, and transportation of materials, particular matter (PM), gases such as Sulphur dioxide, oxides of Nitrogen from vehicular exhaust are the main air pollutants.
- Emissions of noxious gases due to incomplete detonation of explosive may sometimes pollute the air.
- The fugitive dust released from the mining operations may cause effect on the mine workers who are directly exposed to the fugitive dust.
- Simultaneously, the air-borne dust may travel to longer distances and settle in the villages located near the mine lease area.

4.3.1.1. Modelling of Incremental Concentration from Proposed Project

Wind erosion of the exposed areas and the air borne particulate matter generated by quarrying operation, and transportation are mainly PM₁₀ & PM_{2.5} and emissions of Sulphur dioxide (SO₂) & Oxides of Nitrogen (NO_x) due to excavation/loading equipment and vehicles plying on haul roads are the cause of air pollution in the project area.

Similarly, loading - unloading and transportation of Rough Stone, wind erosion of the exposed area and movement of light vehicles causes of pollution. This leads to an impact on the ambient air environment around the project area.

Anticipated incremental concentration due to this quarrying activity and net increase in emissions due to quarrying activities within 500 meters around the project area is predicted by Open Pit Source modelling using

AERMOD Software.

The impact on Air Environment is due to the mining and allied activities during Land Development phase, Mining process and Transportation. The emissions of Sulphur dioxide (SO₂), Oxides of Nitrogen (NO_x) due to excavation/loading equipment and vehicles plying on haul roads are marginal. Loading - unloading and transportation of Rough Stone, wind erosion of the exposed area and movement of light vehicles will be the main polluting source in the mining activities releasing Particulate Matter (PM₁₀) affecting Ambient Air of the area. Prediction of impacts on air environment has been carried out taking into consideration cumulative production three proposed quarries. Air environment and net increase in emissions by Open pit source modelling in AERMOD Software.

4.3.2.1 Emission Estimation

An emissions factor is a representative value that attempts to relate the quantity of a pollutant released to the atmosphere with an activity associated with the release of that pollutant.

The general equation for emissions estimation is:

$$E = A \times EF \times (1-ER/100)$$

Where:

E = emissions;

A = activity rate;

EF = emission factor, and

ER =overall emission reduction efficiency, %

The proposed mining activity includes various activities like ground preparation, excavation, handling and transport of Rough Stone. These activities have been analysed systematically basing on USEPA-Emission Estimation Technique Manual, for Mining AP-42, to arrive at possible emissions to the atmosphere and estimated emissions are given in Table 4-2.

4.3.2 Frame work of Computation & Model details

By using the above-mentioned inputs, ground level concentrations due to the quarrying activities have been estimated to know the incremental concentration in ambient air quality and impact in the study area. The effect of air pollutants upon receptors are influenced by concentration of pollutants and their dispersion in the atmosphere. Air quality modelling is an important tool for prediction, planning and evaluation of air pollution control activities besides identifying the requirements for emission control to meet the regulatory standards and to apply mitigation measures to reduce impact caused by quarrying activities. Suspended Particulate Matter (SPM) is the major pollutant occurred during quarrying activities. The prediction included the impact of Excavation, Drilling, Blasting (Occasionally), loading and movement of vehicles during transportation and meteorological parameters such as wind speed, wind direction, temperature, rainfall, humidity and Cloud cover.

Impact was predicted over the distance of 10 km around the source to assess the impact at each receptor separately at the various locations and maximum incremental GLC value at the project site. Maximum impact of PM10 was observed close to the source due to low to moderate wind speeds. Incremental value of PM10 was superimposed on the base line data monitored at the proposed site to predict total GLC of PM10 due to combined impacts

TABLE 4.2: ESTIMATED EMISSION RATE FOR PM₁₀

Activity	Source type	Value	Unit
Drilling	Point Source	0.110336433	g/s
Blasting	Point Source	0.003955571	g/s
Mineral Loading	Point Source	0.045957025	g/s
Haul Road	Line Source	0.00250414	g/s/m
Overall Mine	Area Source	0.044670449	g/s

TABLE 4.3: ESTIMATED EMISSION RATE FOR SO₂

Activity	Source type	Value	Unit
Overall Mine	Area Source	0.001380823	g/s

TABLE 4.4: ESTIMATED EMISSION RATE FOR NO_x

Activity	Source type	Value	Unit
Overall Mine	Area Source	0.000041332	g/s

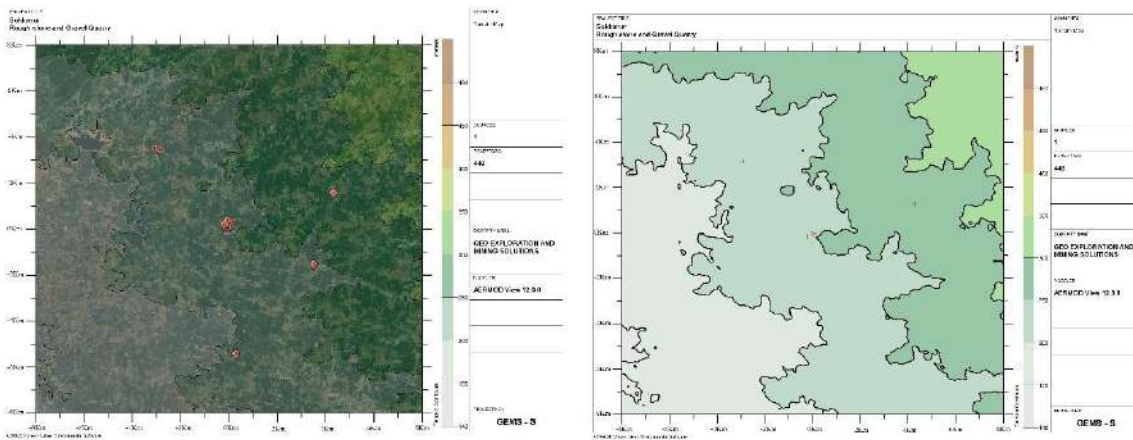
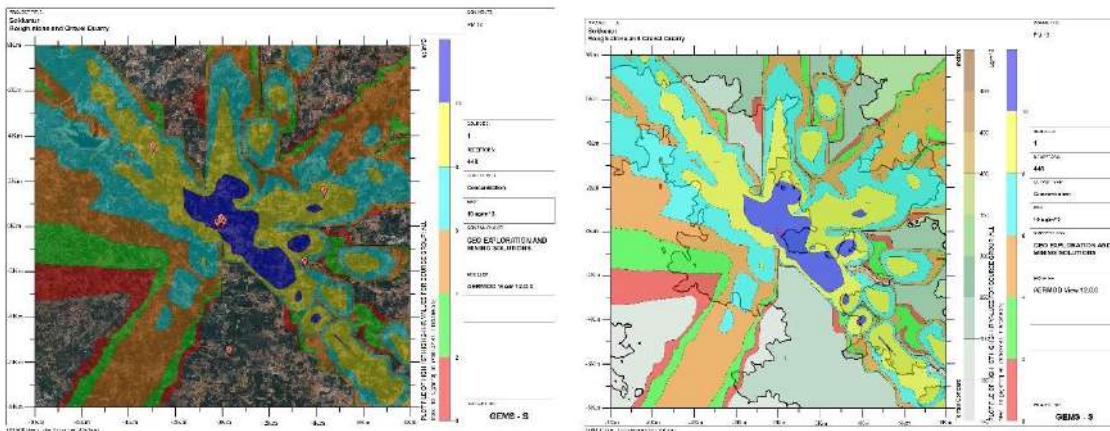
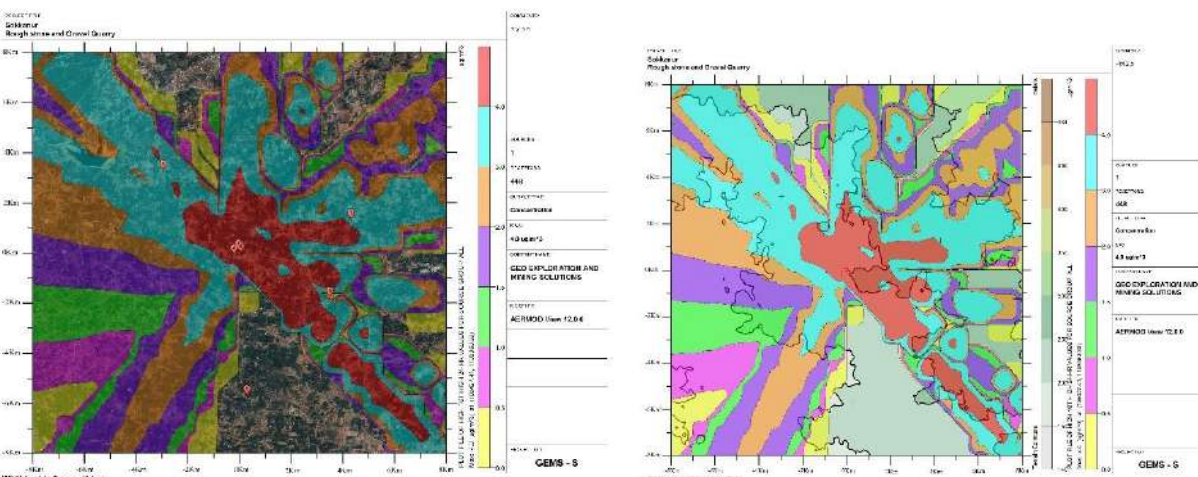
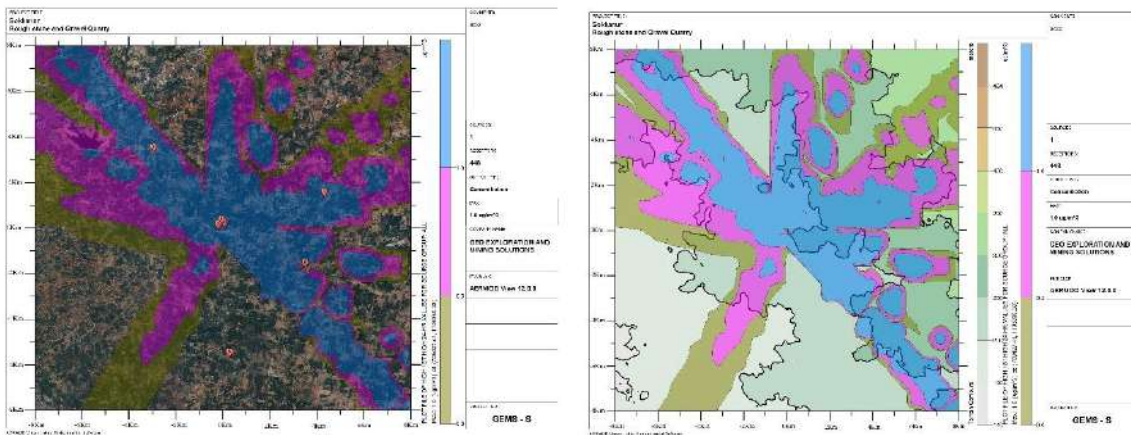
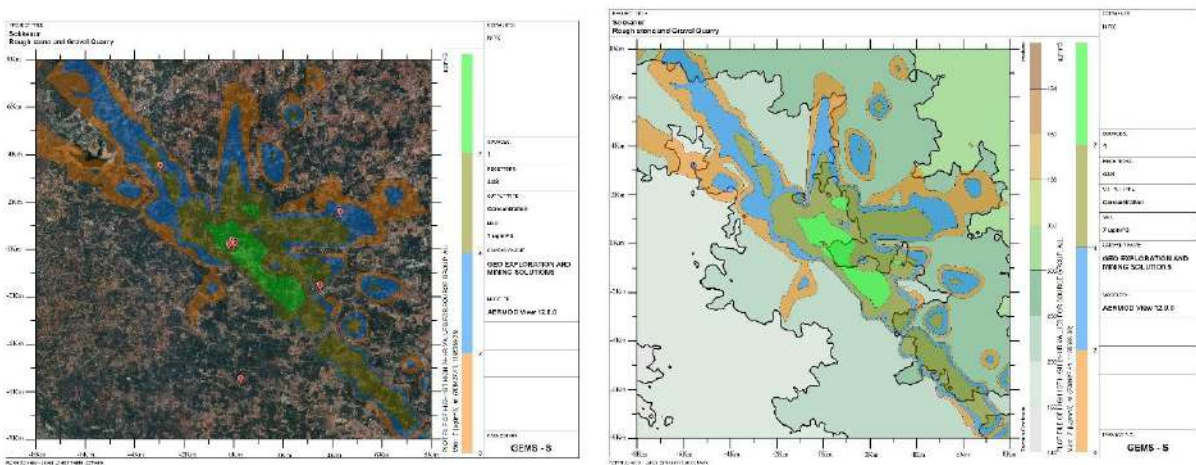
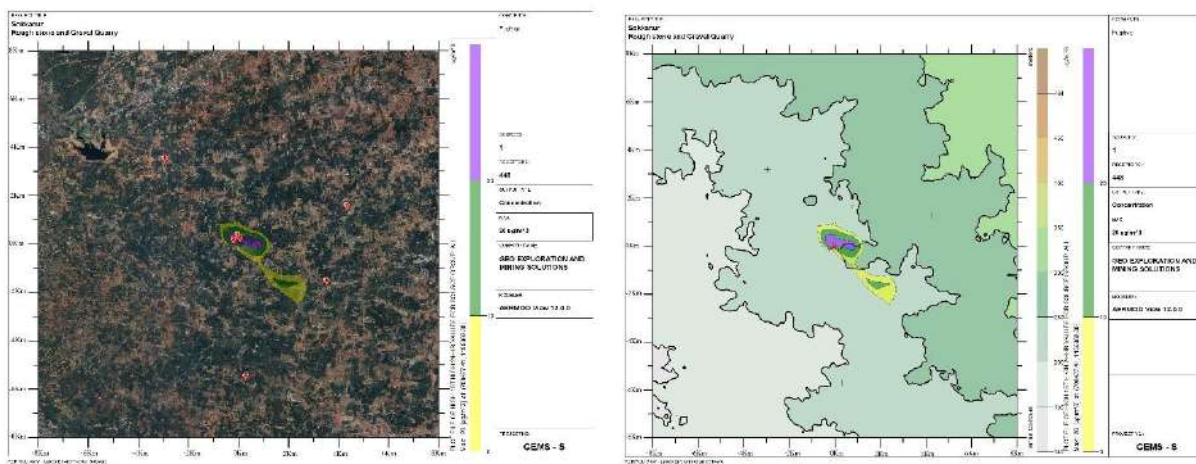
FIGURE 4.1: AERMOD TERRAIN MAP**FIGURE 4.2: PREDICTED INCREMENTAL CONCENTRATION OF PM₁₀****FIGURE 4.3: PREDICTED INCREMENTAL CONCENTRATION OF PM_{2.5}**

FIGURE 4.4: PREDICTED INCREMENTAL CONCENTRATION OF SO₂**FIGURE 4.5: PREDICTED INCREMENTAL CONCENTRATION OF NO_x****FIGURE 4.6: PREDICTED INCREMENTAL CONCENTRATION OF FUGITIVE DUST**

4.3.2.1 Model Results

The post project Resultant Concentrations of PM₁₀, PM_{2.5}, SO₂ & NO_x (GLC) is given in Table below:

TABLE 4.5: INCREMENTAL & RESULTANT GLC OF PM₁₀

Station Code	Location	X Coordinate (m)	Y Coordinate (m)	Average Baseline PM ₁₀ (µg/m ³)	Incremental value of PM ₁₀ due to mining (µg/m ³)	Total PM ₁₀ (µg/m ³)
AAQ1	10°48'27.79"N 76°54'22.88"E	-51	46	42.0	10.69	52.69
AAQ2	10°48'23.96"N 76°54'26.21"E	56	-80	42.5	10.23	52.73
AAQ3	10°48'21.40"N 76°54'17.70"E	-207	-159	45.5	9.86	55.36
AAQ4	10°50'10.14"N 76°52'47.94"E	-2950	3196	44.6	9.00	53.6
AAQ5	10°45'19.47"N 76°54'33.93"E	290	-5766	46.2	0	46.2
AAQ6	10°47'26.39"N 76°56'19.14"E	3508	-1854	45.4	0	45.4
AAQ7	10°49'6.89"N 76°56'45.83"E	4323	1243	44.5	8.50	44.5

TABLE 4.6: INCREMENTAL & RESULTANT GLC OF PM_{2.5}

Station Code	Location	X Coordinate (m)	Y Coordinate (m)	Average Baseline PM _{2.5} (µg/m ³)	Incremental value of PM _{2.5} due to mining (µg/m ³)	Total PM _{2.5} (µg/m ³)
AAQ1	10°48'27.79"N 76°54'22.88"E	-51	46	20.5	4.89	25.39
AAQ2	10°48'23.96"N 76°54'26.21"E	56	-80	21.0	4.67	25.67
AAQ3	10°48'21.40"N 76°54'17.70"E	-207	-159	23.8	4.30	28.1
AAQ4	10°50'10.14"N 76°52'47.94"E	-2950	3196	24.1	3.79	27.89
AAQ5	10°45'19.47"N 76°54'33.93"E	290	-5766	24.3	0	24.3
AAQ6	10°47'26.39"N 76°56'19.14"E	3508	-1854	24.1	0.33	24.43
AAQ7	10°49'6.89"N 76°56'45.83"E	4323	1243	23.5	3.47	26.97

TABLE 4.7: INCREMENTAL & RESULTANT GLC OF SO₂

Station Code	Location	X Coordinate (m)	Y Coordinate (m)	Average Baseline SO ₂ (µg/m ³)	Incremental value due to mining (µg/m ³)	Total SO ₂ (µg/m ³)
AAQ1	10°48'27.79"N 76°54'22.88"E	-51	46	4.3	1.49	5.79
AAQ2	10°48'23.96"N 76°54'26.21"E	56	-80	4.2	1.38	5.58

AAQ3	10°48'21.40"N 76°54'17.70"E	-207	-159	4.8	1.27	6.07
AAQ4	10°50'10.14"N 76°52'47.94"E	-2950	3196	4.5	1.19	5.69
AAQ5	10°45'19.47"N 76°54'33.93"E	290	-5766	4.5	0	4.5
AAQ6	10°47'26.39"N 76°56'19.14"E	3508	-1854	4.8	0	4.8
AAQ7	10°49'6.89"N 76°56'45.83"E	4323	1243	4.7	1.00	5.7

TABLE 4.8: INCREMENTAL & RESULTANT GLC OF NOX

Station Code	Location	X Coordinate (m)	Y Coordinate (m)	Average Baseline NOx ($\mu\text{g}/\text{m}^3$)	Incremental value due to mining ($\mu\text{g}/\text{m}^3$)	Total NOx ($\mu\text{g}/\text{m}^3$)
AAQ1	10°48'27.79"N 76°54'22.88"E	-51	46	19.6	20	39.6
AAQ2	10°48'23.96"N 76°54'26.21"E	56	-80	19.6	16	35.6
AAQ3	10°48'21.40"N 76°54'17.70"E	-207	-159	19.4	0	19.4
AAQ4	10°50'10.14"N 76°52'47.94"E	-2950	3196	19.2	0	19.2
AAQ5	10°45'19.47"N 76°54'33.93"E	290	-5766	19.5	0	19.5
AAQ6	10°47'26.39"N 76°56'19.14"E	3508	-1854	19.6	0	19.6
AAQ7	10°49'6.89"N 76°56'45.83"E	4323	1243	19.6	0	19.6

From the resultant of cumulative concentration i.e., Background + Incremental Concentration of pollutant in all the receptor locations without effective mitigation measures are still within the prescribed NAAQ limits of 100, 80 & 80 $\mu\text{g}/\text{m}^3$ for PM10, SO2 & NOX respectively. By adopting suitable mitigation measures, the pollutant levels in the atmosphere can be further being controlled.

