

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 (Cluster) – MINOR MINERAL – CLUSTER –

PATTA LAND - FRESH QUARRY

Cluster Extent – 17.09.5 Ha

(1 Proposed + 5 Existing Quarries)

Extent – 4.05.0 Ha

Project Proponent

M/s. Gugan Mines,

No.5, Arpakkam Road, Arpakkam,
Walajabad Taluk,
Kancheepuram District- 631 603

M/s. GUGAN MINES ROUGH STONE AND GRAVEL QUARRY

PROJECT LOCATION	PROPOSED PRODUCTION
S.F.Nos.: 182/1A, 1B1, 1B2, 2, 183, 184, 185 & 186/2 Kundiyanthandalam Village, Vembakkam Taluk Tiruvannamalai District, Tamil Nadu	Reserves: 592560 m³ of Rough Stone & 12188 m³ of Gravel Peak Production = 132110m³ of Rough Stone, 51688 m³ of Gravel Proposed Depth = 49m bgl

File No.11675 ToR Identification: TO25B0108TN5991919N Dated: 03.03.2025

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: info@geoexploration@gmail.com Web: www.gemssalem.com	  Laboratory  EHS 360 LABS PRIVATE LIMITED, NABL Accredited laboratory 10/2 Ground floor, 50th street, 7th Avenue, Ashok Nagar, Chennai – 600 083.
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Baseline Monitoring Period

DECEMBER 2024 to FEBRUARY 2025

APRIL 2025

UNDERTAKING

I M/s.Gugan Mines given undertaking that this EIA & EMP report prepared for our Rough stone and Gravel quarry situated in S.F. No 182/1A, 1B1, 1B2, 2, 183, 184, 185, 186/2, over an extent of 4.05.0Ha in Kundiyanthandalam Village, Vembakkam Taluk, Tiruvannamalai District based on the ToR issued by the State Level Environmental Impact Assessment Authority (SEIAA), Tamil Nadu vide File No.11675 ToR Identification: TO25B0108TN5991919N Dated: 03.03.2025.

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.P. Lokesh
(Managing Partner)

Place: Tiruvannamalai

Dated:

DECLARATION

I Dr. M. Ifthikhar Ahmed – EIA Co Ordinator declare that the EIA & EMP report for the Rough stone and Gravel quarry S.F. No 182/1A, 1B1, 1B2, 2, 183, 184, 185, 186/2, over an extent of 4.05.0Ha in Kundiyanthandalam Village, Vembakkam Taluk, Tiruvannamalai 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, Expired and Abandoned Quarries in the Cluster are given unique codes and identifies and studied in this EIA/ EMP Report.

PROPOSED QUARRIES					
CODE	Name of the Owner	Village	S.F. Nos	Extent in Ha	Status
P1	M/s.Gugan Mines, No.5, Arpakkam Road, Arpakkam, Walajabad Taluk, Kancheepuram District	Kundiyanthandalam	182/1A, 182/1B1,182/ B2, 182/2, 183,184,185 & 186/2	4.05.0	File No.11675 ToR Identification: TO25B0108TN5991919N Dated:03.03.2025.
	TOTAL EXTENT			4.05.0	
EXISTING QUARRIES					
CODE	Name of the Owner	Village	S.F. Nos	Extent in Ha	Status
E-1	Thiru.K. Chandrasekaran, S/o. Kathirvel, No.301, Madhurayan Pettai Street, Mamandur Village, Vembakkam Taluk, Tiruvannamalai District.	Kundiyanthandalam	163/1A,163/1 B,163/2,163/3 ,163/4,163/7,1 63/8A,163/9,1 63/10A,163/1 0B & 163/11	1.97.5	02.12.2021 to 01.12.2031
E-2	Thiru.R. Nethaji, S/o. Ramadoss, No.79, Jain Street, Arpakkam, Walajabad Taluk, Kancheepuram District.	Kundiyanthandalam	176/1A,176/1 B,176/1C,176 /2A,176/2B,1 76/3A,176/3B ,176/3C,176/3 D,176/3E,176/ 3F,176/3G& 176/4B	2.45.0	06.12.2021 to 05.12.2031
E-3	M/s.Buvaneshwari Blue Metals, No.8A, Plot No.56, 5 th Street, Lazar Nagar, Kamaraj Nagar, Avadi, Chennai	Kundiyanthandalam	180/1I1,181/1 I2,181/1J1,18 1/1J2,181/1L1 ,181/1L2,181/ 1M1, 181/1N1, 181/1N2, 181/1O1,181/ 1O2,181/1O3, 181/1O4,181/ 1P,181/1Q1,1 81/1Q2& 181/Q3	2.05.5	23.02.2022 to 22.02.2032
E-4	Thiru.A. Dhasarathan, S/o.Annakotti,No.39, Erikkarai Street, Thiruparuthikunram Village, Sevilimedu, Kanchipuram District.	Kundiyanthandalam	186/1,190/2B 1 & 1902B2	2.88.5	15.07.2022 to 14.07.2032
E-5	Thiru K. Moorthi, S/o.Kannaiyan, No.299, Mandabam Junction, Arpakkam Village, Kanchipuram District.	Kundiyanthandalam & Poonathangal Village	162/9,162/10 B,163/5,163/6 ,163/10C,163/ 12,163/13A,1 63/13B,163/1 3C,163/13D,1 63/13E,163/1 3F, 163/14A,181/ 1D1, 181/1D2,181/ 1E1,181/1E2 & 181/1E3 in Kundiyanthan dalam & 117/14 & 117/15 in	3.68.0	08.02.2023 to 07.02.2033

			Poonaihangal Village		
	TOTAL EXTENT			13.04.5 ha	
ABANDONED QUARRY					
A-1	Thiru M. Sudharsan, Pl.No.37, Parvathi Nagar, 3 rd street, Madampakkam, Chennai.	Kundiyanthandala m	178/1B2,178/ 1C1,178/1C2, 178/1D1,178/ 1D1,178/1D2, 178/1D4,181/ 1C1,181/1C2 & 181/1G1	3.25.0	17.09.2018 to 16.09.2023
A-2	Thiru.A. Aron Samuvel S/o.Arockiyanathan, No.15, Sessa Nagar, Poovirnthavalli, Chennai-600 056	Kundiyanthandala m	176/6A,176/6 B,176/7A,176 /7B,176/7C,1 76/9A & 176/9B	1.83.5	17.09.2018 to 16.09.2023
A-3	Thiru. E. Paneerselvam S/o. Elumalai, 89, Vanniya mettu St, Arpakkam Village, Kanchipuram District	Kundiyanthandala m	187/3	1.43.0	14.09.2017 to 13.09.2022
	TOTAL CLUSTER EXTENT			17.09.5	

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

TERMS OF REFERENCE (ToR) COMPLIANCE

M/s.Gugan Mines

File No.11675 TOR Identification No. TO25B0108TN5991919N Dated:03.03.2025

SPECIFIC CONDITIONS		
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
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 & agreed. Copy of affidavit agreement regarding forming CMC will be submitted during the appraisal meeting.
3	The PP shall erect DGPS reference pillars as per MCDR Rules, 1988 and furnish photographic evidences of the same at the time of EIA appraisal.	Noted & agreed.
4	The PP shall ensure that the CCTV Cameras are installed inside the mine premises and the photographs of the same shall be submitted at the time of EIA appraisal.	Noted and agreed
5	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.
6	Since the water bodies are located nearby, the PP shall submit the hydrogeological report based on comprehensive field studies during the EIA appraisal without any deviation	Noted and agreed
7	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 The Bio diversity study has been conducted by the Functional Area Expert approved by the NABET. The same has been detailed in the Chapter No. 3.
8	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 The EMP has been prepared for the entire life of the mine i.e., upto the lease period (5 Years) and the affidavit will be submitted.
9	The PP shall carry out the comprehensive studies on the cumulative environmental impacts of the existing & proposed quarries which included drilling & blasting, loading & hauling on the surrounding village and structures	Noted and agreed.
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	Fresh lease

	(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 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 controlled as well as no fly rock travel beyond 30 m from the blast site.	Noted and agreed
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 no other quarry except this proposal operated by Proponent M/s.Gugan Mines
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.	Fresh Lease
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– 592560 m ³ Peak Production – 132110m ³ Proposed Depth – 49m 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,	Noted and agreed. The PP provided Organization chart indicating the appointment of various statutory officials and other competent persons to be appointed as per

	1961 for carrying out the quarrying operations scientifically and systematically in order to ensure safety and to protect the environment.	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 (Winter) Dec 2024 to Feb 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 900nos 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 2025Nos 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	Noted and agreed It is explained in Chapter -3

	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.	
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 this 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/TNPCCB.	Fresh Lease
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 The Cluster management committee has been formed covering the existing and proposed quarries in the cluster
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 The information will be shared to the cluster management committee during the monthly meeting.
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 list of members of the committee formed will be submitted to AD/Mines before resuming the mining operation.
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 It is an existing Granite quarry the blasting will be used occasionally for the removal of overburden only the blasting frequency and usage of haul roads are discussed.
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 The risk management plan and disaster management plan has been prepared and enclosed in this EIA report, Chapter No. 7.
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 Environmental policy of the cluster management committee is detailed in the EIA Report Chapter No. 6

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 and agreed The Restoration strategy is discussed in the progressive mine closure plan and enclosed in the Scheme of Mining plan.
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 The information on the health of the workers and the local people will be updated periodically along with medical examination.
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 The area is proposed Lease & Few trees present with in lease.
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. This is a proposed lease area.
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 Marudham-R.F- 8.2km-SE
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. Karikili Birds Sanctuary – 19 Km – South East
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 10 open wells and 8 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	Details in Chapter 2 and 4 impact of bio diversity

	water body and Reservoir	
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 10 open wells and 8 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 micro plastic on the environment. The ecological risks and impacts of plastic & micro plastics 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 for (Mining of minerals)		
S.No	Terms of Reference	Reply
1.1	An EIA-EMP Report shall be prepared for peak capacity (.....MTPA) operation in an ML/project area of.....ha based on the generic structure specified in Appendix III of the EIA Notification, 2006.	Peak Production – 1,32,110m ³ Depth – 49m bgl Mine Lease area – 4.05.5 Ha
1.2	An EIA-EMP Report would be prepared for peak capacity operation to cover the impacts and environment management plan for the project specific activities on the environment of the region, and the environmental quality encompassing air, water, land, biotic community, etc. through collection of data and information, generation of data on impacts including prediction modeling for.... MTPA of mineral production based on approved project/Mining Plan for.... MTPA. Baseline data collection can be for any season (three months) except monsoon.	Peak capacity of 1,32,110m ³ operation to cover the impacts and environment management plan in chapter- IV and Chapter 10 covered in project specific activities. Baseline Data were collected for Winter season Dec 2024 to Feb 2025 as per CPCB Notification and MoEF & CC Guidelines. Details in Chapter No. III
1.3	Proper KML file with pin drop and coordinate of mine at 500-1000 m interval be provided.	Noted, Google earth image showing lease area with Coordinates of pillars in

1.4	A Study area map of the core zone (project area) and 10 km area of the buffer zone (1: 50,000 scale) clearly delineating the major topographical features such as the land use, surface drainage pattern including rivers/streams/nullahs/canals, locations of human habitations, major constructions including railways, roads, pipelines, major industries, mines, and other polluting sources. In case of ecologically sensitive areas such as Biosphere Reserves/National Parks/WL Sanctuaries/ Elephant Reserves, forests (Reserved/Protected), migratory corridors of fauna, and areas where endangered fauna and plants of medicinal and economic importance found in the 15 km study area should be given. The above details to be furnished in tabular form also.	Land use and land cover of the 10km Radius of study area is discussed in Chapter No. III. Geology map of the project area covering 10km radius Figure No. 2.9 Geomorphology of the area is given in Chapter No 2 Figure No 2.10 There are No National Parks, Biosphere Reserves, Wildlife Corridors, and Tiger/Elephant Reserves within 10 km Radius from the periphery of the project area.
1.5	Map showing the core zone delineating the agricultural land (irrigated and un-irrigated, uncultivable land as defined in the revenue records, forest areas (as per records), along with other physical features such as water bodies, etc should be furnished.	Land use and land cover of the study area is discussed in Chapter No. III with Physical features such as waterbodies, odai, canal etc.,
1.6	A contour map showing the area drainage of the core zone and 25 km of the study area (where the water courses of the core zone ultimately join the major rivers/streams outside the lease/project area) should also be clearly indicated in the separate map.	DEM data using Drainage pattern around 10km radius showing streams and lakes etc., discussed in Chapter No. 3.
1.7	Catchment area with its drainage map of 25 km area within and outside the mine shall be provided with names, details of rivers/ riverlet system and its respective order. The map should clearly indicate drainage pattern of the catchment area with basin of major rivers. Diversion of drains/ river need elaboration in form of length, quantity and quality of water to be diverted.	Drainage pattern around 10km radius showing streams and lakes etc., is discussed in Chapter No. 3.
1.8	(Details of mineral reserves, geological status of the study area and the seams to be worked, ultimate working depth and progressive stage-wise working scheme until the end of mine life should be provided on the basis of the approved rated capacity and calendar plans of production from the approved Mining Plan. Geological maps and sections should be included. The Progressive mine development and Conceptual Final Mine Closure Plan should also be shown in figures. Details of mine plan and mine closure plan approval of Competent Authority should be furnished for green field and expansion projects.	Details in chapter-2 showing the land features. And also enclosed Approved mining plan in annexure.

1.9	Details of mining methods, technology, equipment to be used, etc., rationale for selection of specified technology and equipment proposed to be used vis-à-vis the potential impacts should be provided.	It is an opencast quarrying operation proposed to operate in Mechanized method. The height and width of the bench will be maintained as 5m with 90 ⁰ 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.
1.10	Impact of mining on hydrology, modification of natural drainage, diversion and channeling of the existing rivers/water courses flowing through the ML and adjoining the lease/project and the impact on the existing users and impacts of mining operations thereon.	Impact Studies and Mitigation Measures of Water Environment including Surface Water and Ground Water are discussed in Chapter 4.
1.11	A detailed Site plan of the mine showing the proposed break-up of the land for mining operations such as the quarry area, OB dumps, green belt, safety zone, buildings, infrastructure, Stockyard, township/colony (within and adjacent to the ML), undisturbed area -if any, and landscape features such as existing roads, drains/natural water bodies to be left undisturbed along with any natural drainage adjoining the lease /project areas, and modification of thereof in terms of construction of embankments/bunds, proposed diversion/re-channeling of the water courses, etc., approach roads, major haul roads, etc should be indicated.	Not Applicable. The details of waste dump management are given in the Chapter No. 4

1.12	Original land use (agricultural land/forestland/grazing land/wasteland/water bodies) of the area should be provided as per the tables given below. Impacts of project, if any on the land use, in particular, agricultural land/forestland/grazing land/water bodies falling within the lease/project and acquired for mining operations should be analyzed. Extent of area under surface rights and under mining rights should be specified. Area under Surface Rights				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,																						
	Sno	ML. project Land use	Area under Surface Rights(ha)	Area Under Mining Rights(ha)	Area under Both (ha)	Description	Present Area (Ha)	Proposed Common boundary	Leaving safety and Benches																		
								Area at the end of lease period (Ha)	Area at the end of lease period (Ha)																		
	1	Agriculture Land				Area Under Quarry	Nil	3.30.0	3.16.0																		
	2	Forest Land																									
	3	Grazing Land				Site Services	Nil	0.01.0	0.01.0																		
	4	Settlements																									
	5	Others (Specify)																									
	<table><tr><th>S.No</th><th>Details</th><th>Area (Ha)</th></tr><tr><td>1</td><td>Buildings</td><td></td></tr><tr><td>2</td><td>Infrastructure</td><td></td></tr><tr><td>3</td><td>Roads</td><td></td></tr><tr><td>4</td><td>Others (Specify)</td><td></td></tr><tr><td></td><td>Total</td><td></td></tr></table>					S.No	Details	Area (Ha)	1	Buildings		2	Infrastructure		3	Roads		4	Others (Specify)			Total		Roads	Nil	0.02.0	0.02.0
	S.No	Details	Area (Ha)																								
	1	Buildings																									
	2	Infrastructure																									
3	Roads																										
4	Others (Specify)																										
	Total																										
					Green Belt	Nil	0.55.0	0.55.0																			
					Unutilized Area	4.05.0	0.17.0	0.31.0																			
					Grand Total	4.05.0	4.05.0	4.05.0																			

| 1.13 | Study on the existing flora and fauna in the study area (10km) should be carried out by an institution of relevant discipline. The list of flora and fauna duly authenticated separately for the core and study area and a statement clearly specifying whether the study area forms a part of the migratory corridor of any endangered fauna should be given. If the study area has endangered flora and fauna, or if the area is occasionally visited or used as a habitat by Schedule-I species, or if the project falls within 15 km of an ecologically sensitive area, or used as a migratory corridor then a Comprehensive Conservation Plan along with the appropriate budgetary provision should be prepared and submitted with EIA-EMP Report; and comments/observation from the CWLW of the State Govt. should also be obtained and furnished. | | | | 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. | | | |
| 1.14 | One-season (other than monsoon) primary baseline data on environmental quality - air (PM10, PM2.5, SOx, NOx and heavy metals such as Hg, Pb, Cr, As, etc), noise, water (surface and groundwater), soil - along with one-season met data coinciding with the same season for AAQ collection period should be provided. The detail of NABL/ MoEF&CC certification of the respective laboratory and NABET accreditation of the consultant to be provided. | | | | Baseline Data were collected for Winter Season Dec 2024 to Feb 2025 as per CPCB Notification and MoEF & CC Guidelines. Details in Chapter No. 3. | | | |

1.15	Map (1: 50, 000 scale) of the study area (core and buffer zone) showing the location of various sampling stations superimposed with location of habitats, other industries/mines, polluting sources, should be provided. The number and location of the sampling stations in both core and buffer zones should be selected on the basis of size of lease/project area, the proposed impacts in the downwind (air) / downstream (surface water)/groundwater regime (based on flow). One station should be in the upwind/upstream/non-impact/non-polluting area as a control station. The monitoring should be as per CPCB guidelines and parameters for water testing for both ground water and surface water as per ISI standards and CPCB classification wherever applicable. Observed values should be provided along with the specified standards.	Details in chapter-3 showing the various sampling stations As per CPCB guidelines.
1.16	For proper baseline air quality assessment, Wind rose pattern in the area should be reviewed and accordingly location of AAMSQ shall be planned by the collection of air quality data by adequate monitoring stations in the downwind areas. Monitoring location for collecting baseline data should cover overall the 10km buffer zone i.e., dispersed in 10 km buffer area. In case of expansion, the displayed data of CAAQMS and its comparison with the monitoring	Noted and agreed Air Quality Modelling and wind rose pattern for prediction of incremental GLC's of pollutant was carried out using AERMOD view 13 Model. Details in Chapter No. 4.
1.17	A detailed traffic study along with presence of habitation in 100 mts distance from both side of road, the impact on the air quality with its proper measures and plan of action with timeline for widening of road. The project will increase the no. of vehicle along the road which will indirectly contribute to carbon emission so what will be the compensatory action plan should be clearly spell out in EIA/ EMP report.	Noted and agreed Traffic density survey was carried out to analyses the impact of Transportation in the study area as per IRC guidelines 1961 and it is inferred that there is no significant impact due to the proposed transportation from the project area. Details in Chapter-II.
1.18	The socio-economic study to conducted with actual survey report and a comparative assessment to be provided from the census data should be provided in EIA/ EMP report also occupational status & economic status of the study area and what economically project will contribute should be clearly mention. The study should also include the status of infrastructural facilities and amenities present in the study area and a comparative assessment with census data to be provided and to link it with the initialization and quantification of need-based survey for CSR activities to be followed.	Noted and agreed Detailed in chapter-3 socio-economic study with occupational status & economic status of the study area. The study should also include the status of infrastructural facilities and amenities present in the study area CSR are discussed under Chapter 8.
1.19	The Ecology and biodiversity study should also indicate the likely impact of change in forest area for surface infrastructural development or mining activity in relation to the climate change of that area and what will be the compensatory measure to be adopted by PP to minimize the impact of forest diversion.	Noted and agreed Detailed Ecology and biodiversity study in chapter-3
1.20	Baseline data on the health of the population in the impact zone and measures for occupational health and safety of the personnel and manpower for the mine should be submitted.	Detailed in chapter-4 population in the impact zone and measures for occupational health and safety and proposed occupational health in chapter-X
1.21	Impact of proposed project/activity on hydrological regime of the area shall be assessed and report be submitted. Hydrological studies as per GEC 2015 guidelines to be prepared and submitted.	Noted and agreed

1.22	Impact of mining and water abstraction from the mine on the hydrogeology and groundwater regime within the core zone and 10 km buffer zone including long-term monitoring measures should be provided. Details of rainwater harvesting and measures for recharge of groundwater should be reflected in case there is a declining trend of groundwater availability and/or if the area falls within dark/grey zone.	The ground water table is at 59-63m below ground level. ultimate depth is 49 m Bgl It is inferred the quarrying activities in the EIA project (Quarry) will not intersect the Ground water table.
1.23	Study on land subsidence including modeling for prediction, mitigation/prevention of subsidence, continuous monitoring measures, and safety issues should be carried out.	Noted and agreed Detailed in Chapter-IV Anticipated and mitigation measures of in the study area.
1.24	Detailed water balance should be provided. The break up of water requirement as per different activities in the mining operations, including use of water for sand stowing should be given separately. Source of water for use in mine, sanction of the Competent Authority in the State Govt. and impacts vis-à-vis the competing users should be provided.	Noted and agreed Total Water Requirement: 2.1 KLD Discussed under Chapter 2, The required water will be met from rainwater accumulated in mine pit (when available) and from the approved water vendors.
1.25	PP shall submit design details of all Air Pollution control equipment (APCEs) to be implemented as part of Environment Management Plan vis-à-vis reduction in concentration of emission for each APCEs	Noted and agreed Methodology And Instrument Used for Air Quality Analysis in chapter-3 and Air Pollution control equipment (APCEs) in chapter-10 sub 10.2 Environmental policy.
1.26	PP shall propose to use LNG/CNG based mining machineries and trucks for mining operation and transportation of mineral. The measures adopted to conserve energy or use of renewable sources shall be explored.	Details in Machinery and equipment details in Chapter-2 Table No 2.16
1.27	PP to evaluate the green house emission gases from the mine operation/ washery plant and corresponding carbon absorption plan.	Noted and agreed
1.28	Site specific Impact assessment with its mitigation measures, Risk Assessment and Disaster Preparedness and Management Plan should be provided.	A Risk Assessment and Disaster Preparedness and management Plan Chapter- 7
1.29	Impact of choice of mining method, technology, selected use of machinery and impact on air quality, mineral transportation, handling & storage/stockyard, etc, Impact of blasting, noise and vibrations should be provided.	Detailed in Machinery and technology used Chapter-3. Methodology and Instrument Used for Air Quality Analysis Detailed study in chapter-4 Impact of choice of mining method and impact on air quality and blasting and noise and vibrations.
1.30	Impacts of mineral transportation within the mining area and outside the lease/project along with flow-chart indicating the specific areas generating fugitive emissions should be provided. Impacts of transportation, handling, transfer of mineral and waste on air quality, generation of effluents from workshop etc, management plan for maintenance of HEMM and other machinery/equipment should be given. Details of various facilities such as rest areas and canteen for workers and effluents/pollution load emanating from these activities should also be provided.	Traffic density survey was carried out to analyses 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. 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.

1.31	Details of various facilities to be provided to the workers in terms of parking, rest areas and canteen, and effluents/pollution load resulting from these activities should also be given.	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
1.32	The number and efficiency of mobile/static water jet, Fog cannon sprinkling system along the main mineral transportation road inside the mine, approach roads to the mine/stockyard/siding, and also the frequency of their use in impacting air quality should be provided.	Detailed in chapter-2 for mineral transportation route with approach roads etc., and impacting air quality detailed given chapter-4
1.33	Conceptual Final Mine Closure Plan and post mining land use and restoration of land/habitat to the pre- mining status should be provided. A Plan for the ecological restoration of the mined-out area and post mining land use should be prepared with detailed cost provisions. Impact and management of wastes and issues of re-handling (wherever applicable) and backfilling and progressive mine closure and reclamation should be furnished.	Discussed under Chapter 2. Mine Closure Plan is a part of Approved Mining Plan enclosed as Annexure Volume – 1.
1.34	Adequate greenbelt nearby areas, mineral stock yard and transportation area of mineral shall be provided with details of species selected and survival rate Greenbelt development should be undertaken particularly around the transport route.	Noted and agreed Greenbelt Development Plan is discussed under Chapter 4,
1.35	Cost of EMP (capital and recurring) should be included in the project cost and for progressive and final mine closure plan.	Noted and agreed The total cost and the details are given in the Chapter No. 10
1.36	Details of R&R. Detailed project specific R&R Plan with data on the existing socio- economic status of the population (including tribals, SC/ST, BPL families) found in the study area and broad plan for resettlement of the displaced population, site for the resettlement colony, alternate livelihood concerns/employment for the displaced people, civic and housing amenities being offered, etc. and costs along with the schedule of the implementation of the R&R Plan should be given.	Not Applicable. 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.
1.37	CSR Plan along with details of villages and specific budgetary provisions (capital and recurring) for specific activities over the life of the project should be given.	CSR are discussed under Chapter 8. And specific budgetary provisions (capital and recurring) for specific activities over the life of the project in chapter-10
1.38	Corporate Environment Responsibility:	CER are discussed under Chapter 8.
1.39	a) The Company must have a well laid down Environment Policy approved by the Board of Directors.	Detailed in chapter-10 The Environment Policy
1.40	b) The Environment Policy must prescribe for standard operating process/procedures to bring into focus any infringements/deviation/violation of the environmental or forest norms/conditions.	
1.41	c) The hierarchical system or Administrative Order of the company to deal with environmental issues and for ensuring compliance with the environmental clearance conditions must be furnished.	The Environment Monitoring Cell discussed under Chapter 6
1.42	d) To have proper checks and balances, the company should have a well laid down 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	The Environment Monitoring Cell discussed under Chapter 6
1.43	e) Environment Management Cell and its responsibilities to be clearly spell out in EIA/ EMP report	The Environment Monitoring Cell discussed under Chapter 6

1.44	f) In built mechanism of self-monitoring of compliance of environmental regulations should be indicated.	The Environment Monitoring Cell discussed under Chapter 6
1.45	Status of any litigations/ court cases filed/pending on the project should be provided.	No litigation is pending in any court against this project
1.46	PP shall submit clarification from DFO that mine does not falls under corridors of any National Park and Wildlife Sanctuary with certified map showing distance of nearest sanctuary.	Karikili Birds Sanctuary – 19 Km – South East DFO Letter will be Submitted final EIA/EMP report
1.47	Copy of clearances/approvals such as Forestry clearances, Mining Plan Approval, mine closer plan approval. NOC from Flood and Irrigation Dept. (if req.), etc. wherever applicable	Noted and agreed
1.48	Details on the Forest Clearance should be given as per the format given: Total Mine lease area (ha): Total Forest Land (Ha) : Date of FC : Extent of Forest Land : Balance area for which FC is yet to be obtained: Status of application for diversion of forest Land: If more than one provides details of each FC	Noted and agreed :Marudham R.F – 8.2 km – South East Total Mine Lease area 4.05.0ha Details on the Forest Clearance will Submit final EIA/EMP report.
1.49	In case of expansion of the proposal, the status of the work done as per mining plan and approved mine closure plan shall be detailed in EIA/ EMP report.	Enclosed Approved mining plan in Annexure volume-I
1.50	Details on Public Hearing should cover the information relating to notices issued in the newspaper, proceedings/minutes of Public Hearing, the points raised by the general public and commitments made by the proponent and the time bound action proposed with budgets in suitable time frame. These details should be presented in a tabular form. If the Public Hearing is in the regional language, an authenticated English Translation of the same. should be provided.	The outcome of public hearing will be updated in the final EIA/AMP report.
1.51	PP shall carry out survey through drone highlighting the ground reality for at least 10 minutes.	Noted and agreed
1.52	Detailed Chronology of the project starting from the first lease deed allotted/Block allotment/ Land acquired to its No. of renewals, CTO /CTE with details of no. renewals, previous EC(s) granted details and its compliance details, NOC details from various Govt bodies like Forest NOC(s), CGWA permissions, Power permissions, etc as per the requisites respectively to be furnished in tabular form.	Fresh lease
1.53	The first page of the EIA/ EMP report must mention the peak capacity production, area, detail of PP, Consultant (NABET accreditation) and Laboratory (NABL / MoEF & CC certification)	Noted and agreed As per detailed in front page of Draft EIA/EMP, NABET, NABL certification detailed given in the report.
1.54	The compliances of Tor must be properly cited with respective chapter section and page no in tabular form and also mention sequence of the respective ToR complied within the EIA-EMP report in all the chapters section.	As per Tor compliance each chapter wise page and table, figure no given in the EIA/EMP report.

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	Not applicable. This is not a violation category project. This proposal falls under B1 Category

	the EIA Notification 1994 came into force, w.r.t. the highest production achieved prior to 1994.	
2	A copy of the document in support of the fact that the Proponent is the rightful lessee of the mine should be given.	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,	Land use and land cover of the study area is discussed in Chapter No. 3.

	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 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	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.

	implementing the same should be made as part of the project cost.	
19	Proximity to Areas declared as 'Critically Polluted' or the Project areas likely to come under the '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 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.	Not Applicable. 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 Dec 2024 to Feb 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 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 ground water table is at 59-63m below ground level. The ultimate depth of this projects is 49m 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 97m AMSL Ultimate depth of the mine is 49m AMSL Water level in the area is 59-63m 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	Details in Chapter 10.

	adequate number of sections) should be given in the EIA report.	
35	Occupational Health impacts of the Project should be anticipated and the proposed preventive measures spelt out in detail. Details of pre-placement medical examination and periodical medical examination schedules should be incorporated in the EMP. The project specific occupational health mitigation measures with required facilities proposed in the mining area may be detailed.	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 entail conducting the PH again with the revised documentation	Noted & agreed.
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.