4.3.4. Common Mitigation Measures for Proposed Project

Drilling – To control dust at source, wet drilling will be practiced. Where there is a scarcity of water, suitably designed dust extractor will be provided for dry drilling along with dust hood at the mouth of the drill-hole collar.

Advantages of Wet Drilling: -

- In this system dust gets suppressed close to its formation. Dust suppression become very effective and the work environment will be improved from the point of occupational comfort and health.
- Due to dust free atmosphere, the life of engine, compressor etc., will be increased.
- The life of drill bit will be increased.
- The rate of penetration of drill will be increased.
- Due to the dust free atmosphere visibility will be improved resulting in safer working conditions.

Blasting –

- Establish time of blasting to suit the local conditions and water sprinkling on blasting face
- Avoid blasting i.e., when temperature inversion is likely to occur and strong wind blows towards residential areas

- Controlled blasting includes Adoption of suitable explosive charge and short delay detonators, adequate stemming of holes at collar zone and restricting blasting to a particular time of the day i.e. at the time lunch hours, controlled charge per hole as well as charge per round of hole
- Before loading of material water will be sprayed on blasted material
- Dust mask will be provided to the workers and their use will be strictly monitored

Haul Road & Transportation –

- Water will be sprinkled on haul roads twice a day to avoid dust generation during transportation
- Transportation of material will be carried out during day time and material will be covered with tarpaulin
- The speed of tippers plying on the haul road will be limited below 20 km/hr to avoid generation of dust.
- Water sprinkling on haul roads & loading points will be carried out twice a day
- Main source of gaseous pollution will be from vehicle used for transportation of mineral; therefore, weekly maintenance of machines improves combustion process & makes reduction in the pollution.
- The un-metalled haul roads will be compacted weekly before being put into use.
- Over loading of tippers will be avoided to prevent spillage.
- It will be ensured that all transportation vehicles carry a valid PUC certificate
- Grading of haul roads and service roads to clear accumulation of loose materials

Green Belt –

- Planting of trees all along main mine haul roads and regular grading of haul roads will be practiced to prevent the generation of dust due to movement of dumpers/trucks
- Green belt of adequate width will be developed around the project areas

Occupational Health –

- Dust mask will be provided to the workers and their use will be strictly monitored
- Annual medical checkups, 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 months once to assess effectiveness of mitigation measures proposed

4.4 NOISE ENVIRONMENT

Noise pollution is mainly due to operation like drilling & blasting and plying of trucks & HEMM. These activities will not cause any problem to the inhabitants of this area because there is no human settlement in close proximity to the project area. 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 working pit due to these major noise-generating sources. Noise modelling has been carried out to assess the impact on surrounding ambient noise levels.

Basic phenomenon of the model is the geometric attenuation of sound. Noise at a point generates spherical waves, which are propagated outwards from the source through the air at a speed of 1,100 ft/sec, with the first wave making an ever-increasing sphere with time. As the wave spreads the intensity of noise diminishes as the fixed amount of energy is spread over an increasing surface area of the sphere. The assumption of the model is based on point source relationship i.e., for every doubling of the distance the noise levels are decreased by 6 dB (A).

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.

$$L_{p2} = L_{p1} - 20 \log (r_2/r_1) - A_{e1,2}$$

Where:

L_{p1} & L_{p2} are sound levels at points located at distances r_1 & r_2 from the source.

$A_{e1,2}$ is the excess attenuation due to environmental conditions. Combined effect of all sources can be determined at various locations by logarithmic addition.

$$L_{p \text{ total}} = 10 \log \{10^{(L_{p1}/10)} + 10^{(L_{p2}/10)} + 10^{(L_{p3}/10)} + \dots\}$$

4.4.1 Anticipated Impact from Proposed Project

Attenuation due to Green Belt has been taken to be 4.9 dB (A). The inputs required for the model are:

- Source data
- Receptor data
- Attenuation factor

Source data has been computed taking into account of all the machinery and activities used in the mining process. Same has been listed in Table 4-8.

TABLE 4.9: ACTIVITY AND NOISE LEVEL PRODUCED BY MACHINERY

Sl.No.	Machinery / Activity	Impact on Environment?	Noise Produced in dB(A) at 50 ft from source*
1	Blasting	Yes	94
2	Jack Hammer	Yes	88
3	Compressor	No	81
4	Excavator	No	85
5	Tipper	No	84
Total Noise Produced			95.8

*50 feet from source = 15.24 meters

Source: U.S. Department of Transportation (Federal Highway Administration) – Construction Noise Handbook

The total noise to be produced by mining activity is calculated to be 95.8 dB (A). Generally, most mining operations produce noise between 100-109 dB (A). We have considered equipment and operation noise levels (max) to be approx. 109 dB (A) for noise prediction modelling.

TABLE 4.10: PREDICTED NOISE INCREMENTAL VALUES

Location ID	N1	N2	N3	N4	N5	N6	N7
Maximum Monitored Value (Day) dB(A)	45	46	46.8	47.4	46.3	47.6	46
Incremental Value dB(A)	60.1	60.1	56.6	27.4	25.6	28.1	27.8
Total Predicted Noise level dB(A)	60.2	60.3	57.0	47.4	46.3	47.6	46.1

The incremental noise level is found within the range of 60.1 dB (A) in Core Zone and 25.6 – 56.6 dB (A) in Buffer zone. The noise level at different receptors in buffer zone is lower due to the distance involved and other topographical features adding to the noise attenuation. 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, it can be seen that the ambient noise levels at all the locations are within permissible limits of Industrial area (core zone) & Residential area (buffer zone) as per THE NOISE POLLUTION (REGULATION AND CONTROL) RULES, 2000 (The Principal Rules were published in the Gazette of India, vide S.O. 123(E), dated 14.2.2000 and subsequently amended vide S.O. 1046(E), dated 22.11.2000, S.O. 1088(E), dated 11.10.2002, S.O. 1569 (E), dated 19.09.2006 and S.O. 50 (E) dated 11.01.2010 under the Environment (Protection) Act, 1986.).

4.4.2 Common Mitigation Measures for Proposed Project

The following noise mitigation measures are proposed for control of Noise

- Usage of sharp drill bits while drilling which will help in reducing noise;
- Secondary blasting will be totally avoided and hydraulic rock breaker will be used for breaking boulders;
- Controlled blasting with proper spacing, burden, stemming and optimum charge/delay will be maintained;

- The blasting will be carried out during favourable atmospheric condition and less human activity timings by using nonelectrical initiation system;
- Proper maintenance, oiling and greasing of machines will be done every week to reduce generation of noise;
- Provision of sound insulated chambers for the workers working on machines (HEMM) producing higher levels of noise;
- Silencers / mufflers will be installed in all machineries;
- Green Belt/Plantation will be developed around the project area and along the haul roads. The plantation minimizes propagation of noise;
- Personal Protective Equipment (PPE) like ear muffs/ear plugs will be provided to the operators of HEMM and persons working near HEMM and their use will be ensured through training and awareness.
- Regular medical check-up and proper training to personnel to create awareness about adverse noise level effects

4.4.3 Ground Vibrations

Ground vibrations due to the proposed mining activities are anticipated due to operation of Mining Machines like Excavators, drilling and blasting, transportation vehicles, etc., However, the major source of ground vibration from the quarry is blasting. The major impact of the ground vibrations is observed on the domestic houses located in the villages nearby the mine lease area. The kuchha houses are more prone to cracks and damage due to the vibrations induced by blasting whereas RCC framed structures can withstand more ground 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 agricultural fields nearby the mining lease area and may cause injury to persons or damage to the structures. Nearest habitation from the proposed project areas is listed in below table. The ground vibrations due to the blasting in the quarry are calculated using the empirical equation.

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

$$V = K [R/Q^{0.5}]^{-B}$$

Where –

V = peak particle velocity (mm/s)

K = site and rock factor constant

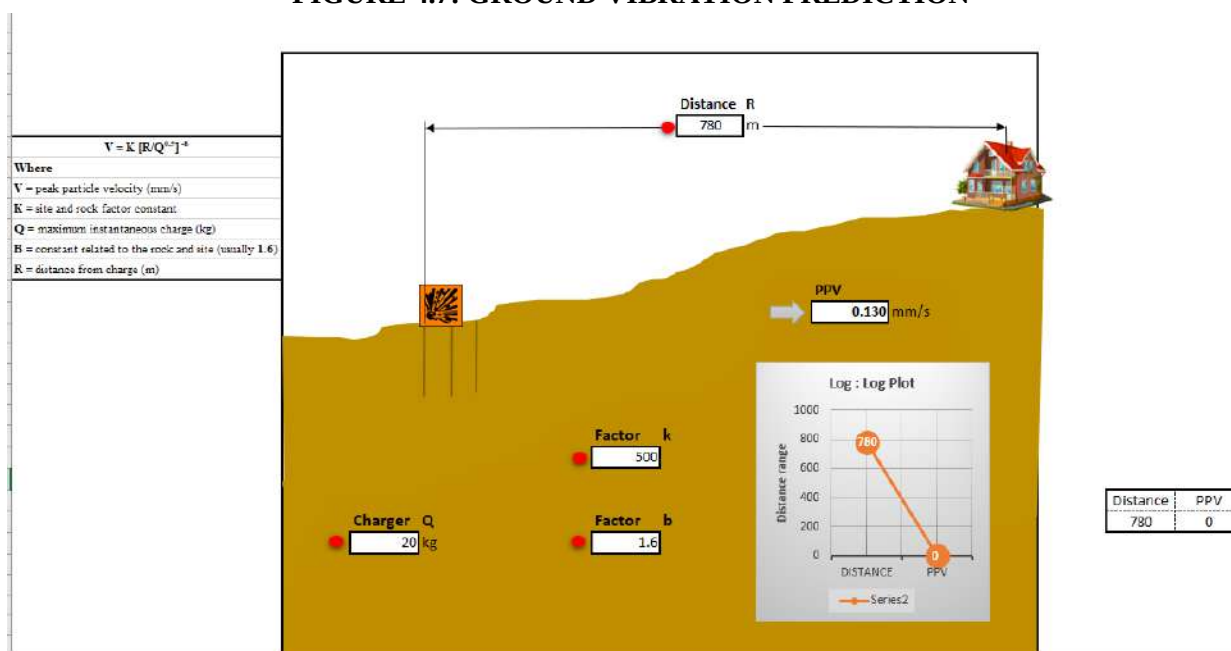
Q = maximum instantaneous charge (kg)

B = constant related to the rock and site (usually 1.6)

R = distance from charge (m)

TABLE 4.11: PREDICTED PPV VALUES DUE TO BLASTING

Maximum Charge in kgs	Nearest Habitation in m	PPV in m/ms
20	780m -SE	0.130

FIGURE 4.7: GROUND VIBRATION PREDICTION

From the above graph, the charge per blast of 20kg is well below the Peak Particle Velocity of 8 mm/s as per Directorate General of Mines Safety for safe level criteria through Circular No. 7 dated 29/8/1997. But the all the project proponents ensure that the charge per blast shall be less than 2 kg and carry out blasting twice or thrice a day based on the onsite conditions under the supervision of competent person employed. However, as per statutory requirement control measures will be adopted to avoid the impacts due to ground vibrations and fly rocks due to blasting.

4.4.3.1 Common Mitigation Measures for Proposed Project

- The blasting operations in the cluster quarries are carried out without deep hole drilling and blasting using delay detonators, which reduces the ground vibrations;
- Proper quantity of explosive, suitable stemming materials and appropriate delay system will be adopted to avoid overcharging and for safe blasting;
- Adequate safe distance from blasting will be maintained as per DGMS guidelines;
- Blasting shelter will be provided as per DGMS guidelines;
- Blasting operations will be carried out only during day time;
- The charge per delay will be minimized and preferably a greater number of delays will be used per blasts;
- During blasting, other activities in the immediate vicinity will be temporarily stopped;
- Drilling parameters like depth, diameter and spacing will be properly designed to give proper blast;
- A fully trained explosives blast man (Mining Mate, Mines Foreman, 2nd Class Mines Manager/ 1st Class Mines Manager) will be appointed.
- A set of shot firing rules will be drawn up and blasting shall commence outlining the detailed operating procedures that will be followed to ensure that shot firing operations on site take place without endangering the workforce or public.
- Sufficient angular stemming material will be used to confine the explosive force and minimise environmental disturbance caused by venting / misfire.
- The detonators will be connected in a predetermined sequence to ensure that only one charge is detonated at any one time and a NONEL or similar type initiation system will be used.

-
- The detonation delay sequence shall be designed so as to ensure that firing of the holes is in the direction of free faces so as to minimise vibration effects.
 - Appropriate blasting techniques shall be adopted such that the predicted peak particle velocity shall not exceed 8 mm/s.
 - Vibration monitoring will be carried out every 6 months to check the efficacy of blasting practices

4.5 ECOLOGY AND BIODIVERSITY

4.5.1 Impact Identification and Evaluation

In general, impact prediction methods argue that the foremost step in impact appraisal must consider and identify project actions that are likely to bring significant changes in the project environment. The present study determined to predict the likely impacts of the Proposed Rough stone and Gravel quarry, mining Project in the surrounding environment with a specific focus on biological attributes covering habitats/ecosystems and associated biodiversity. Likely impacts identified were categorized into different levels like direct or primary and indirect or secondary impacts based on the influence of sources of impacts.

4.5.2. Impact on Flora

The proposed mine lease area exhibits undulated topography and it is not fit for cultivation. It is mostly devoid of any considerable vegetation. The proposed mine lease area (core zone) does not encompass any designated forest land within it. The vegetation is very sparse and scanty. So, there will be no impact on flora from the mining operation. There will not be much contamination of soil or any other materials from the mining operation. No threatened plant species were reported in the core and buffer study area during the field survey.

4.5.2.1. Anticipated Impact of mining activity on local flora, fauna and agricultural land

1. Mining of rough stone involves clearing the flora and fauna in core zone. This can lead to habitat destruction for plant species and removal of trees from the site. However, the core zone contains widely occurring herbs, shrubs and trees. This must be compensated with suitable green belt development practices.
2. The excavation process can remove topsoil, which is crucial for plant growth. In some cases, this can lead to erosion, loss of soil fertility, and changes in soil structure, making it difficult for native plant species to thrive.
3. Mining activity can they destroy the natural habitats of various animal species. However, the proposed area is very small and the animals can migrate to buffer zone.
4. During the loading of the truck, dust generation will be likely to occur. This shall be a temporary effect and not anticipated to affect the surrounding vegetation significantly.

4.5.3 Mitigation Measures

4.5.3.1. General Guidelines for Green Belt Development

Drone survey was covered the green belt and fencing as per the terms of references. The green belt and plantation purposes in and around the proposed mine lease area native species, fruit-bearing trees, medicinal plants, and dense canopy trees should be selected. These species should be tolerant to pollution levels as per Bio- Geography zones of India.

After the operation of mining production capacity, Green belt and Plantation species should be in accordance with the Terms and Conditions of the Environmental Clearance Green belt is created not only for the purpose of protecting sensitive areas or maintaining the ecological balance but because they also act as efficient biological filters or sinks for particulate and gaseous emissions, generated by vehicular movements and various industrial and mining activities. Optimally designed green belts can be effective in reducing the impact of fugitive emissions and pollutants accidentally or otherwise released at ground levels.

4.5.3.2.Proposed Green Belt

Extensive green belt development will be started during the construction phase, which will continue till the operation of the plant. About 500 trees will be planted per hectare all around the quarry safety barrier, approach roads, and township premises. Locally available types of trees that are resistant to pollutants will be planted. In addition to the above, all open spaces available within the premises will be developed as nurseries, parks, gardens, and other forms of greenery. 5 m wide greenbelt will be developed along the plant premises, as per land available.

4.5.3.3. Guidelines & Techniques for Green Belt Development

An extensive survey of the project area was undertaken to observe the structure and composition of vegetation. Hence a combination of plants is selected depending upon the topographical suitability and species selected as per the SPCB Guideline and ToR. The soil characteristics were kept in mind. Based on this survey and environmental conditions suitable native plant species have been proposed for the green belt development plan.

4.5.3.4. Development of Green Belt

The plantation matrix adopted for the green belt development includes pit of 0.3 m x 0.3 m in size with a spacing of 2 m x 2 m. In addition, earth filling and manure may also be required for the proper nutritional balance and nourishment of the sapling. It is also recommended that the plantation has to be taken up randomly and the landscaping aspects could be taken into consideration. Multi-layered plantations comprising of medium height trees (7 m to 10 m) and shrubs (5 m height) are proposed for the green belt.

A greenbelt is a set of rows of trees planted in such a fashion, to create an effective barrier between the project and its surroundings. The greenbelt helps to capture fugitive emissions, attenuate the noise levels in the existing project, and simultaneously improve aesthetics of the surroundings.

4.5.3.5. Design of Green Belt

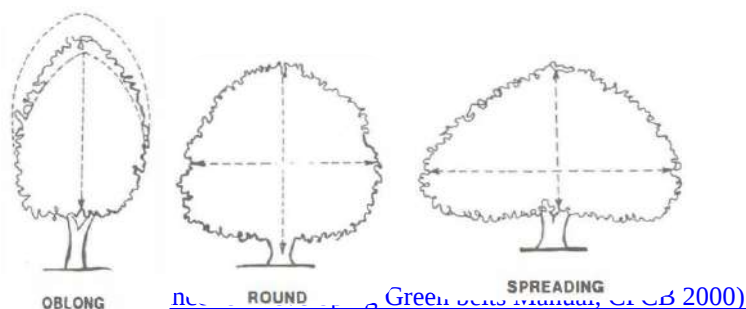
The present plan comprises the details of field investigations. Plant species for greenbelt development are selected as per CPCB guidelines. The green belt will be developed along the periphery of the Proposed Rough stone quarry. The greenbelt development plan has been formulated considering the parameters such as climate, soil types, topography, etc.

a. Characteristic features of plants to be used for Absorption of pollutant gases

- Plant species should be perennial and evergreen with thick canopy cover.
- The crown of the tree (mass of foliage/leaves and branches growing outward from the trunk of the tree) should be either Oblong, Round, or Spreading for effective absorption of pollutant gases.
- Plant should have foliage of longer duration.
- The foliage should be freely exposed through: Adequate height of crown, Openness of foliage/leaves in canopy, Big leaves (long and broad laminar surfaces).

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 was planted as given in the table No 4.1 & 4.2 in consulted with the DFO. The plant species with dense/moderate canopy of native origin was chosen are given below. Species of small/ medium/tall trees alternating with shrubs was planted.

- Plants that grow fast will be preferred.
- Preference for high canopy covers plants with local varieties.
- Perennial and evergreen plants will be preferred.
- The development of the Green Belt is an important aspect for any plant because:
 - a. It improves the ambient air quality by controlling Suspended Particulate Matter (SPM) in the air.
 - b. It helps in noise abatement for the surrounding area.
 - c. It helps in the settlement of new birds and insects within itself.
 - d. It maintains the ecological balance.
 - e. It increases the aesthetic value of the site.



. List of plant species proposed for Greenbelt development

S. No	Scientific name	Tamil Name
1	<i>Aegle marmelos</i>	Vilva maram

2	<i>Albizia lebbeck</i>	Vaagai maram
3	<i>Cassia fistula</i>	Konrai tree
4	<i>Lannea coromandelica</i>	Othiyam
5	<i>Limonia acidissima</i>	Vila maram
6	<i>Syzygium cumini</i>	Naval maram
8	<i>Ficus hispida</i>	Aththi maram
9	<i>Borassus flabellifer</i>	Panai-maram
10	<i>Madhuca longifolia</i>	Illupai maram
11	<i>Pongamia pinnata</i>	Pongamaram
12	<i>Cassia roxburghi</i>	Sengondrai

(*Source: Term of Reference-ToR)

Species suitable for abatement of noise and dust pollution

S. No	Botanical name	Common name
1	<i>Azadirachta indica</i>	Vembhu maram
2	<i>Ficus religiosa</i>	Arasan maram
3	<i>Ficus hispida</i>	Aththi maram
4	<i>Bombax ceiba</i>	Mul Elavu
5	<i>Syzygium cumini</i>	Naval maram
6	<i>Tamarindus indica</i>	Puliyamaram
7	<i>Mangifera indica</i>	Manga maram
8	<i>Harwickia binata</i>	Anjan maram
9	<i>Delonix regia</i>	Neruppu Kondrai
10	<i>Cassia fistula</i>	Sara Kondrai

(*Source: Guidance for Developing Green belts Manual, CPCB 2000)

The above-suggested list covers species with thick canopy cover, perennial green nature, native origin, and a large leaf area index. The proposed species will help in forming an effective barrier between the mine site area and the surroundings.

These species need to be planted along the periphery of the lease area for absorb fugitive emissions and noise levels which is generated during mining activities. All the open spaces, where tree plantation may not be possible, should be covered with shrubs and grass to prevent erosion of topsoil.

- ✓ Planting of trees in each row will be in staggered orientation.
- ✓ In the front row, shrubs will be grown.
- ✓ Since the trunks of the tall trees are generally devoid of foliage, it will be useful to have shrubs in front of the trees so as to give coverage to this portion.
- ✓ The spacing between the trees will be maintained slightly less than the normal spaces, so that the trees may grow vertically and slightly increase the effective height of the green belt.

4.5.4. Anticipated Impact on Fauna

- Since the terrestrial fauna in the study area are distributed away from the mine site, the impacts of project are likely to be much low on terrestrial fauna of the region. The proposed mining lease area is devoid of any significant vegetation, it is not suitable for permanent habitat for any specific wildlife.
- Habitat degradation and disturbance to faunal group due to ground vibration and increase in noise level will be minimize or resolved by modern technologies. So, from above facts it is revealed that there will be no impact on fauna. No threatened fauna species reported in the core and buffer study area.

4.5.4.1. Measures for protection and conservation of wildlife species

- Topsoil has a large number of seeds of native plant species in the mining area.
- Topsoil will be used for restoration and suitable surfaces for planted seedlings.
- Checks and controls the movement of vehicles in and out of the mine.
- Undertaking mitigative measures for a conducive environment to the flora and fauna in consultation with Forest Department.
- A dust suppression system will be installed within the mine and periphery of the mine.
- Plantation around the mine area will help in creating habitats for small faunal species and create a better environment for various fauna. Creating and developing awareness for nature and wildlife in the adjoining villages.

4.5.3. Impact on Aquatic Biodiversity

Mining activities will not disturb the aquatic ecology as there is no effluent discharge proposed Rough stone quarry. There is no natural perennial surface water body within the mine lease area, like wetlands, rivers streams, lakes, and farmer sites. There is no impact on fish habitats and the food WEB/ food chain in the water body and Reservoir. Kindly refer the clause no 3.6.3. Aquatic biodiversity is observed in the study area.

4.5.4. Impacts on Bird Fauna:

The project does not involve any tree felling or removal of vegetation. Therefore, there may not be loss of nesting and roosting habitat of avian fauna.

4.5.5. Impacts on wildlife

There is no National Park, Biosphere Reserve, Wildlife corridors, and Tiger/Elephant Reserve found within 10 km radius of the project site.

Overall Ecological impact assessments

S.No	Attributes	Assessment
1	Impact of mining activity on agricultural land nearby the proposed project site.	Agricultural land is located away from the proposed project site. Mostly around the project site <i>Cocus nucifera</i> tree is planted. There are no impacts on the agricultural land

		& Horticulture. Kindly refer to the conclusion.
	Activities of the project affect the breeding/nesting sites of birds and animals	No breeding and nesting site was identified in the mining lease site. The fauna sighted mostly migrated from the buffer area.
2	Located near an area populated by rare or endangered species	No Endangered, Critically Endangered, or vulnerable species were sighted in the core mining lease area.
3	Proximity to national park/wildlife sanctuary/reserve forest /mangroves/ coastline/estuary/sea	Bolampatti I R.F has located about 8 km on the Northwest side of the area. Indira Gandhi (Anamalai) Wildlife Sanctuary is located 28.2km on the Southern side of the area.
4	The proposed project restricts access to waterholes for wildlife	‘No ‘
5	Proposed mining project impact surface water quality that also provides water to wildlife	‘No ‘scheduled or threatened wildlife animals are sighted regularly core in the core area.
6	Proposed mining project increase siltation that would affect nearby biodiversity areas.	Surface runoff management such as drains is constructed properly so there will be no siltation effect in the nearby mining area.
7	Risk of fall/slip or cause death to wild animals due to project activities.	‘No‘
8	The project release effluents into a water body that also supplies water to a wildlife.	No water body near to core zone so the chances of water becoming polluted is low.
9	Mining projects affect the forest-based livelihood/ any specific forest product on which local livelihood depended.	‘No‘
10	The project likely to affect migration routes.	‘No ‘migration route was observed during the monitoring period.
11	The project is likely to affect the flora of an area, which have medicinal value	‘No‘
12	Forestland is to be diverted, has carbon high sequestration.	‘No ‘There was no forest land diverted.
13	The project is likely to affect wetlands, Fish breeding grounds, and marine ecology.	‘No‘. Wetland was not present in the near core Mining lease area. No breeding and nesting ground is present in the core mining area.

TABLE 4.12: GREENBELT DEVELOPMENT PLAN

Year	No.of trees proposed to be planted	Area to be covered sq.m	Name of the species
I	610	Along safety distance, panchayat road and approach road	Neem, Poovarasu,Pungam, Naval etc,

TABLE 4.13: BUDGET FOR GREENBELT DEVELOPMENT PLAN

S.No	Details of work	Year wise details plantation for each area		
		1st year	Total No. plants (5years)	Total Cost (Rs.)
1	Sapling of plant (Approximately cost @ INR 200 per sapling/ plant).	610	610	1,22,000.00
2	Maintenance (Rs.) (Manuring, Fertilizer, Insecticide application, watchman etc.)	Cost (Rs. 10000/-) per year for five-year period		
		Total		
				1,72,000.00

After complete extraction of mineral, the pit will be allowed to collect rain and seepage water to serve as a reservoir to charge the nearby wells. Fish culture will also be attempted. A bund will be constructed around the pits. In order to minimize the impact of mining on the vegetation outside the mine lease area, it is recommended that adequate protection measures must be implemented. As mining involves movement of vehicles and increased anthropogenic activities, some of the areas can be fenced by involving local people and educating them about increased benefits of such activities.

TABLE 4.14: ANTICIPATED IMPACT OF ECOLOGY AND BIODIVERSITY

Sl. No	Aspect Description	Likely Impacts on Ecology and Biodiversity (EB)	Impact Consequence - Probability Description / Justification	Significance	Mitigation Measures
Pre-Mining Phase					
1	Uprooting of vegetation of lease area	Site specific loss of common floral diversity (Direct impact)	Site possesses common floral (not trees) species. Clearance of these species will not result in loss of flora	Less severe	No immediate action required. However, Greenbelt /plantation will be developed in project site and in periphery of the project boundary, which will improve flora and fauna diversity of the project area.
		Site specific loss of associated faunal diversity (Partial impact)	Site supports only common species, which use wide variety of habitats of the buffer zone reserve forest area. So, there is no threat of faunal diversity.		

		-Loss of Habitat (Direct impact)	Site does not form Unique / critical habitat structure for unique flora or fauna.		
Mining phase					
2	Excavation of mineral using machine and labours, Transportation activities will generate noise.	Site-specific disturbance to normal faunal movements at the site due to noise. (Partial impact)	Site does not form unique / critical habitat structure for unique flora or fauna.	Less severe	Mining activity should not be operated after 5PM. Excavation of dump and transportation work should stop before 7PM.
3	Vehicular Movement for transportation of materials will result in generation of dust (SPM) due to haul roads and emission of SO ₂ ,NO ₂ ,CO etc.	Impact on surrounding agriculture and associated fauna due to deposition of dust and Emission of CO. (Indirect impact)	Impact is less as the agricultural land far from core area.	Less severe	All vehicles will be certified for appropriate Emission levels. More plantation has been suggested Upgrade the vehicles with alternative fuel such as biodiesel, methanol and biofuel around the mining area.

4.6 SOCIO ECONOMIC

4.6.1 Anticipated Impact from Proposed Project

- Dust generation from mining activity can have negative impact on the health of the workers and people in the nearby area.
- Approach roads can be damaged by the movement of tippers
- Increase in Employment opportunities both direct and indirect thereby increasing economic status of people of the region.

4.6.2 Common Mitigation Measures for Proposed Project

- Good maintenance practices will be adopted for all 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.
- 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, duties, etc., from this project directly and indirectly.
- From above details, the quarry operations will have highly beneficial positive impact in the area

4.7 OCCUPATIONAL HEALTH AND SAFETY

Occupational health and safety hazards occur during the operational phase of mining and primarily include the following:

- Respiratory hazards
- Noise
- Physical hazards
- Explosive storage and handling

4.7.1 Respiratory Hazards

Long-term exposure to silica dust may cause silicosis the following measures are proposed:

- Cabins of excavators and tippers will be enclosed with AC and sound proof
- Use of personal dust masks will be made compulsory

4.7.2 Noise

Workers are likely to get exposed to excessive noise levels during mining activities. The following measures are proposed for implementation

- No employee will be exposed to a noise level greater than 85 dB(A) for a duration of more than 8 hours per day without hearing protection
- The use of hearing protection will be enforced actively when the equivalent sound level over 8 hours reaches 85 dB(A), the peak sound levels reach 140 dB(C), or the average maximum sound level reaches 110 dB(A)
- Ear muffs provided will be capable of reducing sound levels at the ear to at least 85 dB(A)
- Periodic medical hearing checks will be performed on workers exposed to high noise levels

4.7.3 Physical Hazards

The following measures are proposed for control of physical hazards

- Specific personnel training on work-site safety management will be taken up;
- Work site assessment will be done by rock scaling of each surface exposed to workers to prevent accidental rock falling and / or landslide, especially after blasting activities;
- Natural barriers, temporary railing, or specific danger signals will be provided along rock benches or other pit areas where work is performed at heights more than 2m from ground level;
- Maintenance of yards, roads and footpaths, providing sufficient water drainage and preventing slippery surfaces with an all-weather surface, such as coarse gravel will be taken up

4.7.4 Occupational Health Survey

All the persons will undergo pre-employment and periodic medical examination. Employees will be monitored for occupational diseases by conducting the following tests

- General physical tests
- Audiometric tests
- Full chest, X-ray, Lung function tests, Spirometry tests
- Periodic medical examination – yearly
- Lung function test – yearly, those who are exposed to dust
- Eye test

Essential medicines will be provided at the site. The medicines and other test facilities will be provided at free of cost. The first aid box will be made available at the mine for immediate treatment.

First aid training will be imparted to the selected employees regularly. The lists of first aid trained members shall be displayed at strategic places.

4.8 MINE WASTE MANAGEMENT

No waste is anticipated from any of the proposed quarries.

4.9 MINE CLOSURE

Mine closure plan is the most important environmental requirement in mining projects. The mine closure plan should cover technical, environmental, social, legal and financial aspects dealing with progressive and post closure activities. The closure operation is a continuous series of activities starting from the decommissioning of the project. Therefore, progressive mine closure plan should be specifically dealt with in the mining plan and is to be reviewed along with mining plan. As progressive mine closure is a continuous series of activities, it is obvious that the proposals of scientific mining have included most of the activities to be included in the closure plan. While formulating the closure

objectives for the site, it is important to consider the existing or the pre-mining land use of the site; and how the operation will affect this activity.

The primary aim is to ensure that the following broad objectives along with the abandonment of the mine can be successfully achieved:

- To create a productive and sustainable after-use for the site, acceptable to mine owners, regulatory agencies, and the public
- To protect public health and safety of the surrounding habitation
- To minimize environmental damage
- To conserve valuable attributes and aesthetics
- To overcome adverse socio-economic impacts.

4.9.1 Mine Closure Criteria

The criteria involved in mine closure are discussed below:

4.9.1.1 Physical Stability

All anthropogenic structures, which include mine workings, buildings, rest shelters etc., remaining after mine decommissioning should be physically stable. They should present no hazard to public health and safety as a result of failure or physical deterioration and they should continue to perform the functions for which they were designed. The design periods and factors of safety proposed should take full account of extreme events such as floods, hurricane, winds or earthquakes, etc. and other natural perpetual forces like erosion, etc.,

4.9.1.2 Chemical Stability

The solid wastes on the mine site should be chemically stable. This means that the consequences of chemical changes or conditions leading to leaching of metals, salts or organic compounds should not endanger public health and safety nor result in the deterioration of environmental attributes. If the pollutant discharges likely to cause adverse impacts is predicted in advance, appropriate mitigation measures like settling of suspended solids or passive treatment to improve water quality as well as quantity, etc., could be planned. Monitoring should demonstrate that there is no adverse effect of pollutant concentrations exceeding the statutory limits for the water, soil and air qualities in the area around the closed mine.

4.9.1.3 Biological Stability

The stability of the surrounding environment is primarily dependent upon the physical and chemical characteristics of the site, whereas the biological stability of the mine site itself is closely related to rehabilitation and final land use. Nevertheless, biological stability can significantly influence physical or chemical stability by stabilizing soil cover, prevention of erosion/wash off, leaching, etc.,

A vegetation cover over the disturbed site is usually one of the main objectives of the rehabilitation programme, as vegetation cover is the best long-term method of stabilizing the site. When the major earthwork components of the rehabilitation programme have been completed, the process of establishing a stable vegetation community begins. For re-vegetation, management of soil nutrient levels is an important consideration. Additions of nutrients are useful under three situations.