TABLE OF CONTENTS

1.INTRODUCTION.....	1
1.0 <i>PREAMBLE</i>	1
1.1 <i>PURPOSE OF THE REPORT</i>	1
1.2 <i>IDENTIFICATION OF PROJECT AND PROJECT PROPONENTS</i>	3
1.3 <i>BRIEF DESCRIPTION OF THE PROJECT</i>	4
1.4 <i>ENVIRONMENTAL CLEARANCE</i>	5
1.5 <i>TERMS OF REFERENCE (ToR)</i>	5
1.6 <i>POST ENVIRONMENT CLEARANCE MONITORING</i>	6
1.7 <i>GENERIC STRUCTURE OF EIA DOCUMENT</i>	6
1.8 <i>THE SCOPE OF THE STUDY</i>	6
2. PROJECT DESCRIPTION.....	8
2.0 <i>GENERAL</i>	8
2.1 <i>DESCRIPTION OF THE PROJECT</i>	8
2.2 <i>LOCATION OF THE PROJECT</i>	8
2.3 <i>GEOLOGY</i>	17
2.4 <i>RESOURCES AND RESERVES</i>	22
2.5 <i>METHOD OF MINING</i>	27
2.6 <i>GENERAL FEATURES</i>	28
2.7 <i>PROJECT REQUIREMENT</i>	30
2.8 <i>EMPLOYMENT REQUIREMENT:</i>	31
2.9 <i>PROJECT IMPLEMENTATION SCHEDULE</i>	31
3. DESCRIPTION OF ENVIRONMENT	32
3.0 <i>GENERAL</i>	32
3.1 <i>LAND ENVIRONMENT</i>	34
3.2 <i>WATER ENVIRONMENT</i>	44
3.3 <i>AIR ENVIRONMENT</i>	56
3.4 <i>NOISE ENVIRONMENT</i>	65
3.6 <i>Socio Economic Environment</i>	90
4. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES	99
4.0 <i>GENERAL</i>	99
4.1 <i>LAND ENVIRONMENT:</i>	99
4.2 <i>WATER ENVIRONMENT</i>	100
4.3 <i>AIR ENVIRONMENT</i>	101

4.4	NOISE ENVIRONMENT.....	107
4.6	SOCIO ECONOMIC	114
4.7	OCCUPATIONAL HEALTH AND SAFETY	114
4.8	MINE WASTE MANAGEMENT	115
4.9	MINE CLOSURE.....	115
5.0	INTRODUCTION.....	118
5.1	FACTORS BEHIND THE SELECTION OF PROJECT SITE.....	118
5.2	ANALYSIS OF ALTERNATIVE SITE	118
5.3	FACTORS BEHIND SELECTION OF PROPOSED TECHNOLOGY.....	118
5.4	ANALYSIS OF ALTERNATIVE TECHNOLOGY.....	118
6.	ENVIRONMENTAL MONITORING PROGRAMME.....	119
6.0	GENERAL	119
6.1	METHODOLOGY OF MONITORING MECHANISM.....	119
6.2	IMPLEMENTATION SCHEDULE OF MITIGATION MEASURES.....	120
6.3	MONITORING SCHEDULE AND FREQUENCY	121
6.4	BUDGETARY PROVISION FOR EMP.....	121
6.5	REPORTING SCHEDULES OF MONITORED DATA.....	122
7.	ADDITIONAL STUDIES.....	123
7.0	GENERAL	123
7.1.	PUBLIC CONSULTATION	123
7.2	RISK ASSESSMENT	123
7.3	DISASTER MANAGEMENT PLAN.....	125
7.4	CUMULATIVE IMPACT STUDY	128
7.5	PLASTIC WASTE MANAGEMENT PLAN.....	139
8.	PROJECT BENEFITS	140
8.0	GENERAL	140
8.1	EMPLOYMENT POTENTIAL	140
8.2	SOCIO-ECONOMIC WELFARE MEASURES PROPOSED	140
8.3	IMPROVEMENT IN PHYSICAL INFRASTRUCTURE	140
8.4	IMPROVEMENT IN SOCIAL INFRASTRUCTURE	140
8.5	OTHER TANGIBLE BENEFITS	140
9.	ENVIRONMENTAL COST BENEFIT ANALYSIS	142
10.	ENVIRONMENTAL MANAGEMENT PLAN	143
10.0.	GENERAL	143
10.1.	ENVIRONMENTAL POLICY	143

10.2.	LAND ENVIRONMENT MANAGEMENT –.....	144
10.3.	SOIL MANAGEMENT.....	144
10.4.	WATER MANAGEMENT.....	145
10.5.	AIR QUALITY MANAGEMENT	145
10.6.	NOISE POLLUTION CONTROL	145
10.7.	GROUND VIBRATION AND FLY ROCK CONTROL.....	146
10.8.	BIOLOGICAL ENVIRONMENT MANAGEMENT	146
10.9.	OCCUPATIONAL SAFETY & HEALTH MANAGEMENT.....	148
10.10.:	CONCLUSION –.....	154
11.	SUMMARY AND CONCLUSION	156

LIST OF TABLES

TABLE 1.1: DETAILS OF PROJECT PROPONENT	3
TABLE 1.2: SALIENT FEATURES OF THE PROPOSED PROJECT	3
TABLE 1.3: ENVIRONMENT ATTRIBUTES	6
TABLE 2.2: CO-ORDINATES – PROJECT BOUNDARY	8
TABLE 2.3: LAND USE PATTERN	17
TABLE 2.4: RESOURCES AND RESERVES	17
TABLE 2.5: RESOURCES AND RESERVES	22
TABLE 2.6: YEAR-WISE PRODUCTION PLAN FOR FIVE YEARS	22
TABLE 2.7: ULTIMATE PIT DIMENSION	24
TABLE 2.8 PROPOSED MACHINERY DEPLOYMENT	28
TABLE.2.9: TRAFFIC SURVEY LOCATIONS	28
TABLE 2.10: EXISTING TRAFFIC VOLUME	29
TABLE 2.11: ROUGH STONE & GRAVEL HOURLY TRANSPORTATION REQUIREMENT	29
TABLE 2.12: SUMMARY OF TRAFFIC VOLUME	29
TABLE 2.13: WATER REQUIREMENT FOR THE PROJECT	30
TABLE 2.14: PROPOSED MANPOWER DEPLOYMENT	31
TABLE 2.15: EXPECTED TIME SCHEDULE	31
TABLE 3.1: MONITORING ATTRIBUTES AND FREQUENCY OF MONITORING	33
TABLE 3.2: LAND USE / LAND COVER TABLE 10 Km RADIUS	34
TABLE 3.3: DETAILS OF ENVIRONMENT SENSITIVITY AROUND THE CLUSTER	38
TABLE 3.4: NEARBY WATER BODIES FROM THE PROPOSED PROJECT SITE	38
TABLE 3.5: SOIL SAMPLING LOCATIONS	38
TABLE 3.6: METHODOLOGY OF SAMPLING COLLECTION	39
TABLE 3.7: SOIL QUALITY OF THE STUDY AREA	42
TABLE 3.8: WATER SAMPLING LOCATIONS	45
TABLE 3.9: GROUND WATER SAMPLING RESULTS	47
TABLE 3.10: SURFACE WATER SAMPLING RESULTS	48
TABLE 3.11: WINTER SEASON WATER LEVEL OF OPEN WELLS 1 KM RADIUS	50
TABLE 3.12: WINTER SEASON WATER LEVEL OF BOREWELLS 1 KM RADIUS	51
TABLE 3.13: RAINFALL DATA	56

TABLE 3.14: METEOROLOGICAL DATA RECORDED AT SITE	57
TABLE 3.15: METHODOLOGY AND INSTRUMENT USED FOR AAQ ANALYSIS.....	58
TABLE 3.16: NATIONAL AMBIENT AIR QUALITY STANDARDS	58
TABLE 3.17: AMBIENT AIR QUALITY (AAQ) MONITORING LOCATIONS	59
TABLE 3.18: SUMMARY OF AAQ 1 to AAQ 7	61
TABLE 3.19: ABSTRACT OF AMBIENT AIR QUALITY DATA.....	62
TABLE 3.20: DETAILS OF SURFACE NOISE MONITORING LOCATIONS	66
TABLE 3.21: AMBIENT NOISE QUALITY RESULT	68
Table No.3.34 Description of Macrophytes.....	88
TABLE 3.37 – POPULATION CHARACTERISTICS AROUND 10KM RADIUS	92
TABLE 3.38– OCCUPATIONAL CHARACTERISTICS AROUND 10KM RADIUS	95
TABLE 4.1: ESTIMATED EMISSION RATE.....	102
TABLE 4.2: INCREMENTAL & RESULTANT GLC OF PM ₁₀	105
TABLE 4.3: INCREMENTAL & RESULTANT GLC OF PM _{2.5}	105
TABLE 4.4: INCREMENTAL & RESULTANT GLC OF SO ₂	105
TABLE 4.5: INCREMENTAL & RESULTANT GLC OF NOX	106
TABLE 4.7: ACTIVITY AND NOISE LEVEL PRODUCED BY MACHINERY	108
TABLE 4.8: PREDICTED NOISE INCREMENTAL VALUES.....	108
TABLE 4.9: PREDICTED PPV VALUES DUE TO BLASTING	109
TABLE 4.12: RECOMMENDED SPECIES FOR GREENBELT DEVELOPMENT PLAN	113
TABLE 4.13: GREENBELT DEVELOPMENT PLAN	114
TABLE 6.1 IMPLEMENTATION SCHEDULE	120
TABLE 6.2: PROPOSED MONITORING SCHEDULE POST EC.....	121
TABLE 6.3 ENVIRONMENT MONITORING PROGRAM BUDGET	121
TABLE 7.1 RISK ASSESSMENT& CONTROL MEASURES	123
TABLE 7.2: PROPOSED TEAMS TO DEAL WITH EMERGENCY SITUATION	126
TABLE 7.3: PROPOSED FIRE EXTINGUISHERS AT DIFFERENT LOCATIONS	127
TABLE 7.4: LIST OF QUARRIES WITHIN 500 METER RADIUS	128
TABLE 7.7: SALIENT FEATURES OF PROPOSAL “E1”	131
TABLE 7.8: SALIENT FEATURES OF PROPOSAL “E2”	131
TABLE 7.7: SALIENT FEATURES OF PROPOSAL “E3”	132

TABLE 7.8: SALIENT FEATURES OF PROPOSAL “E4”	132
TABLE 7.7: SALIENT FEATURES OF PROPOSAL “E5”	132
TABLE 7.11: CUMULATIVE PRODUCTION LOAD OF ROUGH STONE	133
TABLE 7.12: CUMULATIVE PRODUCTION LOAD OF GRAVEL	134
TABLE 7.14: EMISSION ESTIMATION FROM QUARRIES WITHIN 500 METER RADIUS	134
TABLE 7.15: INCREMENTAL & RESULTANT GLC WITHIN CLUSTER	135
TABLE 7.16: PREDICTED NOISE INCREMENTAL VALUES FROM CLUSTER.....	136
TABLE 7.17: NEAREST HABITATION FROM EACH MINE.....	137
TABLE 7.18: GROUND VIBRATIONS AT 6 MINES.....	137
TABLE 7.19: SOCIO ECONOMIC BENEFITS FROM 6 MINES	138
TABLE 7.20: EMPLOYMENT BENEFITS FROM 6 MINES.....	138
TABLE 7.21: GREENBELT DEVELOPMENT BENEFITS FROM 6 MINES.....	138
TABLE 7.22: ACTION PLAN TO MANAGE PLASTIC WASTE	139
TABLE 8.1 CER – ACTION PLAN	141
TABLE 10.1. PROPOSED CONTROLS FOR LAND ENVIRONMENT	144
TABLE 10.2. PROPOSED CONTROLS FOR SOIL MANAGEMENT	144
TABLE 10.3. PROPOSED CONTROLS FOR WATER ENVIRONMENT	145
TABLE 10.4. PROPOSED CONTROLS FOR AIR ENVIRONMENT	145
TABLE 10.5.: PROPOSED CONTROLS FOR NOISE ENVIRONMENT	146
TABLE 10.6.: PROPOSED CONTROLS FOR GROUND VIBRATIONS & FLY ROCK.....	146
TABLE 10.7: PROPOSED GREENBELT ACTIVITIES.....	147
TABLE 10.8. RECOMMENDED SPECIES FOR THE PLANTS/ANIMALS.....	148
TABLE 10.9. MEDICAL EXAMINATION SCHEDULE	148
TABLE 10.10: EMP BUDGET FOR PROPOSED PROJECT	150

LIST OF FIGURES

FIGURE 1.1 SATELLITE IMAGERY CLUSTER QUARRIES	3
FIGURE 1.2 LOCATION MAP OF THE PROJECT SITE.....	5
FIGURE 1.3: TOPOSHEET MAP OF THE STUDY AREA 10 KM RADIUS	3
FIGURE 1.4: TOPOSHEET MAP OF THE STUDY AREA 2KM RADIUS	4
FIGURE 2.1: TOPOGRAPHICAL VIEW OF PROJECT AREA.....	9
FIGURE 2.2: PHOTOGRAPHS OF GREENBELT & FENCING	10
FIGURE 2.3: PHOTOGRAPHS OF GARLAND	10
FIGURE 2.4: GOOGLE IMAGE OF THE PROJECT AREA	11
FIGURE 2.6: VILLAGE MAP SUPERIMPOSED ON GOOGLE EARTH IMAGE.....	13
FIGURE 2.7: IMAGE SHOWING SURFACE FEATURES AROUND 10 KM RADIUS	14
FIGURE 2.8: IMAGE SHOWING SURFACE FEATURES AROUND 5 KM RADIUS	15
FIGURE 2.9: IMAGE SHOWING SURFACE FEATURES AROUND 1 KM RADIUS	16
https://www.twadboard.tn.gov.in/content/tiruvannamalai	19
FIGURE 2.11: GEOMORPHOLOGY MAP	21
FIGURE 2.12: TOPOGRAPHY, GEOLOGICAL, YEAR-WISE DEVELOPMENT PRODUCTION PLAN AND SECTIONS	23
FIGURE 2.13: CLOSURE PLAN AND SECTIONS.....	25
FIGURE.2.14: MINERAL TRANSPORTATION ROUTE MAP	29
FIGURE 3.1: PIE DIAGRAM OF LAND USE AND LAND COVER	34
FIGURE 3.2: PHYSIOGRAPHIC MAP 10KM RADIUS	36
FIGURE 3.3: LAND USE LAND COVER MAP 10KM RADIUS	37
FIGURE 3.5: SOIL SAMPLING LOCATIONS AROUND 10 KM RADIUS	40
FIGURE 3.6: SOIL MAP	41
FIGURE 3.8: WATER SAMPLING LOCATIONS AROUND 10 KM RADIUS	46
FIGURE 3.9: OPEN WELL CONTOUR MAP DEC 2024 to FEB 2025	50
FIGURE 3.10: BOREWELL CONTOUR MAP – DEC 2024 to FEB 2025	51
FIGURE 3.11: DRAINAGE MAP AROUND 10 KM RADIUS FROM PROJECT SITE.....	52
FIGURE 3.12: GROUND WATER PROSPECT MAP	53
FIGURE 3.13: WINDROSE DIAGRAM.....	57
FIGURE 3.15: AMBIENT AIR QUALITY LOCATIONS AROUND 10 KM RADIUS	60
FIGURE 3.16: BAR DIAGRAM OF SUMMARY OF AAQ 1 – AAQ7.....	63

FIGURE 3.17: BAR DIAGRAM OF PARTICULATE MATTER PM ₁₀	63
FIGURE 3.18: BAR DIAGRAM OF PARTICULATE MATTER PM _{2.5}	64
FIGURE 3.19: BAR DIAGRAM OF GASEOUS POLLUTANT SO ₂	64
FIGURE 3.20: BAR DIAGRAM OF GASEOUS POLLUTANT NO _x	65
FIGURE 3.23: NOISE MONITORING STATIONS AROUND 10 KM RADIUS	67
FIGURE 3.24: DAY TIME NOISE LEVELS IN CORE AND BUFFER ZONE	68
FIGURE 3.25: NIGHT TIME NOISE LEVELS IN CORE AND BUFFER ZONE	69
FIGURE 4.1: AERMOD TERRAIN MAP.....	103
FIGURE 4.2: PREDICTED INCREMENTAL CONCENTRATION OF PM ₁₀	103
FIGURE 4.3: PREDICTED INCREMENTAL CONCENTRATION OF PM _{2.5}	103
FIGURE 4.4: PREDICTED INCREMENTAL CONCENTRATION OF NO _x	104
FIGURE 4.5: PREDICTED INCREMENTAL CONCENTRATION OF SO ₂	104
FIGURE 4.6: PREDICTED INCREMENTAL CONCENTRATION OF FUGITIVE DUST	104
FIGURE 4.6: GROUND VIBRATION PREDICTION	109
FIGURE 6.1: PROPOSED ENVIRONMENTAL MONITORING CELL	120
FIGURE 7.1: DISASTER MANAGEMENT TEAM LAYOUT	125
FIGURE 10.1.: PERSONAL PROTECTIVE EQUIPMENT TO THE MINE WORKERS	149

1.INTRODUCTION

1.0 PREAMBLE

Project History: -

The project proponent M/s.Gugan Mines applied for Rough Stone and Gravel Quarry over an extent of 4.05.0 Ha in S.F.No 182/1a,182/1b1, 182/1b2, 182/2, 183, 184, 185 & 186/2, Kundiyanthandalam Village, Vembakkam Taluk, Tiruvannamalai District.

- Proponent applied for Rough stone and Gravel quarry lease on 20.08.2024
- Precise area communication letter was issued by the District Collector vide RC. No. 274/Kanimam/2024 Dated 13.11.2024
- The Mining plan has been prepared by the Qualified person and got approval vide Letter RC. No. 274/kanimam/2024 Dated 12.12.2024
- The Mining plan has been approved for the quantity of 5,92,560 m³ of Rough stone 1,21,188m³ Gravel up to the depth of 49m bgl for the period of five years.

As per the EIA Notification, 2006 and subsequent amendments and OM The proposal falls in the B1 Category (Cluster quarries - 1 proposal and 5 Existing quarries forming Cluster Category {Total Extent of the Cluster is 17.09.5 Ha}- Cluster area calculated as per MoEF & CC Notification S.O. 2269(E) Dated 1st July 2016).

- Proponent applied for ToR for Environmental Clearance vide online Proposal No. SIA/TN/MIN/517285/2025. dated: 06.01.2025 and obtained Terms of Reference File no.11675 Tor Identification No: TO25B0108TN5991919N Dated 03.03.2025

Based on the ToR Baseline Monitoring study has been carried out for one season ie (**Winter Season**), **December 2024 to February 2025** and this EIA/EMP report is prepared for considering cumulative impacts arising out of this project, 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) is the management tool to ensure the sustainable development and it is a process, used to identify the environmental, social and economic impacts of a project prior to decision-making. It is a decision-making tool, which guides the decision makers in taking appropriate decisions for any project. EIA systematically examines both beneficial and adverse consequences of the project and ensures that these impacts are taken into account during the project designing. It also reduces conflicts by promoting community participation, information, decision makers, and helps in developing the base for environmentally sound project.

1.1 PURPOSE OF THE REPORT

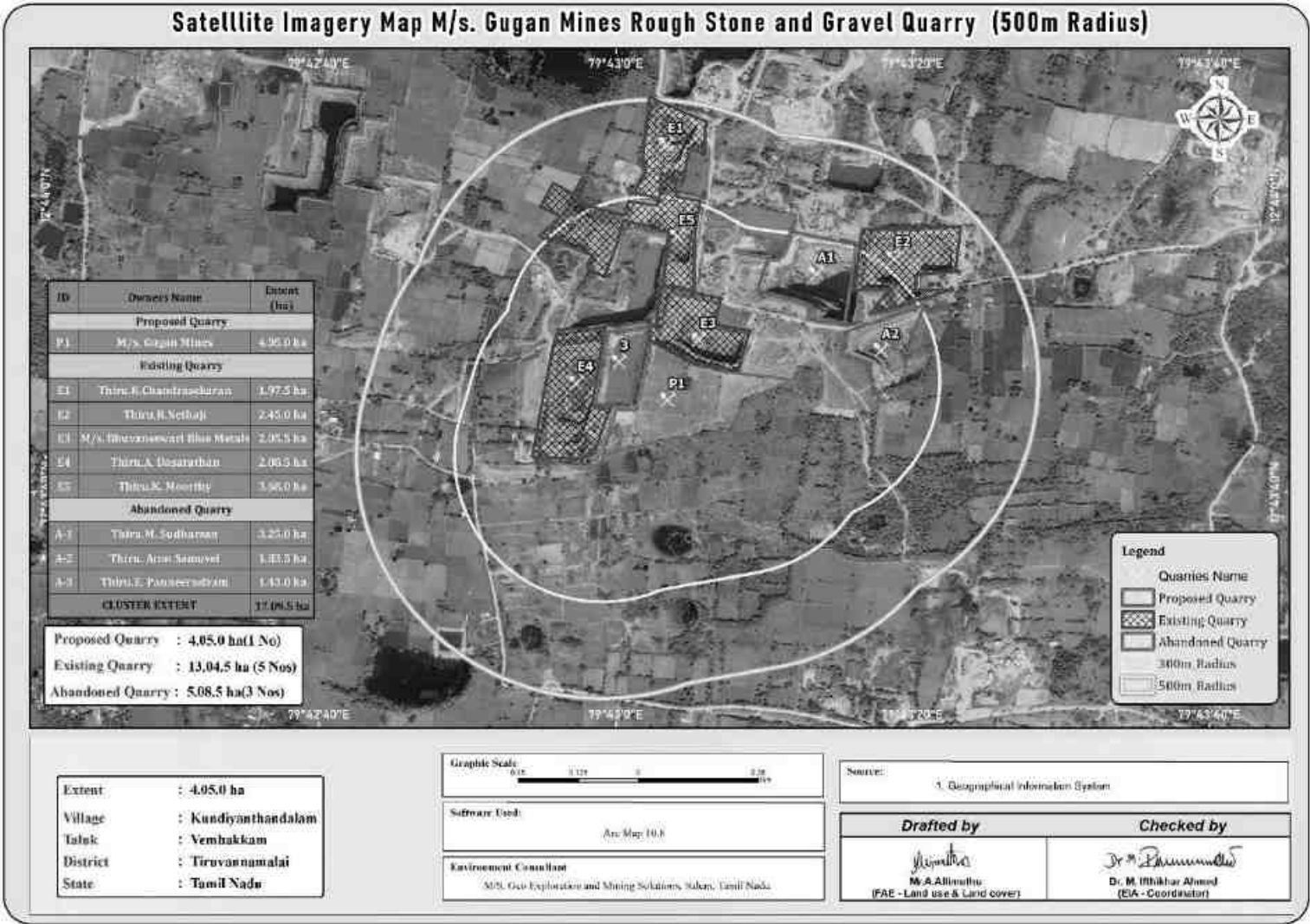
The Ministry of Environment and Forests, Govt. of India, through its EIA notification S.O. 1533(E) of 14th September 2006 and its subsequent amendments as per Gazette Notification S.O. 1889 of 20th April 2022, Mining Projects are classified under two categories i.e. A (> 250 Ha) and B (≤ 250 Ha), and 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 PROPONENTS

1.2.1 Identification of Project Proponent

TABLE 1.1: DETAILS OF PROJECT PROPONENT

Name of the Project Proponent	M/s.Gugan Mines Rough Stone and Gravel Quarry
Address	No.5, Arpakkam road, Arpakkam Walajabad Taluk, Kancheepuram District, Tamilnadu State- 631 603
Mobile	+91 99408 03493 and 90878 33332
Email	bhuvaneshwariblue metals@gamil.com
Status	Partnership Firm

1.2.2 Identification of Project

TABLE 1.2: SALIENT FEATURES OF THE PROPOSED PROJECT

Name of the Project	M/s.Gugan Mines Rough Stone and Gravel Quarry	
S.F. No.	182/1a, 1b1,1b2,2, 183, 184,185 and 186/2	
Extent	4.05.0 ha	
Village,Taluk and District	Kundiyanthandalam Village, Vembakkam Taluk, Tiruvannamalai District.	
Land Type	It is a patta lands, registered in the name of the Thiru.V.Venkateshan, Thiru.J.Mathankumar, Thiru.P.Lokesh , Thiru.M.Karthik vide patta Nos.869,734,863,879,875 & 872	
Toposheet No	57 P/10	
Latitude between	12° 43' 42.35"N to 12° 43' 50.05"N	
Longitude between	79° 42' 58.59"E to 79° 43' 11.68"E	
Elevation of the area	97m AMSL	
Lease period	5 Years	
Mining Plan period	5 years	
Proposed Depth of Mining	49m bgl (4m Gravel + 45m Rough stone)	
Geological Resources	Rough Stone in m ³	Gravel m ³
	18,21,960	1,61,952
Mineable Reserves	5,92,560	1,21,188
Year wise Production for first five years	5,92,560	1,21,188
Peak Production	1,32,110	51,688
Ultimate Pit Dimension	Pit – 1: 140m (L) X 233m (W) X 49m BGL(D) Pit – 2: 64m (L) X 53m (W) X 24m BGL(D)	
Water Level in the region	59-63m bgl	
Method of Mining	Opencast Mechanized Mining Method involving drilling and Controlled blasting using Slurry Explosives	
Topography	The lease applied area is plain terrain. The area has gentle sloping towards Northeastern side and altitude of the area is 97m above from Mean Sea level. The area is covered by 4m thickness of Gravel and followed by Massive Charnockite which is clearly inferred from the surface outcrops & nearby existing quarry pit.	
Machinery proposed	Jack Hammer	4 Nos
	Compressor	1 Nos
	Excavator with Bucket and Rock Breaker	2 Nos
	Wagon Drill Machine	2 Nos
	Tippers	4 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	35 Nos	
Project Cost	Rs. 4,85,51,000/-	
EMP Cost	Rs. 19,30,000/-	
Total Project cost	Rs. 5,04,81,000/-	
CER Cost	Rs. 5,00,000/-	
Nearby Water Bodies	Kuttai	210m-NW
	Tank	480m-SW
	Tank	530m-NW
	Odai	700m-NW
	Tank	1km-NE
	cheyyar River	3.7km-SE
	Palar River	6.3km-NE
	Kuttai	210m-NW
Greenbelt Development Plan	Proposed to plant 2025 Nos of trees considering 500 Nos of trees/ Ha criteria The plantation will be developed around the project site and nearby village roads	
Proposed Water Requirement	2.1 KLD	
Nearest Habitation	600m – South west	
Nearest Reserve Forest	Marudham R.F – 8.2 Km – SE (Source - TNGIS)	
Nearest Wild Life Sanctuary	Karikili Birds Sanctuary – 14 Km – SE Vedanthangal Birds Sanctuary + 5km Safety distance – 20km - SE	

Source: Approved Mining & Land Documents.

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 Drilling & Slurry Explosive during blasting. Hydraulic Excavator and tippers are used for Loading and transportation. Rock Breakers are deployed to avoid secondary blasting.

The peak production of Rough stone is 132110m³ maximum in a year (440m³ per day/ 37 Tippers per day considering 12m³ per load). The depth of the mining is 49m bgl.

1.3.2 Location of the Project

- The project site is located in Kundiyanthandalam Village, Vembakkam Taluk and Tiruvannamalai District.
- 90km Northeast of Tiruvannamalai town, 16km Southeast of Vembakkam and lease applied area located along Sithalapakkam Village.

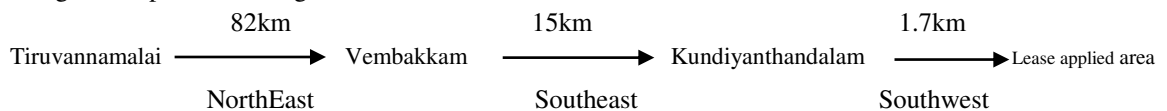
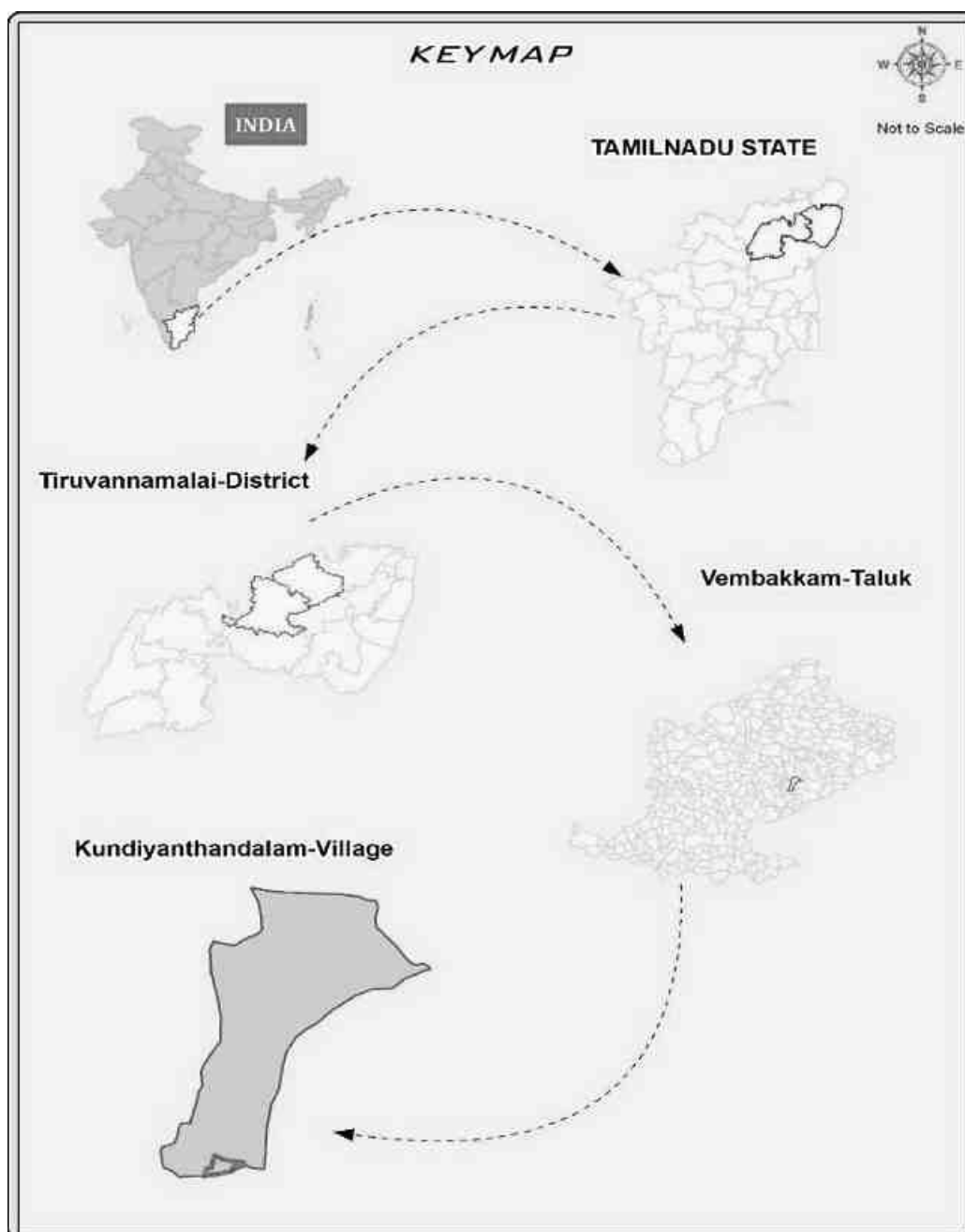