- Where the nutrient level of spread topsoil is lower than material in-situ e.g. for development of social forestry
- Where it is intended to grow plants with a higher nutrient requirement than those occurring naturally e.g. planning for agriculture
- Where it is desirable to get a quick growth response from the native flora during those times when moisture is not a limiting factor e.g. development of green barriers

The Mine closure plan should be as per the approved mine plan. The mine closure is a part of approved mine plan and activities of closure shall be carried out as per the process described in mine closure plan.

5. ANALYSIS OF ALTERNATIVES (TECHNOLOGY AND SITE)

5.0 INTRODUCTION

Consideration of alternatives to a project proposal is a requirement of EIA process. During the scoping process, alternatives to a proposal can be considered or refined, either directly or by reference to the key issues identified. A comparison of alternatives helps to determine the best method of achieving the project objectives with minimum environmental impacts or indicates the most environmentally friendly and cost-effective options.

5.1 FACTORS BEHIND THE SELECTION OF PROJECT SITE

Thiru.A.Subramaniam Rough Stone and Gravel Quarry Project at Sokkanur Village is a mining project for excavation of Rough Stone, which is site specific. The proposed project has following advantages: -

- It is an existing quarry already mining operation is carried out
- The mineral deposit occurs in a non-forest area.
- There is no habitation within the project area; hence no R & R issues exist.
- Availability of skilled, semi-skilled and unskilled workers in this region.
- All the basic amenities such as medical, firefighting, education, transportation, communication and infrastructural facilities are well connected and accessible.
- The mining operations will not intersect the ground water level. Hence, no impact on ground water environment.
- Study area falls in seismic zone – II, there is no major history of landslides, earthquake, subsidence etc., recorded in the past history.

5.2 ANALYSIS OF ALTERNATIVE SITE

No alternatives are suggested as all the mine sites are mineral specific

5.3 FACTORS BEHIND SELECTION OF PROPOSED TECHNOLOGY

Mechanized open cast mining operation with drilling and blasting method will be used to extract Rough Stone in the area. All the applied mining lease areas have following advantages –

- As the mineral deposition is homogeneous and batholith formation, therefore opencast method of working is preferred over underground method
- The material will be loaded with the help of excavators into dumpers / trippers and transported to the needy customers.
- Blasting and availability of drills along with controlled blasting technology gives desired fragmentation so that the mineral is handled safely and used without secondary blasting.
- Semi-skilled labours fit for quarrying operations are easily available around the nearby villages.

5.4 ANALYSIS OF ALTERNATIVE TECHNOLOGY

Open cast mechanized method is being practiced in this project. This technology is having least gestation period, economically viable, safest and less labour intensive. The method has inbuilt flexibility for increasing or decreasing the production as per market condition.

6. ENVIRONMENTAL MONITORING PROGRAMME

6.0 GENERAL

The monitoring and evaluation of environmental parameters indicates potential changes occurring in the environment, which paves way for implementation of rectifying measures wherever required to maintain the status of the natural environment. Evaluation is also a very effective tool to judge the effectiveness or deficiency of the measures adopted and provides insight for future corrections.

The main objective of environmental monitoring is to ensure that the obtained results in respect of environmental attributes and prevailing conditions during operation stage are in conformity with the prediction during the planning stage. In case of substantial deviation from the earlier prediction of results, this forms as base data to identify the cause and suggest remedial measures. Environmental monitoring is mandatory to meet compliance of statutory provisions under the Environment (Protection) Act, 1986, relevant conditions regarding monitoring covered under EC orders issued by the SEIAA as well as the conditions set forth under the order issued by Tamil Nadu Pollution Control Board while granting CTO.

6.1 METHODOLOGY OF MONITORING MECHANISM

Implementation of EMP and periodic monitoring will be carried out by Project Proponent. A comprehensive monitoring mechanism has been devised for monitoring of impacts due to proposed project; Environmental protection measures like dust suppression, control of noise and blast vibrations, maintenance of machinery and vehicles, housekeeping in the mine premises, plantation, implementation of Environmental Management Plan and environmental clearance conditions will be monitored by the Respective Mine Management. On the other hand, implementation of area level protection measures like green belt development, environmental quality monitoring etc., are taken up by a senior executive who reports to their Mine Management.

An Environment monitoring cell (EMC) will be constituted to monitor the implementation of EMP and other environmental protection measures in all the proposed quarries.

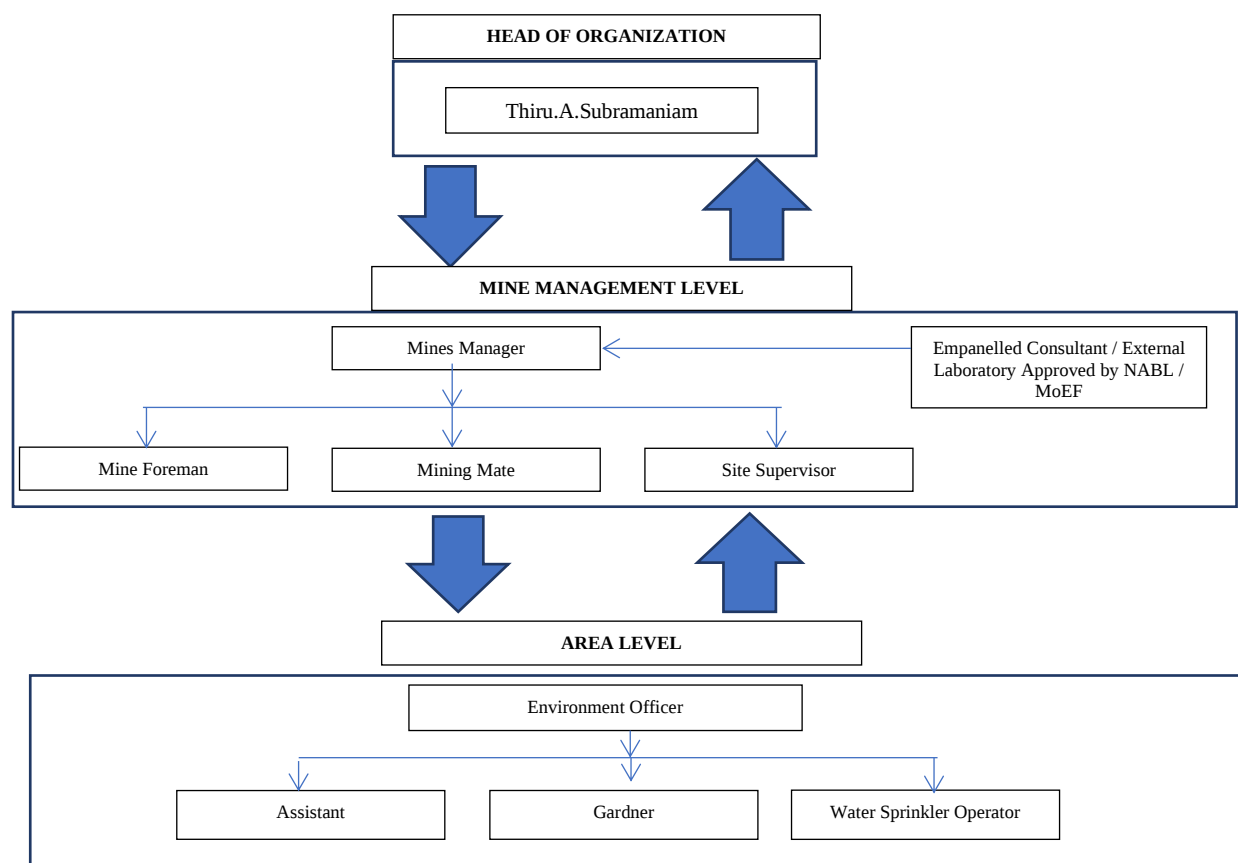
The responsibilities of this cell will be:

- Implementation of pollution control measures
- Monitoring programme implementation
- Post-plantation care
- To check the efficiency of pollution control measures taken
- Any other activity as may be related to environment
- Seeking expert's advice when needed.

The environmental monitoring cell will co-ordinate all monitoring programs at site and data thus generated will be regularly furnished to the State regulatory agencies as compliance status reports.

The sampling and analysis report of the monitored environmental attributes will be submitted to the Tamil Nadu Pollution Control Board (TNPCB) at a frequency of half-yearly and yearly by each proposed project proponent. The half-yearly reports are submitted to Ministry of Environment and Forest, Regional Office and SEIAA as well.

The sampling and analysis of the environmental attributes will be as per the guidelines of Central Pollution Control Board (CPCB)/Ministry of Environment, Forest and Climate Change (MoEF & CC).

FIGURE 6.1: PROPOSED ENVIRONMENTAL MONITORING CELL

6.2 IMPLEMENTATION SCHEDULE OF MITIGATION MEASURES

The mitigation measures proposed in Chapter-4 will be implemented so as to reduce the impact on the environment due to the operations of the proposed project. Implementation schedule of mitigation measures is given in Table 6.1.

TABLE 6.1 IMPLEMENTATION SCHEDULE

SI No.	Recommendations	Time Period	Schedule
1	Land Environment Control Measures	Before commissioning of the project	Immediately after the commencement of project
2	Soil Quality Control Measures	Before commissioning of the project	Immediately after the commencement of project
3	Water Pollution Control Measures	Before commissioning of the project and along with mining operation	Immediately and as project progress
4	Air Pollution Control Measures	Before commissioning of the project and along with mining operation	Immediately and as project progress
5	Noise Pollution Control Measures	Before commissioning of the project and along with mining operation	Immediately and as project progress
6	Ecological Environment	Phase wise implementation every year along with mine operations	Immediately and as project progress

6.3 MONITORING SCHEDULE AND FREQUENCY

Monitoring shall confirm that commitments are being met. This may take the form of direct measurement and recording of quantitative information, such as amounts and concentrations of discharges, emissions and wastes, for measurement against statutory standards. Monitoring may include socio-economic interaction, through local liaison activities or even assessment of complaints.

The environmental monitoring will be conducted in the mine operations as follows:

- Air quality;
- Water and wastewater quality;
- Noise levels;
- Soil Quality; and
- Greenbelt Development

The details of monitoring are detailed in Table 6.2

TABLE 6.2: PROPOSED MONITORING SCHEDULE POST EC

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	Monitoring water level depth variations
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

Source: Guidance of manual for mining of minerals, February 2010

6.4 BUDGETARY PROVISION FOR EMP

The cost in respect of monitoring of environmental attributes, parameter to be monitored, sampling/monitoring locations with frequency and cost provision against each proposal is shown in Table 6.3. Monitoring work will be outsourced to external laboratory approved by NABL / MoEF.

The proposed capital cost for Environmental Monitoring Programme is Rs 76,000/- and the recurring cost is Rs 76,000/- per annum.

TABLE 6.3 ENVIRONMENT MONITORING BUDGET

Sl.No.	Parameter	Capital Cost	Recurring Cost per annum
1	Air Quality	Rs. 76,000/-	Rs. 76,000/-
2	Meteorology		
3	Water Quality		
4	Hydrology		
5	Soil Quality		
6	Noise Quality		
7	Vibration Study		
Total		Rs 76,000/-	Rs 76,000/-

Source: Approved Mining Plan

6.5 REPORTING SCHEDULES OF MONITORED DATA

The monitored data on air quality, water quality, noise levels and other environmental attributes will be periodically examined by the Mine Management Coordinator and Head of Organization for taking necessary corrective measures. The monitoring data will be submitted to Tamil Nadu State Pollution Control Board in the Compliance to CTO Conditions & environmental audit statements every year to MoEF & CC and Half-Yearly Compliance Monitoring Reports to MoEF & CC Regional Office and SEIAA.

Periodical reports to be submitted to: -

- MoEF & CC – Half yearly status report
- TNPCB - Half yearly status report
- Department of Geology and Mining: quarterly, half yearly annual reports

Besides the Mines Manager/Agent of respective project will submit the periodical reports to –

- Director of mines safety,
- Labour enforcement officer,
- Controller of explosives as per the norms stipulated by the department.

7. ADDITIONAL STUDIES

7.0 GENERAL

The following Additional Studies were done as per items identified by project proponent and items identified by regulatory authority. And items identified by public and other stakeholders will be incorporated after Public Hearing.

- Public Consultation
- Risk Assessment
- Disaster Management Plan
- Cumulative Impact Study
- Plastic Waste Management

7.1. PUBLIC CONSULTATION

Application to The Member Secretary of the Tamil Nadu Pollution Control Board (TNPCB) to conduct Public Hearing in a systematic, time bound and transparent manner ensuring widest possible public participation at the project site or in its close proximity in the district is submitted along with this Draft EIA / EMP Report and the outcome of public hearing proceedings will be detailed in the Final EIA/EMP Report.

7.2 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 in order 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 for all proposed projects. Risk Assessment is all about prevention of accidents and to take necessary steps to prevent it from happening.

Factors of risks involved due to human induced activities in connection with these proposed mining & allied activities with detailed analysis of causes and control measures for the mine is given in below Table 7.1.

TABLE 7.1 RISK ASSESSMENT& CONTROL MEASURES

S. No	Risk factors	Causes of risk	Control measures
1	Accidents due to explosives and heavy mining machineries	Improper handling and unsafe working practice	All safety precautions and provisions of Mine Act, 1952, Metalliferous Mines Regulation, 1961 and Mines Rules, 1955 will be strictly followed during all mining operations; Workers will be sent to the Training in the nearby Group Vocational Training Centre Entry of unauthorized persons will be prohibited; Fire-fighting and first-aid provisions in the mine office complex and mining area; Provisions of all the safety appliances such as safety boot, helmets, goggles etc. will be made available to the employees and regular check for their use Working of quarry, as per approved plans and regularly updating the mine plans; Cleaning of mine faces on daily basis shall be daily done in order to avoid any overhang or undercut; Handling of explosives, charging and firing shall be carried out by competent persons only under the supervision of a Mine Manager;

			Maintenance and testing of all mining equipment as per manufacturer's guidelines.
2	Drilling	Improper and unsafe practices Due to high pressure of compressed air, hoses may burst Drill Rod may break	Safe operating procedure established for drilling (SOP) will be strictly followed. Only trained operators will be deployed. No drilling shall be commenced in an area where shots have been fired until the blaster/blasting foreman has made a thorough Examination of all places, Drilling shall not be carried on simultaneously on the benches at places directly one above the other. Periodical preventive maintenance and replacement of worn-out accessories in the compressor and drill equipment as per operator manual. All drills unit shall be provided with wet drilling shall be maintained in efficient working in condition. Operator shall regularly use all the personal protective equipment.
4	Blasting	Fly rock, ground vibration, Noise and dust. Improper charging, stemming & Blasting/fining of blast holes Vibration due to movement of vehicles	Restrict maximum charge per delay as per regulations and by optimum blast hole pattern, vibrations will be controlled within the permissible limit and blasting can be conducted safely. SOP for Charging, Stemming & Blasting/Firing of Blast Holes will be followed by blasting crew during initial stage of operation Shots are fired during daytime only. All holes charged on any one day shall be fired on the same day. The danger zone will be distinctly demarcated (by means of red flags)
5	Transportation	Potential hazards and unsafe workings contributing to accident and injuries Overloading of material While reversal & overtaking of vehicle Operator of truck leaving his cabin when it is loaded.	Before commencing work, drivers personally check the dumper/truck/tipper for oil(s), fuel and water levels, tyre inflation, general cleanliness and inspect the brakes, steering system, warning devices including automatically operated audio-visual reversing alarm, rear view mirrors, side indicator lights etc., are in good condition. Not allow any unauthorized person to ride on the vehicle nor allow any unauthorized person to operate the vehicle. Concave mirrors should be kept at all corners All vehicles should be fitted with reverse horn with one spotter at every tipping point Loading according to the vehicle capacity Periodical maintenance of vehicles as per operator manual
6	Natural calamities	Unexpected happenings	Escape Routes will be provided to prevent inundation of storm water Fire Extinguishers & Sand Buckets
7	Failure of Mine Benches and Pit Slope	Slope geometry, Geological structure	Ultimate or over all pit slope shall be below 60° and each bench height shall be 5m height.

Source: Analysed and Proposed by FAE & EC

7.3 DISASTER MANAGEMENT PLAN

Natural disasters like Earthquake, Landslides have not been recorded in the past history as the terrain is categorized under seismic zone II. The area is far away from the sea hence the disaster due to heavy floods and tsunamis are not anticipated

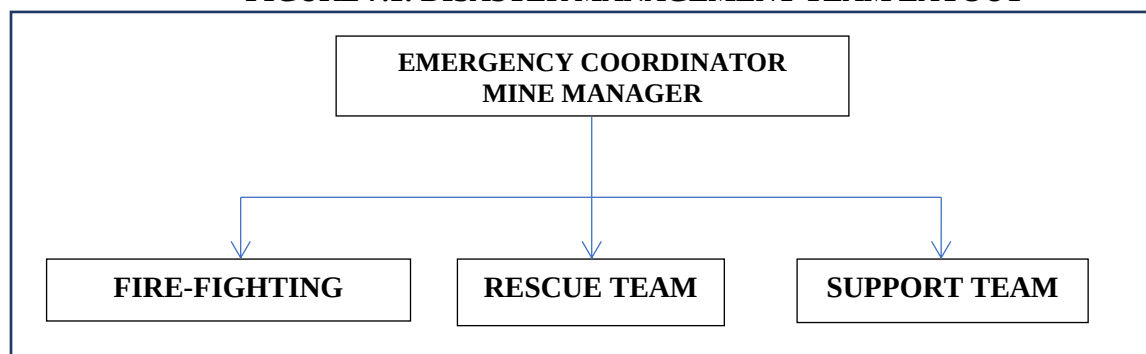
The Disaster Management Plan is aimed to ensure safety of life, protection of environment, protection of installation, restoration of production and salvage operations in this same order of priorities.

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.

In case a disaster takes place, despite preventive actions, disaster management will have to be done in line with the descriptions below. There is an organization proposed for dealing with the emergency situations and the coordination among key personnel and their team has been shown in Fig 7.1.

FIGURE 7.1: DISASTER MANAGEMENT TEAM LAYOUT



The emergency organization shall be headed by emergency coordinator who will be qualified competent mine manager. In his absence senior most people available at the mine shall be emergency coordinator till arrival of mine manager. There would be three teams for taking care of emergency situations – Fire-Fighting Team, Rescue Team and Support Team. The proposed composition of the teams is given in Table 7.2.

TABLE 7.2: PROPOSED TEAMS TO DEAL WITH EMERGENCY SITUATION

DESIGNATION	QUALIFICATION
FIRE-FIGHTING TEAM	
Team Leader/ Emergency Coordinator (EC)	Mines Manager
Team Member	Mines Foreman
Team Member	Mining Mate
RESCUE TEAM	
Team Leader/ Emergency Coordinator (EC)	Mines Manager
Team Member/ Incident Controller (IC)	Environment Officer
Team Member	Mining Foreman
SUPPORT TEAM	
Team Leader/ Emergency Coordinator (EC)	Mines Manager
Assistant Team Leader	Environment Officer
Team Member	Mining Mate
Security Team Leader/ Emergency Security Controller	Mines Foreman

Once the mine becomes operational, the above table along with names of personnel will be prepared and made easily available to workers for respective proposed quarries. A mobile communication network and wireless shall connect Mine Emergency Control Room (MECR) to control various departments of the mine, fire station and neighbouring industrial units/mines.

Roles and responsibilities of emergency team –

(a) Emergency coordinator (EC)

The emergency coordinator shall assume absolute control of site and shall be located at MECR.

(b) Incident controller (IC)

Incident controller shall be a person who shall go to the scene of emergency and supervise the action plan to overcome or contain the emergency. Shift supervisor or Environmental Officer shall assume the charge of IC.

(c) Communication and advisory team

The advisory and communication team shall consist of heads of Mining Departments i.e., Mines Manager

(d) Roll call coordinator

The Mine Foreman shall be Roll Call Coordinator. The roll call coordinator will conduct the roll call and will evacuate the mine personnel to assembly point. His prime function shall be to account for all personnel on duty.

(e) Search and rescue team

There shall be a group of people trained and equipped to carryout rescue operation of trapped personnel. The people trained in first aid and fire-fighting shall be included in search and rescue team.

(f) Emergency security controller

Emergency Security Controller shall be senior most security person located at main gate office and directing the outside agencies e.g. fire brigade, police, doctor and media men etc.,

Emergency control procedure –

The onset of emergency, will in all probability, commence with a major fire or explosion or collapse of wall along excavation and shall be detected by various safety devices and also by members of operational staff on duty. If located by a staff member on duty, he (as per site emergency procedure of which he is adequately briefed) will go to nearest alarm call point, break glass and trigger off the alarms. He will also try his best to inform about location and nature of accident to the emergency control room. In accordance with work emergency procedure the following key activities will immediately take place to interpret and take control of emergency.

- On site fire crew led by a fireman will arrive at the site of incident with fire foam tenders and necessary equipment.
- Emergency security controller will commence his role from main gate office
- Incident controller shall rush to the site of emergency and with the help of rescue team and will start handling the emergency.
- Site main controller will arrive at MECR with members of his advisory and communication team and will assume absolute control of the site.
- He will receive information continuously from incident controller and give decisions and directions to:
 - Incident controller
 - Mine control rooms
 - Emergency security controller

Proposed fire extinguishers at different locations –

The following type of fire extinguishers has been proposed at strategic locations within the mine.

TABLE 7.3: PROPOSED FIRE EXTINGUISHERS AT DIFFERENT LOCATIONS

LOCATION	TYPE OF FIRE EXTINGUISHERS
Electrical Equipment's	CO ₂ type, foam type, dry chemical powder type

Fuel Storage Area	CO ₂ type, foam type, dry chemical powder type, Sand bucket
Office Area	Dry chemical type, foam type

Alarm system to be followed during disaster –

On receiving the message of disaster from Site Controller, fire-fighting team, the mine control room attendant will sound siren wailing for 5 minutes. Incident controller will arrange to broadcast disaster message through public address system. On receiving the message of "Emergency Over" from Incident Controller the emergency control room attendant will give "All Clear Signal", by sounding alarm straight for 2 minutes.

The features of alarm system will be explained to one and all to avoid panic or misunderstanding during disaster. In order to prevent or take care of hazard / disasters if any the following control measures have been adopted.

- All safety precautions and provisions of Metalliferous Mines Regulations (MMR), 1961 is strictly followed during all mining operations.
- Observance of all safety precautions for blasting and storage of explosives as per MMR 1961.
- Entry of unauthorized persons into mine & allied areas is completely prohibited.
- Fire-fighting and first-aid provisions in the mines office complex and mining area are provided.
- Provisions of all the safety appliances such as safety boot, helmets, goggles, dust masks, ear plugs and ear muffs etc. are made available to the employees and the use of same is strictly adhered to through regular monitoring.
- Training and refresher courses for all the employees working in hazardous premises.
- Working of mine, as per approved plans and regularly updating the mine plans.
- Cleaning of mine faces is regularly done.
- Handling of explosives, charging and blasting are carried out only by qualified persons following SOP.
- Checking and regular maintenance of garland drains and earthen bunds to avoid any inflow of surface water in the mine pit.
- Provision of high-capacity standby pumps with generator sets with enough quantity of diesel for emergency pumping especially during monsoon.
- A blasting SIREN is used at the time of blasting for audio signal.
- Before blasting and after blasting, red and green flags are displayed as visual signals.
- Warning notice boards indicating the time of blasting and NOT TO TRESPASS are displayed at prominent places.
- Regular maintenance and testing of all mining equipment were carried out as per manufacturer's guidelines.

7.4 CUMULATIVE IMPACT STUDY

For easy representation of Proposed and Existing Quarries in the Cluster are given unique codes and identifies and studied in this EIA/ EMP Report.

TABLE 7.4: LIST OF QUARRIES WITHIN 500 METER RADIUS

*PROPOSED QUARRIES				
CODE	Name of the Owner	S.F. Nos	Extent	Status
P1	Thiru.A.Subramaniam	834/2(Part), Sokkanur	1.21.5 ha	File No.11525 TOR Identification No. TO24B0108TN5903516N Dated:23.10.2024
P2	Thiru. K.Mahalingam	816(P), 818, 819/1, 822/1(P), 822/2A(P), 824/1A	3.01.0 ha	Application is in Process
Total			4.22.5 ha	
*EXISTING QUARRY				
CODE	Name of the Owner	S.F. No	Extent	Status

E-1	N.K.Ravikumar	860/1D(P) & 893/1	1.21.0 ha	29.10.2021 – 28.10.2026
TOTAL			1.21.0 ha	
EXPIRED QUARRIES				
CODE	Name of the Owner	S.F. No	Extent	Status
EX-1	Thiru.S.Kavitha	859/3A1	1.09.0 ha	22.01.2019 – 21.01.2024
EX-2	Thiru.A.Subramaniam	894	1.01.5 ha	25.01.2019 – 24.01.2024
ABANDONED QUARRY				
Nil				
TOTAL CLUSTER EXTENT*			5.43.5 Ha	

- Cluster area is calculated as per MoEF & CC Notification – S.O. 2269 (E) Dated: 01.07.2016

TABLE 7.5: SALIENT FEATURES OF PROPOSAL “P1”

Name of the Quarry	Thiru. A. Subramaniam Rough stone and Gravel quarry	
Land Ownership	It is a Own Patta land,	
SF No & Area (Ha)	834/2 (Part) & 1.21.50 ha	
Village,Taluk & District	Sokkanur Village, Kinathukadavu Taluk, Coimbatore District.	
Toposheet No	58 B/13	
Latitude between	10°48'23.73"N to 10°48'28.30"N	
Longitude between	76°54'22.54"E to 76°54'26.67"E	
Highest Elevation	268m AMSL	
Proposed Depth of Mining	37m (2m Gravel + 35m Rough Stone) below the ground level	
Geological Resources	Rough Stone in m ³	Gravel m ³
	4,28,730 m³	25,492 m³
Mineable Reserves	Rough Stone in m ³	Gravel m ³
	1,24,456 m³	17,174 m³
Year wise Production	Rough Stone in m ³	Gravel m ³
	1,24,456 m³	17,174 m³
Ultimate Pit Dimension	XY-AB - 100m (L) x 73m (W) x 37m (D) bgl X1Y1-CD - 33m (L) x 39m (W) x 15m (D) bgl	
Water Level in the surrounds area	68 m – 73m bgl	
Method of Mining	Opencast Mechanized Mining Method involving drilling and blasting	
Topography	The lease applied area is exhibits undulated topography. The area has gentle sloping towards Northern side. The altitude of the area is 268m (max) above Mean Sea level. The area is covered by 2m thickness of Gravel formation. Massive Charnockite which is clearly inferred from the existing quarry pits.	
Machinery proposed	Jack Hammer	4 Nos
	Compressor	1 Nos
	Excavator with Bucket and Rock Breaker	1 No
	Tipper	2 Nos
	Water Sprinkling Tanker	1 Nos
Blasting Method	Controlled Blasting Method by shot hole drilling and small dia of 25mm slurry explosive are proposed to be used for shattering and heaving effect for removal and winning of Rough Stone. No deep hole drilling is proposed.	
Proposed Manpower Deployment	25 Nos	
Project Cost	Rs. 36,73,000/-	
EMP cost	Rs. 3,80,000/-	
CER Cost	Rs. 5,00,000/-	

Nearby Water Bodies	Vari	70m SE
	Kuttai	100m North
	Odai	400m NW
	Kumitipathi Stream	3.7km NW
	Walayar Reservoir	6km NW
Greenbelt Development Plan	It is proposed to plant 610 Nos of trees in the safety barrier and village road.	
Proposed Water Requirement	2.5 KLD	
Nearest Habitation	780m SouthEast	

Source: Approved Mining Plan

TABLE 7.6: SALIENT FEATURES OF PROPOSAL “E1”

Name of the Quarry	Thiru. N.K.Ravikumar Rough Stone & Gravel Quarry	
S.F.No	860/1D(P) & 893/1(P)	
Extent	1.21.0 Ha	
Toposheet No	58 B/13	
Latitude between	10°48'18.19"N to 10°48'21.44"N	
Longitude between	76°54'17.80"E to 76°54'22.68"E	
Proposed Depth of Mining	32 m bgl	
Proposed quantity of reserves for production in m ³	Rough Stone in m ³	Gravel m ³
	1,25,150	17,388
Method of Mining	Opencast Mechanized Mining Method involving drilling and blasting	
Topography	The lease applied area is flat Terrain. The area has gentle sloping towards Southeast side. The altitude of the area is 320 m above mean sea level. The area is covered by 2m thickness of Gravel with 2m weathered Rock and followed by Massive Charnockite is found after 4m (Gravel + Weathered Formation) which is clearly inferred from the existing quarrying pit.	
Machinery proposed	Jack Hammer	2 Nos
	Compressor	1 No
	Hydraulic Excavator	1 No
	Tippers	2 Nos
Blasting Method	Controlled Blasting Method by shot hole drilling and small dia of 25mm slurry explosive are proposed to be used for shattering and heaving effect for removal and winning of Rough Stone. No deep hole drilling is proposed.	
Proposed Manpower Deployment	24 Nos	
Project Cost	Rs.55,18,000/-	
CER Cost	Rs 1,38,000/-	
Greenbelt Development Plan	Proposed to plant 650 trees in the 7.5 m Safety Zone, Village Road & Panchayat Road	
Proposed Water Requirement	2.17 KLD	

Source: Approved Mining Plan

The Cumulative Impact is mainly anticipated due to drilling & blasting and excavation and transportation activities in all the quarries (proposed and existing) within the cluster and major impact anticipated is on Air & Noise Environment and Ground Vibrations due to blasting.

Air Environment –

Calculating the Cumulative Load of Mining within the cluster is as shown in table 7.16 & 7.17.

TABLE 7.7: CUMULATIVE PRODUCTION LOAD OF ROUGH STONE

Quarry	Production for five-year plan period	Per Year Production in m ³	Per Day Production in m ³	Number of Lorry Load Per Day
P1	1,24,456	24,891	82	7
E1	1,25,150	25,030	83	7

Grand Total	2,49,606	49,921	165	14
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TABLE 7.8: CUMULATIVE PRODUCTION LOAD OF GRAVEL

Quarry	Production for five-year plan period	Per Year Production in m ³	Per Day Production in m ³	Number of Lorry Load Per Day
P1	17,174	5,724	19	1
E1	17,388	5,796	19	1
Grand Total	34,562	11,520	38	2

On a cumulative basis considering the proposed quarries, it can be seen that the overall production of Rough Stone is 165m³ per day and overall production of Gravel is 38m³ per day with a capacity of 14 trips of Rough Stone per day and 2 Trips per day of Gravel from the cluster.

Note: Per day production of Rough Stone is calculated for 5 Years Lease Period and for Gravel production with 1 or 3 years of production period. And the load of existing quarries is covered under existing environment of the cluster.

Based on the above production quantities the emissions due to various activities in all the 11 mines includes various activities like ground preparation, excavation, handling and transport of ore. These activities have been analysed systematically basing on USEPA-Emission Estimation Technique Manual, for Mining AP-42, to arrive at possible emissions to the atmosphere and estimated emissions are given in Table 7.18.

TABLE 7.9: EMISSION ESTIMATION FROM QUARRIES WITHIN 500 METER RADIUS

EMISSION ESTIMATION FOR QUARRY "P1"				
Estimated Emission Rate for PM ₁₀	Activity	Source type	Value	Unit
	Drilling	Point Source	0.110336433	g/s
	Blasting	Point Source	0.003955571	g/s
	Mineral Loading	Point Source	0.045957025	g/s
	Haul Road	Line Source	0.00250414	g/s
	Overall Mine	Area Source	0.044670449	g/s
Estimated Emission Rate for SO ₂	Overall Mine	Area Source	0.001380823	g/s
Estimated Emission Rate for NO _x	Overall Mine	Area Source	0.000041332	g/s
EMISSION ESTIMATION FOR QUARRY "E1"				
Estimated Emission Rate for PM ₁₀	Activity	Source type	Value	Unit
	Drilling	Point Source	0.110520654	g/s
	Blasting	Point Source	0.003988703	g/s
	Mineral Loading	Point Source	0.045986404	g/s
	Haul Road	Line Source	0.002504281	g/s
	Overall Mine	Area Source	0.044619025	g/s
Estimated Emission Rate for SO ₂	Overall Mine	Area Source	0.001388435	g/s
Estimated Emission Rate for NO _x	Overall Mine	Area Source	0.000041420	g/s

Source: Emission Calculation

TABLE 7.10: INCREMENTAL & RESULTANT GLC WITHIN CLUSTER

PM ₁₀ in µg/m ³	
Background	24.2
Incremental	17.72
Resultant	41.92
NAAQ Norms	100 µg/m ³
PM _{2.5} in µg/m ³	
Background	43.4
Incremental	10.95
Resultant	54.35
NAAQ Norms	60 µg/ m ³

So2 in $\mu\text{g}/\text{m}^3$	
Background	19.8
Incremental	3.59
Resultant	23.39
NAAQ Norms	80 $\mu\text{g}/\text{m}^3$
No2 in $\mu\text{g}/\text{m}^3$	
Background	23.4
Incremental	11.85
Resultant	35.25
NAAQ Norms	80 $\mu\text{g}/\text{m}^3$

Noise Environment –

Noise pollution is mainly due to operation like drilling & blasting and plying of trucks & HEMM. Cumulative Noise modelling has been carried out considering blasting and compressor operation (drilling) and transportation activities. Predictions have been carried out to compute the noise level at various distances around the different quarries within the 500 m radius.

For hemispherical sound wave propagation through homogeneous loss free medium, one can estimate noise levels at various locations at different sources using model based on first principle.

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

Where:

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

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

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

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 7.11: PREDICTED NOISE INCREMENTAL VALUES FROM CLUSTER

Location ID	Background Value (Day) dB(A)	Incremental Value dB(A)	Total Predicted dB(A)	Residential Area Standards dB(A)
Proposed				
Habitation Near P1	46.8	42.3	48.1	55-45
Existing				
Habitation Near E1	47.0	40.1	47.8	

Source: Lab Monitoring Data

The incremental noise level is found within the range of 47.8 – 48.1 dB (A) in Buffer zone. The noise level at different receptors in buffer zone is lower due to the distance involved and other topographical features adding to the noise attenuation. 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, it can be seen that the ambient noise levels at all the locations near habitations are within permissible limits of Residential Area (buffer zone) as per THE NOISE POLLUTION (REGULATION AND CONTROL) RULES, 2000 (The Principal Rules were published in the Gazette of India, vide S.O.123(E), dated 14.2.2000 and subsequently amended vide S.O. 1046(E), dated 22.11.2000, S.O. 1088(E), dated 11.10.2002, S.O. 1569 (E), dated 19.09.2006 and S.O. 50 (E) dated 11.01.2010 under the Environment(Protection) Act, 1986).

Ground Vibrations

Ground vibrations due to mining activities in the all the 11 Mines within cluster are anticipated due to operation of Mining Machines like Excavators, drilling and blasting, transportation vehicles, etc. However, the major source of ground vibration from the all the 9 mines is blasting. The major impact of the ground vibrations is observed

on the domestic houses located in the villages nearby the mine lease area. The kuchha houses are more prone to cracks and damage due to the vibrations induced by blasting whereas RCC framed structures can withstand more ground 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 agricultural fields nearby the mining areas and may cause injury to persons or damage to the structures.