FIGURE 1.2 LOCATION MAP OF THE PROJECT SITE

Source: Survey of India Toposheet 57-P/10 & 16

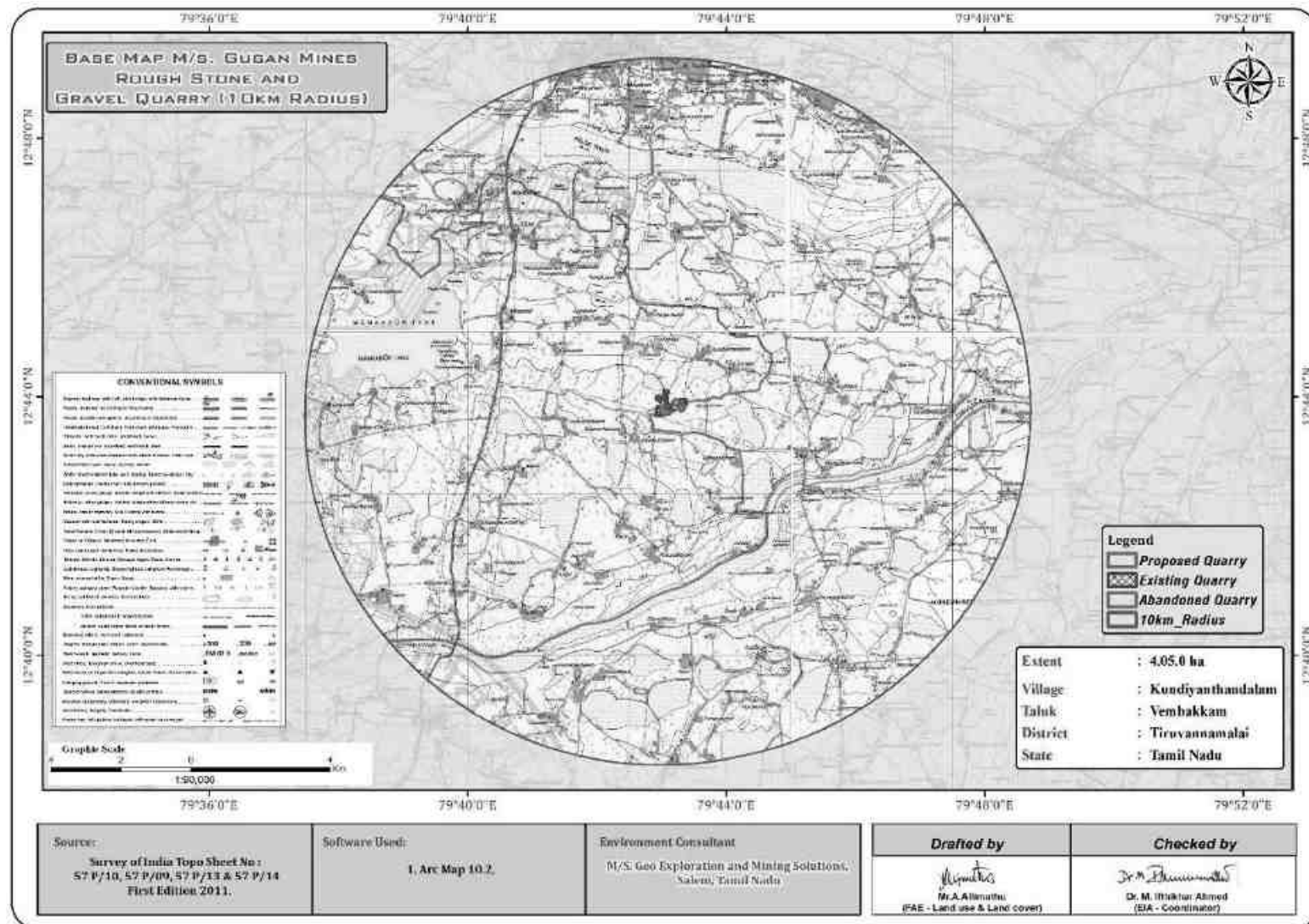
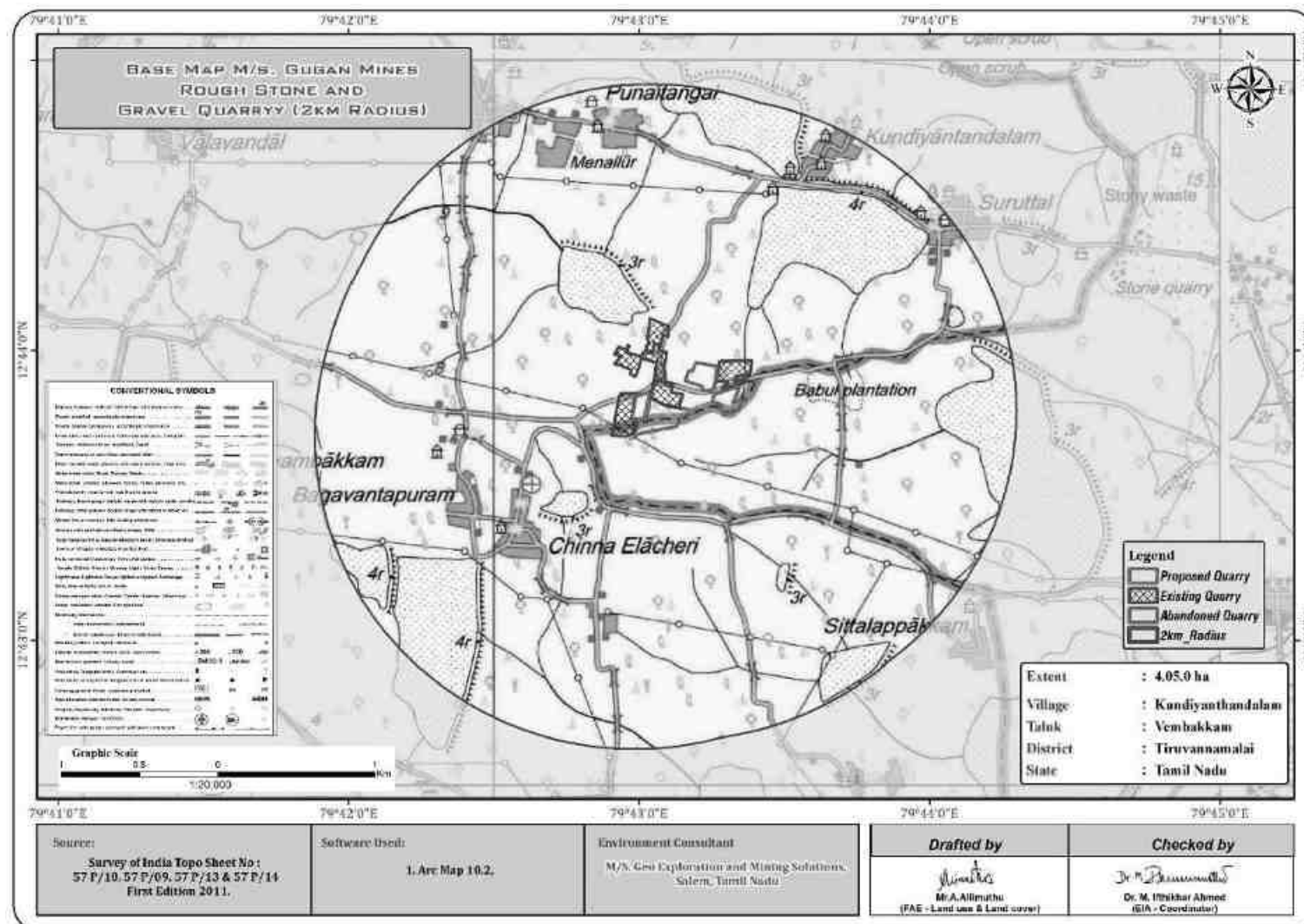
FIGURE 1.3: TOPOSHEET MAP OF THE STUDY AREA 10 KM RADIUS

FIGURE 1.4: TOPOSHEET MAP OF THE STUDY AREA 2KM RADIUS



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 –

- Proponent applied for Rough stone and Gravel quarry lease on 20.08.2024
- Precise area communication letter was issued by the District Collector vide RC. No. 197/Kanimam/2022 Dated 13.11.2024
- The Mining Plan was prepared by Recognized Qualified Person and approved by Assistant Director, Geology and Mining, Tiruvannamalai District, vide RC.No. 274/kanimam/2024 Dated.12.12.2024
- 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/517285/2025. dated: 06.01.2025.

SCOPING:

- The proposal was placed in 532nd SEAC meeting held on 13.02.2025 and the committee recommended for issue of ToR.
- The proposal was considered in 798thSEIAA meeting held on 26.02.2025 and issued Terms of Reference File no.11675 Tor Identification No: TO25B0108TN5991919N Dated 03.03.2025

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.

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.

1.5 TERMS OF REFERENCE (ToR)

The ToR was issued by the SEIAA vide Terms of Reference File no.11675 Tor Identification No: TO25B0108TN5991919N Dated 03.03. 2025.The Details of the ToR Compliance is given in the Page No. i-xxii.

1.6 POST ENVIRONMENT CLEARANCE MONITORING

The 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. 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 summer season (Dec 2024 to Feb 2025) 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 1.3: 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 – 2 Surface water and 4 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)	8 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 all Proposed Quarries

- 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.
- Environment Protection Act, 1986
- Water (Prevention and control of Pollution) act, 1974
- Air (Prevention and control of Pollution) act, 1981
- Terms of Reference File no.11675 Tor Identification No: TO25B0108TN5991919N Dated 03.03.2025

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2. PROJECT DESCRIPTION

2.0 GENERAL

The Proposed Rough Stone Quarry requires Environmental Clearance. There are 1 proposed and 5 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 17.09.50 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 project is site specific and there is no additional area required for this project. There is no effluent generation/discharge from this project. Method of mining is 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

90km Northeast of Tiruvannamalai town, 16km Southeast of Vembakkam and lease applied area located along Sithalapakkam Village.

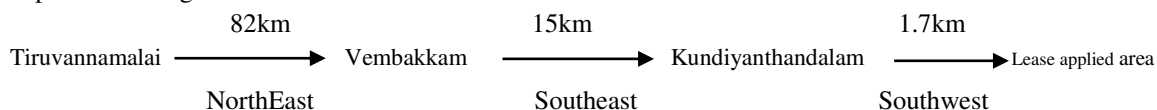


TABLE 2.1: SITE CONNECTIVITY

Nearest Roadway	NH – 132B – Kancheepuram – Chengalpattu -9.6 km -NE SH – 118A – Kancheepuram – Uthiramerur -3.5km-NE
Nearest Village	Kundiyanthan– 850 m – South West
Nearest Town	Kancheepuram - 10km – NW
Nearest Railway Station	Kancheepuram – 12.2km – NW
Nearest Airport	Chennai - 57km – NE
Seaport	Chennai - 74.0km – NE

Source: Survey of India Toposheet

TABLE 2.2: CO-ORDINATES – PROJECT BOUNDARY

Corner Nos.	Latitude	Longitude
1	12°43'42.69" N	79°42'58.33" E
2	12°43'45.80" N	79°42'59.65" E
3	12°43'45.66" N	79°43'01.13" E
4	12°43'50.31" N	79°43'02.18" E
5	12°43'48.70" N	79°43'05.11" E
6	12°43'48.20" N	79°43'07.97" E

7	12°43'47.74" N	79°43'11.64" E
8	12°43'46.18" N	79°43'08.32" E
9	12°43'44.37" N	79°43'07.49" E
10	12°43'43.85" N	79°43'04.56" E
11	12°43'43.54" N	79°43'02.70" E
12	12°43'43.25" N	79°43'00.90" E
13	12°43'43.02" N	79°43'59.65" E
Datum: UTM-WGS84, Zone 44 North		

Source: Approved Mining Plan

FIGURE 2.1: TOPOGRAPHICAL VIEW OF PROJECT AREA



project site Photographs



FIGURE 2.2: PHOTOGRAPHS OF GREENBELT & FENCING

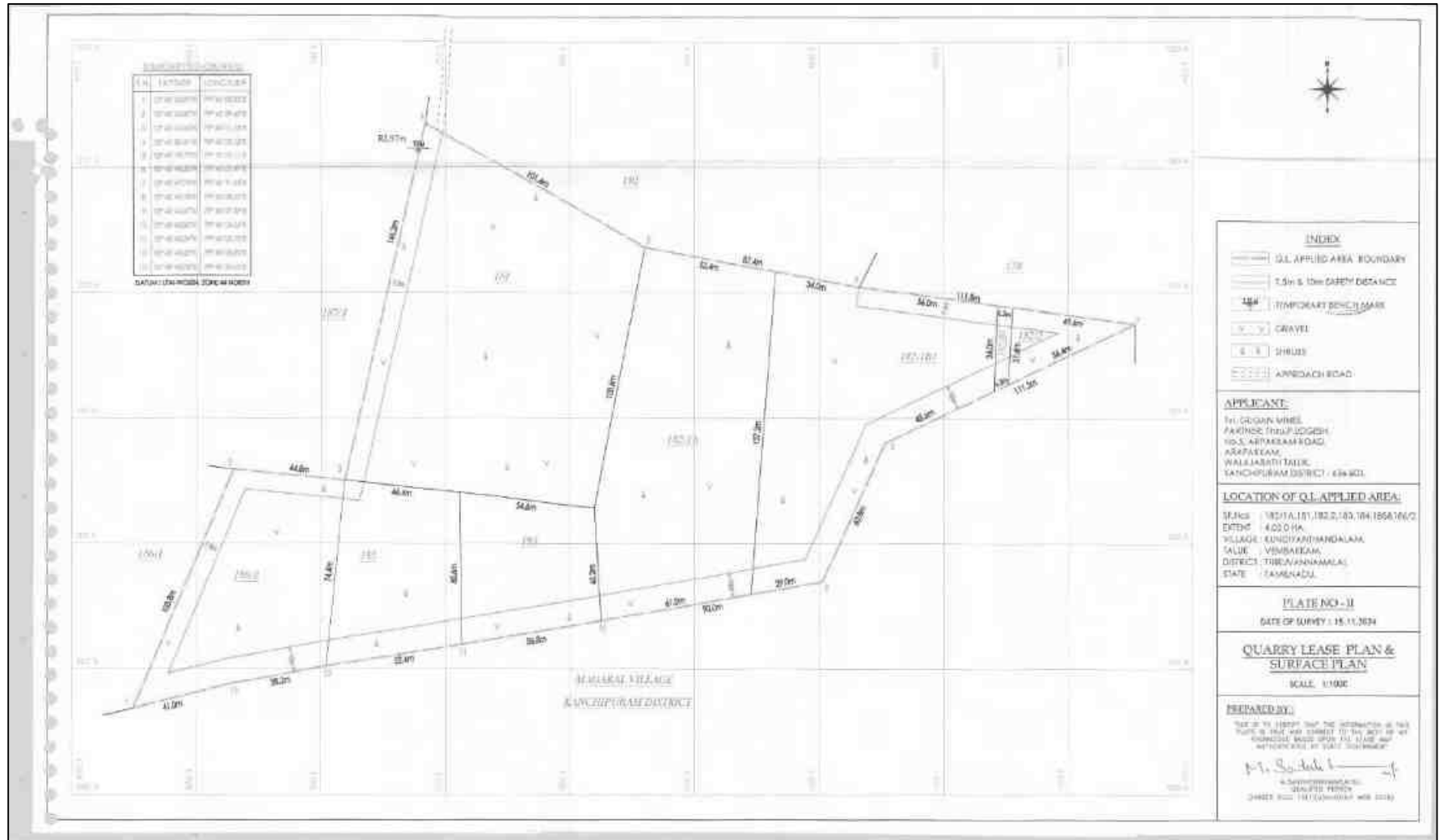
FIGURE 2.3: PHOTOGRAPHS OF GARLAND



FIGURE 2.4: GOOGLE IMAGE OF THE PROJECT AREA

Source: Google Earth Imagery

FIGURE 2.5: QUARRY LEASE PLAN / SURFACE PLANN



Source: Approved Mining Plan

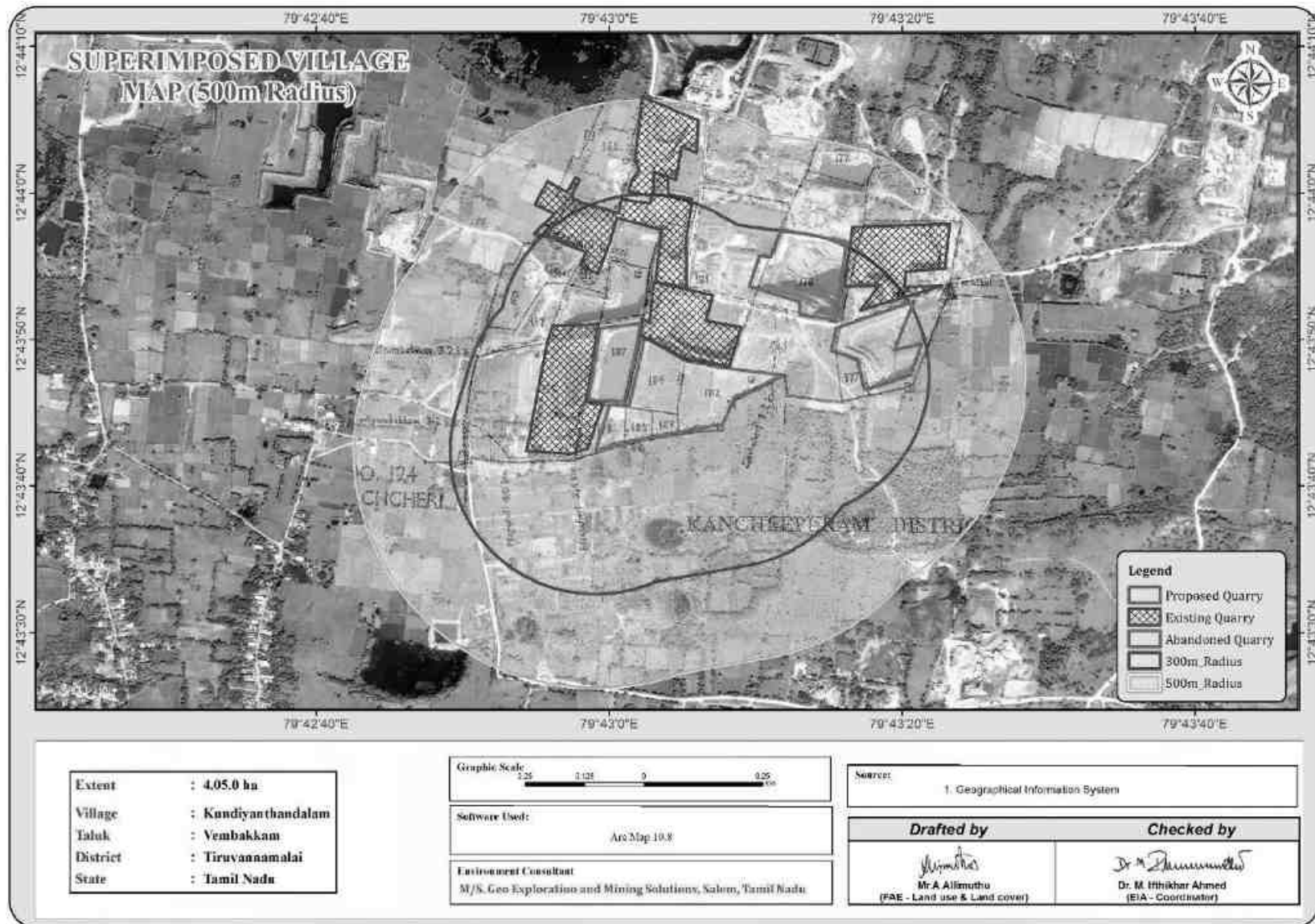
FIGURE 2.6: VILLAGE MAP SUPERIMPOSED ON GOOGLE EARTH IMAGE

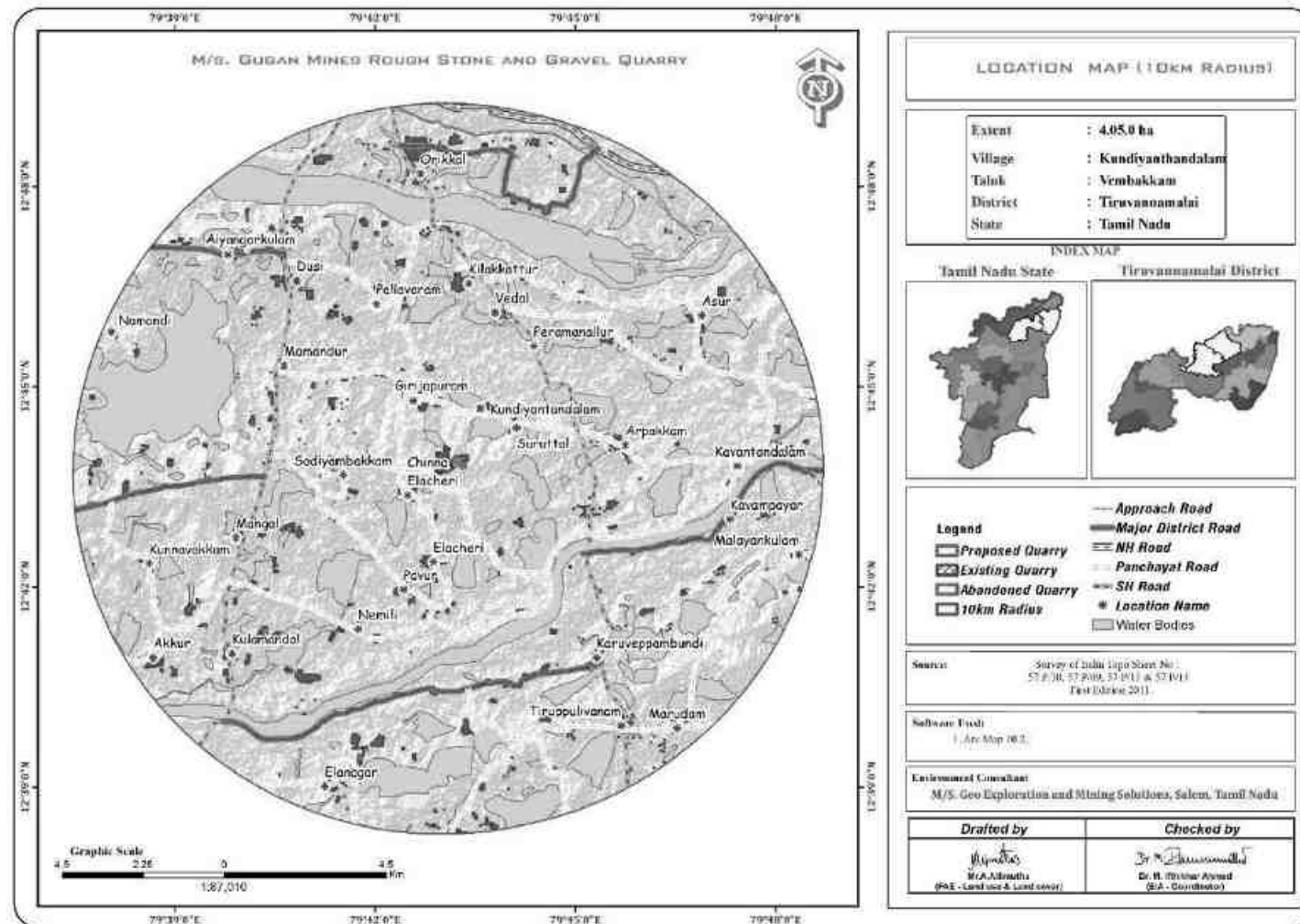
FIGURE 2.7: IMAGE SHOWING SURFACE FEATURES AROUND 10 KM RADIUS

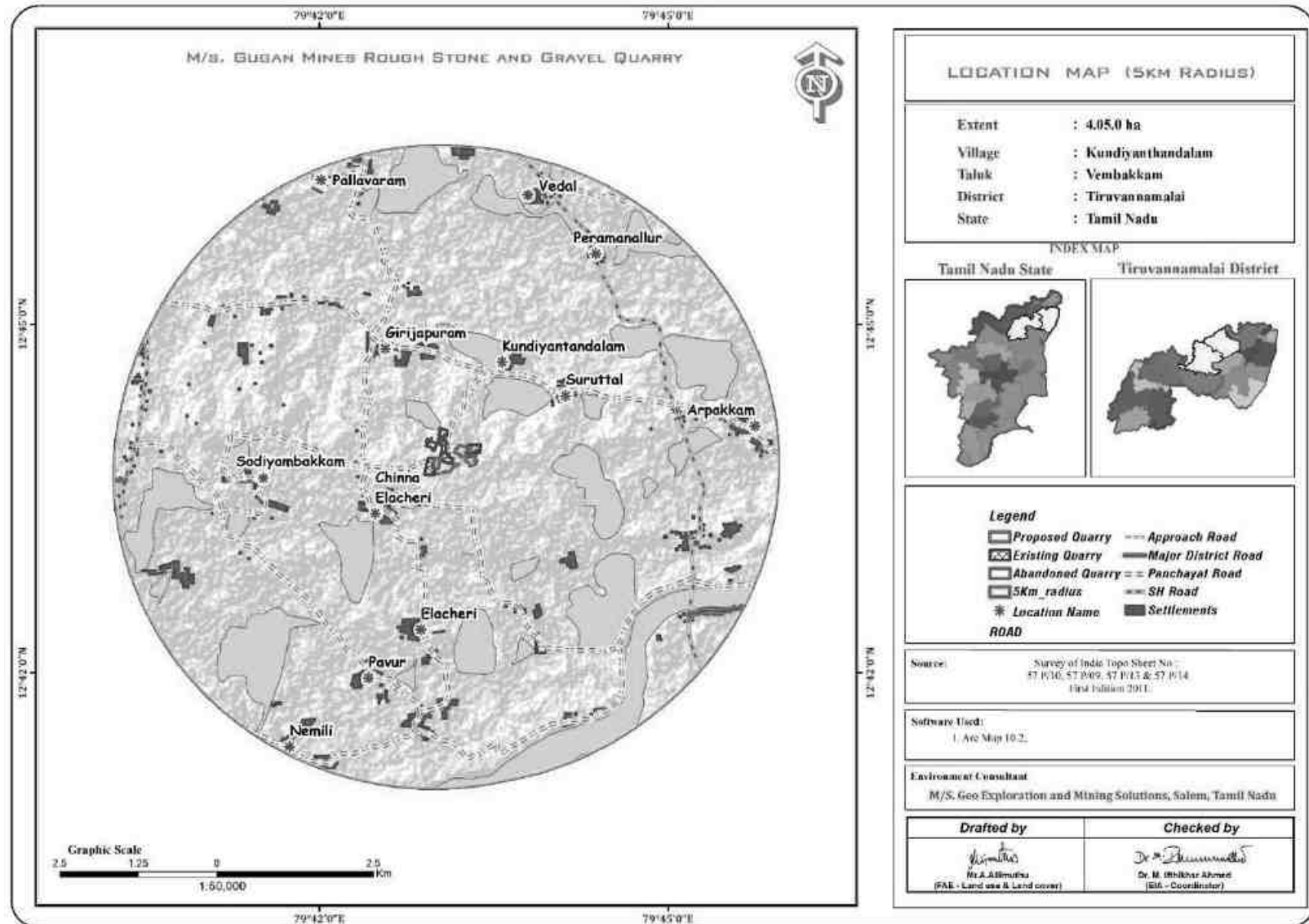
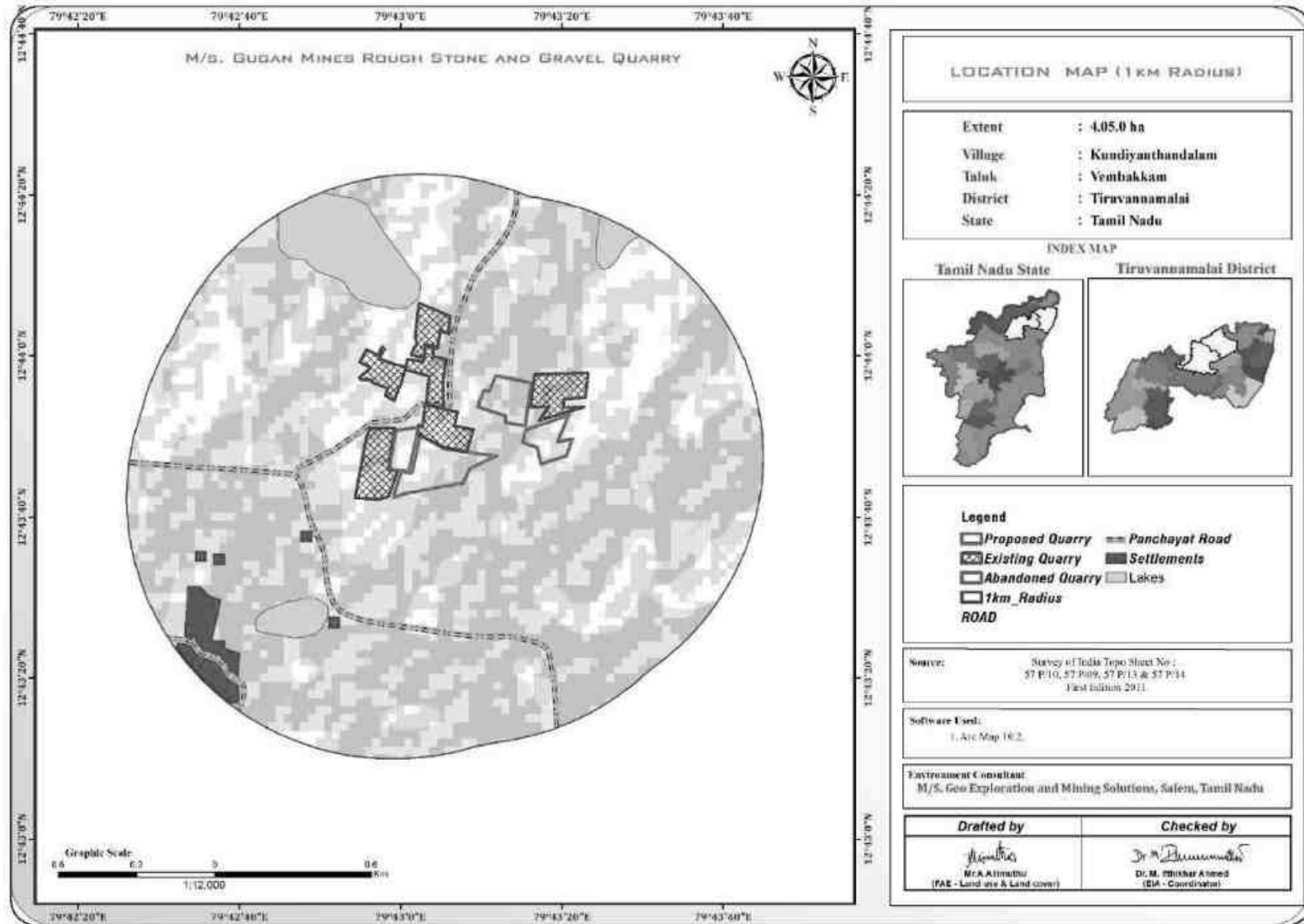
FIGURE 2.8: IMAGE SHOWING SURFACE FEATURES AROUND 5 KM RADIUS

FIGURE 2.9: IMAGE SHOWING SURFACE FEATURES AROUND 1 KM RADIUS

2.2.1 Project Area

- The project is site specific & no beneficiation or processing in the project site.
- There is no forest land involved in the proposed projects and is devoid of major vegetation and trees.

TABLE 2.3: LAND USE PATTERN

Description	Present area (Ha)	Proposed Boundary	Common	Leaving Safety and Benches
		Area at the end of lease period (Ha)		Area at the end of lease period (Ha)
Area under quarrying	Nil	3.30.0		3.16.0
Site Services	Nil	0.01.0		0.01.0
Roads	Nil	0.02.0		0.02.0
Green Belt	Nil	0.55.0		0.55.0
Unutilized Area	4.05.0	0.17.0		0.31.0
Grand Total	4.05.0	4.05.0		4.05.0

Source: Approved Mining

2.2.2 Size or Magnitude of Operation

TABLE 2.4: RESOURCES AND RESERVES

PARTICULARS	DETAILS	
	Rough Stone in m ³	Gravel in m ³
Geological Resources	18,21,960	1,61,952
Mineable Reserves	5,92,560	1,21,188
Production for first five-year plan period	5,92,560	1,21,188
Peak Production	1,32,110	51,688
Mining Plan Period / Lease Applied Period	5 Years	
Number of Working Days	300 Days	
Production per day	395	135
No of Lorry loads (12m ³ per load)	33	11
Total Depth of Mining	49m (4m Gravel +45m Rough stone) below ground level.	

Source: Approved mining plan.

2.3 GEOLOGY

2.3.1 Regional Geology

Tiruvannamalai District mainly comprises of rocks of Archaean age. The type of rocks found in the district are Charnockite, Granitic gneiss, Epidote Hornblende Gneiss, Amphibolite, Pyroxenite, Dunite, Migmatites, Banded Magnetite Quartzite, Shale and Clay. Dolerite dykes (Black Granite) are also noticed cutting across the country rocks.

The hard rock terrain comprises predominantly of Charnockite and Khondalite groups and their migmatitic derivatives, supra-crustal sequences of Sathyamangalam and Kolar groups and Peninsular Gneissic Complex (Bhavani Group), intruded by ultramafic-mafic complexes, basic dykes, granites and syenites. The sedimentary rocks of the coastal belt include fluvial, fluvio-marine and marine sequences, such as Gondwana Supergroup (Carboniferous to Permian and Upper Jurassic to Lower Cretaceous), marine sediments of Cauvery basin (Lower Cretaceous to Paleogene), Cuddalore /Pannambarai Formation (Mio-Pliocene) and sediments of Quaternary and Recent age.

The Charnockite Group comprises pyroxene granulite and charnockite. The pyroxene granulite is dark grey, medium grained granulitic rock with typical salt and pepper texture, seen on the weathered surface. It consists of diopside, hypersthene, plagioclase, hornblende, biotite and quartz. Charnockite is the predominant rock in the area. It

is grey, medium to coarse grained, greasy looking with foliation seen prominently on the weathered surface. It is essentially made of smoky or grey quartz, pale grey microcline and hypersthene as major minerals with plagioclase, hornblende and biotite as accessories.

Migmatite Complex is represented by hornblende-biotite gneiss, granitic gneiss and pink migmatite. This Complex is a group of banded felsic rocks of varying mineralogical composition that are formed due to the influx of quartzofeldspathic material into high grade metamorphic rocks. Two types of migmatite are seen in the district, one is grey and the other is pink. Next to charnockite, migmatite gneiss is the second most extensive rock. The migmatite gneiss consists of quartz, K-feldspar, plagioclase, hornblende and biotite in varying proportions.

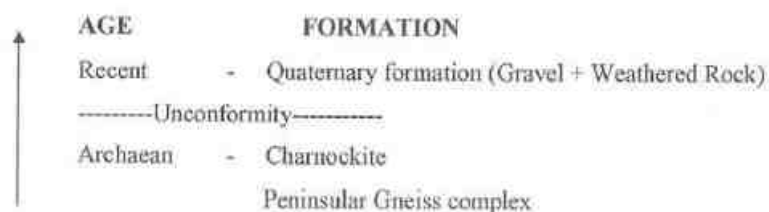
Source: District Survey Report for Minor Minerals Tiruvannamalai District – May 2019.

<https://tiruvannamalai.nic.in/document/district-survey-report-rough-stone/>

Exploration :

No Exploration is required, the Rough stone and Gravel formation is clearly inferred from the existing quarry pit situated on the south side.

The General Geological sequence of the area is given below:



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. The project areas are plain terrain, The project areas are covered with Gravel formation of 2m thickness; Massive Charnockite formation is found after 2m Gravel formation which is clearly inferred from the existing quarry pit.

2.3.3 Hydrogeology

Cheyyar River which originates from Jawadhu Hills, flows in a southern direction at first, and turns south-east near Chengam after flowing through Polur, Vandavasi and Cheyyartaluk. Palar rising near Nandidurg in Mysore enters Vellore district passing through Gudiyatham, Walajah and Arakonam taluks before entering into Cheyyartaluk of Tiruvannamalai district and there after enters into Kancheepuram district. Pennaiyar and South Pennaiyar originate from Nandidurg of Karnataka. They pass through Dharmapuri district and enter southern part of Chengam taluk before entering into Viluppuram district. Finally, the river enters into the Bay of Bengal at Cuddalore. The river is dry for the most part of the year. Water flows during the monsoon season when it is fed by the southwest monsoon in catchment area and the northeast monsoon in Tamil Nadu. A dam has been constructed across this river at Sathanur which is a picnic spot in this district. Sathanur Reservoir provides drinking water to Tiruvannamalai town and the water is used for irrigation when the reservoir is filled with surplus water.

The origin, occurrence and movement of groundwater are controlled by geological setup of a terrain. During the study it is inferred that the entire cluster area is a Hard rock terrain and the low resistance encountered at the depth between 57m, hence it is assumed that the possibility of Ground water occurrence will be below this level and it also proved that this hard batholith above 50m will not encounter any subsurface water.

There is a possibility of seepage water from the surface levels i.e., below 30m, this surface water will be collected in the mine pits and later used for dust suppression and afforestation. In the geophysical study it has been clearly inferred that the depth of the quarrying operation will not intersect the ground water table.

2.2.2.3 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 Tiruvannamalai 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.

2.2.2.3 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.

Tertiary Cuddalore sandstone

Tertiary formations are represented by Cuddalore Sandstone and characterised as fluvial to brackish marine deposits. Predominantly this formation is divided into Lower and Upper Cuddalore formations. In the Upper Cuddalore formations the groundwater occurs in semi confined conditions, whereas in the Lower Cuddalore the groundwater occurs in confined condition with good groundwater potential.

Cretaceous Formations

Groundwater occurring in the lens shape in the sandy clay lenses and fine sand is underlain by white and black clay beds which constitute phreatic aquifer depth which ranges 10m to 15m below ground level. Phreatic aquifer in Limestone is potential due to the presence of Oolitic Limestone.

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 transmissivity values of fractured aquifers range from < 1 to $141 \text{ m}^2/\text{day}$ and storativity varies between 2.84×10^{-5} and 8.9×10^{-3} . The transmissivity of sedimentary formation varies from 21 to $748 \text{ m}^2/\text{day}$ and storativity is in the order of 2.75×10^{-3}

.Actual Rainfall in Mm					Normal Rainfall in Mm
2017	2018	2019	2020	2021	
1251.3	799.2	1071.9	1034.5	1592.5	985

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

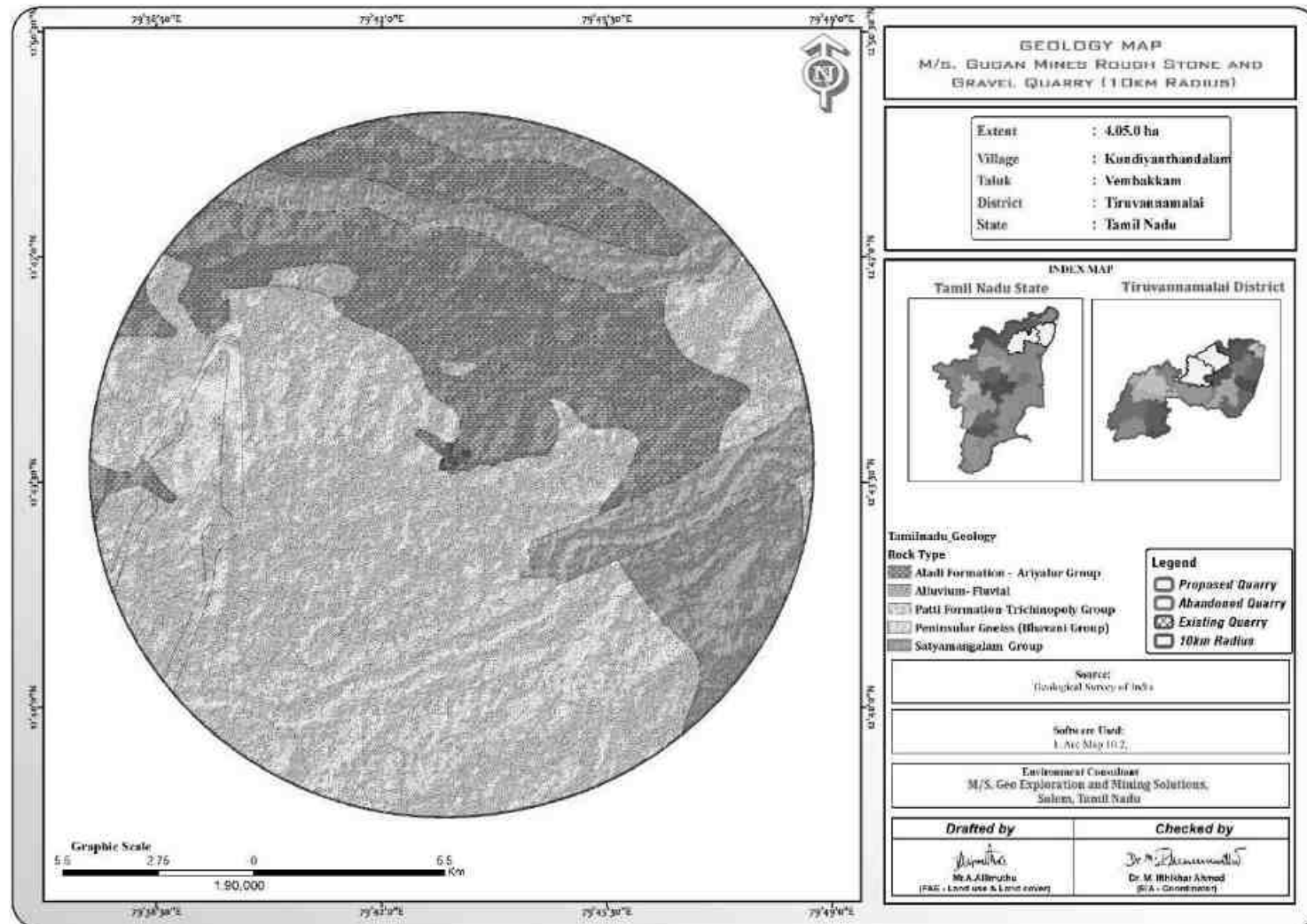
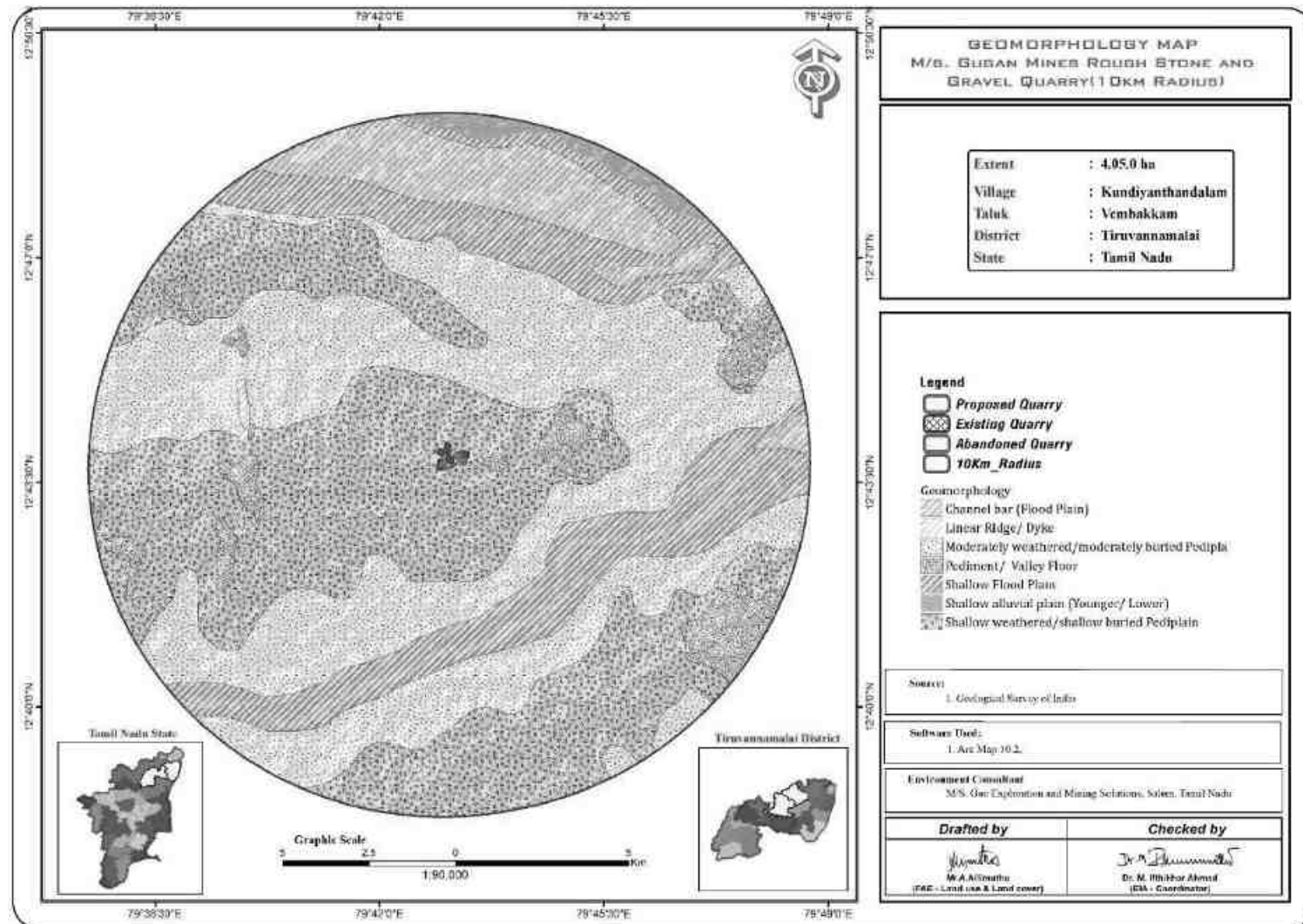
FIGURE 2.10: REGIONAL GEOLOGY MAP

FIGURE 2.11: GEOMORPHOLOGY MAP

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. 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).

TABLE 2.5: RESOURCES AND RESERVES

Description	Rough Stone m ³	Gravel m ³
Geological Resource in m ³	18,21,960	1,61,952
Mineable Resource in m ³	5,92,560	1,21,188
Year wise production for Ten-year plan period	5,92,560	1,21,188

Source: Approved Mining Plan

TABLE 2.6: YEAR-WISE PRODUCTION PLAN FOR FIVE YEARS

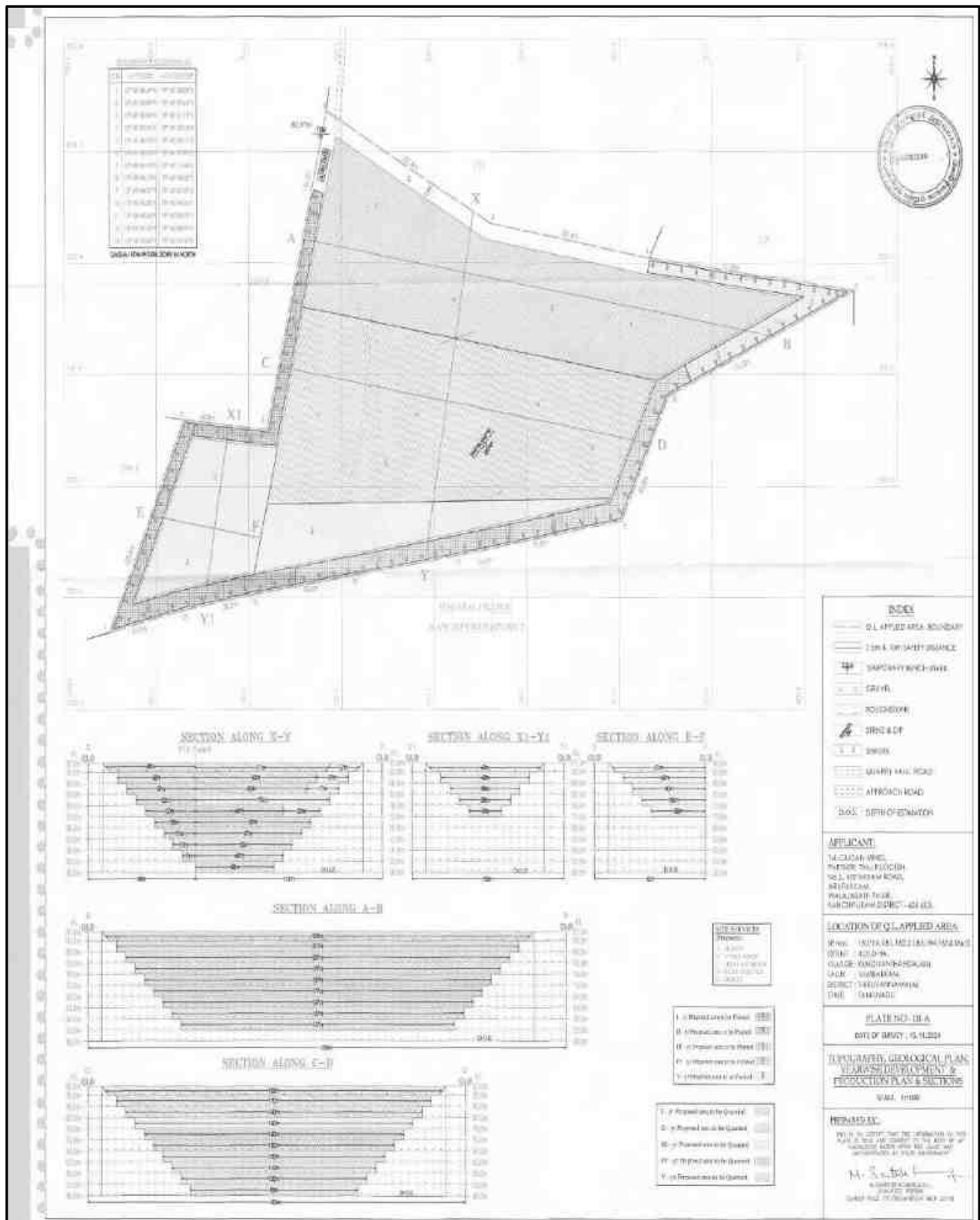
YEAR	ROUGH STONE (m ³)	GRAVEL (m ³)
I	1,15,385	44,884
II	1,03,250	51,688
III	1,22,050	24,616
IV	1,32,110	-
V	1,19,765	-
TOTAL	5,92,560	1,21,188

Source: Approved Mining Plan

Disposal of Waste

The overburden in the form of Gravel formation is about 36,316m³ up to depth 2m for during this period. the Gravel will be directly loaded into tippers for the filling and levelling of low-lying areas, this will be done only after obtaining permission and paying necessary seigniorage fees to the Government.

FIGURE 2.12: TOPOGRAPHY, GEOLOGICAL, YEAR-WISE DEVELOPMENT PRODUCTION PLAN AND SECTIONS



Source: Approved Mining Plan

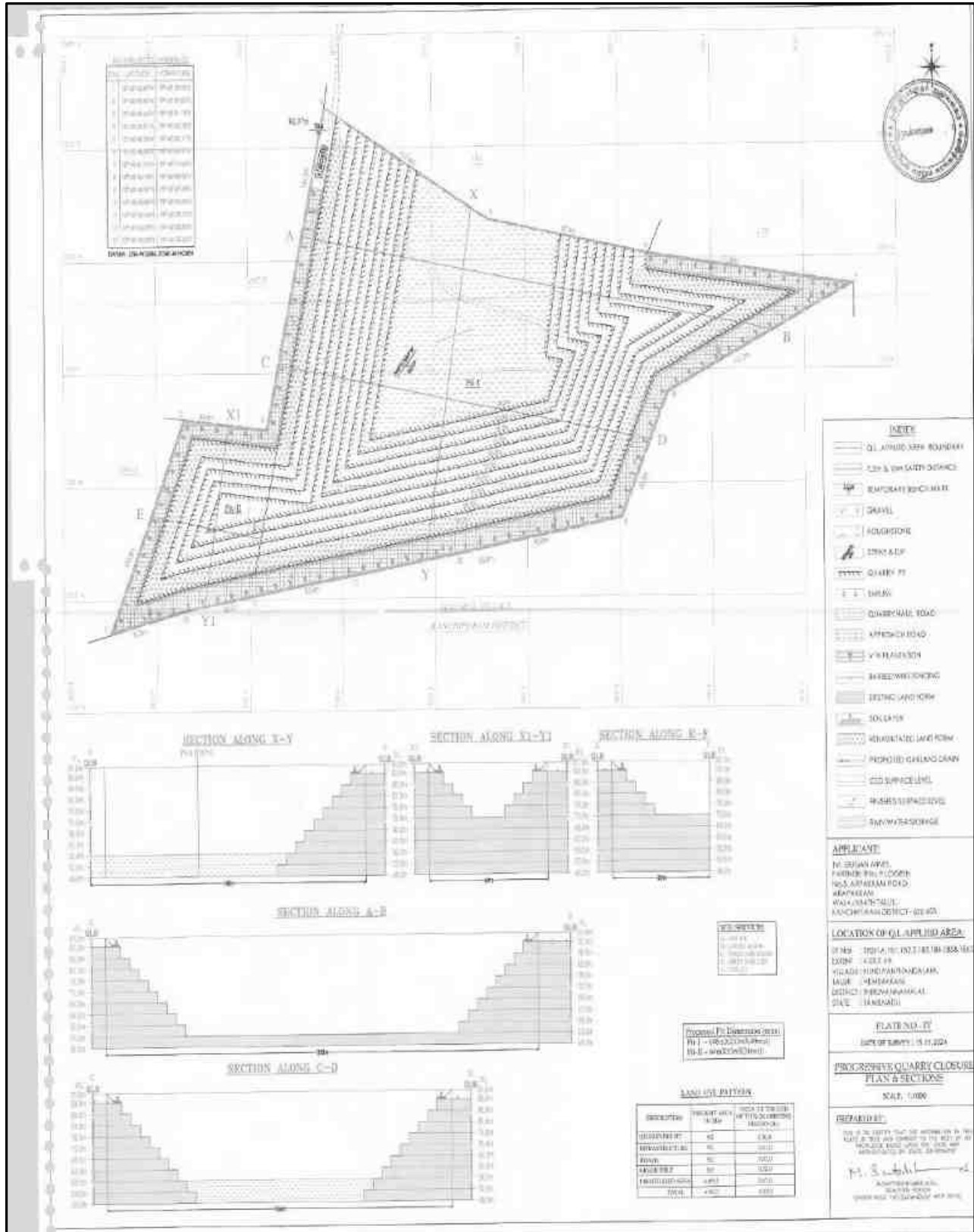
Conceptual Mining Plan/ Final Mine Closure Plan

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

TABLE 2.7: ULTIMATE PIT DIMENSION

Pit	Length (Max) (m)	Width (Max) (m)	Depth (Max)
I	140	233	49m bgl
II	64	53	24m bgl

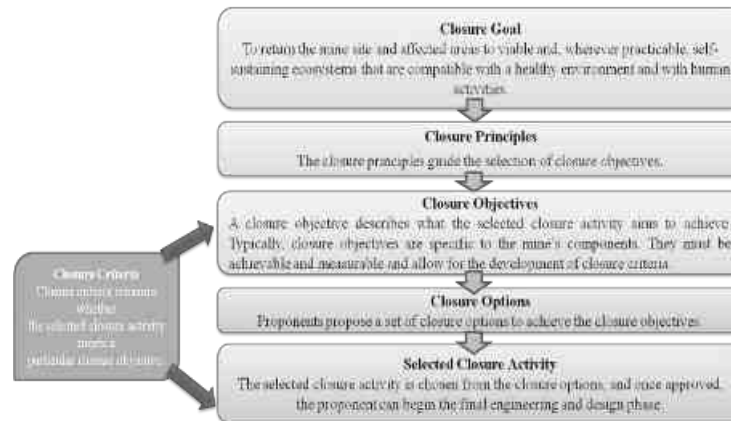
Source: Approved Mining Plan

FIGURE 2.13: CLOSURE PLAN AND SECTIONS

Source: Approved Mining Plan

- At the end of life of mine, the excavated mine pit / void will act as artificial reservoir for collecting rain water and helps to meet out the demand or crises during drought season.
- After mine closure the greenbelt developed along the safety barrier and top benches and temporary water reservoir will enhance the ecosystem
- Mine Closure is a process of returning a disturbed site to its natural state or which prepares it for other productive uses that prevents or minimizes any adverse effects on the environment or threats to human health and safety.
- The principal closure objectives are for rehabilitated mines to be physically safe to humans and animals, geo-technically stable, geo-chemically non-polluting/ non-contaminating, and capable of sustaining an agreed post-mining land use.

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.
- Water quality in flooded pits is safe for humans, aquatic life, and wildlife.
- Discharge of contaminated drainage has been minimized and controlled.
- Original or desired new surface drainage patterns have been established.
- For flooded pits, in-pit aquatic habitat has been established where practical and feasible.
- Emergency access and escape routes from flooded pits for humans and wildlife are in place.
- Dust levels are safe for people, vegetation, aquatic life, and wildlife.

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
- 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

2.5 METHOD OF MINING

Opencast Mechanized Mining Method is proposed by formation of 5.0-meter height bench with a bench width not less than the bench height. Bench slope will be maintained as 60°.

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 Excavator attached with rock breaker/ bucket with tipper combination will be involved for the excavation/breaking of Rough stone after blasting. 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.

It is recommended to obtain necessary statutory permission from the Department of Geology and Mining for Using Heavy Earth Moving Machineries, Blasting and appointment of Mines Manager etc.,

2.5.1 Drilling & Blasting Parameters

Drilling will be carried out using Jack hammer and compressor, the depth of the hole will be maximum 1.5m Drilling & Blasting will be carried out as per parameters given below: -

Spacing	–	3.5m
Burden	–	2.75 m
Depth of hole	–	5 m
Charge per hole	–	0.50 – 0.75kg
Powder factor	–	6.0 tonnes/kg
Diameter of hole	–	110 mm
Peak production Capacity	=	440m ³ of Rough stone per day
Spacing X Burden X Depth	=	1.2m X 1.0m X 1.5m = 1.8m ³
	=	1.8m ³ X 2.6 (Bulk Density) = 4.6Ts per hole

hence for the peak production of 440m³ (1144Ts) = 58 Nos of holes to be drilled per day

Explosives per hole = ½ kg hence 25 kg of Explosives will be utilized maximum considering the peak production

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 will 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 2.8 PROPOSED MACHINERY DEPLOYMENT

S.NO.	TYPE	NOS	SIZE/CAPACITY	MOTIVE POWER
1	Jack hammers	4	1.2m to 2.0m	Compressed air
2	Compressor	1	400psi	Diesel Drive
3	Wagon Drill Machine	2	3m to 10m	Diesel Drive
4	Excavator with Bucket and Rock Breaker	2	300 HP	Diesel Drive
5	Tippers	4	20 Tonnes	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

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

Traffic density measurements were performed at two locations

1. Chinna Ezhacheri Panchayat road
2. Kavantandalam to Mamandur Panchayat road

Traffic density measurement was 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.2.9: TRAFFIC SURVEY LOCATIONS

Station Code	Road Name	Distance and Direction	Type of Road
TS1	Chinna Ezhacheri Panchayat road	1Km_SW	Panchayat Road
TS2	Kavantandalam to Mamandur Panchayat road	1.5Km_NW	Panchayat Road

Source: On-site monitoring by GEMS FAE & TM

TABLE 2.10: EXISTING TRAFFIC VOLUME

Station code	HMV		LMV		2/3 Wheelers		Total PCU
	No	PCU	No	PCU	No	PCU	
TS1	100	300	80	80	70	35	415
TS2	110	330	60	60	80	40	430

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 2.11: ROUGH STONE & GRAVEL HOURLY TRANSPORTATION REQUIREMENT

Transportation of Rough Stone & Gravel per day		
Capacity of trucks	No. of Trips per day	Volume in PCU
20 tonnes	44	132

FIGURE.2.14: MINERAL TRANSPORTATION ROUTE MAP



TABLE 2.12: 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
Chinna Ezhacheri Panchayat road	415	42	457	1500
Kavantandalam to Mamandur Panchayat road	430	42	472	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 District road can handle 1,200 PCU in hour and State Highway 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 2.13: WATER REQUIREMENT FOR THE PROJECT

Purpose	Quantity	Source
Dust Suppression	0.7KLD	From the existing pit or from the water vendors
Green Belt	0.8KLD	From the existing pit or from the water vendors
Sanitation & Drinking	0.6KLD	From the existing pit or from the water vendors.
Total	2.1 KLD	

Source: Prefeasibility report

2.7.2 Power and Other Infrastructure Requirement

Power is not required for the mining operation; the mining operation will be carried out using Diesel Generator and Earth moving machineries using 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 by project proponent.

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

One Excavator will excavate 25m³ of Broken up Rough stone per hour and 60m³ of Gravel per hour.

Peak production of Rough stone = 440m³

Peak production of Gravel = 172m³

Type of machinery	Working hours	Average Diesel consumption/ Hour	Quantity of Diesel in Ltrs
Working hours of Excavator (Aprx)	440m ³ /25m ³ = 18 Hrs (Rough stone)	22 Ltrs	396
	172/60m ³ = 3Hrs	18 Ltrs	54
Compressor	Working hours per day 3 Hrs	8 Ltrs	24
Tippers, Motor pumps to drain water	Occasionally		20
Total Diesel Consumption			494

The Maximum diesel consumption is around 494 Ltrs per day considering the peak production.

2.7.4 Project Cost

The Environmental Management plan has been prepared considering the mode of working, Safety of the employees and Monitoring periods the total Cost is 50.48 Lakhs.

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 2.14: PROPOSED MANPOWER DEPLOYMENT

Designation	No of persons
Mines Manager	1
Geologist	1
Mines Foreman	1
Mate/Blaster	1
Jack hammer operator	8
Excavator Operator & Tipper Driver	2
Wagon Drill Operator	2
Water Sprinkler Driver	1
Truck Driver	4
Labour & Helper	4
Cleaner & Co-operator	9
Security	1
Total	35

Source: Approved Mining Plan & Pre-Feasibility report.

2.9 PROJECT IMPLEMENTATION SCHEDULE

The mining operation will commence after the grant of Environmental Clearance, Consent to operate (CTO), Execution of Lease Deed and Obtaining permission from the DGMS (Notice of Opening).

TABLE 2.15: 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						
3	Execution of Lease deed						
4	Permission from DGMS						
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

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 December 2024 to February 2025 with CPCB guidelines for the following attributes –

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

Environmental data has been collected with reference to cluster quarries by EHS 360 Lab Private Limited, – An accredited by ISO/IEC 17025:2017 (NABL).

Study Area

An area of 10 km radius (aerial distance) from the periphery of the cluster is considered for EIA study. The study area has been divided into two zones viz **core zone** and **buffer zone**.

- Core zone is considered as cluster area
- 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 **Winter season i.e., December 2024 to February 2025**.