Nearest Habitations from 11 mines respectively are as in below Table 7.21.

TABLE 7.12: NEAREST HABITATION FROM EACH MINE

Location ID	Distance & Direction
Proposed	
Habitation Near P1	780m-SE
Existing	
Habitation Near E1	1040m SE

The ground vibrations due to the blasting in all the mines are calculated using the empirical equation for assessment of peak particle velocity (PPV) is:

$$V = K [R/Q^{0.5}]^{-B}$$

Where –

V = peak particle velocity (mm/s)

K = site and rock factor constant

Q = maximum instantaneous charge (kg)

B = constant related to the rock and site (usually 1.6)

R = distance from charge (m)

TABLE 7.13: GROUND VIBRATIONS AT 2 MINES

Location ID	Maximum Charge in kgs	Nearest Habitation in m	PPV in mm/s
P1	20	780m-SE	0.130
P2	20	1040m SE	0.082

Source: Blasting Calculations

From the above table, the charge per blast is considered as maximum in each mine and the resultant PPV is well below the Peak Particle Velocity of 8 mm/s as per Directorate General of Mines Safety for safe level criteria through Circular No. 7 dated 29/8/1997.

Socio Economic Environment –

The 4 mines shall contribute towards CER and the community shall develop.

TABLE 7.14: SOCIO ECONOMIC BENEFITS FROM 2 MINES

Location ID	Project Cost	CER Cost
P1	Rs.36,73,000/-	Rs. 5,00,000/-
E1	Rs. 55,18,000/-	Rs 1,38,000 /-
Grand Total	Rs. 91,91,000/-	Rs. 6,38,000/-

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.

- Proposed Projects shall fund towards CER – **Rs 5,00,000/-**
- Existing Projects shall fund towards CER – **Rs.1,38,000/-**
- Projects in Cluster shall fund towards CER – **Rs 6,38,000/-**

TABLE 7.15: EMPLOYMENT BENEFITS FROM 2 MINES

Description	Employment
P1	25
E1	24
Grand Total	49

A total of 34 people will get employment due to 2 proposed mines in cluster and 44 people are already employed at existing mines.

TABLE 7.16: GREENBELT DEVELOPMENT

Code	No of Trees proposed to be planted	Area to be covered	Name of the Species
P1	610	Safety barrier & village road	Vembu, Poovarasu, Pungan, Naval etc.,
E1	650		
Total	1,260		

Based on the Proposed Mining Plan it's anticipated that there shall growth of native species of Vembu, Poovarasu, Pungan, Naval etc., in the Cluster at a rate of 1260 Trees Planted over a period of 5 Years with Survival Rate of 80 %.

7.5 PLASTIC WASTE MANAGEMENT PLAN

The Project Proponent shall comply with Tamil Nadu Government Order (Ms) No. 84 Environment and Forest (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.

Objective –

- To investigate the actual supply chain network of plastic waste.
- To identify and propose a sustainable plastic waste management by installing bins for collection of recyclables with all the plastic waste
- Preparation of a system design layout, and necessary modalities for implementation and monitoring.

TABLE 7.17: ACTION PLAN TO MANAGE PLASTIC WASTE

Sl.No.	Activity	Responsibility
1	Framing of Layout Design by incorporating provision of the Rules, user fee to be charged from waste generators for plastic waste management, penalties/fines for littering, burning plastic waste or committing any other acts of public nuisance	Mines Manager
2	Enforcing waste generators to practice segregation of bio-degradable, recyclable and domestic hazardous waste	Mines Manager
3	Collection of plastic waste	Mines Foreman
4	Setting up of Material Recovery Facilities	Mines Manager
5	Segregation of Recyclable and Non-Recyclable plastic waste at Material Recovery Facilities	Mines Foreman
6	Channelization of Recyclable Plastic Waste to registered recyclers	Mines Foreman
7	Channelization of Non-Recyclable Plastic Waste for use either in Cement kilns, in Road Construction	Mines Foreman
8	Creating awareness among all the stakeholders about their responsibility	Mines Manager
9	Surprise checking's of littering, open burning of plastic waste or committing any other acts of public nuisance	Mine Owner

Source: Proposed by FAE's and EC

Carbon Emission.

Carbon dioxide (CO₂): Carbon dioxide enters the atmosphere through burning fossil fuels (coal, natural gas, and oil), solid waste, trees and other biological materials. Carbon dioxide is removed from the atmosphere (or "sequestered") when it is absorbed by plants as part of the biological carbon cycle.

Methane (CH₄): Methane is emitted during the production and transport of coal, natural gas, and oil. Methane emissions also result from livestock and other agricultural practices, land use and by the decay of organic waste in municipal solid waste landfills.

Nitrous oxide (N₂O): Nitrous oxide is emitted during agricultural, land use, and industrial activities; combustion of fossil fuels and solid waste; as well as during treatment of wastewater.

In this quarrying activities, anticipated GHG is mainly CO₂ as its proposed for usage of HSD (High Speed Diesel) for proposed machinery totally deployed are 1 Compressor, 1 Excavator and 2 Tippers for which an approximate usage of HSD is around 150 Liters per day (as per pre-feasibility report). Which contributes to 40.20 kg of CO₂ for the stretch of daily activity of 20 kms @ 1 Litter Diesel produces 2.68 kg of CO₂ on the contrast 1 tree absorbs approximately 20-40 kgs of CO₂ per year.

- It is proposed to plant 1260 Nos trees from this project shall absorb 25,200 kgs of CO₂ per year on average basis.
- Apart from which, its proposed for deployment of New Modern Machineries (BSVI) and PUC certified Vehicles

Therefore, the implementation of proposed mitigation measures for winning of mineral may not have much of impact on the surrounding environment leading to release of Greenhouse gases (GHC), rise in temperature & livelihood of local people.

Hydrothermal/Geothermal effect due to destruction in the Environment.

- Hydrothermal – relating to hot water — used especially of the formation of minerals by hot solutions rising from a cooling magma.
- Geothermal – relating to or produced by the internal heat of the earth.
- The proposed activity is for quarrying of Rough stone by opencast mechanized mining method for an ultimate depth of 37 m bgl.
- The proposed mining area and the surrounding falls under hard rock formation i.e., Charnockite Formation and the district has not recorded any Hydrothermal / Geothermal effect and as per the Seismic Zonation Map of India, the district falls under the Zone II of seismic zones classification.
- The resultant of this open cast mining shall not have any Hydrothermal/Geothermal effect on the surrounding environment.

Bio-geochemical processes and its foot prints including environmental stress.

- Bio-geochemical cycle – any of the natural pathways by which essential elements of living matter are circulated. The term biogeochemical is a contraction that refers to the consideration of the biological, geological, and chemical aspects of each cycle.
 - This proposed activity is for quarrying of rough stone quarry and maximum depth of mining is 37 m bgl and the applied area for quarrying is a patta land with no major vegetation and it is proposed for greenbelt development all along the safety barrier and construction of garland drainage and implement the proposed EMP strictly to mitigate the impacts on surrounding environment.
 - No Bio-geochemical processes and its foot prints including environmental stress are anticipated and at the end of life of mine the proposed quarry shall be left as an artificial reservoir structure and allowed to collect rain water and shall enrich the ecosystem.
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Sediments geochemistry in the surface streams.

- Sedimentary Geochemistry has been in use to understand the conditions of deposition, climatic variations, tectonic setting, provenance, reservoir characteristics, etc.,
- The elemental composition of sediments in surface streams is the product of physical and chemical erosion of rocks, which is then transported across drainage networks.
- The project area when broken up lead to create void and land use pattern of the proposed area is alerted by ways of formation of open pit and as mitigation measure its proposed for garland drain all along the boundary barrier to ensure that no natural drainage pattern is disturbed and the garland drains are in turn connected to settlement traps were its ensured that no debris are carried away and hence the proposed activity shall not lead to any deposition of sediments in the nearby surface streams.

7.6 CLUSTER MANAGEMENT COMMITTEE

The cluster management committee is proposed to form including of 2 Proposed quarries and 1 existing quarries total extent of the cluster is 5.43.5 Ha

In the cluster management committee, the following Environmental Management plan will be followed the activities such as

- Transportation of Minerals and blasting activities with the coordination between the individual quarry owners.
- Sprinkling of water regularly thrice a day in the mutual understanding with the quarry owners
- Carrying out blasting operation as specified times by the Mines Managers and as per the EIA report
- Usage of Haul roads in a time specified by the Cluster Management Committee
- Following Safe operating procedure prescribed by the Mines Manager during natural calamities
- Planting Trees in the Government Land, School and within the project site
- Celebrating Safety month, Environmental Month along with the Mines Managers in every six months once
- Regularly follow the health of the workers and take medical examination as per the DGMS norms under the guidance of Mines Manager
- Meet at Association Hall monthly once to review the Environmental Management and Safety activities prescribed by the Cluster Management Committee
- We have read and understood all the above steps and we ensure to follow these specific steps Quarry owners in the Cluster management committee

Quarries in the Cluster Management Committee

*PROPOSED QUARRIES				
CODE	Name of the Owner	S.F. Nos	Extent	Status
P1	Thiru.A.Subramaniam	834/2(Part), Sokkanur	1.21.5 ha	File No.11525 TOR Identification No. TO24B0108TN5903516N Dated:23.10.2024
P2	Thiru. K.Mahalingam	816(P), 818, 819/1, 822/1(P), 822/2A(P), 824/1A	3.01.0 ha	Application is in Process
Total			4.22.5 ha	
*EXISTING QUARRY				
CODE	Name of the Owner	S.F. No	Extent	Status
E-1	N.K.Ravikumar	860/1D(P) & 893/1	1.21.0 ha	29.10.2021 – 28.10.2026
TOTAL			1.21.0 ha	

EXPIRED QUARRIES				
CODE	Name of the Owner	S.F. No	Extent	Status
EX-1	Thiru.S.Kavitha	859/3A1	1.09.0 ha	22.01.2019 – 21.01.2024
EX-2	Thiru.A.Subramaniam	894	1.01.5 ha	25.01.2019 – 24.01.2024
ABANDONED QUARRY				
Nil				
TOTAL CLUSTER EXTENT*			5.43.5 Ha	

STANDARD OPERATING PROCEDURE FOR SOKKANUR CLUSTER MANAGEMENT COMMITTEE

1. Maintenance of Haul Roads and Village Roads:

- Water will be sprinkled on haul roads twice a day to avoid dust generation during transportation
- Transportation of material will be carried out during day time and material will be covered with tarpaulin
- The speed of tippers plying on the haul road will be limited below 20 km/hr to avoid generation of dust.
- Water sprinkling on haul roads & loading points will be carried out twice a day
- Main source of gaseous pollution will be from vehicle used for transportation of mineral; therefore, weekly maintenance of machines improves combustion process & makes reduction in the pollution.
- The un-metalled haul roads will be compacted weekly before being put into use.
- Over loading of tippers will be avoided to prevent spillage.
- It will be ensured that all transportation vehicles carry a valid PUC certificate
- Grading of haul roads and service roads to clear accumulation of loose materials

2. Maintenance of Drilling Activities

- 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.
 - Usage of sharp drill bits while drilling which will help in reducing noise;
 - Secondary blasting will be totally avoided and hydraulic rock breaker will be used for breaking boulders;
 - Controlled blasting with proper spacing, burden, stemming and optimum charge/delay will be maintained;
 - The blasting will be carried out during favourable atmospheric condition and less human activity timings by using nonelectrical initiation system;
 - Proper maintenance, oiling and greasing of machines will be done every week to reduce generation of noise;
 - Provision of sound insulated chambers for the workers working on machines (HEMM) producing higher levels of noise;
 - Silencers / mufflers will be installed in all machineries;
 - Green Belt/Plantation will be developed around the project area and along the haul roads. The plantation minimizes propagation of noise;
 - Personal Protective Equipment (PPE) like ear muffs/ear plugs will be provided to the operators of HEMM and persons working near HEMM and their use will be ensured through training and awareness.
 - Regular medical check-up and proper training to personnel to create awareness about adverse noise level effects
-

3. Maintenance of Blasting Activities

- 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 (1.00 PM to 2.00 PM), 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
- The blasting operations in the cluster quarries are carried out without deep hole drilling and blasting using delay detonators, which reduces the ground vibrations;
- Proper quantity of explosive, suitable stemming materials and appropriate delay system will be adopted to avoid overcharging and for safe blasting;
- Adequate safe distance from blasting will be maintained as per DGMS guidelines;
- Blasting shelter will be provided as per DGMS guidelines;
- Blasting operations will be carried out only during day time;
- The charge per delay will be minimized and preferably a greater number of delays will be used per blasts;
- During blasting, other activities in the immediate vicinity will be temporarily stopped;
- Drilling parameters like depth, diameter and spacing will be properly designed to give proper blast;
- A fully trained explosives blast man (Mining Mate, Mines Foreman, 2nd Class Mines Manager/ 1st Class Mines Manager) will be appointed.
- A set of shot firing rules will be drawn up and blasting shall commence outlining the detailed operating procedures that will be followed to ensure that shot firing operations on site take place without endangering the workforce or public.
- Sufficient angular stemming material will be used to confine the explosive force and minimise environmental disturbance caused by venting / misfire.
- The detonators will be connected in a predetermined sequence to ensure that only one charge is detonated at any one time and a NONEL or similar type initiation system will be used.
- The detonation delay sequence shall be designed so as to ensure that firing of the holes is in the direction of free faces so as to minimise vibration effects.
- Appropriate blasting techniques shall be adopted such that the predicted peak particle velocity shall not exceed 8 Hz.
- Vibration monitoring will be carried out every 6 months to check the efficacy of blasting practices

4. Maintenance of Greenbelt Activities

- 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
 - Suitable plan for conservation of Schedule-I Species have prepared and necessary fund for implement for the same will be made.
 - All the preventive measures will be taken for growth & development of fauna.
 - Creating and development awareness for nature and wildlife in the adjoin villages.
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- The workers shall be trained to not harm any wildlife, should it come near the project site. No work shall be carried out after 6.00 pm

5. Maintenance of Occupational Health

- Dust mask will be provided to the workers and their use will be strictly monitored
- Annual medical checkups, 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 months once to assess effectiveness of mitigation measures proposed
- Specific personnel training on work-site safety management will be taken up;
- Work site assessment will be done by rock scaling of each surface exposed to workers to prevent accidental rock falling and / or landslide, especially after blasting activities;
- Natural barriers, temporary railing, or specific danger signals will be provided along rock benches or other pit areas where work is performed at heights more than 2m from ground level;
- Maintenance of yards, roads and footpaths, providing sufficient water drainage and preventing slippery surfaces with an all-weather surface, such as coarse gravel will be taken up

Occupational health and safety hazards occur during the operational phase of mining and primarily include the following:

- Respiratory hazards
- Noise
- Physical hazards
- Explosive storage and handling

All the persons will undergo pre-employment and periodic medical examination. Employees will be monitored for occupational diseases by conducting the following tests

- General physical tests
- Audiometric tests
- Full chest, X-ray, Lung function tests, Spirometric tests
- Periodic medical examination – yearly
- Lung function test – yearly, those who are exposed to dust
- Eye test

Essential medicines will be provided at the site. The medicines and other test facilities will be provided at free of cost. The first aid box will be made available at the mine for immediate treatment.

First aid training will be imparted to the selected employees regularly. The lists of first aid trained members shall be displayed at strategic places.

6. Cluster Management Committee Policy

- Meet the requirements of all laws, acts, regulations, and standards relevant to its operations and activities
 - Implement a program to train employees in general environmental issues and individual workplace environmental responsibilities
 - Allocate necessary resources to ensure the implementation of the environmental policy
 - Ensure that an effective closure strategy is in place at all stages of project development and that progressive reclamation is undertaken as early as possible to reduce potential long-term environmental and community impacts
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- Implement monitoring programme to provide early warning of any deficiency or unanticipated performance in environmental safeguards
 - Conduct periodic reviews to verify environmental performance and to continuously strive towards improvement
 - Monitoring of the water/ waste water quality, air quality and solid waste generated
 - Analysis of the water and air samples collected through external laboratory
 - 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.
 - Co-ordination of the environment related activities within the project as well as with outside agencies
 - Collection of health statistics of the workers and population of the surrounding villages
 - Green belt development
 - Monitoring the progress of implementation of the environmental monitoring programme

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.

8. PROJECT BENEFITS

8.0 GENERAL

The Proposed Project for Quarrying Rough Stone at Sokkanur Village aims to produce 1,24,456 m³ Rough Stone over a period of 5 Years and Gravel 17,174 m³. 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

8.1 EMPLOYMENT POTENTIAL

It is proposed to provide employment to about 25 persons for carrying out mining operations and give preference to the local people in providing employment. In addition, there will be opportunity for indirect employment to many people in the form of contractual jobs, business opportunities, service facilities etc. the economic status of the local people will be enhanced due to mining project.

8.2 SOCIO-ECONOMIC WELFARE MEASURES PROPOSED

The impact of mining activity in the area will be more positive on the socio-economic environment in the immediate project impact area. The employment opportunities both direct and indirect will contribute to enhanced money incomes to job seekers with minimal skill sets especially among the local communities.

8.3 IMPROVEMENT IN PHYSICAL INFRASTRUCTURE

The project area is located in Sokkanur Village, Kinathukadavu Taluk and Coimbatore District of Tamil Nadu and the area have communications, roads and other facilities already well established. The following physical infrastructure facilities will further improve due to this project.

- Road Transport facilities
- Communications
- Medical, Educational and social benefits will be made available to the nearby civilian population in addition to the workmen employed in the mine.

8.4 IMPROVEMENT IN SOCIAL INFRASTRUCTURE

Employment is expected during civil construction period, in trade, garbage lifting, sanitation and other ancillary services, Employment in these sectors will be primarily temporary or contractual and involvement of unskilled labour will be more. A major part of the labour force will be mainly from local villagers who are expected to engage themselves both in agriculture and mining activities. This will enhance their income and lead to overall economic growth of the area.