Study Methodology

- The project area was surveyed in detail with the help of Total Station Survey instruments and pillars were marked. 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 in order to assess the impact due to mining activities and to recommend saplings for Greenbelt development.
- Ground water samples were collected from the existing bore wells, Surface water was collected from water bodies in the buffer zone and analysed as per CPCB Guidelines.
- 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.
- Air quality Data's 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 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 (2 surface water & 4 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 (Dec 2024 to 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 Quadrate & 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 EHS 360Lab Private Limited 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

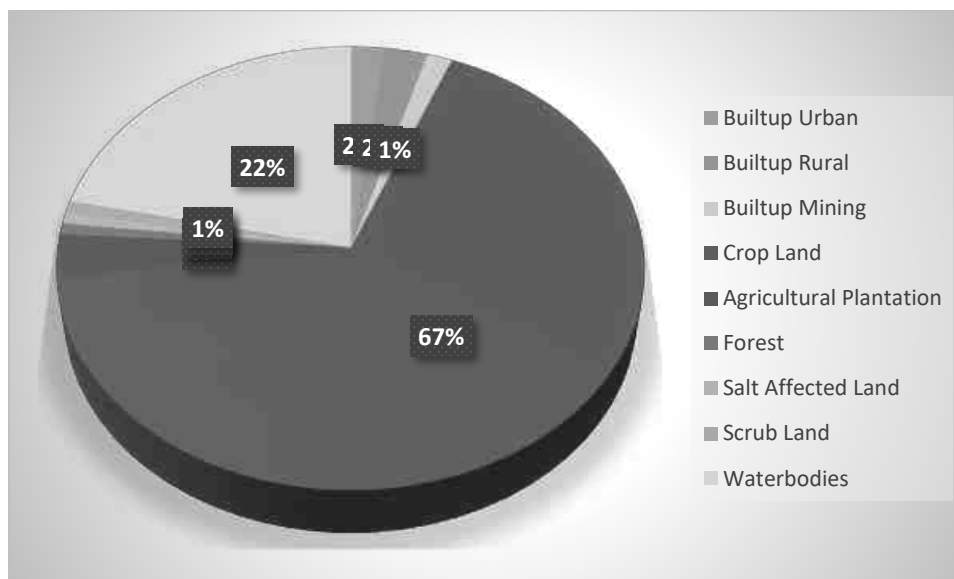
A visual interpretation technique has been adopted for land use classification based on the keys suggested in the chapter – V of the guidelines issued by NNRMS Bangalore & Level III classification with 1:50,000 scale for the preparation of land use mapping. Land use pattern of the area was studied through 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 in HA	AREA in %
BUILTUP			
1	Builtup Urban	669.82	2.07
2	Builtup Rural	825.65	2.55
3	Builtup Mining	488.31	1.51
AGRICULTURAL LAND			
4	Crop Land	21606.96	66.70
5	Agriculture Land	1012.04	3.12
BARREN/WASTE LANDS			
8	Scrub Land	298.07	0.92
9	Salt Affected Area	246.42	0.76
FOREST			
10	Forest	260.20	0.80
WETLANDS/ WATER BODIES			
11	Waterbodies	6985.86	21.57
TOTAL		32393.31	100.00

Source: Survey of India Toposheet and Landsat Satellite Imagery

FIGURE 3.1: PIE DIAGRAM OF LAND USE AND LAND COVER



From the above table, pie diagram and land use map it is inferred that the majority of the land in the study area is Agriculture includes crop land 69.82% followed by Built-up Lands – 4.62%, Scrub land – 0.92%, and Water bodies 21.57%.

The total mining area within the study area is 488.31 ha i.e., 1.51%. The cluster area of 17.09.5 ha contributes about 3.50% 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

The project area is almost plain terrain having gentle slope towards North-eastern side. The altitude of the area is 97m AMSL The area is covered by 2m thickness of gravel & followed by massive charnockite which is clearly inferred from the surface outcrops

3.1.3 Drainage Pattern of the Area

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

3.1.4 Seismic Sensitivity

The proposed project site falls in the seismic Zone III, 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.

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.

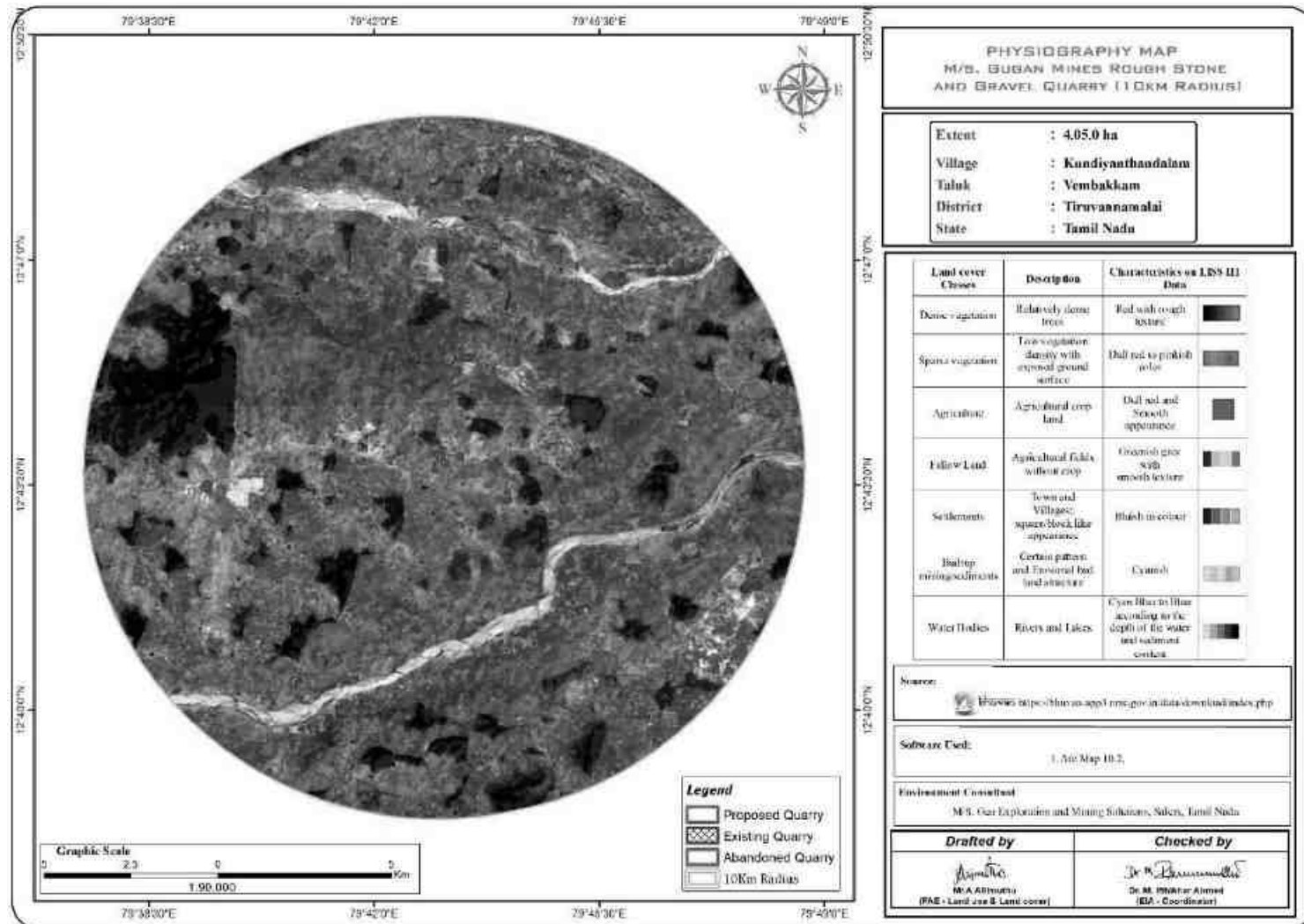
FIGURE 3.2: PHYSIOGRAPHIC MAP 10KM RADIUS

FIGURE 3.3: LAND USE LAND COVER MAP 10KM RADIUS

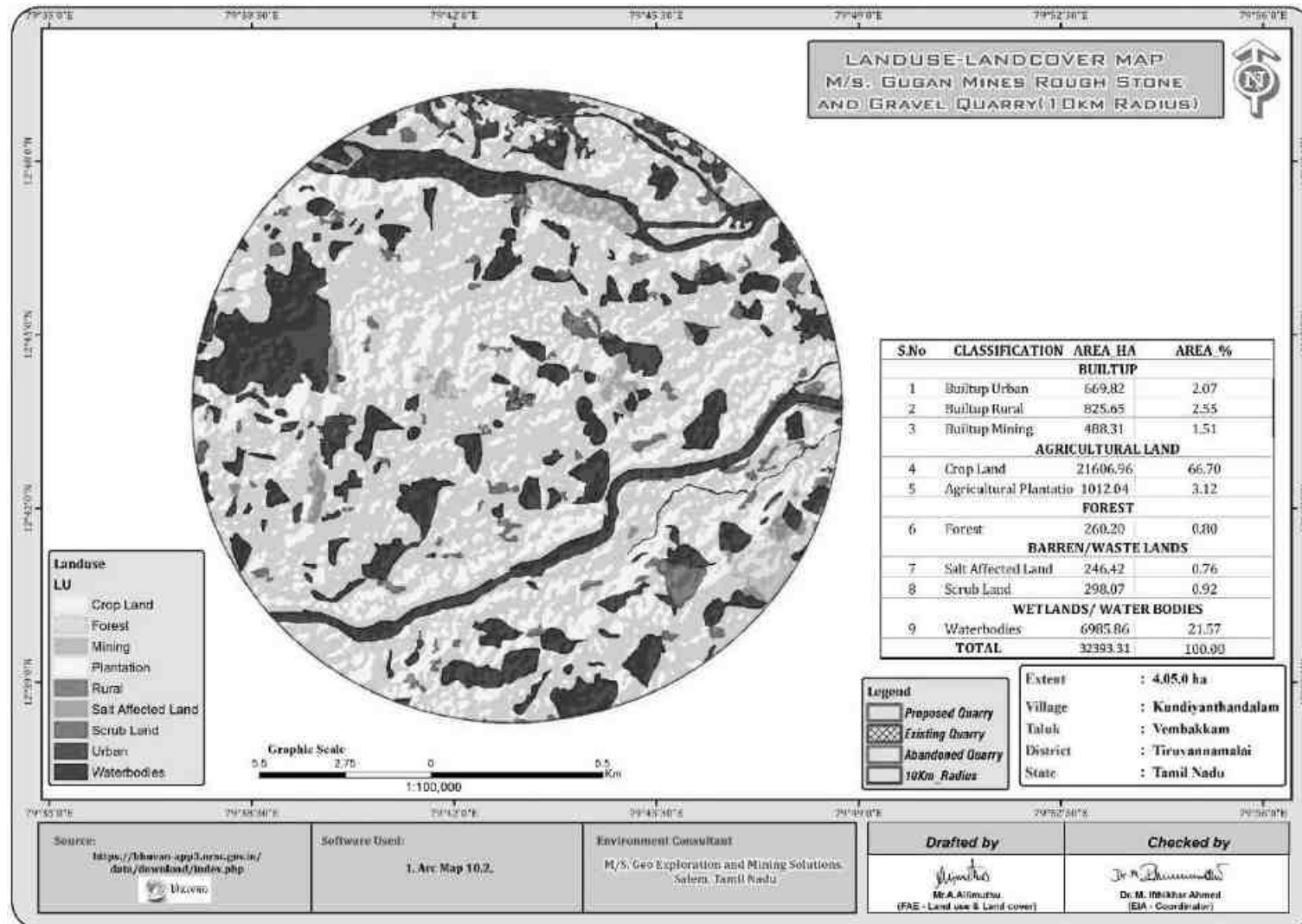


TABLE 3.3: DETAILS OF ENVIRONMENT SENSITIVITY AROUND THE CLUSTER

Sl.No	Sensitive Ecological Features	Name	Arial Distance in km from Cluster
1	National Park / Wild life Sanctuaries	Karikili Birds Sanctuary	14km - SE
2	Reserve Forest	Marudham R.F	8.2 Km - SE (Source - TNGIS)
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	None	Nil within 10km Radius

Source: Survey of India Toposheet

TABLE 3.4: NEARBY WATER BODIES FROM THE PROPOSED PROJECT SITE

Sl.No	NAME	DISTANCE & DIRECTION
1	Kuttai	210m-NW
2	Tank	480m-SW
3	Tank	530m-NW
4	Odai	700m-NW
5	Tank	1km -NE
6	cheyyar River	3.7km-SE
7	Palar River	6.3km-NE
8	Kuttai	210m-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 3.5.

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	Project Area	Core Zone	12°43'44.89"N 79°43'7.06"E
2	S-2	Near Project Area	210m NE	12°43'53.35"N 79°43'24.38"E
3	S-3	Mathur	4.5km SW	12°42'55.15"N 79°40'37.38"E
4	S-4	Arpakkam	5.0km NE	12°43'54.18"N 79°45'54.71"E
5	S-5	Azhisoor	6.6km South	12°40'1.96"N 79°43'27.62"E
6	S-6	Kalakattur	5km North	12°46'35.84"N 79°43'11.97"E

Source: On-site monitoring/sampling by EHS 360Lab Private Limited lab 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 EHS 360Lab Private Limited 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 are presented below in Figure 3.4 and the physico-chemical characteristics of the soil & Test Results in Table 3.7.

FIGURE 3.5: SOIL SAMPLING LOCATIONS AROUND 10 KM RADIUS

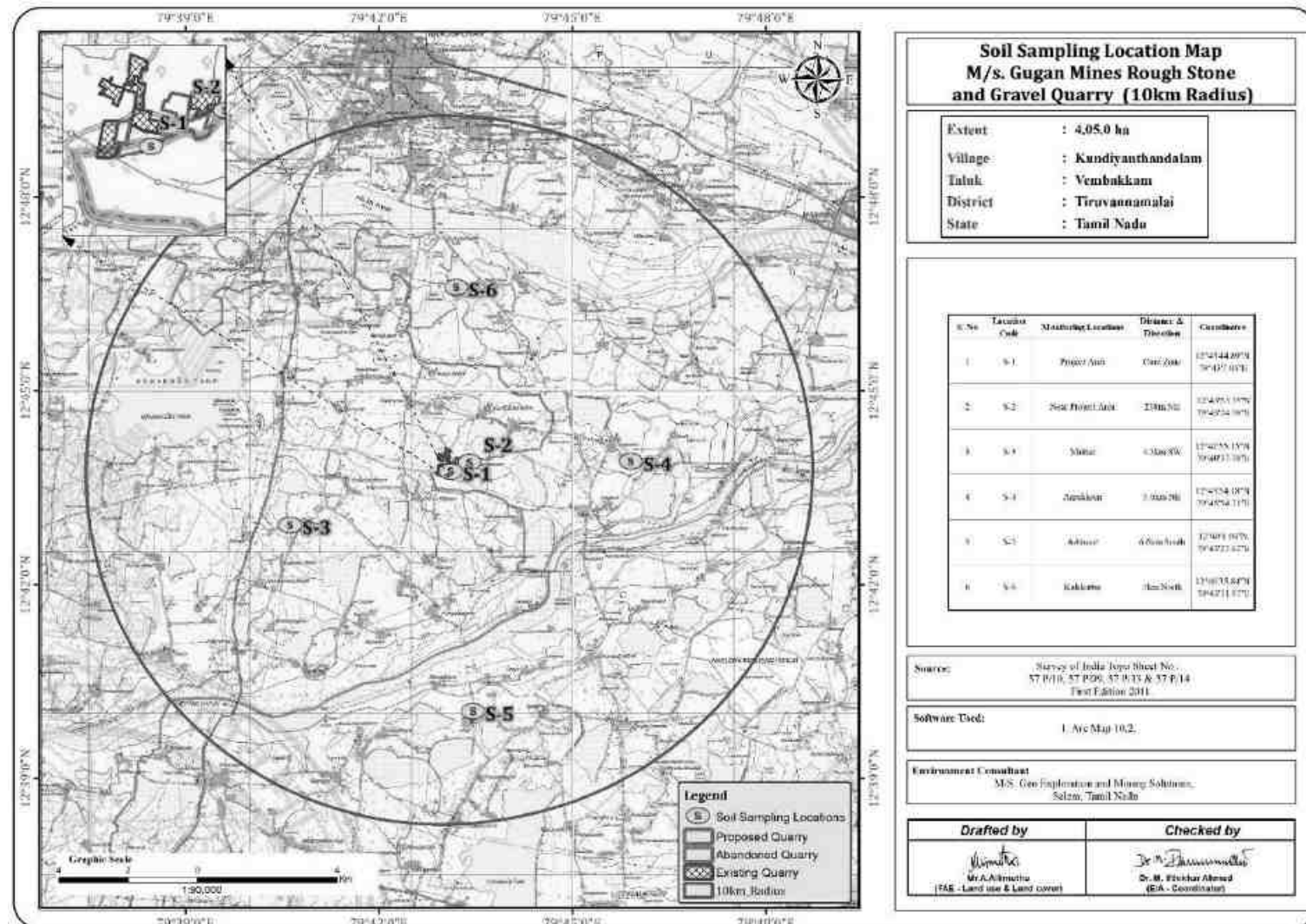


FIGURE 3.6: SOIL MAP

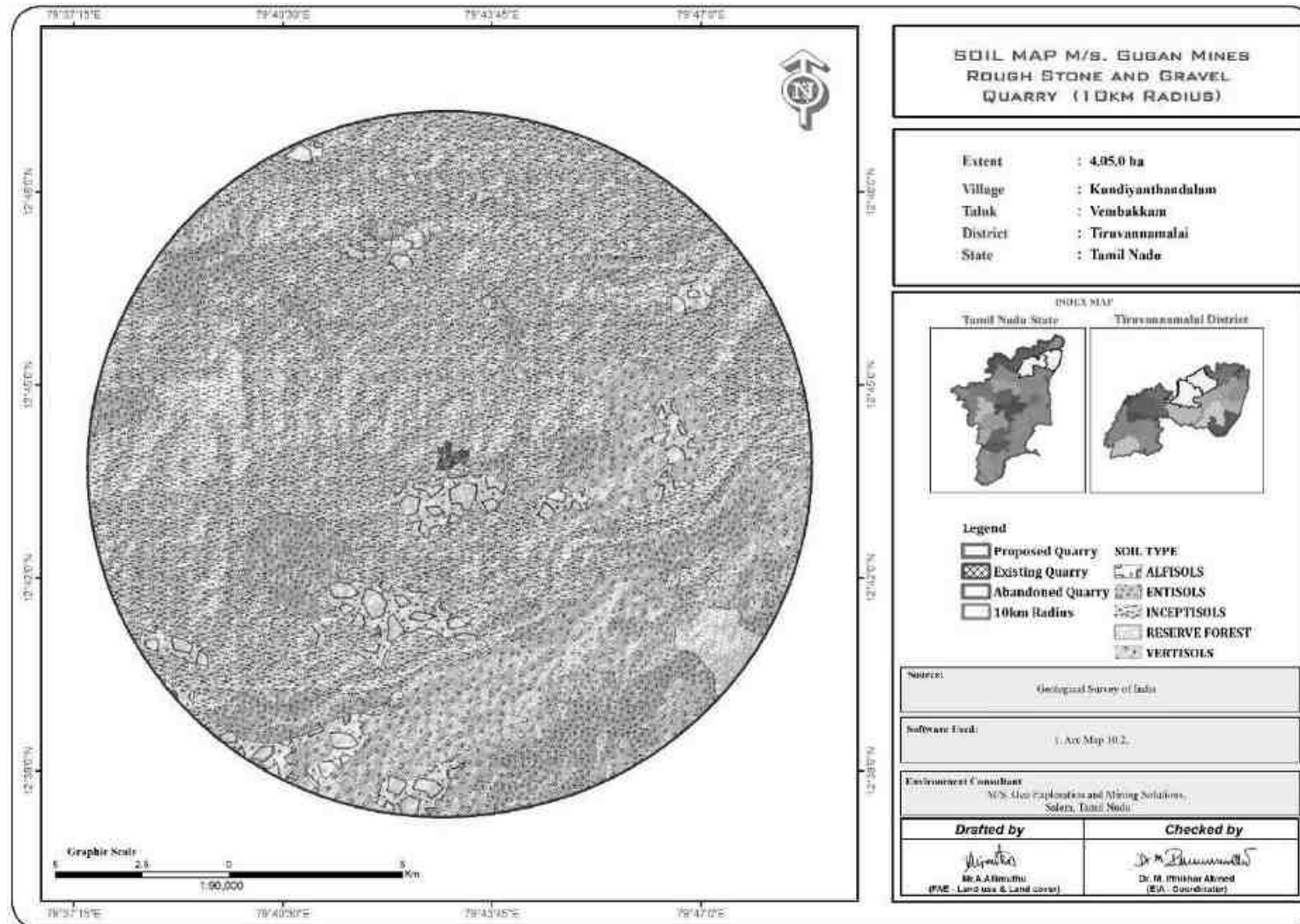


TABLE 3.7: SOIL QUALITY OF THE STUDY AREA

Sl. No	Test Parameters	Test Method	Unit	S1 Core Zone	S2 Near Project area	S3 Mathur	S4 Arpakkam	S5 Azhisoor	S6 Kalakattur
1	pH @ 25°C	IS 2720 Part 26 - 1987 (Reaff:2016)	-	7.12	7.09	7.18	7.35	8.02	8.09
2	Conductivity @ 25°C	IS 14767 - 2000 (Reaff : 2016)	µmhos/cm	359 µmhos/cm	376.5 µmhos/cm	383 µmhos/cm	356.6 µmhos/cm	421.2 µmhos/cm	454 µmhos/cm
3	Water Holding Capacity	By Gravimetric Method	%	38.5 %	45.2 %	44.1 %	38.8 %	40.29 %	47.8 %
4	Bulk Density	By Cylindrical Method	g/cm ³	1.06 g/cm ³	0.82 g/cm ³	1.19 g/cm ³	1.09 g/cm ³	1.08 g/cm ³	1.18 g/cm ³
5	Porosity	By Gravimetric Method	%	36.8 %	41.7 %	38.9 %	35.8 %	38.6 %	43.6 %
6	Calcium as Ca	Food and Agriculture organization of the united Nation Rome 2007 : 2018	mg/kg	41.2 mg/kg	61.4 mg/kg	59.9 mg/kg	70.9 mg/kg	58.6 mg/kg	66.8 mg/kg
7	Magnesium as Mg	GLCS/SOP/S/021	mg/kg	23.8 mg/kg	30 2mg/kg	26.6 mg/kg	36.4 mg/kg	22.9 mg/kg	32.9 mg/kg
8	Chloride as Cl	APHA 23rd Edn 2019 4500 Cl B	mg/kg	65.9 mg/kg	63.7 mg/kg	79.4 mg/kg	60.5 mg/kg	60.4 mg/kg	74.6 mg/kg
9	Soluble Sulphate as SO ₄	IS 2720 Part 27 : 1977 (Reaff:2015)	%	0.0017 %	0.0021 %	0.0023 %	0.0017 %	0.0023 %	0.0016 %
10	Total Phosphorus as P	IS 10158 : 1982 (Reaff: 2019)	mg/kg	2.01 mg/kg	1.92 mg/kg	3.96 mg/kg	1.72 mg/kg	5.20 mg/kg	4.56 mg/kg
11	Total Nitrogen as N	IS 14684 : 1999 (Reaff:2019)	mg/kg	412.8 mg/kg	412.8 mg/kg	436.9 mg/kg	401.7 mg/kg	462.5 mg/kg	475 mg/kg
12	Organic Matter	IS : 2720 Part 22: 1972 (Reaff: 2015)	%	1.50 %	1.57 %	2.03 %	2.17 %	1.91 %	2.08 %
13	Organic Carbon	IS : 2720 Part 22: 1972 (Reaff: 2015)	%	0.87 %	0.91 %	1.18 %	1.26 %	1.11 %	1.21 %
14	Texture :	Gravimetric Method	-	-	-	-	-	-	-
	Clay		%	25.9 %	24.0 %	24.1 %	23.0 %	22.8 %	24.5 %

	Sand		%	35.2 %	36.2 %	35.7 %	35.9 %	36.9 %	35.4 %
	Silt		%	38.9%	39.8 %	40.2 %	41.1 %	40.3 %	40.1 %
15	Manganese as Mn	USEPA 3050 B – 1996 & USEPA 6010 C - 2000	mg/kg	22.1 mg/kg	26.4 mg/kg	23.3 mg/kg	27.6 mg/kg	23.5 mg/kg	28.8 mg/kg
16	Zinc as Zn		mg/kg	1.19 mg/kg	2.31 mg/kg	1.27 mg/kg	1.56 mg/kg	1.91 mg/kg	1.38 mg/kg
17	Boron as B		mg/kg	1.72 mg/kg	1.13 mg/kg	1.56 mg/kg	1.94 mg/kg	1.87 mg/kg	1.08 mg/kg
18	Potassium as K		mg/kg	30.6 mg/kg	32.8 mg/kg	36.9 mg/kg	43.4 mg/kg	42.1 mg/kg	49.8 mg/kg
19	Cadmium as Cd		mg/kg	BDL (DL : 1.0 mg/kg)	BDL (DL : 1.0 mg/kg)	BDL (DL : 1.0 mg/kg)	BDL (DL : 1.0 mg/kg)	BDL (DL : 1.0 mg/kg)	BDL (DL : 1.0 mg/kg)
20	Total Chromium as Cr		mg/kg	BDL (DL : 1.0 mg/kg)	BDL (DL : 1.0 mg/kg)	BDL (DL : 1.0 mg/kg)	BDL (DL : 1.0 mg/kg)	BDL (DL : 1.0 mg/kg)	BDL (DL : 1.0 mg/kg)
21	Copper as Cu		mg/kg	BDL (DL : 1.0 mg/kg)	BDL (DL : 1.0 mg/kg)	BDL (DL : 1.0 mg/kg)	BDL (DL : 1.0 mg/kg)	BDL (DL : 1.0 mg/kg)	BDL (DL : 1.0 mg/kg)
22	Lead as Pb		mg/kg	1.11 mg/kg	0.90 mg/kg	1.74 mg/kg	1.91 mg/kg	1.46 mg/kg	0.95 mg/kg
23	Iron as Fe		mg/kg	2.42 mg/kg	5.97 mg/kg	7.29 mg/kg	8.09mg/kg	7.78 mg/kg	4.56 mg/kg
24	Cation Exchange Capacity	USEPA 9080 – 1986	meq/100g of soil	40.8 meq/100g of soil	44.6 meq/100g of soil	40.7 meq/100g of soil	44.9 meq/100g of soil	45.9 meq/100g of soil	47.5 meq/100g of soil

Source: Sampling Results by EHS 360Lab Private Limited in association with GEMS

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 (22.8 % to 25.9%) to Sandy Loam Soil and Bulk Density of Soils in the study area varied between 0.82 – 1.19 g/cm³. The Water Holding Capacity is found to be medium i.e., ranging from 38.5-47.8 %.

Chemical Characteristics –

- The nature of soil is slightly alkaline to strongly alkaline with pH range 7.09 to 8.09
- The available Nitrogen content range between 401.7 to 475 mg/kg
- The available Phosphorus content range between 1.72 to 5.2 mg/kg
- The available Potassium range between 30.6 to 49.8 mg/kg

Observation:

The pH of the Soil indicates that the soil is Neutral and arid region and ideal for plant growth.

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:

Cheyyar River 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., 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

Two (2) surface water and Four (4) 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	CO-ORDINATES
SURFACE WATER				
1	SW1	Cheybaru River	3.7km SE	12°42'33.23"N 79°44'47.37"E
2	SW2	Kalakattur Tank	4.5km North	12°46'15.81"N 79°43'11.29"E
GROUND WATER				
3	WW-1	Near Project Area	410m SW	12°43'35.15"N 79°42'47.28"E
4	WW-2	Arpakkam	4.0km NE	12°43'55.87"N 79°45'25.27"
5	BW-1	Near Project Area	370m North	12°44'0.59"N 79°43'8.25"E
6	BW-2	Mathur	4.5km SW	12°42'54.89"N 79°40'35.96"E

Source: On-site monitoring/sampling by EHS 360 Lab Private Limited in association with GEMS

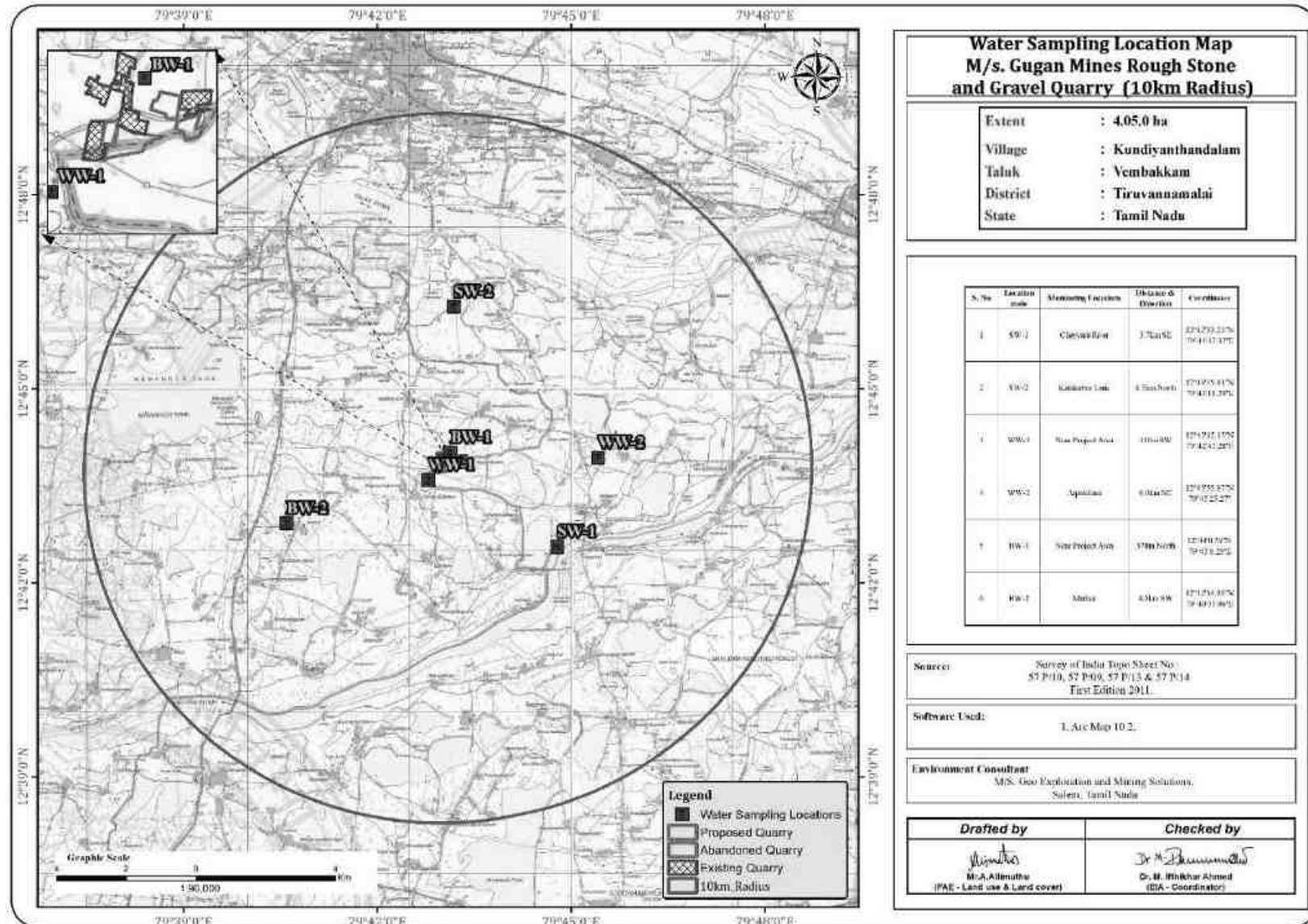
FIGURE 3.8: WATER SAMPLING LOCATIONS AROUND 10 KM RADIUS

TABLE 3.9: GROUND WATER SAMPLING RESULTS

S.NO	Parameter	BW-1 Near Project area	BW-2 Mathur	WW-1 Near Project Area	WW-2 Arpakkam
1	Color	< 5	< 5	< 5	< 5
2	Odour	Agreeable	Agreeable	Agreeable	Agreeable
3	pH@ 25°C	7.29	7.23	7.61	7.28
4	Electrical Conductivity @ 25°C	1531 µmhos/cm	1376.0 µmhos/cm	1760 µmhos/cm	1092.0 µmhos/cm
5	Turbidity	< 1 NTU	< 1 NTU	< 1 NTU	< 1 NTU
6	Total Dissolved Solids	803.0 mg/l	814.0 mg/l	1043 mg/l	975 mg/l
7	Total Hardness as CaCO ₃	906 mg/l	276.0 mg/l	344.0 mg/l	320.0 mg/l
8	Calcium as Ca	70.5 mg/l	65.7 mg/l	67.3 mg/l	60.1 mg/l
9	Magnesium as Mg	32.1 mg/l	27.2 mg/l	42.8 mg/l	40.8 mg/l
10	Total Alkalinity	282.5 mg/l	258.5 mg/l	312.5 mg/l	288.5 mg/l
11	Chloride as Cl ⁻	322.5 mg/l	293.5 mg/l	380.5 mg/l	355.0 mg/l
12	Sulphate as SO ₄ ⁻	48.6 mg/l	47.5 mg/l	58.6 mg/l	56.4 mg/l
13	Iron as Fe	0.44 mg/l	0.38 mg/l	0.39 mg/l	0.49 mg/l
14	Free Residual Chlorine	BDL (DL:0.1 mg/l)	BDL (DL:0.1 mg/l)	BDL (DL:0.1 mg/l)	BDL (DL:0.1 mg/l)
15	Fluoride as F	0.39 mg/l	0.44 mg/l	0.37 mg/l	0.38 mg/l
16	Nitrates as NO ₃	2.5 mg/l	2.8 mg/l	2.9 mg/l	2.2 mg/l
17	Copper as Cu	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)
18	Manganese as Mn	BDL (DL:0.02 mg/l)	BDL (DL:0.02 mg/l)	BDL (DL:0.02 mg/l)	BDL (DL:0.02 mg/l)
19	Mercury as Hg	BDL (DL:0.0005 mg/l)	BDL (DL:0.0005 mg/l)	BDL (DL:0.0005 mg/l)	BDL (DL:0.0005 mg/l)
20	Cadmium as Cd	BDL (DL:0.001 mg/l)	BDL (DL:0.001 mg/l)	BDL (DL:0.001 mg/l)	BDL (DL:0.001 mg/l)
21	Selenium as Se	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)
22	Aluminium as Al	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)
23	Lead as Pb	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)
24	Zinc as Zn	BDL(DL : 0.05 mg/l)	BDL(DL : 0.05 mg/l)	BDL(DL : 0.05 mg/l)	BDL(DL : 0.05 mg/l)
25	Total Chromium	BDL(DL : 0.02 mg/l)	BDL(DL : 0.02 mg/l)	BDL(DL : 0.02 mg/l)	BDL(DL : 0.02 mg/l)
26	Boron as B	BDL(DL : 0.05 mg/l)	BDL(DL : 0.05 mg/l)	BDL(DL : 0.05 mg/l)	BDL(DL : 0.05 mg/l)
27	Mineral Oil	BDL(DL : 0.01 mg/l)	BDL(DL : 0.01 mg/l)	BDL(DL : 0.01 mg/l)	BDL(DL : 0.01 mg/l)
28	Phenolic Compunds as C ₆ H ₅ OH	BDL (DL:0.0005 mg/l)	BDL (DL:0.0005 mg/l)	BDL (DL:0.0005 mg/l)	BDL (DL:0.0005 mg/l)
29	Anionic Detergents as	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)
30	Cyanide as CN	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)
31	Barium as Ba	BDL(DL:0.05 mg/l)	BDL(DL:0.05 mg/l)	BDL(DL:0.05 mg/l)	BDL(DL:0.05 mg/l)
32	Ammonia (as total ammonia-N)	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)
33	Sulphide as H ₂ S	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)
34	Molybdenum as Mo	BDL (DL:0.02 mg/l)	BDL (DL:0.02 mg/l)	BDL (DL:0.02 mg/l)	BDL (DL:0.02 mg/l)
35	Total Arsenic as As	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)
36	Total Suspended Solids	BDL (DL:1.0 mg/l)	BDL (DL:1.0 mg/l)	BDL (DL:1.0 mg/l)	BDL (DL:1.0 mg/l)
37	Total Coliform	129 MPN/100ml	123 MPN/100ml	156 MPN/100ml	115 MPN/100ml
38	Escherichia coli	< 1.8 MPN/100ml	< 1.8 MPN/100ml	< 1.8 MPN/100ml	< 1.8 MPN/100ml

* 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- Cheyyar River	SW2- Kalakattur Tank
1	Colour	Hazen	10 Hazen	11 Hazen
2	Odour	-	Agreeable	Agreeable
3	pH@ 25°C	-	8.63	8.21
4	Electrical Conductivity @ 25°C	µs/cm	2062 µmhos/cm	1920 µmhos/cm
5	Turbidity	NTU	5.5 NTU	8.6 NTU
6	Total Dissolved Solids	mg /l	1219 mg/l	1135 mg/l
7	Total Hardness as CaCO ₃	mg/l	392 mg/l	368 mg/l
8	Calcium as Ca	mg/l	81.7 mg/l	78.5 mg/l
9	Magnesium as Mg	mg/l	45.7 mg/l	41.8 mg/l
10	Total Alkalinity as CaCO ₃	mg/l	375.5 mg/l	354.6 mg/l
11	Chloride as Cl ⁻	mg/l	421.5 mg/l	396.5 mg/l
12	Sulphate as SO ₄ ⁻	mg/l	78.1 mg/l	58.1 mg/l
13	Iron as Fe	mg/l	0.56 mg/l	0.51 mg/l
14	Free Residual Chlorine	mg/l	BDL (DL:0.1 mg/l)	BDL (DL:0.1 mg/l)
15	Fluoride as F	mg/l	0.61 mg/l	0.43 mg/l
16	Nitrates as NO ₃	mg/l	7.3 mg/l	9.1 mg/l
17	Copper as Cu	mg/l	BDL (DL:0.01 mg/l)	
18	Manganese as Mn	mg/l	BDL (DL:0.02 mg/l)	
19	Mercury as Hg	mg/l	BDL (DL:0.0005 mg/l)	
20	Cadmium as Cd	mg/l	BDL (DL:0.001 mg/l)	
21	Selenium as Se	mg/l	BDL (DL:0.005 mg/l)	
22	Aluminium as Al	mg/l	BDL (DL:0.005 mg/l)	
23	Lead as Pb	mg/l	BDL (DL:0.005 mg/l)	
24	Zinc as Zn	mg/l	BDL(DL : 0.05 mg/l)	
25	Total Chromium	mg/l	BDL(DL : 0.02 mg/l)	
26	Boron as B	mg/l	BDL(DL : 0.05 mg/l)	
27	Mineral Oil	mg/l	BDL(DL : 0.01 mg/l)	
28	Phenolic Compounds as C ₆ H ₅ OH	mg/l	BDL (DL:0.0005 mg/l)	
29	Anionic Detergents as MBAS	mg/l	BDL (DL:0.01 mg/l)	
30	Cyanide as CN	mg/l	BDL (DL:0.01 mg/l)	
31	Biological Oxygen Demand, 3 days @ 27°C	mg/l	15.5 mg/l	9.6 mg/l
32	Chemical Oxygen Demand	mg/l	50.0 mg/l	30 mg/l
33	Dissolved Oxygen	mg/l	12.2 mg/l	12.7 mg/l
34	Barium as Ba	mg/l	BDL(DL:0.05 mg/l)	BDL(DL:0.05 mg/l)
35	Ammonia (as total ammonia-N)	mg/l	3.8 mg/l	4.6 mg/l
36	Sulphide as H ₂ S	mg/l	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)
37	Molybdenum as Mo	mg/l	BDL (DL:0.02 mg/l)	BDL (DL:0.02 mg/l)
38	Total Arsenic as As	mg/l	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)
39	Total Suspended Solids	mg/l	12.1 mg/l	19.1 mg/l
40	Total Coliform	MPN/100ml	520 MPN/100ml	536 MPN/100ml
41	Escherichia coli	MPN/100ml	112 MPN/100ml	125 MPN/100ml

Note : APHA – American Public Health Association, BDL – Below Detection Limit, DL – Detection Limit, MPN – Most Probable Number.

3.2.4 Interpretation& Conclusion

Surface Water

The pH varied from 8.21 -8.63 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 varied from 1135 to 1219 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 396.5 to 421.5mg/l. Nitrates varied from 7.3 to 9.1 mg/l, while sulphates varied from 58.1 to 78.1 mg/l.

Ground Water

The pH of the water samples collected ranged from 7.23 to 7.61 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. Total Dissolved Solids were found in the range of 803 to 1043mg/l in all samples. Total hardness varied between 276 to 906 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 59-63m bgl. The maximum depth proposed out of proposed projects is 49m (4m Gravel + 45m Rough stone) below ground level.

Ground water levels and Flow Direction based on the Bore well and open well Data's

In general, the ground water movement is based on the gradient ie., water moves from the highest static ground water elevation to lowest static ground water elevation point. The ground water movement is important aspect to locating the recharge and discharge areas. Therefore, the data has been collected in the study area. Water level measured in the ten open well and eight borewells.

The average water level in the open well is varies from = 9.4m to 13.4m bgl

The water level in the bore well is varies from = 64.8 to 68.2m bgl

Based on the water level contour map of the open well and bore well the water flow direction in the particular region is towards North side.

The water level in the area is above 59-63m 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.

TABLE 3.11: WINTER SEASON WATER LEVEL OF OPEN WELLS 1 KM RADIUS

S.NO	LABEL	LONGITUDE	LATITUDE	Dec 24	Jan-25	Feb 25
1	OW1	79° 42' 47.1646" E	12° 43' 35.1591" N	10.2	11	11.6
2	OW2	79° 42' 31.7579" E	12° 43' 52.8547" N	10.4	11.2	11.8
3	OW3	79° 42' 35.2809" E	12° 44' 17.3798" N	9.8	10.6	11.2
4	OW4	79° 43' 07.5045" E	12° 44' 31.3037" N	9.4	10.2	10.8
5	OW5	79° 43' 23.8804" E	12° 43' 45.5891" N	11.1	11.9	12.5
6	OW6	79° 43' 51.4905" E	12° 44' 07.1378" N	9.9	10.7	11.3
7	OW7	79° 43' 38.6216" E	12° 43' 14.8704" N	11	11.8	12.4
8	OW8	79° 43' 03.5166" E	12° 43' 20.5597" N	10.3	11.1	11.7
9	OW9	79° 42' 38.2493" E	12° 43' 08.2645" N	10.9	11.7	12.3
10	OW10	79° 43' 05.3354" E	12° 43' 01.6586" N	12	12.8	13.4

Source: Onsite monitoring data

FIGURE 3.9: OPEN WELL CONTOUR MAP DEC 2024 to FEB 2025

TABLE 3.12: WINTER SEASON WATER LEVEL OF BOREWELLS 1 KM RADIUS

S.NO	LABEL	LONGITUDE	LATITUDE	DEC-24	JAN-25	FEB-25
1	BW1	79° 43' 08.2888" E	12° 44' 00.5831" N	66.3	67.1	67.5
2	BW2	79° 42' 40.9480" E	12° 43' 45.0557" N	66.8	67.6	68
3	BW3	79° 42' 17.1455" E	12° 43' 44.5816" N	67	67.8	68.2
4	BW4	79° 43' 22.3266" E	12° 44' 31.0499" N	64.8	65.6	66
5	BW5	79° 43' 42.3493" E	12° 43' 58.5341" N	66.1	66.9	67.3
6	BW6	79° 43' 26.3062" E	12° 43' 37.8546" N	65.3	66.1	66.5
7	BW7	79° 43' 45.3311" E	12° 43' 32.3479" N	66.2	67	67.4
8	BW8	79° 42' 51.8812" E	12° 43' 07.0939" N	67	67.8	68.2

Source: Onsite monitoring data

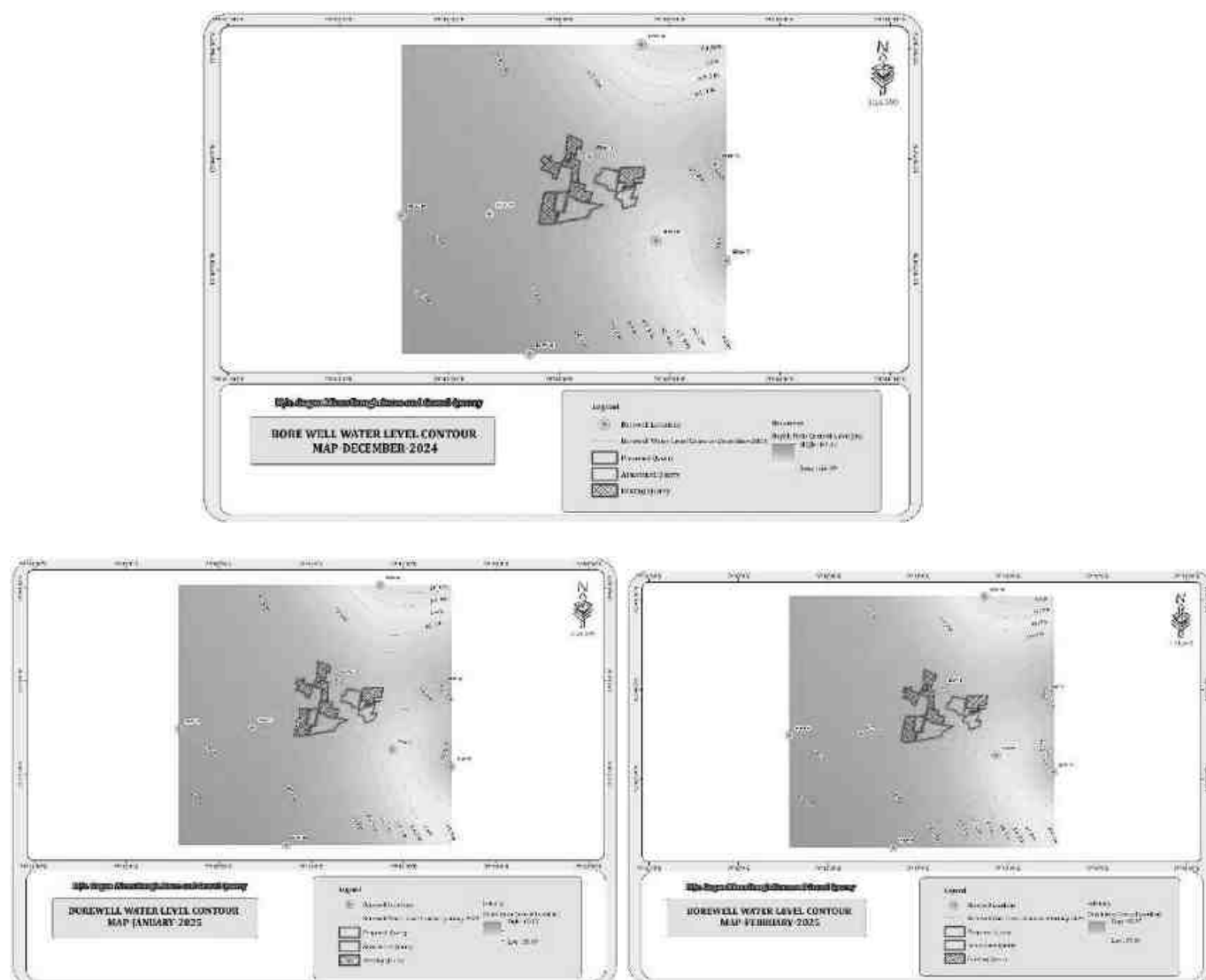
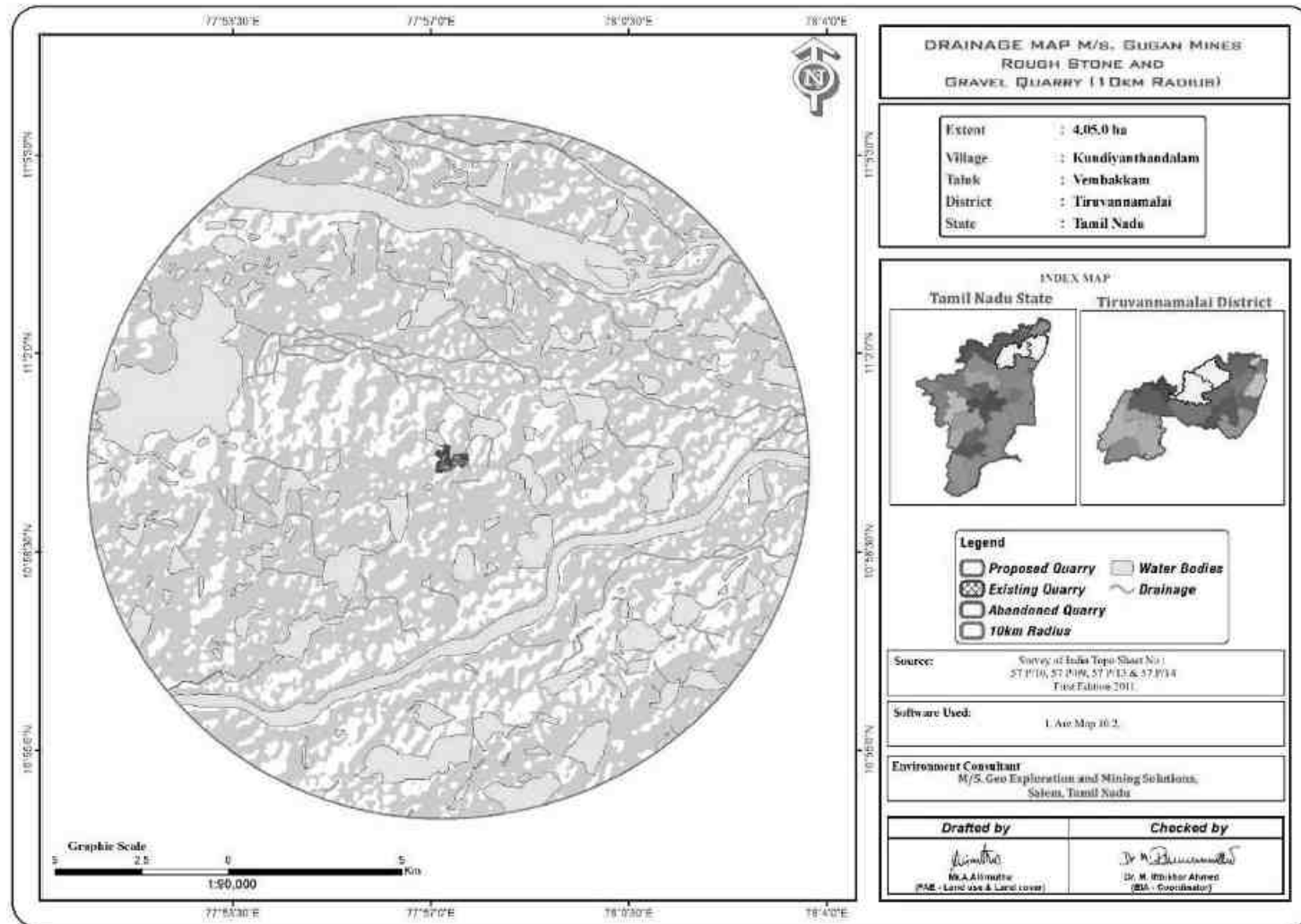
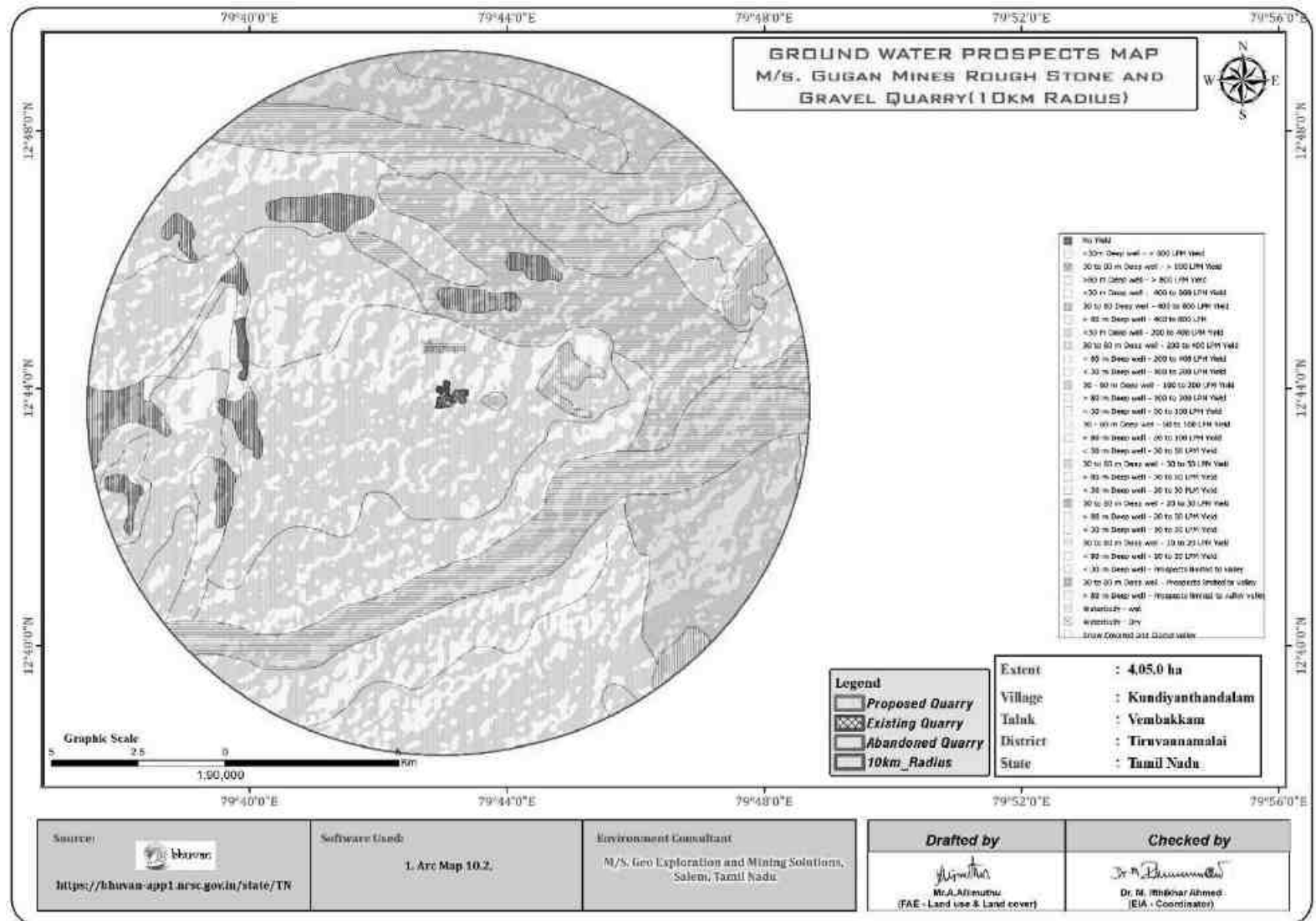
FIGURE 3.10: BOREWELL CONTOUR MAP – DEC 2024 to FEB 2025

FIGURE 3.11: DRAINAGE MAP AROUND 10 KM RADIUS FROM PROJECT SITE

Remarks: it is inferred that the area is dendritic to sub dendritic pattern

FIGURE 3.12: GROUND WATER PROSPECT MAP



Remarks: Water table in the area is 30-80m as per the Bhuvan Data

Geophysical Resistivity Survey

3.2.5.1 Methodology and Data Acquisition

The Geophysical Electrical Resistivity survey conducted in the area Schlumberger configuration, Vertical Electrical Sounding (VES) method. 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,

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

ρ_r = Resistivity of Rocks

ρ_w = Resistivity of water in pores of rock

F = Formation Factor

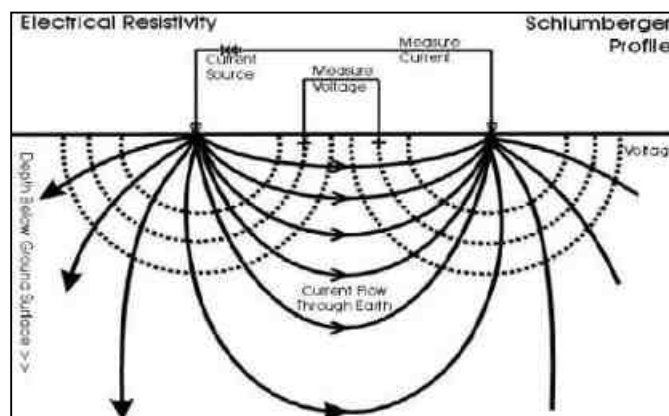
ϕ = Fractional pore volume

A = Constants with values ranging from 0.5 to 2.5

3.2.5.2 Survey Layout

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 57m. The maximum depth proposed out of proposed projects 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.

It is inferred that the existing quarries in the surrounding area reaches maximum of 45m and the water table is not intersected, only the seepage water during rainy season encountered from the upper layer and it will be used for the Greenbelt development, Dust suppression and quarrying operation.

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 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.

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

- The climatic conditions of Tiruvannamalai are characterized by a tropical climate. In Tiruvannamalai, the quantity of rainfall during summers surpasses that of winters. This location is classified as Aw by Köppen and Geiger. The average annual temperature is 27.4 °C | 81.3 °F in Tiruvannamalai. The rainfall here is around 811 mm | 31.9 inch per year.
- Tiruvannamalai are in the middle of our planet and the summers are not easy to define. The optimal period to plan a visit would be during the months of January, February, March, September, December.
- In terms of precipitation, the month with the lowest amount of rainfall is February, recording a mere 7 mm | 0.3 inch in its entirety. This denotes an exceptionally dry period within that particular time frame. On average, the highest amount of rainfall occurs during October with a mean value of 154 mm | 6.1 inch.
- The month that experiences the highest temperatures throughout the year is referred to as May, where an average temperature of 31.3 °C | 88.4 °F prevails. On average, the month of January is considered to be the coldest time of year with temperatures averaging at around 23.3 °C | 73.9 °F.

<https://en.climate-data.org/asia/india/tamil-nadu/tiruvannamalai-24067/>

Rainfall

TABLE 3.13: RAINFALL DATA

Actual Rainfall in mm					Normal Rainfall in mm
2017	2018	2019	2020	2021	
1251.3	799.2	1071.9	1034.5	1592.5	985

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

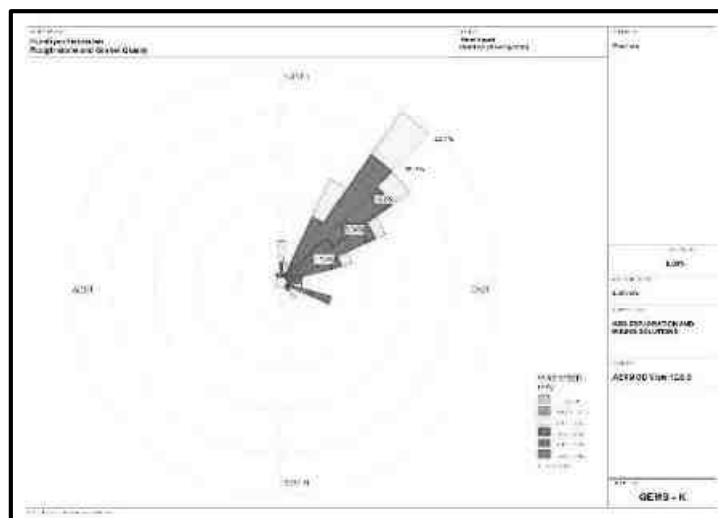
TABLE 3.14: METEOROLOGICAL DATA RECORDED AT SITE

S. No	Parameters		DEC-2024	JAN-2025	FEB 2025
1	Temperature ($^{\circ}\text{C}$)	Max	27.05	25.51	27.02
		Min	22.92	23.55	24.63
		Avg.	24.98	24.53	25.82
2	Relative Humidity (%)	Avg.	85.4	78.45	75.57
3	Wind Speed (m/s)	Max	8.07	6.45	5.73
		Min	2.35	2.95	1.79
		Avg.	5.21	4.7	3.76
4	Cloud Cover (OKTAS)		0-8	0-8	0-8
5	Wind direction		NE,NNE	NE,NNE	ENE,NE

Source: On-site monitoring/sampling by EHS 360Lab Private Limited in association with GEMS

Correlation between Secondary and Primary Data

The average rain fall over the period of five years is 985mm. The meteorological data collected at the site is almost similar to that of secondary data collected from IMD Villupuram. A comparison of site data generated during the three months with that of IMD, Villupuram. Wind rose diagram of the study site is depicted in Figure. 3.13 Predominant downwind direction of the area during study season is -South East to North East.

FIGURE 3.13: WINDROSE DIAGRAM

In the abstract of collected data wind rose were drawn on presented in figure No.3.13 during the monitoring period in the study area

1. Predominant winds were from NE, NNE, ENE
2. Wind velocity readings were recorded between 0.50 to 8.80m/s
3. Calm conditions prevail of about 0.00 % of the monitoring period
4. Temperature readings ranging from 24.53 to 25.82 $^{\circ}\text{C}$
5. Relative humidity ranging from 75.57 to 85.4 %
6. The monitoring was carried out continuously for three months. (December 2024 to February 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
PM _{2.5}	Gravimetric Method Beta attenuation Method	Fine Particulate Sampler Make – Thermo Environmental Instruments – TEI 121
PM ₁₀	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 EHS 360Lab Private Limited & 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 Mar 2024 – May 2024. 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.

The equipment was placed preferably at a height of at least $3 \pm 0.5\text{m}$ 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	AAQ-1	Core Zone	Project Area	12°43'43.48"N 79°43'2.05"E
2	AAQ-2	Core Zone	Project Area	12°43'49.46"N 79°43'3.11"E
3	AAQ-3	Near Project Area	210m NE	12°43'51.74"N 79°43'17.19"E
4	AAQ-4	Mathur	4.5km SW	12°42'54.62"N 79°40'39.28"E
5	AAQ-5	Arpakkam	4.8km NE	12°43'58.51"N 79°45'50.04"E
6	AAQ-6	Azhisoor	6.8km South	12°39'53.01"N 79°43'21.08"E
7	AAQ-7	Kalakattur	5km North	12°46'34.41"N 79°43'11.82"E

Source: On-site monitoring/sampling by EHS 360Lab Private Limited in association with GEMS.