8.5 OTHER TANGIBLE BENEFITS

The proposed mine is likely to have other tangible benefits as given below.

- Indirect employment opportunities to local people in contractual works like construction of infrastructural facilities, transportation, sanitation, for supply of goods and services to the mine and other community services.
 - Additional housing demand for rental accommodation will increase
 - Cultural, recreation and aesthetic facilities will also improve
 - Improvement in communication, transport, education, community development and medical facilities and overall change in employment and income opportunity
 - The State Government will also benefit directly from the proposed mine, through increased revenue from royalties, cess, DMF, GST etc.,
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CORPORATE SOCIAL RESPONSIBILITY

Project proponent will take responsibility to develop awareness among all levels of their staff about CSR activities and the integration of social processes with business processes. Those involved with the undertaking of CSR activities will be provided with adequate training and re-orientation.

Under this programme, the project proponents will take-up following programmes for social and economic development of villages within 10 km of the project site. For this purpose, separate budget will be provided every year. For finalization of these schemes, proponent will interact with LSG. The schemes will be selected from the following broad areas –

- Health Services
- Social Development
- Infrastructure Development
- Education & Sports
- Self-Employment

CSR Cost Estimation

- CSR activities will be taken up in the Moooduthurai village mainly contributing to education, health, training of women self-help groups and contribution to infrastructure etc., CSR budget is allocated as 2.5% of the profit.

CORPORATE ENVIRONMENT RESPONSIBILITY

Allocation for Corporate Environment Responsibility (CER) shall be made as per Government of India, MoEF & CC Office Memorandum F.No.22-65/2017-IA.III, Dated: 01.05.2018.

The project proponent will have spent Rs.5,00,000/- towards Corporate Environmental Responsibility for the Nearby Government School (Panchayat Union Primary School, Veerappagoundanur, Sokkanur Village, Coimbatore)

TABLE 8.1: CER – ACTION PLAN

Activity	Beneficiaries	Total
Providing Sanitation facilities to the school	Sokkanur villagers	Rs 5,00,000/-
Planting and maintaining of trees in the school compound	Sokkanur villagers	
Painting the classrooms and providing RO water facilities	Sokkanur villagers	
Providing Environmental related books to the school library	Sokkanur villagers	

Source: Field survey conducted by FAE, consultation with project proponent

9. ENVIRONMENTAL COST BENEFIT ANALYSIS

Not Applicable, Since Environmental Cost Benefit Analysis not recommended at the Scoping stage.

10. ENVIRONMENTAL MANAGEMENT PLAN

10.0. GENERAL

Environment Management Plan (EMP) aims at the preservation of ecological system by considering in-built pollution abatement facilities at the proposed site. Good practices of Environmental Management plan will ensure to keep all the environmental parameters of the project in respect of Ambient Air quality, Water quality, Socio – economic improvement standards.

Mitigation measures at the source level and an overall environment management plan at the study area are elicited so as to improve the supportive capacity of the receiving bodies. The EMP presented in this chapter discusses the administrative aspects of ensuring that mitigative measures are implemented and their effectiveness monitored after approval of the EIA.

10.1. ENVIRONMENTAL POLICY

The Project Proponent is committed to conduct all its operations and activities in an environmentally responsible manner and to continually improve environmental performance.

The Proponent Thiru. A. Subramaniam will –

- Meet the requirements of all laws, acts, regulations, and standards relevant to its operations and activities
- Implement a program to train employees in general environmental issues and individual workplace environmental responsibilities
- Allocate necessary resources to ensure the implementation of the environmental policy
- Ensure that an effective closure strategy is in place at all stages of project development and that progressive reclamation is undertaken as early as possible to reduce potential long-term environmental and community impacts
- Implement monitoring programmes to provide early warning of any deficiency or unanticipated performance in environmental safeguards
- Conduct periodic reviews to verify environmental performance and to continuously strive towards improvement

Description of the Administration and Technical Setup –

The Environment Monitoring Cell discussed under Chapter 6 will ensure effective implementation of environment management plan and to ensure compliance of environmental statutory guidelines through Mine Management Level of each Proposed Quarry.

The said team will be responsible for:

- Monitoring of the water/ waste water quality, air quality and solid waste generated
 - Analysis of the water and air samples collected through external laboratory
 - 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.
 - Co-ordination of the environment related activities within the project as well as with outside agencies
 - Collection of health statistics of the workers and population of the surrounding villages
 - Green belt development
 - Monitoring the progress of implementation of the environmental monitoring programme
 - 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.
-

10.2. LAND ENVIRONMENT MANAGEMENT –

Landscape of the area will be changed due to the quarrying operation, restoration of the land by converting the quarry pit into temporary reservoir and the remaining part of the area (un utilized areas, infrastructure, haul Roads) will be utilized for greenbelt development. Aesthetic of the Environment will not be affected. There is no major vegetation in the project area during the course of quarrying operation and after completion of the quarrying operation thick plantation will be developed under greenbelt development programme.

TABLE 10.1: PROPOSED CONTROLS FOR LAND ENVIRONMENT

CONTROL	RESPONSIBILITY
Design vehicle wash-down areas so that all runoff water is captured and passed through oil water separators and sediment catchment devices.	Mines Manager
Re-fuelling to be undertaken in a safe location, away from vehicle movement pathways & 100 m away of any watercourse Refuelling activity to be under visual observation at all times. Drainage of refuelling areas to sumps with oil/water separation	Mine Foreman & Mining Mate
Soil and groundwater testing as required following up a particular incident of contamination.	Mines Manager
At conceptual stage, the mining pits will be converted into Rain Water Harvesting. Remaining area will be converted into greenbelt area	Mines Manager
No external dumping i.e., outside the project area	Mine Foreman
Garland drains with catch pits / settlement traps to be provided all around the project area to prevent run off affecting the surrounding lands.	Mines Manager
The periphery of Project area will be planted with thick plantation to arrest the fugitive dust, which will also act as acoustic barrier.	Mines Manager

Source: Proposed by FAE's & EIA Coordinator

10.3. SOIL MANAGEMENT

There is no overburden or waste anticipated from proposed project.

TABLE 10.2: PROPOSED CONTROLS FOR SOIL MANAGEMENT

CONTROL	RESPONSIBILITY
Surface run-off from the project boundary via garland drains will be diverted to the mine pits	Mine Foreman & Mining Mate
Design haul roads and other access roads with drainage systems to minimize concentration of flow and erosion risk	Mines Manager
Empty sediment from sediment traps Maintain, repair or upgrade garland drain system	Mines Manager
Test soils for pH, EC, chloride, size & water holding capacity	Manager Mines

Source: Proposed by FAE's & EIA Coordinator

10.4. WATER MANAGEMENT

In the proposed quarrying project, no process is involved for the effluent generation, only oil & grease from the machinery wash is anticipated and domestic sewage from mine office. The quarrying operation is proposed upto a depth of 37 m BGL, the water table in the area is 68 - 73 m below ground level, hence the proposed projects will not intersect the Ground water table during entire quarry period.

TABLE 10.3: PROPOSED CONTROLS FOR WATER ENVIRONMENT

CONTROL	RESPONSIBILITY
To maximize the reuse of pit water for water supply	Mines Foreman
Temporary and permanent garland drain will be constructed to contain the catchments of the mining area and to divert runoff from undisturbed areas through the mining areas	Mines Manager
Natural drains/nallahs/brooklets outside the project area should not be disturbed at any point of mining operations	Mines Manager
Ensure there is no process effluent generation or discharge from the project area into water bodies	Mines Foreman
Domestic sewage generated from the project area will be disposed in septic tank and soak pit system	Mines Foreman
Monthly or after rainfall, inspection for performance of water management structures and systems	Mines Manager
Conduct ground water and surface water monitoring for parameters specified by CPCB	Manager Mines

Source: Proposed by FAE's & EIA Coordinator

10.5. AIR QUALITY MANAGEMENT

The proposed quarrying activity would result in the increase of particulate matter concentrations due to fugitive dust. Daily water sprinkling on the haul roads, approach roads in the vicinity would be undertaken and will be continued as there is possibility for dust generation due to truck mobility. It will be ensured that vehicles are properly maintained to comply with exhaust emission requirements

TABLE 10.4: PROPOSED CONTROLS FOR AIR ENVIRONMENT

CONTROL	RESPONSIBILITY
Generation of dust during excavation is minimized by daily (twice) water sprinkling on working face and daily (twice) water sprinkling on haul road	Mines Manager
Wet drilling procedure /drills with dust extractor system to control dust generation during drilling at source itself is implemented	Mines Manager
Maintenance as per operator manual of the equipment and machinery in the mines to minimizing air pollution	Mines Manager
Ambient Air Quality Monitoring carried out in the project area and in surrounding villages to access the impact due to the mining activities and the efficacy of the adopted air pollution control measures	Mines Manager
Provision of Dust Mask to all workers	Mines Manager
Greenbelt development all along the periphery of the project area	Mines Manager

Source: Proposed by FAE's & EIA Coordinator

10.6. NOISE POLLUTION CONTROL

There will be intermittent noise levels due to vehicular movement, trucks loading, drilling and blasting and cutting activities. No mining activities are planned during night time.

TABLE 10.5: PROPOSED CONTROLS FOR NOISE ENVIRONMENT

CONTROL	RESPONSIBILITY
Development of thick greenbelt all along the Buffer Zone (7.5 Meters) of the project area to attenuate the noise and the same will be maintained	Mines Manager
Preventive maintenance of mining machinery and replacement of worn out accessories to control noise generation	Mines Foreman
Deployment of mining equipment with an inbuilt mechanism to reduce noise	Mines Manager
Provision of earmuff / ear plugs to workers working in noise prone zones in the mines	Mining Mate
Provision of effective silencers for mining machinery and transport vehicles	Mines Manager

Provision of sound proof AC operator cabins to HEMM	Mines Manager
Sharp drill bits are used to minimize noise from drilling	Mines Foreman
Controlled blasting technologies are adopted by using delay detonators to minimize noise from blasting	Mines Manager
Annual ambient noise level monitoring are carried out in the project area and in surrounding villages to assess the impact due to the mining activities and the efficacy of the adopted noise control measures. Additional noise control measures will be adopted if required as per the observations during monitoring	Mines Manager
Reduce maximum instantaneous charge using delays while blasting	Mining Mate
Change the burden and spacing by altering the drilling pattern and/or delay layout, or altering the hole inclination	Mines Manager
Undertake noise or vibration monitoring	Mines Manager

Source: Proposed by FAE's & EIA Coordinator

10.7.C GROUND VIBRATION AND FLY ROCK CONTROL

The Rough stone quarry operation creates vibration due to the blasting and movement of Heavy Earth moving machineries, fly rocks due to the blasting.

TABLE 10.6: PROPOSED CONTROLS FOR GROUND VIBRATIONS & FLY ROCK

CONTROL	RESPONSIBILITY
Controlled blasting using delay detonators will be carried out to maintain the PPV value (below 8Hz) well within the prescribed standards of DGMS	Mines Manager
Drilling and blasting will be carried under the supervision of qualified persons	Mines Manager
Proper stemming of holes should be carried out with statutory competent qualified blaster under the supervision of statutory mines manager to avoid any anomalies during blasting	Mines Manager
Suitable spacing and burden will be maintained to avoid misfire / fly rocks	Manager Mines
Number of blast holes will be restricted to control ground vibrations	Manager Mines
Blasting will be carried out only during noon time	Mining Mate
Undertake noise or vibration monitoring	Mines Manager
ensure blast holes are adequately stemmed for the depth of the hole and stemmed with suitable angular material	Mines Foreman

Source: Proposed by FAE's & EIA Coordinator

10.8. BIOLOGICAL ENVIRONMENT MANAGEMENT

The proponent will take all necessary steps to avoid the impact on the ecology of the area by adopting suitable management measures in the planning and implementation stage. During mining, thick plantation will be carried out around the project periphery, on safety barrier zone, on top benches of quarried out area etc.,

Following control measures are proposed for its management and will be the responsibility of the Mines Manager.

- Greenbelt development all along the safety barrier of the project area
- It is also proposed to implement the greenbelt development programme and post plantation status will be regularly checked for every season.
- The main attributes that retard the survival of sapling is fugitive dust, this fugitive dust can be controlled by water sprinkling on the haul roads and installing a sprinkler unit near the newly planted area.
- Year wise greenbelt development will be recorded and monitored
 - Based on the area of plantation.
 - Period of plantation
 - Type of plantation
 - Spacing between the plants
 - Type of manuring and fertilizers and its periods

- Lopping period, interval of watering
- Survival rate
- Density of plantation
- The ultimate reclamation planned leaves a congenial environment for development of flora & immigration of small fauna through green belt and water reservoir. The green belt and water reservoir developed within the Project at the end of mine life will attract the birds and animals towards the project area in the post mining period.

10.8.1. Green Belt Development Plan

About 900 nos. of saplings is proposed to be planted for the Mining plan period in safety barrier of applied mine lease area with survival rate 80%. The greenbelt development plan has been prepared keeping in view the land use changes that will occur due to mining operation in the area.

TABLE 10.7. PROPOSED GREENBELT ACTIVITIES

No. of trees proposed to be planted	Recommended area	Name of the species
610	Safety barrier, Unutilized land, Village roads	Vembu, Poovarasu, Pungan, Naval etc.,

Source: Conceptual Plan of Approved Mining plan & Proposed by FAE's & EIA Coordinator

The objectives of the greenbelt development plan are –

- Provide a green belt around the periphery of the quarry area to combat the dispersal of dust in the adjoining areas,
- Protect the erosion of the soil, Conserve moisture for increasing ground water recharging,
- Restore the ecology of the area, restore aesthetic beauty of the locality and meet the requirement of fodder, fuel and timber of the local community.

A well-planned Green Belt with multi rows (three tiers) preferably with long canopy leaves shall be developed with dense plantations around the boundary and haul roads to prevent air, dust noise propagation to undesired places and efforts will be taken for the enhancement of survival rate.

10.8.2. Species Recommended for Plantation

Following points have been considered while recommending the species for plantation:

- Creating of bio-diversity.
- Fast growing, thick canopy cover, perennial and evergreen large leaf area,
- Efficient in absorbing pollutants without major effects on natural growth

TABLE 10.8.: RECOMMENDED SPECIES TO PLANT IN THE GREENBELT

S.No	Botanical Name	Local Name	Importance
1.	Azadirachta indica	Neem, Vembu	Neem oil & neem products
2.	Tamarindus indica	Tamarind	Edible & Medicinal and other Uses
3.	Polyalthia longifolia	Nettilinkam	Tall and evergreen tree
4.	Borassus Flabellifer	Palmyra Palm	Tall Wind breaker tree and its fruits are edible

Source: Proposed by FAE's & EIA Coordinator

10.9. OCCUPATIONAL SAFETY & HEALTH MANAGEMENT

Occupational safety and health are very closely related to productivity and good employer-employee relationship. The main factors of occupational health impact in quarries are fugitive dust and noise. Safety of employees during quarrying operation and maintenance of mining equipment will be taken care as per Mines Act 1952 and Rule 29 of Mines Rules 1955. To avoid any adverse effect on the health of workers due to dust, noise and vibration sufficient measures have been provided.

10.9.1. Medical Surveillance and Examinations –

- Identifying workers with conditions that may be aggravated by exposure to dust & noise and establishing baseline measures for determining changes in health.
- Evaluating the effect of noise on workers
- Enabling corrective actions to be taken when necessary
- Providing health education

The health status of workers in the mine shall be regularly monitored under an occupational surveillance program. Under this program, all the employees are subjected to a detailed medical examination at the time of employment. The medical examination covers the following tests under mines act 1952.

- General Physical Examination and Blood Pressure
- X-ray Chest and ECG
- Sputum test
- Detailed Routine Blood and Urine examination

The medical histories of all employees will be maintained in a standard format annually. Thereafter, the employees will be subject to medical examination annually. The below tests keep upgrading the database of medical history of the employees.

TABLE 10.9.: MEDICAL EXAMINATION SCHEDULE

Sl.No	Activities	1 st Year	2 nd Year	3 rd Year	4 th Year	5 th Year
1	Initial Medical Examination (Mine Workers)					
A	Physical Check-up					
B	Psychological Test					
C	Audiometric Test					
D	Respiratory Test					
2	Periodical Medical Examination (Mine Workers)					
A	Physical Check – up					
B	Audiometric Test					
C	Eye Check – up					
D	Respiratory Test					
3	Medical Camp (Mine Workers & Nearby Villagers)					
4	Training (Mine Workers)					

Medical Follow ups:- Work force will be divided into three targeted groups age wise as follows:-		
Age Group	PME as per Mines Rules 1955	Special Examination
Less than 25 years	Once in a Three Years	In case of emergencies
Between 25 to 40 Years	Once in a Three Years	In case of emergencies
Above 40 Years	Once in a Three Years	In case of emergencies
Medical help on top priority immediately after diagnosis/ accident is the essence of preventive aspects.		

10.9.2.: Proposed Occupational Health and Safety Measures –

- The mine site will have adequate drinking water supply so that workers do not get dehydrated.
- Lightweight and loose-fitting clothes having light colours will be preferred to wear.
- Noise exposure measurements will be taken to determine the need for noise control strategies.
- The personal protective equipment will be provided for mine workers.
- Supervisor will be instructed for reporting any problems with hearing protectors or noise control equipment.
- At noisy working activity, exposure time will be minimized.
- Dust generating sources will be identified and proper control measure will be adopted.
- Periodic medical examinations will be provided for all workers.
- Strict observance of the provisions of DGMS Acts, Rules and Regulations in respect of safety both by management and the workers.
- The width of road will be maintained more than thrice the width of the vehicle. A code of traffic rules will be implemented.
- In respect of contract work, safety code for contractors and workers will be implemented. They will be allowed to work under strict supervision of statutory person/officials only after they will impart training at vocational training centres. All personal protective equipment's will be provided to them.
- A safety committee meeting every month will be organized to discuss the safety of the mines and the persons employed.
- Celebration of annual mines safety week and environmental week in order to develop safety awareness and harmony amongst employees and co quarry owners.