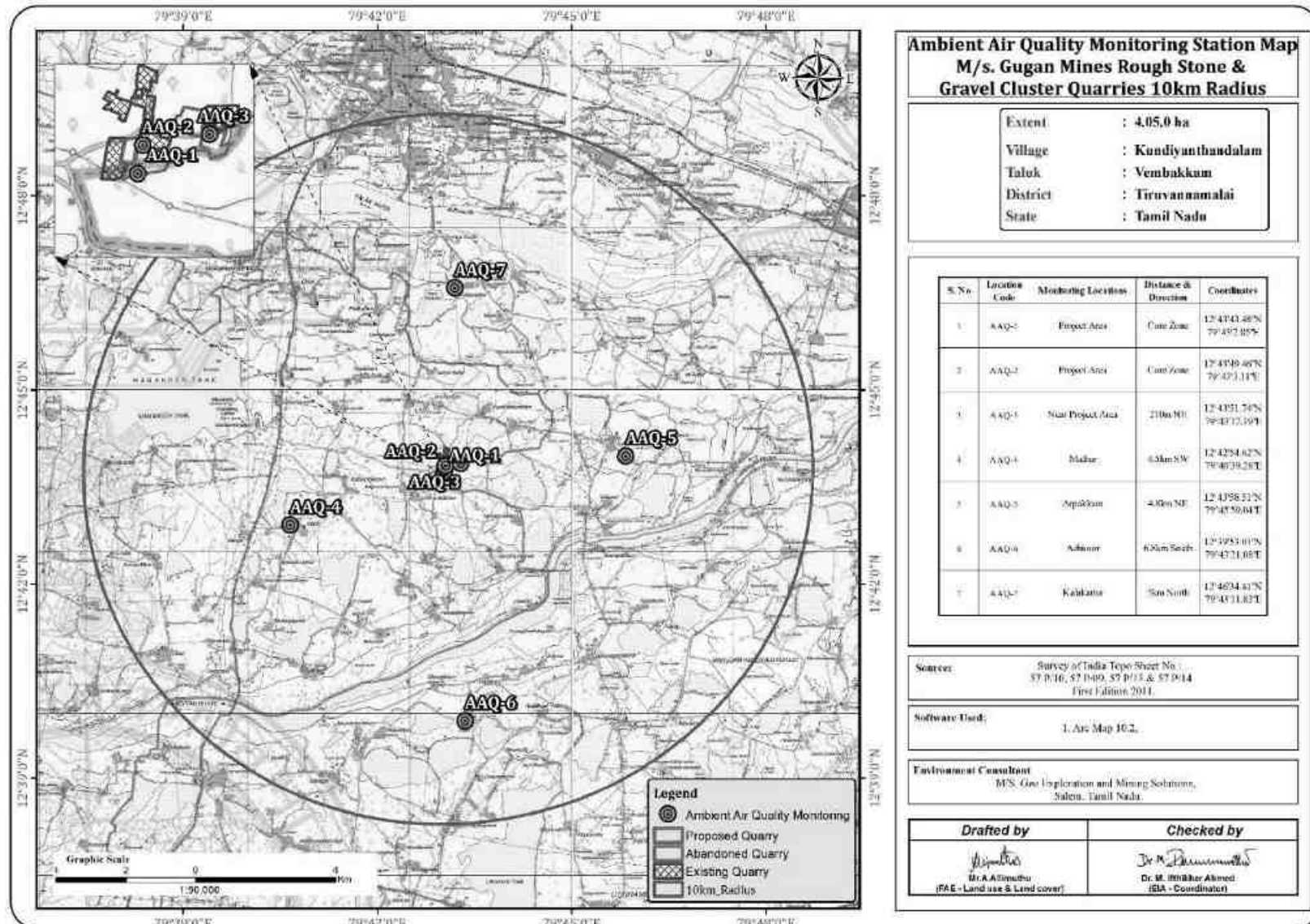
FIGURE 3.15: AMBIENT AIR QUALITY LOCATIONS AROUND 10 KM RADIUS

TABLE 3.18: SUMMARY OF AAQ 1 to AAQ 7

PM₁₀	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7
Arithmetic Mean	44.3	40.8	40.2	43.0	44.1	43.6	43.7
Minimum	41.2	38.2	36.0	40.0	40.8	42.1	41.0
Maximum	46.7	45.4	43.7	46.5	46.1	45.1	46.3
NAAQ Norms	100.0	100.0	100.0	100.0	100.0	100.0	100.0
PM_{2.5}	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7
Arithmetic Mean	23.3	21.2	21.4	21.7	21.7	20.2	22.0
Minimum	21.8	19.2	18.9	20.1	20.3	18.0	20.1
Maximum	25.6	23.4	23.5	23.7	24.1	21.9	23.8
NAAQ Norms	60.0	60.0	60.0	60.0	60.0	60.0	60.0
SO₂	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7
Arithmetic Mean	6.7	5.7	5.8	5.8	7.2	6.4	6.3
Minimum	5.0	4.1	4.2	4.3	5.6	5.1	4.6
Maximum	7.7	7.9	6.8	7.9	8.8	7.9	7.6
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	22.4	21.6	24.2	22.8	23.2	21.8	22.1
Minimum	19.8	19.5	21.4	19.5	20.2	20.2	18.4
Maximum	24.6	23.8	26.6	26.5	25.3	23.7	25.8
NAAQ Norms	80.0	80.0	80.0	80.0	80.0	80.0	80.0

TABLE 3.19: ABSTRACT OF AMBIENT AIR QUALITY DATA

1	Parameter	PM ₁₀	PM _{2.5}	SO ₂	NO ₂
2	No. of Observations	260	260	260	260
3	10 th Percentile Value	39.9	19.6	4.9	20.4
4	20 th Percentile Value	40.9	20.1	5.3	20.7
5	30 th Percentile Value	42.0	20.6	5.6	21.6
6	40 th Percentile Value	42.6	21.1	5.9	21.9
7	50 th Percentile Value	42.9	21.5	6.3	22.5
8	60 th Percentile Value	43.5	21.7	6.6	23.1
9	70 th Percentile Value	43.9	22.1	6.8	23.6
10	80 th Percentile Value	44.5	22.6	7.2	24.1
11	90 th Percentile Value	45.2	23.3	7.5	25.1
12	95 th Percentile Value	45.5	23.5	7.9	25.8
13	98 th Percentile Value	46.3	23.8	8.4	26.5
14	Arithmetic Mean	43.4	21.8	6.6	23.2
15	Geometric Mean	43.3	21.8	6.5	23.1
16	Standard Deviation	2.0	1.4	1.1	2.0
17	Minimum	39.9	19.6	4.9	20.4
18	Maximum	46.3	23.8	8.4	26.5
19	NAAQ Norms*	100.0	60.0	80.0	80.0

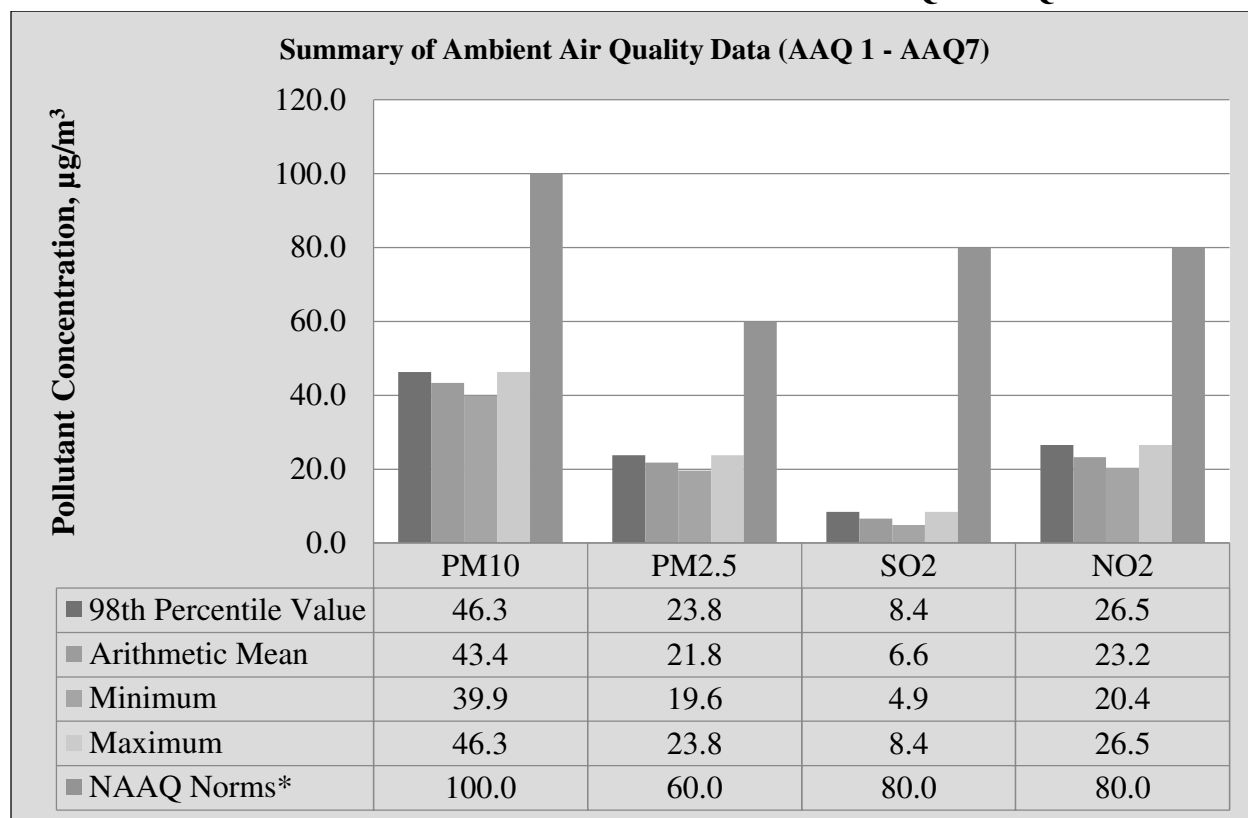
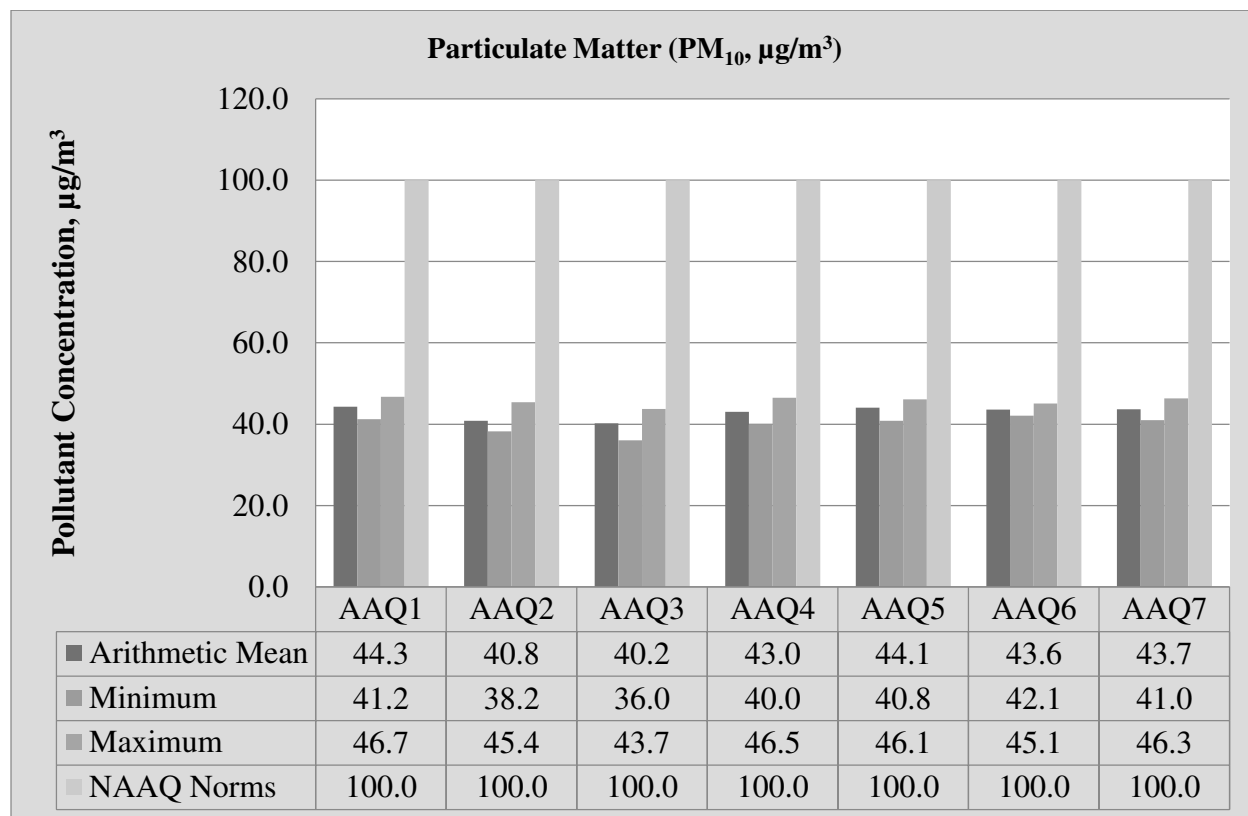
FIGURE 3.16: BAR DIAGRAM OF SUMMARY OF AAQ 1 – AAQ7**FIGURE 3.17: BAR DIAGRAM OF PARTICULATE MATTER PM₁₀**

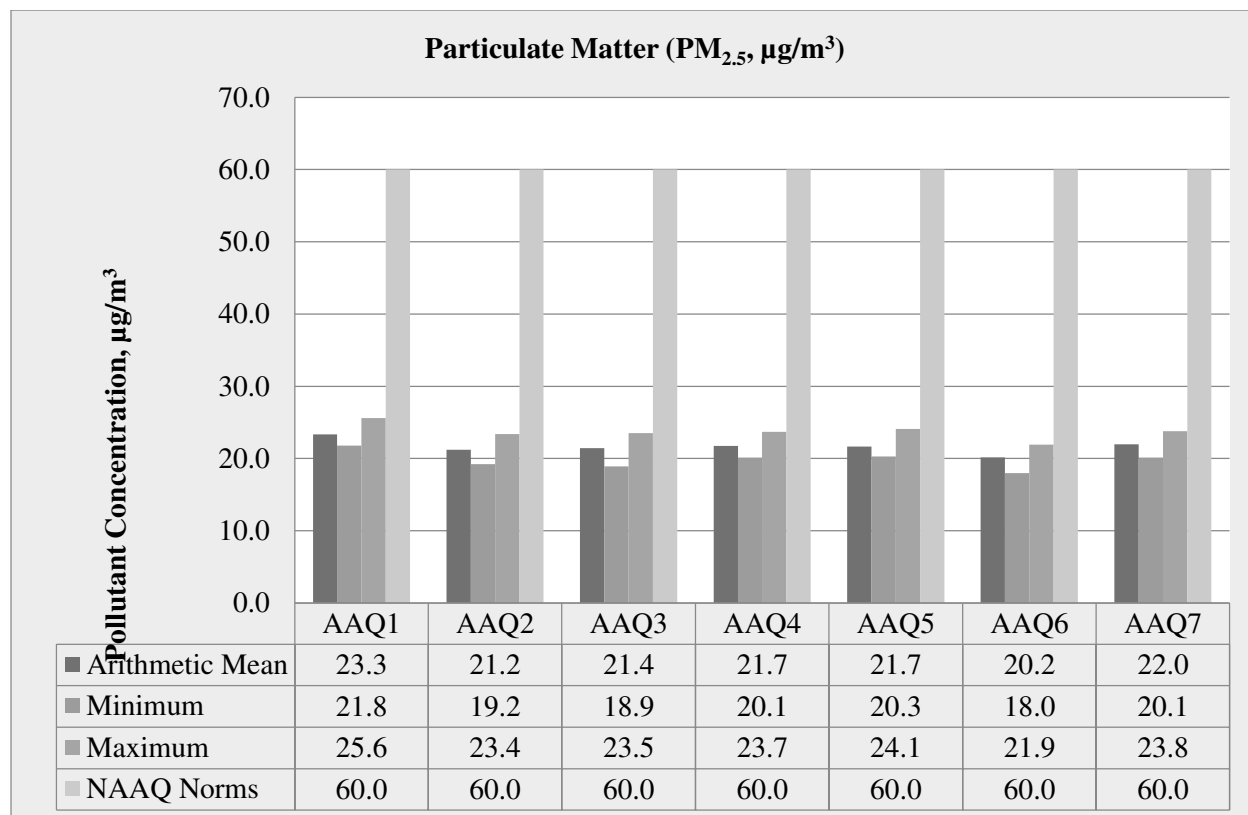
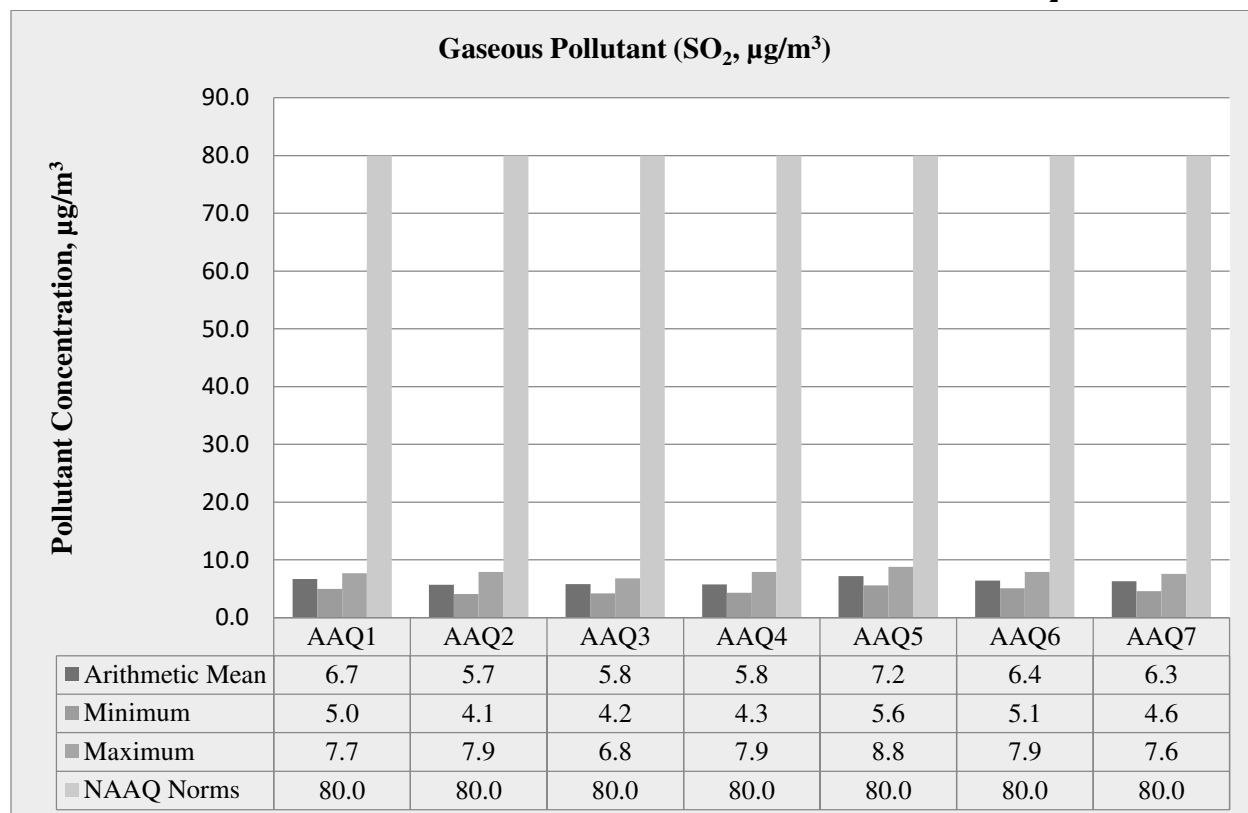
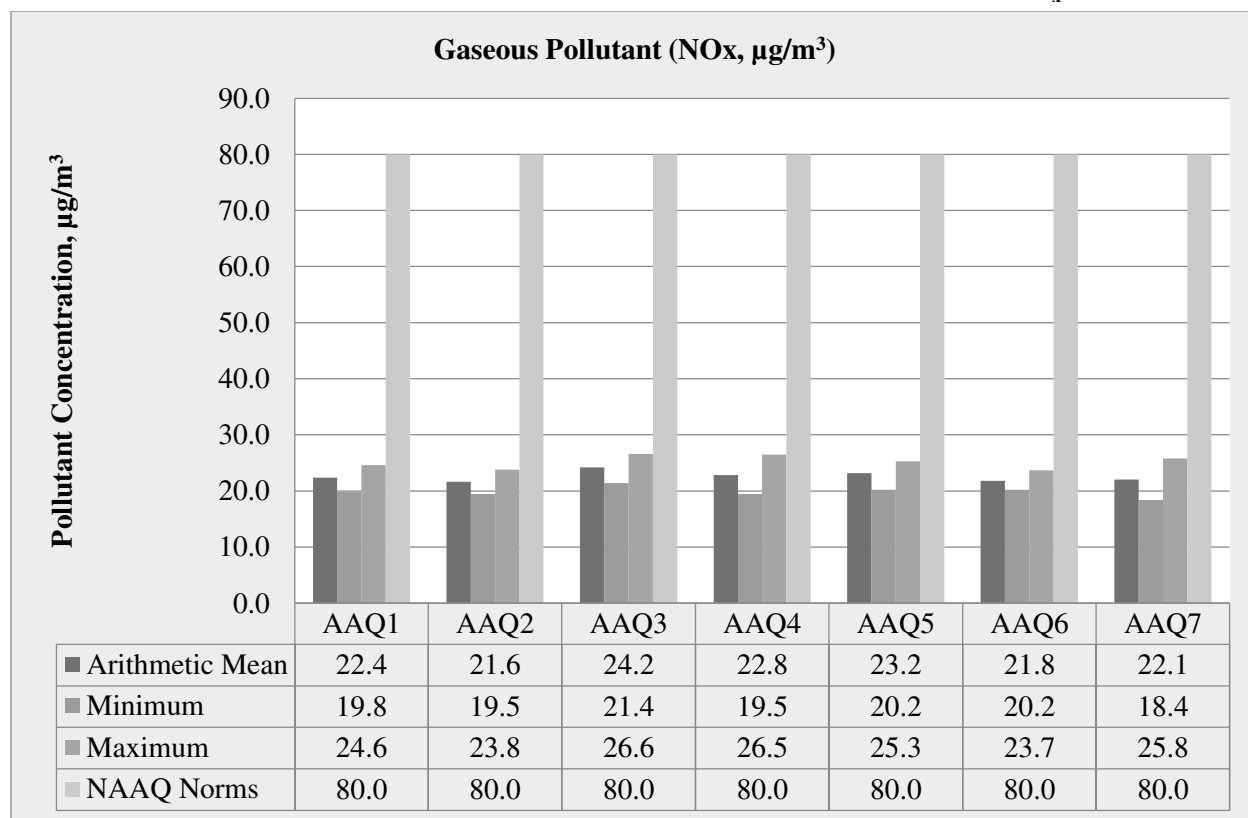
FIGURE 3.18: BAR DIAGRAM OF PARTICULATE MATTER PM_{2.5}**FIGURE 3.19: BAR DIAGRAM OF GASEOUS POLLUTANT SO₂**

FIGURE 3.20: BAR DIAGRAM OF GASEOUS POLLUTANT NO_x

3.3.6 Interpretations & Conclusion

As per monitoring data, PM₁₀ ranges from 40.2 µg/m³ to 44.3 µg/m³, PM_{2.5} data ranges from 20.2 µg/m³ to 23.3 µg/m³, SO₂ ranges from 5.7 µg/m³ to 7.2 µg/m³ and NO₂ data ranges from 21.6 µg/m³ to 24.2 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 measurement was carried out at each ambient air quality station. The main aim of the noise level monitoring is

- To assess the ambient Noise level in the study area
- Type of noise pollution generated in the core zone

- To predict the temporal changes in the ambient noise level in the area

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 3.20: DETAILS OF SURFACE NOISE MONITORING LOCATIONS

S. No	Location Code	Monitoring Locations	Distance & Direction	Coordinates
1	N1	Core Zone	Project Area	12°43'43.62"N 79°43'2.81"E
2	N2	Core Zone	Project Area	12°43'48.39"N 79°43'5.24"E
3	N3	Near Project Area	210m NE	12°43'51.54"N 79°43'16.77"E
4	N4	Mathur	4.5km SW	12°42'54.78"N 79°40'38.10"E
5	N5	Arpakkam	4.8km NE	12°43'56.27"N 79°45'50.23"E
6	N6	Azhisoor	6.8km South	12°39'52.83"N 79°43'28.49"E
7	N7	Kalakattur	5km North	12°46'36.47"N 79°43'11.56"E

Source: On-site monitoring/sampling by EHS 360Lab Private Limited 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,

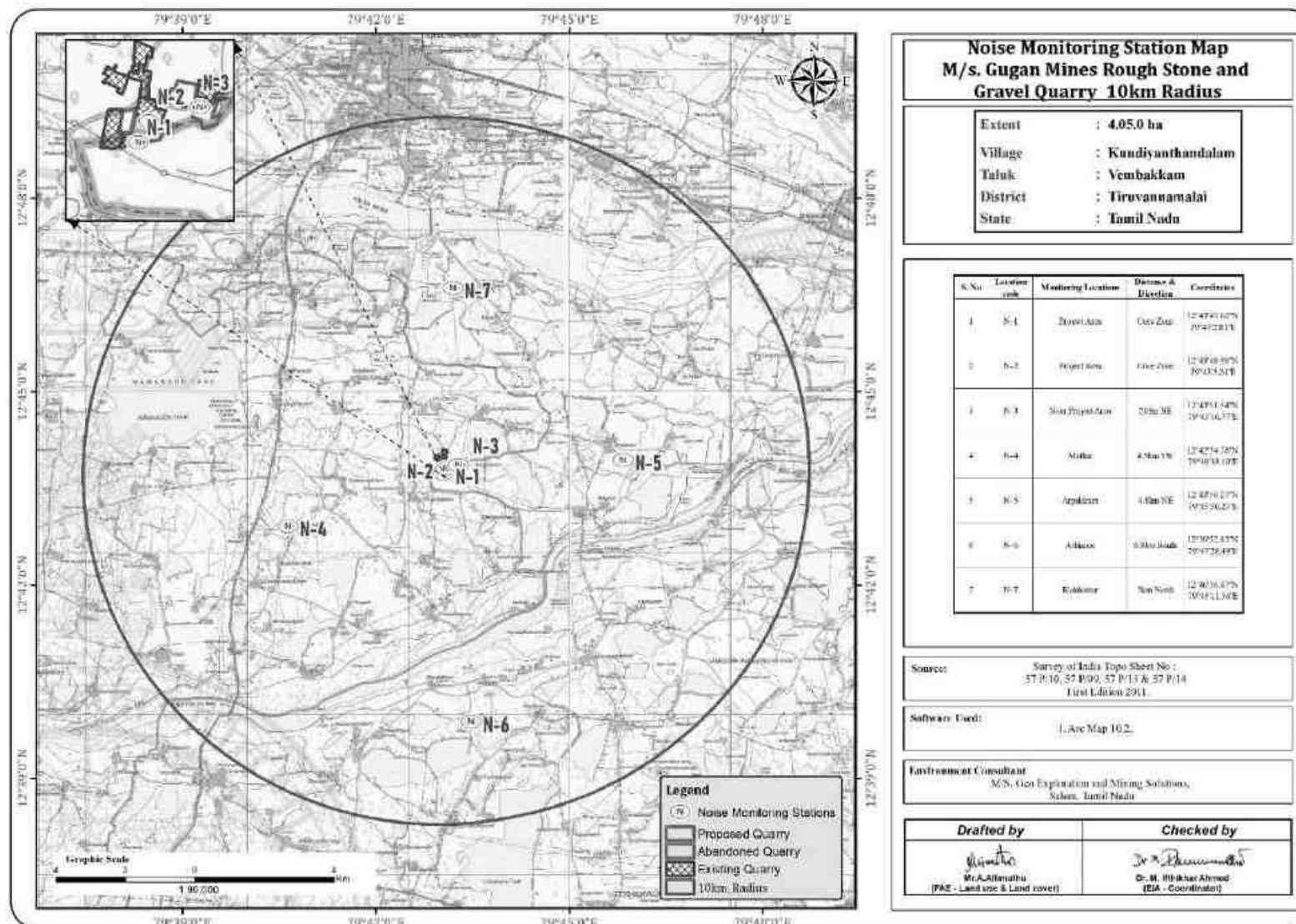
$$Leq = 10 \log L / T \sum (10L_n/10)$$

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 60minutes are computed for equivalent noise levels. Equivalent noise level is a single number descriptor for describing time varying noise levels.

FIGURE 3.23: 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 3.21: AMBIENT NOISE QUALITY RESULT

S. No	Locations	Noise level (dB (A) Leq)		Ambient Noise Standards
		Day Time	Night Time	
1	Core Zone	41.9	35.2	Industrial Day Time- 75 dB (A) Night Time- 70 dB (A)
2	Core Zone	40.3	34.5	
3	Near Project Area	40.4	34.6	Residential Day Time- 55 dB (A) Night Time- 45 dB (A)
4	Mathur	39.0	34.5	
5	Arpakkam	41.9	35.1	
6	Azhisoor	41.0	35.7	
7	Kalakattur	42.2	34.5	

Source: On-site monitoring/sampling by EHS 360 lab Private Limited in association with GEMS

FIGURE 3.24: DAY TIME NOISE LEVELS IN CORE AND BUFFER ZONE

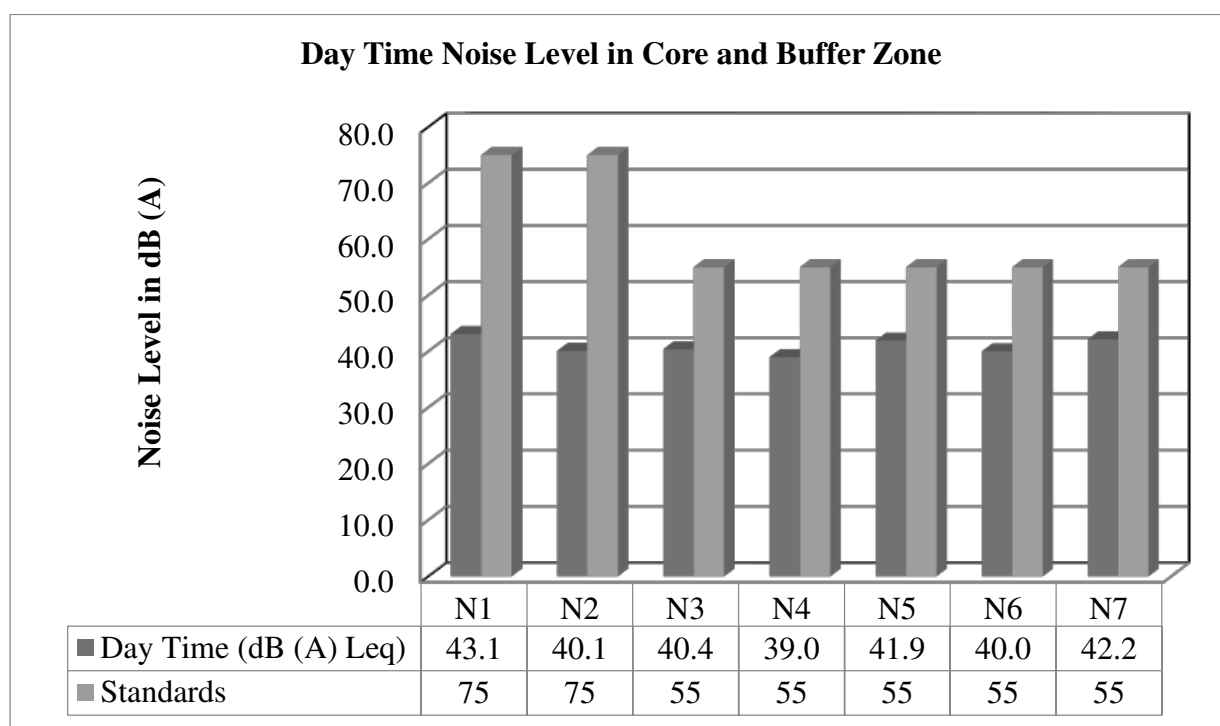
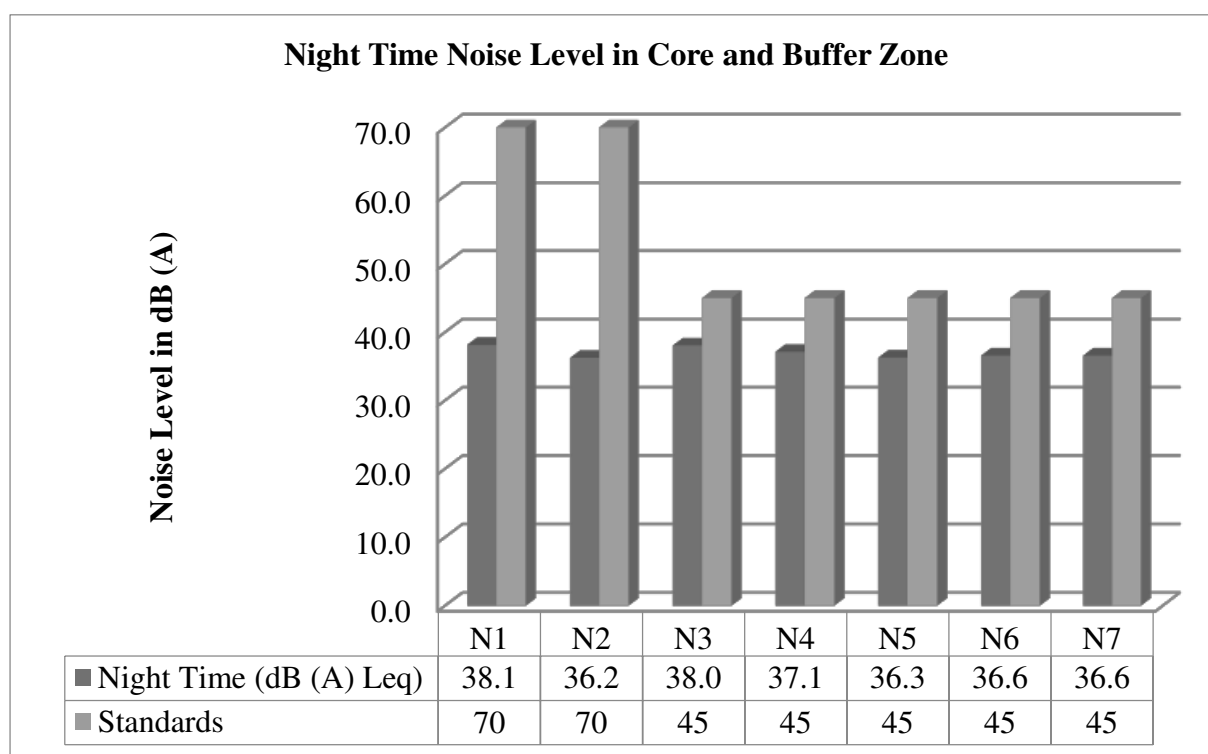


FIGURE 3.25: NIGHT TIME NOISE LEVELS IN CORE AND BUFFER ZONE

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 were from 40.1-43.1 dB (A) Leq and during night time were from 36.2-38.1 dB (A) Leq. Noise levels recorded in buffer zone during day time were from 39.0 to 42.2 dB (A) Leq and during night time were from 36.3 to 38.0 dB (A) Leq. Thus, the noise level for Industrial and Residential area meets the requirements of CPCB.