FIGURE 10.1.: PERSONAL PROTECTIVE EQUIPMENT TO THE MINE WORKERS

10.9.3.: Health and Safety Training Programme

The Proponent will provide special induction program along with machinery manufacturers for the operators and co-operators to run and maintain the machinery effectively and efficiently. The training program for the supervisors and office staffs will be arranged in the Group Vocational Training Centres in the State and engage Environmental Consultants to provide periodical training to all the employees to carry out the mining operation in and eco-friendly manner.

TABLE 10.10.: LIST OF PERIODICAL TRAININGS PROPOSED FOR EMPLOYEES

Course	Personnel	Frequency	Duration	Instruction
New-Employee Training	All new employees exposed to mine hazards	Once	One week	Employee rights Supervisor responsibilities Self-rescue Respiratory devices Transportation controls Communication systems Escape and emergency evacuation Ground control hazards Occupational health hazards Electrical hazards First aid Explosives
Task Training Like Drilling, Blasting, Stemming, safety, Slope stability, Dewatering, Haul road maintenance,	Employees assigned to new work tasks	Before new Assignments	Variable	Task-specific health & safety procedures and SOP for various mining activity. Supervised practice in assigned work tasks.
Refresher Training	All employees who received new-hire training	Yearly	One week	Required health and safety standards Transportation controls Communication systems Escape ways, emergency evacuations Fire warning Ground control hazards First aid Electrical hazards Accident prevention Explosives Respirator devices
Hazard Training	All employees exposed to mine hazards	Once	Variable	Hazard recognition and avoidance Emergency evacuation procedures Health standards Safety rules Respiratory devices

Source: Proposed by FAE's & EIA Coordinator as per DGMS Norms

10.9.4.: Budgetary Provision for Environmental Management –

Adequate budgetary provision has been made by the Company for execution of Environmental Management Plan. The Table 10.11 gives overall investment on the environmental safeguards and recurring expenditure for successful monitoring and implementation of control measures.

TABLE 10.11: EMP BUDGET FOR PROPOSED PROJECT

Activities	Mitigation Measure	Provision for Implementation	Capital	Recurring
Air Environment	Haul road maintenance & Water sprinkling	Lump sum fund allocation for daily maintenance of haul roads and thrice a day water sprinkling by fixed sprinklers or water tankers	0	50000
	Muffle blasting – To control fly rocks during blasting	Lump sum fund allocation Blasting face will be covered with sand bags / steel mesh / old tyres / used conveyor belts	0	5000
	Wet drilling procedure	Lump sum fund allocation for ensuring wet drilling by covering drill holes with wet gunny bags and spraying water while drilling	0	10000
	No overloading of trucks/tippers/tractors	Lump sum fund allocation Manual Monitoring through Security guard	0	5000
	Stone carrying trucks will be covered by tarpaulin	Lump sum fund allocation Manual Monitoring through Security guard	0	5000
	Enforcing speed limits of 20 km/hr within ML area	Lump sum fund allocation Manual Monitoring through Security guard	0	5000
	Regular monitoring of exhaust fumes as per RTO norms	Lump sum fund allocation Manual Monitoring through Security guard	0	5000
	Installing wheel wash system near gate of quarry	Installation + Maintenance + Supervision	50000	5000
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
	NONEL Blasting will be practiced to control Ground vibration and fly rocks	Rs. 30/- per 6 Tonnes of Blasted Material	0	0
Waste Management	Waste management (Spent Oil, Grease etc.,)	Provision for domestic waste collection and disposal through authorized agency	5000	20000
		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
Mine Closure	1. Progressive Closure Activity - Surface Runoff managent	Provision made in Operating Cost	0	0
	2. Progressive Closure Activity Barbed Wire Fencing to quarry area will be provisioned.	Provision made in Operating Cost	0	0

	3. Greenbelt development under safety zone during the Scheme period (150 Saplings)	Provision made in Operating Cost	0	0
Implementation of EC, Mining Plan & DGMS Condition	Size 6' X 5' with blue background and white letters as mentioned in MoM Appendix II by the SEAC TN	Fixed Display Board at the Quarry Entrance as permanent structure mentioning Environmental Conditions	10000	1000
	Air, Water, Noise and Soil Quality Sampling every 6 Months for Compliance Report of EC Conditions	Submission of 2 Half Yearly Compliance - Lab Monitoring Report as per CPCB norms	0	100000
	Workers will be provided with Personal Protective Equipment's	Lumpsum fund allocation	50000	15000
	Health check up for workers will be provisioned	IME & PME Health check up for all the employees will be covered batch wise.	0	50000
	First aid facility will be provided	Lumpsum fund allocation	0	5000
	Mine will have safety precaution signages, boards.	Provision for signages and boards made	10000	2000
	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	Lumpsum fund allocation	50000	10000

	Installation of CCTV cameras in the mines and mine entrance	Camera 4 Nos, DVR, Monitor with internet facility	30000	5000
	Appointment of Competent person for ensuring the safety operation	Provision made in operational cost	0	0
CER	As per MoEF &CC OM 22-65/2017-IA.III Dated 25.02.2021	Lumpsum fund allocation	200000	0
TOTAL			4,60,000	3,02,000

10.10.: CONCLUSION –

Various aspects of mining activities were considered and related impacts were evaluated. Considering all the possible ways to mitigate the environmental concerns Environmental Management Plan was prepared and fund has been allocated for the same. The EMP is dynamic, flexible and subjected to periodic review. For project where the major environmental impacts are associated, EMP will be under regular review. Senior Management responsible for the project will conduct a review of EMP and its implementation to ensure that the EMP remains effective and appropriate. Thus, the proper steps will be taken to accomplish all the goals mentioned in the EMP and the project will bring the positive impact in the study area.

11. SUMMARY AND CONCLUSION

Thiru. A. Subramaniam Rough Stone and Gravel (Extent – 1.21.50 ha) falls under “B” category as per MoEF & CC Notification S.O. 3977 (E).

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

Environmental monitoring and audit mechanism have been recommended before and after commencement of the project, where necessary, to verify the accuracy of the EIA predictions and the effectiveness of recommended mitigation measures.

The main scope of the EIA study is to quantify the cumulative impact in the study area due to cluster quarries and formulate the effective mitigation measures for each individual leases. A detailed account of the emission sources, emissions control equipment, background Air quality levels, Meteorological measurements, Dispersion model and all other aspects of pollution like effluent discharge, Dust generation etc., have been discussed in this report. The baseline monitoring study has been carried out during the months March -May 2025 for various environmental components so as to assess the anticipated impacts of the cluster quarry projects on the environment and suitable mitigation measures for likely adverse impacts due to the proposed project is suggested individually for the respective proposed project under Chapter 10.

The project proponent ensures to obtain necessary clearances and quarrying will be carried out as per rules and regulations. The Mining Activity will be carried out in a phased manner as per the approved mining plan after obtaining EC, CTO from TNPCB, execution of lease deed and obtaining DGMS Permission and working will be carried out under the supervision of Competent Persons employed.

Overall, the EIA report has predicted that the project will comply with all environment standards and legislation after commencement of the project and operational stage mitigation measures are implemented.

Mining operations has positive impact on environment and socio economy such as landscape improvement, water as by-product, economy development and better public services, providing and supply of Rough Stone as per market demand.

Sustainable and modern mining leads us to see positive impact of mining operation and providing consistent employment for 25 people directly in the proposed project and indirectly around 50 people.

As discussed, it is safe to say that the proposed quarries are not likely to cause any significant impact to the ecology of the area, as adequate preventive measures will be adopted to keep the various pollutants within the permissible limits. Green belt development around the area will also be taken up as an effective pollution mitigate technique, as well as to serve as biological indicators for the pollutants released from the Thiru.A. Subramaniam Rough Stone and Gravel Quarry. (Extent 1.21.50 ha)

12. DISCLOSURE OF CONSULTANT

The Project Proponent Thiru. A. Subramaniam Proprietor of Thiru. A. Subramaniam Rough Stone and Gravel Quarry have engaged M/s Geo Exploration and Mining Solutions, an Accredited Organization under Quality Council of India – National Accreditation Board for Education & Training, New Delhi, for carrying out the EIA Study as per the ToR Issued for the proposed project.

Name and address of the consultancy:

GEO EXPLORATION AND MINING SOLUTIONS

No 17, Advaita Ashram Road,

Alagapuram, Salem – 636 004

Tamil Nadu, India

Email:infogeoexploration@gmail.com

Web: www.gemssalem.com

Phone: 0427 2431989.

The Accredited Experts and associated members who were engaged for this EIA study as given below –

Sl.No.	Name of the expert	In house/ Empanelled	EIA Coordinator		FAE	
			Sector	Category	Sector	Category
1	Dr. M. Ifthikhar Ahmed	In-house	1	A	WP GEO SC	B A A
2	Dr. P. Thangaraju	In-house	-	-	HG GEO	A A
3	Mr. A. Jagannathan	In-house	-	-	AP NV SHW	B A B
4	Mr. N. Senthilkumar	Empanelled	38 28	B B	AQ WP RH	B B A
5	Mrs. Jisha parameswaran	In-house	-	-	SW	B
6	Mr. Govindasamy	In-house	-	-	WP	B
7	Mrs. K. Anitha	In-house	-	-	SE	A
8	Mrs. Amirtham	In-house	-	-	EB	B
9	Mr. Alagappa Moses	Empanelled	-	-	EB	A
10	Mr. A. Allimuthu	In-house	-	-	LU	B
11	Mr. S. Pavel	Empanelled	-	-	RH	B
12	Mr. J. R. Vikram Krishna	Empanelled	-	-	SHW RH	A A

Abbreviations			
EC	EIA Coordinator	EB	Ecology and bio-diversity
AEC	Associate EIA Coordinator	NV	Noise and vibration
FAE	Functional Area Expert	SE	Socio economics
FAA	Functional Area Associates	HG	Hydrology, ground water and water conservation
TM	Team Member	SC	Soil conservation
GEO	Geology	RH	Risk assessment and hazard management
WP	Water pollution monitoring, prevention and control	SHW	Solid and hazardous wastes
AP	Air pollution monitoring, prevention and control	MSW	Municipal Solid Wastes
LU	Land Use	ISW	Industrial Solid Wastes
AQ	Meteorology, air quality modeling, and prediction	HW	Hazardous Wastes

DECLARATION BY EXPERTS CONTRIBUTING TO THE EIA/EMP

Declaration by experts contributing to the EIA/EMP for Thiru. A. Subramaniam Rough Stone & Gravel Quarry Project over an Extent of 1.21.50 ha in Sokkanur Village of Kinathukadavu Taluk, Coimbatore District of Tamil Nadu. It is also certified that information furnished in the above EIA study are true and correct to the best of our knowledge.

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

Name: **Dr. M. Ifthikhar Ahmed**

Designation: **EIA Coordinator**

Date & Signature:

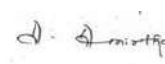


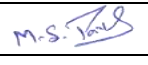
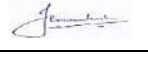
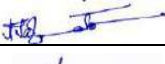
Period of Involvement: **January 2019 to till date**

Associated Team Member with EIA Coordinator:

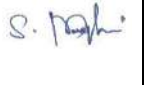
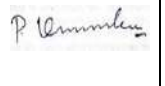
1. **Mr. S. Nagamani**
2. **Mr.P. Viswanathan**
3. **Mr. M.Santhoshkumar**
4. **Mr. S. Ilavarasan**

FUNCTIONAL AREA EXPERTS ENGAGED IN THE PROJECT

Sl. No.	Functional Area	Involvement	Name of the Expert/s	Signature
1	AP	▪ Identification of different sources of air pollution due to the proposed mine activity ▪ Prediction of air pollution and propose mitigation measures / control measures	Mr. A. Jagannathan	
2	WP	▪ Suggesting water treatment systems, drainage facilities ▪ Evaluating probable impacts of effluent/waste water discharges into the receiving environment/water bodies and suggesting control measures.	Dr. M. Ifthikhar Ahmed	
			Mr. N. Senthilkumar	
3	HG	▪ Interpretation of ground water table and predict impact and propose mitigation measures. ▪ Analysis and description of aquifer Characteristics	Dr. P. Thangaraju	
4	GEO	▪ Field Survey for assessing the regional and local geology of the area. ▪ Preparation of mineral and geological maps. ▪ Geology and Geo morphological analysis/description and Stratigraphy/Lithology.	Dr. M. Ifthikhar Ahmed	
			Dr. P. Thangaraju	
5	SE	▪ Revision in secondary data as per Census of India, 2011. ▪ Impact Assessment & Preventive Management Plan ▪ Corporate Environment Responsibility.	Mrs. K. Anitha	
6	EB	▪ Collection of Baseline data of Flora and Fauna. ▪ Identification of species labelled as Rare, Endangered and threatened as per IUCN list.	Mrs. Amirtham	

		- Impact of the project on flora and fauna. - Suggesting species for greenbelt development.	Mr. Alagappa Moses	
7	RH	- Identification of hazards and hazardous substances - Risks and consequences analysis - Vulnerability assessment - Preparation of Emergency Preparedness Plan - Management plan for safety.	Mr. N. Senthilkumar	
			Mr. S. Pavel	
			Mr. J. R. Vikram Krishna	
8	LU	- Construction of Land use Map - Impact of project on surrounding land use - Suggesting post closure sustainable land use and mitigative measures.	Mr. A. Allimuthu	
9	NV	- Identify impacts due to noise and vibrations - Suggesting appropriate mitigation measures for EMP.	Mr. A. Jagannathan	
10	AQ	- Identifying different source of emissions and propose predictions of incremental GLC using AERMOD. - Recommending mitigations measures for EMP	Mr. N. Senthilkumar	
11	SC	Assessing the impact on soil environment and proposed mitigation measures for soil conservation	Dr. M. Ifthikhar Ahmed	
12	SHW	- Identify source of generation of non-hazardous solid waste and hazardous waste. - Suggesting measures for minimization of generation of waste and how it can be reused or recycled.	Mr. A. Jagannathan	
			Mr. J. R. Vikram Krishna	

LIST OF TEAM MEMBERS ENGAGED IN THIS PROJECT

Sl.No.	Name	Functional Area	Involvement	Signature
1	Mr. S. Nagamani	AP; GEO; AQ	- Site Visit with FAE - Provide inputs & Assisting FAE with sources of Air Pollution, its impact and suggest control measures - Provide inputs on Geological Aspects - Analyse & provide inputs and assist FAE with meteorological data, emission estimation, AERMOD modelling and suggesting control measures	
2	Mr. Viswathanan	AP; WP; LU	- Site Visit with FAE - Provide inputs & Assisting FAE with sources of Air Pollution, its impact and suggest control measures - Assisting FAE on sources of water pollution, its impacts and suggest control measures - Assisting FAE in preparation of land use maps	
3	Mr. Santhoshkumar	GEO; SC	- Site Visit with FAE - Provide inputs on Geological Aspects - Assist in Resources & Reserve Calculation and preparation of Production Plan & Conceptual Plan - Provide inputs & Assisting FAE with soil conservation methods and identifying impacts	
4	Mr. Umamahesvaran	GEO	- Site Visit with FAE - Provide inputs on Geological Aspects	

			Assist in Resources & Reserve Calculation and preparation of Production Plan & Conceptual Plan	
5	Mr. A. Allimuthu	SE	- Site Visit with FAE - Assist FAE with collection of data's - Provide inputs by analysing primary and secondary data	<i>A. Allimuthu</i>
6	Mr. S. Ilavarasan	LU; SC	- Site Visit with FAE - Assisting FAE in preparation of land use maps - Provide inputs & Assisting FAE with soil conservation methods and identifying impacts	<i>S. Ilavarasan</i>
7	Mr. E. Vadivel	HG	- Site Visit with FAE - Assist FAE & provide inputs on aquifer characteristics, ground water level/table - Assist with methods of ground water recharge and conduct pump test, flow rate	<i>E. Vadivel</i>
8	Mr. D. Dinesh	NV	- Site Visit with FAE - Assist FAE and provide inputs on impacts due to proposed mine activity and suggest mitigation measures - Assist FAE with prediction modelling	<i>D. Dinesh</i>
9	Mr. Panneer Selvam	EB	- Site Visit with FAE - Assist FAE with collection of baseline data - Provide inputs and assist with labelling of Flora and Fauna	<i>P. Panneer Selvam</i>
10	Mrs. Nathiya	EB	- Site Visit with FAE - Assist FAE with collection of baseline data - Provide inputs and assist with labelling of Flora and Fauna	<i>T. Annappa</i>

DECLARATION BY THE HEAD OF THE ACCREDITED CONSULTANT ORGANIZATION

I, Dr. M. Ifthikhar Ahmed, Managing Partner, Geo Exploration and Mining Solutions, hereby, confirm that the above-mentioned Functional Area Experts and Team Members prepared the EIA/EMP for Thiru. A. Subramaniam Rough Stone & Gravel Quarry Project over an Extent of 1.21.50 ha in Sokkanur Village of Kinathukadavu Taluk, Coimbatore District of Tamil Nadu. It is also certified that information furnished in the EIA study are true and correct to the best of our knowledge.

Signature& Date:



Name:

Dr. M. Ifthikhar Ahmed

Designation:

Managing Partner

Name of the EIA Consultant Organization:

M/s. Geo Exploration and Mining Solutions

NABET Certificate No & Issue Date:

NABET/EIA/2225/RA0276 Dated: 20.02.2023

Validity:

Valid till 06.08.2025