3.5. Biological Environment

3.5.1. Study area Ecology

The core area extent of 4.05.0Ha of 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 mine lease area is situated on a plain terrain. The following methods were applied during the baseline study of flora, fauna and diversity assessment.

3.5.2. Objectives of Biological Studies

- Undertake an 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.
- 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.

3.5.2.1. District of Tiruvannamalai

Tiruvannamalai is one of the northern districts of Tamil Nadu with Vellore, part of Chengalpattu and South Arcot districts as northern, southern and western boundaries. It is the administrative headquarters of Tiruvannamalai District. This district comprises of Tiruvannamalai, Chengam, Polur, Arni, Cheyyar and Vandavasi taluks. It came into existence on 30th September 1989 after the bifurcation of North Arcot district. The district lies between 11.55° and 13.15° North latitude and 78.20° to 79.50° East longitude. Tiruvannamalai District is located in the Northern part of Tamil Nadu with a distance of 190 km from Chennai and 210 km from Trichy. (Ref-District Industrial Profile Tiruvannamalai 2019-20)

3.5.2.2. Forest Types in Tiruvannamalai Forest and Hills

One sixth area of the district is covered by reserve forest and hills which are parts of Eastern Ghats under Jawadhu Hills. The Javadis are the loftiest mountains of the region. They cover the north-western portion of Chengam taluk and the western part of Polur taluk. The general elevation of Jawadhu Hills is 2500 ft. with peaks rising up to 4200 ft. in some parts. Other important peaks of the district are Tiruvannamalai (2668 ft.) and Kalasagiri (2743 ft.). The general slope of the region is from west to east. Total forest coverage is 152810 hec.

3.5.2.3. Floral Study

- The floral survey of the project area is based on field survey of the area.
- The local flora was identified by their morphological observation, such as the size, age and shape of the leaf, flowers, fruits, and their bark features of the stem, and also documented their habitat viz. Trees, Shrubs, Herbs, Grasses, Climbers etc.
- After surveying the core and the buffer areas, a detailed floral inventory has been compiled. A list of all plants from the study area was prepared and their habitats were recorded.
- Selection of sampling locations was made with reference to topography, land use, vegetation pattern, wind pattern, etc. The observations were taken on natural vegetation, roadside plantations, and non-forest areas (agricultural fields, in plain areas, village wasteland, etc.) for quantitative representation of different species.

3.5.3. Methodology of Sampling

Primary survey was conducted with established and accepted ecological methods in different habitats of study area. The field data collection mainly included biodiversity status assessment of different life forms habit of flora elements such as Trees, Shrubs, Climbers Herbs and Grass. Faunal diversity was assessed by inventorying the taxonomical groups like Mammals, Herpetofauna, birds and butterflies.

Nocturnal faunal species were searched by locating their calls during night time and by searching along the forest shrubs areas, dense dry bushes, below the stones, water bodies. During the study, to know more about the seasonal presence of flora and faunal species, information was obtained from local people and forest department.

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.

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 ordinales. 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).

The secondary baseline data of flora and fauna has been complied through the following data sources:

1. Forest working plan
2. Schedule I to V: Indian Wildlife (Protection) Act, 1972
3. Vivek Menon, Indian Mammals: A Field Guide. Hachette Book publishing India Pvt.Ltd., India.
4. Daniel J.C. The Book of Indian Reptiles and Amphibians, Bombay Natural History Society., India.
5. Ali, S and Ripley. handbook of the Birds of India and Pakistan together with those of Nepal, Sikkim and Bhutan, Oxford University Press, Bombay.
6. ENVIS Centre on Wildlife and Protected Area.
7. Birds Life Data Zone
8. Ebird.org
9. Global Biodiversity Information Facility

3.5.3.1. 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.

3.5.3.2. Sampling Size

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

3.5.3.3. 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.

3.5.3.4. Observations from Sampling

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

3.5.3.5. Field Equipment's/ References

Following tools/equipment were used for conducting phytosociological study.

- Ballpoint pen, Field bags, Field notebooks, field shoes, gloves, GPS, Measuring tapes and scales, Plant cutters, packet lens, ropes etc.
- 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.

3.5.4. Part I Field Sampling Techniques (Fauna Sampling)

3.5.4.1. Transect walk – Birds

Eight 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.

3.5.4.2. 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.

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

3.5.4.4. 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.

3.5.5. Flora Composition in the Core Zone (Primary Survey)

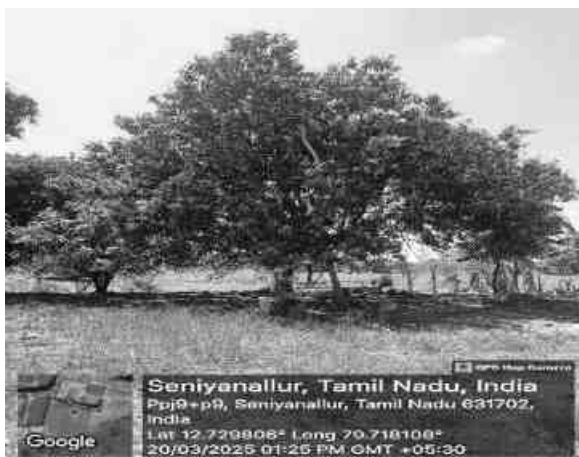
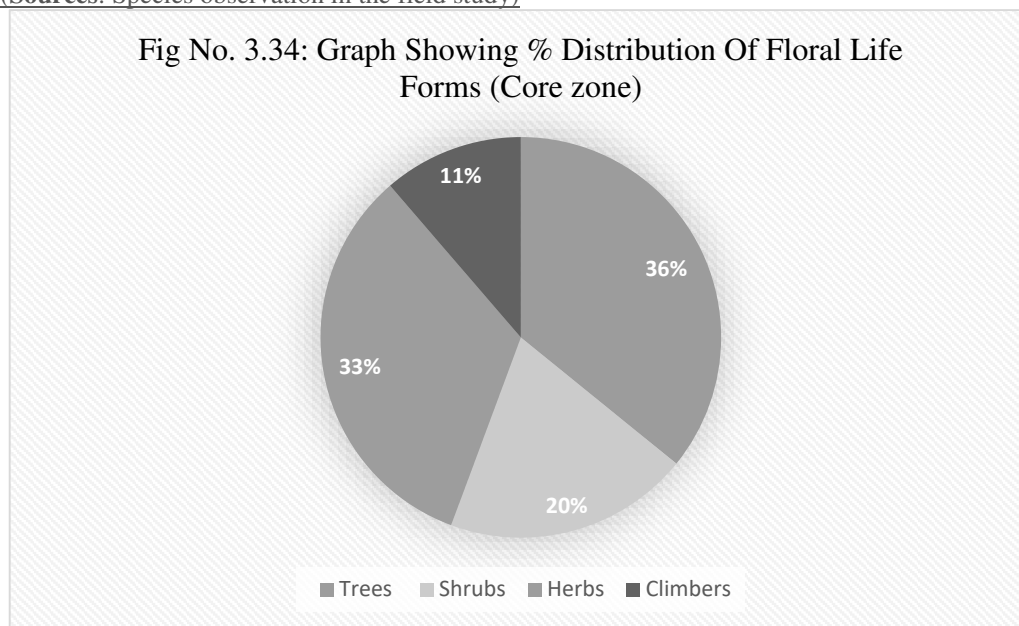
Core zone flora sampling was conducted between 8.00 am to 10.00 am in three locations. The proposed applied area exhibiting plain terrain, so we used quadrat sampling methods. Taxonomically a total of 18 species belonging to 12 families have been recorded from the core mining lease area. Based on the habitat classification of the enumerated plants the majority of species were Herbs 10 followed by Shrubs 3, Trees 5, and Climbers 1. Details of flora with the scientific name were mentioned in Table No. 3.53. The result of the core zone of flora studies shows that Asteraceae and Arecaceae are the main dominating species in the study area mentioned in Table No.3.53. No species found as threatened category.

Table No: 3.22. Flora in the Core zone of Kundiyanthandalam Village, Rough stone and gravel quarry (Primary data)

SI. No	English Name	Vernacular Name	Scientific Name	Family Name
Trees				
1.	Mesquite	Mullu maram	<i>Prosopis juliflora</i>	Fabaceae
2.	Eucalyptus	Taila maram	<i>Eucalyptus obliqua</i>	Myrtaceae
3.	Neem	Vembu	<i>Azadirachta indica</i>	Meliaceae
4.	Teak	Theaku	<i>Tectona grandis</i>	Lamiaceae
5.	Mango	Maa maram	<i>Mangifera indica</i>	Anacardiaceae
Shrubs				
1.	Avaram Senna	Avarai	<i>Senna auriculata</i>	Caesalpinioideae
2.	Milk Weed	Erukku	<i>Calotropis gigantea</i>	Apocynaceae
3.	Indian fig opuntia	Sapathikalli	<i>Opuntia ficus-indica</i>	Cactaceae
Herbs and Grass				
1.	Coat buttons	Thatha poo	<i>Tridax procumbens</i>	Asteraceae
2.	Indian Acalypha	Kuppaimeni	<i>Acalypha indica</i>	Euphorbiaceae
3.	Bermuda Grass	Arugampul	<i>Cynodon dactylon</i>	Poaceae
4.	Pulapoo	Polpola	<i>Aerva lanata</i>	Amaranthaceae
5.	Carrot grass	Partiniyam	<i>Parthenium hysterophorus</i>	Asteraceae
6.	Bindii	Nerunji mullu	<i>Tribulus terrestris</i>	Zygophyllaceae
7.	Chrismas Bush	Poom pul	<i>Chromolaena odorata</i>	Asteraceae
8.	Holy basil	Thulasi	<i>Ocimum tenuiflorum</i>	Lamiaceae
9.	Prickly chaff flower	Nayuruv	<i>Achyranthes aspera</i>	Amaranthaceae
10.	Common Tephrosia	Kolunchi	<i>Tephrosia purpurea</i>	Fabaceae
Climbers				

11.	Stemmed vine	Perandai	Cissus quadrangularis	Vitaceae
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(Sources: Species observation in the field study)



a. *Mangifera indica*



b. *Tectona grandis*



c. *Tephrosia purpurea*



d. *Eucalyptus obliqua*

e. *Prosopis juliflora*f. *Azadirachta indica***Fig No: 3.35. Flora species observation in the Core zone area****3.5.5.1. Tree survey an around 300m radius**

The trees surveys were conducted around 300m radius from the proposed project site. This is the standard scientific method followed by various workers in respect of phytosociological studies (Cottom and Curtis 1956; Ralhan et al. 1982; Saxena and Sing 1982; Nayak et al. 2000; Lu et al. 2004; Nautiyal 2008). While sampling, circumference at breast Height (CBH) of tree species was measured at 1.37m from ground level, along with the name of the species, phenology (flowering, fruiting, and flushes), and uses. After surveying areas, a detailed trees inventory has been compiled. A list of all plants from the study area was prepared and their habitats were recorded. The species of trees were documented during this base line survey. The dominant plant species growing in this area were *Borassus flabellifer*, *Prosopis juliflora*, etc. Please refer the Table No.3.54.

Table No: 3.23. Tree survey around 300m radius from the proposed project site.

S.No	English Name	Vernacular Name	Scientific Name	No of trees
Trees				
1.	Acacia Nilotica	Karuvelam maram	Vachellianilotica	12
2.	Coconut	Thennai maram	Cocos nucifera	15
3.	Mesquite	Mullumaram	Prosopis juliflora	26
4.	Neem	Vembu	Azadirachta indica	17
5.	Asian Palmyra palm	Panai maram	Borassus flabellifer	10

(Sources: Species observation in the field study)

Table No: 3.24. Flora in Buffer Zone of Kundiyanthandalam Village, Rough stone and gravel quarry, Tiruvannamalai District, Tamil Nadu (Primary data & Secondary data)

S.No.	English Name	Vernacular Name	Scientific Name	Family Name
Trees				
1.	White Bark Acacia	Vela maram	Vachellia leucophloea	Fabaceae
2.	Indian siris	Vaaga	Albizia lebbeck (L.) Willd	Fabaceae
3.	Blue gum	Thayala maram	Eucalyptus	Myrtaceae
4.	Alangium salviifolium	Azhinja maram	Alangium salviifolium	Cornaceae
5.	Banana tree	Vazhaimaram	Musa acuminata	Musaceae
6.	Neem	Vembu	Azadirachta indica	Meliaceae
7.	Tamarind	Puliyamaram	Tamarindus indica	Legumes
8.	Mesquite	Mullu maram	Prosopis juliflora	Fabaceae
9.	Coral Tree	Kalyana murungai	Erythrina variegata	Papilionoide
10.	Bamboo	Moonghil	Bambusa bambo	Poaceae
11.	Yellow flame tree	Perunkondrai	Peltophorum pterocarpum	Fabaceae
12.	Indian almond	Padam maram	Terminalia catappa	Combretaceae
13.	Asian Palmyra palm	Panai maram	Borassus flabellifer	Arecaceae
14.	Indian ash tree	Odiya maram	Lannea coromandelica	Anacardiaceae
15.	Lemon	Ezhumuchaipalam	Citrus lemon	Rutaceae
16.	Rusty Acacia	Parambai	Acacia ferruginea	Mimosaceae
17.	Mango	Manga	Mangifera indica	Anacardiaceae
18.	Peepal	Arasanmaram	Ficus religiosa	Moraceae
19.	Custard apple	Seethapazham	Annona reticulata	Annonaceae
20.	Chinaberry	Malai vembu	Melia azedarach L.	Meliaceae
21.	Monkey pod tree	Thungumoonchi	Samanea saman	Fabaceae
22.	Teak	Thekku	Tectona grandis	Verbenaceae
23.	Indian gooseberry	Nelli	Emblica officinalis	Phyllanthaceae
24.	Henna	Marudaani	Lawsonia inermis	Lythraceae
25.	Madras thorn	Kudukapuli	Pithecellobium dulce	Fabaceae
26.	Malayan Cherry	Ten Pazham	Muntingia calabura	Muntingiaceae
27.	Pomegranate	Mathulai	Punica granatum	Lythraceae
28.	Jamun Fruit Plant	Naval maram	Syzygium cumini	Myrtaceae
29.	Banyan tree	Alamaram	Ficus benghalensis	Moraceae
30.	Chinese chaste tree	Nochi	Vitex negundo	Verbenaceae
31.	Indian Jujube	Ilanthai	Ziziphus jujuba	Rhamnaceae
32.	Millettia pinnata	Pongam oiltree	Pongamia pinnata	Fabaceae
33.	Coconut	Thennai maram	Cocos nucifera	Arecaceae

34.	Guava	Koyya	Psidium guajava	Myrtaceae
35.	Pala indigo	Pala maram	Wrightia tinctoria	Apocynaceae
36.	Portia tree	Poovarasan	Thespesia populnea	Malvaceae
37.	Drumstick tree	Murunga maram	Moringa oleifera	Moringaceae
38.	Papaya	Pappali maram	Carica papaya L	Caricaceae
Shrubs				
1.	Tanner's cassia	Avaram	Senna auriculata	Fabaceae
2.	Hopbush	Virali	Dodonaea viscosa	Sapindaceae
3.	Castor oil plant	Amanakku	Ricinus communis	Euphorbiaceae
4.	Milk Weed	Erukku	Calotropis gigantea	Apocynaceae
5.	Indian Oleander	Arali	Nerium indicum	Apocynaceae
6.	Triangular spruge	Chaturakalli	Euphorbia antiquorum	Euphorbiaceae
7.	Night shade plan	Sundaika	Solanum torvum	Solanaceae
8.	Broom creeper	Kattukodi	Cocculus hirsutus	Menispermaceae
9.	Solanum pubescens	Malaisundai	Solanum pubescens Willd	Solanaceae
10.	Thorn apple	Oomathai	Datura stramonium	Solanaceae
11.	Shoe flower	Chemparuthi	Hibiscu rosa-sinensis	Malvaceae
12.	Puriging nut	Kattamanakku	Jatropha curcas	Euphorbiaceae
13.	Touch-me-not	Thottalchinungi	Mimosa pudica	Mimosaceae
14.	Chinese chastetree	Nalla nochi	Vitex negundo L	Verbinaceae
15.	Jackal jujube	Suraimullu	Ziziphus oenoplia	Rhamnaceae
16.	Malabar catmint	Pei veratti	Anisomeles malabarica	Lamiaceae
17.	Indian mallow	Thuthi	Abutilon indicum	Meliaceae
18.	Bush Morning Glory	Neiveli Kattamani	Ipomoea carnea	Convolvulaceae
19.	Lantana	Unni chedi	Lantana camara	Verbenaceae
20.	Flame of the Woods	Idlipoo	Xoracoc cineia	Rubiaceae
21.	Triangular spruge	Chaturakalli	Euphorbia antiquorum	Euphorbiaceae
Herbs				
1.	Coat buttons	Thatha poo	Tridax procumbens	Asteraceae
2.	Malabar catmint	Peimiratti	Anisomeles malabarica	Lamiaceae
3.	Eggplant	Kathrikkai	Solanum melongena	Solanaceae
4.	Chrismas Bush	Poom pul	Chromolaena odorata	Asteraceae
5.	Aloe barbadensis	Katrashai	Aloe vera	Asphodelaceae
6.	-	Karaiyaan poondu	Lepidagathis cristat	Acanthaceae
7.	Mountain knotgrass	Thengaipoo kirai	Aerva lanata	Amaranthaceae
8.	Prickly chaff flower	Nayuruv	Achyranthes aspera	Amaranthaceae
9.	Bindii	Nerunchi	Tribulus terrestris	Zygophyllaceae

10.	Fish poison	Kolinchai	Tephrosia purpurea	Fabaceae
11.	Ban Tulsi	Melakai poondur	Croton bonplandianus	Euphorbiaceae
12.	Asthma-plant	Amman pacharisi	Euphorbia hirta	Euphorbiaceae
13.	Indian doab	Arugampul	Cynodon dactylon	Poaceae
14.	Spiny amaranth	Mullu keera	Amaranthus spinosus	Amaranthaceae
15.	Chilli	Milakai	Capsicum annuum	Solanaceae
16.	Indian Copperleaf	Kuppaimeni	Acalypha indica	Euphorbiaceae
17.	Marsh barbel	Neermulli	Hygrophila auriculata	Acanthaceae
18.	Yellow-fruit nightshade	Kandakathirika	Solanum surattense	Solanaceae
19.	Asian spiderflower	Naaikaduku	Cleome viscosa L	Cleomaceae
20.	Tomato	Thakkali	Solanum lycopersicum	Solanaceae
21.	White dammar	Mookutipoondur	Vicoa indica	Asteraceae
22.	Cleome viscosa	Nai kadugu	Celome viscosa	Capparidaceae
23.	Bindii	Nerunji mullu	Tribulus terrestris	Zygophyllaceae
24.	Digeria muricata	Thoiya keera	Digeria muricata	Amaranthaceae
25.	False daisy	Karisalankanni	Eclipta alba	Asteraceae
26.	Sessile Joyweed	Ponnakanni	Alternanthera sessilis	Amaranthaceae
27.	Field beans	Avarai	Hyacinth Beans	Fabaceae
28.	Common leucas	Thumbai	Leucas aspera	Lamiaceae
29.	Holy basil	Thulasi	Ocimum tenuiflorum	Lamiaceae
30.	Coat buttons	Thatha poo	Tridax procumbens	Asteraceae
31.	Indian mint	Karpura valli	Coleus amboinicus	Lamiaceae
32.	Europeanblack nightshade	Manathakkali	Solanumnigrum	Solanaceae
33.	Bright eyes	Nithiyakalyani	Catharanthus roseus	Apocynaceae
34.	Carrot grass	Partiniyam	Parthenium hysterophorus	Asteraceae
35.	Red Spiderling	Mukirattai	Boerhavia diffusa	Nyctaginaceae
Climbers/ Creepers				
1.	Stemmed vine	Perandai	Cissus quadrangularis	Vitaceae
2.	Indian sarsaparilla	Nannaari	Hemidesmus indicus	Apocynaceae
3.	Rosary Pea	Gundumani	Abrus precatorius	Fabaceae
4.	Ivy gourd	Kovai	Coccinia grandis	Cucurbitaceae
5.	Balloon plant	Mudakrtan	Cardiospermum halicacabum	Sapindaceae
6.	Butterfly pea	Sangu poo	Clitoria ternatea	Fabaceae
7.	Pointed gourd	Kovakkai	Trichosanthes dioica	Cucurbitaceae
8.	Bottle Guard	Sorakkai	Lagenaria siceraria	Cucurbitaceae
9.	White pumpkin	Poosanaikkaai	Cucurbitaceae	Cucurbitaceae
10.	Wild jasmine	Malli	Jasminum augustifolium	Oleaceae

11.	Nut grass	Korai	Cyperus rotandus	Poaceae
12.	Cucumis maderaspatanus	Musumusukkai	Mukia maderaspatana	Cucurbitaceae
Grasses				
1.	Windmill grass	Chevvarakupul	Chloris barbata	Poaceae
2.	Jungle rice	Kuthirai vaalKattu arusi	Echinochloa colona	Poaceae
3.	Swollen Windmill Grass	Kondai Pul	Chloris barbata	Poaceae
4.	Eragrostis	Pullu	Eragrostis ferruginea	Poaceae
5.	Mauritian Grass	Moongil pul	Apluda mutica	Amaranthaceae

(Sources:

Species observation in the field study

Tamil Nadu state Forest department working plan

Plant resources of tiruvannamalai district tamilnadu India

medicinal plant diversity in tiruvannamalai hill, tiruvannamalai, Tamil Nadu

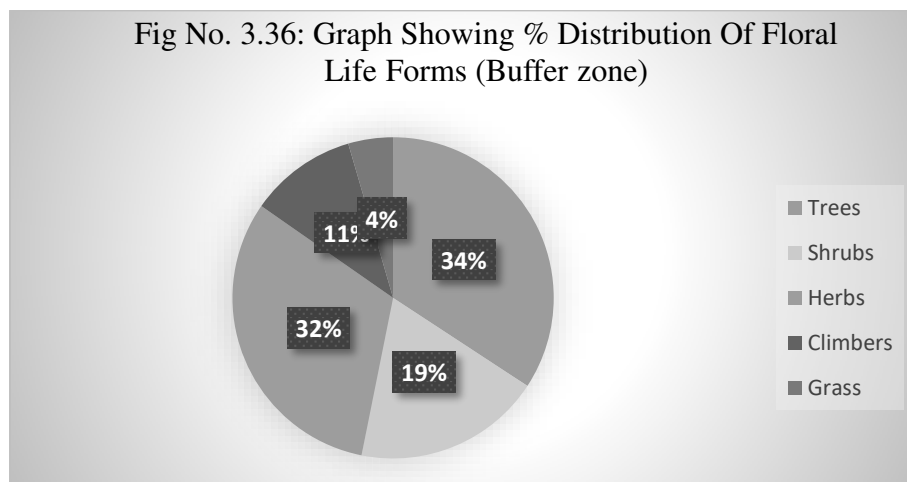
file:///C:/Users/Kishore%20K/Downloads/An Ethnobotanical Survey of Medicinal Or%20(1).pdf

3.6. Flora Composition in the Buffer Zone

Buffer zone flora sampling was conducted between 10.00 am to 4.00 pm in eight different locations in 10 km radius as per the ToR. The most important and widely used methods for a general assessment is belt transect methods. The study area was divided according to habitat types followed the random sampling methods in the selected area. The area exhibiting plain terrain. so we used quadrat sampling methods. 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. 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 and there are 130 species in the buffer zone study area in total, based on records. The floral (111) varieties among them Trees 38, Herbs 35, Shrubs 21, Climbers/Creepers 12, and Grasses 5 were identified. The result of the buffer zone of flora studies shows that Fabaceae and Cucurbitaceous, Euphorbiaceous is the main dominating species in the study area mentioned in Table No.3.56. 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 primary survey (site observations) and discussion with local people. The total number of different plant life forms under trees, shrubs, herbs, and climbers is shown in Table no 3.56 and their % distribution is shown in Figure no 3.36.

Table No: 3.25 Number of floral life forms in the Study Area

S. No	Plant Life Form	Number of Species
1	Trees	38
2	Shrubs	21
3	Herbs	35
4	Climber/Creepers	12
6	Grasses	5
Total No. of Species		111





a. *Lantana camara*



b. *Jatropha curcas*



c. *Calotropis gigantea*



d. *Azardicata indica*



e. *Borassus flabellifer*



f. *Borassus flabellifer*



g. *Mangifera indica*



h. *Cissus quadrangularis*

Fig No: 3.37. Flora species observation in the Buffer zone area

3.6.1. Drainage and Irrigation

3.6.2. Sources of Irrigation

There are no perennial rivers in the district. The district was mostly drained by Cheyyar river, a major tributary of river Palar, originating from the forest area of Jawadhu hills and traveling through Chengam, Polur, Arni and Cheyyar taluks before confluence with river Palar in Kancheepuram district. Other minor streams in the district like, Kamandala Naga Nadhi, Thenpennai, Thuringjalaru and Suganadhi were the important seasonal rivers in the district.

Tanks and dug wells were the major sources of irrigation in the district. The district had 604 major tanks (with ayacut of 40 ha. or more) and 1,361 small tanks (with ayacut of less than 40 ha.) There were 1,050 private bore wells, 200 dug-cum-bore wells and 1, 54,415 open wells in the district. Sathanur reservoir is built across the Thenpennai river with an ayacut of 18,882 ha. Benefiting both Tiruvannamalai and Villupuram districts.

3.6.3. Crop Patterns in Tiruvannamalai District

Agriculture is the main occupation in the district. The gross and net cultivated areas were 3, 04,929 and 2, 42,387 ha. respectively. The cropping intensity was 126 per cent and the ratio of net sown area to cultivable area (indicating extent of use of cultivable area) was 67.60 per cent only. Paddy, sugarcane and groundnut were the major crops grown in the district. More details refer- (Source: G-Return 2017-18, Season Crop Report 2015-16.).

3.6.4. Agriculture & Horticulture

3.6.4.1. Agricultural

Agriculture is the main source of livelihood for the people in the district. The district is dependent on seasonal rains for successful agricultural operations. Different crops in dry and wet lands are cultivated in the district. Some of the taluks, in particular, which enjoy irrigation facilities are Tiruvannamalai, Cheyyar, Polur and Vandavasi.

Paddy is the main agricultural crop in this district. In 2017-18, paddy & Cereal was sown in 161709 hectares that was 51.4 percent to the total crop sown area in the district. But, groundnut sown in the district which was 20.3 percent in 63862 hectares.

3.6.4.2. Horticulture

As horticultural crops, different types of fruits and vegetables are grown largely in the district. However, due to hot weather and dry climate, not many horticultural crops are cultivated. More details refer- (Source: G-Return 2017-18, Season Crop Report 2015-16.)

3.6.4.2.1. Medicinal and economic importance

Ethnobotanical survey and documentation of medicinal, field grown, ornamental, and wild plants were carried out in and around Kundiyanthandalam village, Tiruvannamalai district, Tamilnadu. This study aimed to identify plants collected for medicinal and other purposes by the local people of the village. A total of 17 and more plant species were observed in this study. These plant species, belonging to 12 families are tabulated below.

There is very limited information available regarding medicinal plants used by traditional healers and general people in villages, for treating common ailments and diseases. It is very urgent need for identifying and documenting these valuable resources before they become inaccessible and extinct. Ethnobotanical survey is highly needed for the conservation of plants.

Table No. 3.26. Medicinal and economic importance

S.No	Botanical name	Family	Vernacular name
1.	<i>Abrus precatorius L.</i>	Fabaceae	Gundumani
2.	<i>Abutilon indicum (Link) Sweet.</i>	Malvaceae	Thuthi
3.	<i>Acalypha indica L</i>	Euphorbiaceae	Kuppaimeni

4.	<i>Achyranthes aspera L</i>	Amaranthaceae	Naaiuruvi
5.	<i>Aegle marmalos (L.) Corrêa.</i>	Rutaceae	Vilvam
6.	<i>Aloe vera (L.) Burm.f.</i>	Asphodelaceae	Sotrukkatrazhai
7.	<i>Alternanthera sessilis (L.)</i>	Amaranthaceae	Ponnaankanni
8.	<i>Amaranthus spinosa L.</i>	Amaranthaceae	Mullu keerai
9.	<i>Andrographis paniculata (Burm.f.) Wall. ex Nees.</i>	Acanthaceae	Nila vembu, Siriyaa nantai
10.	<i>Azadirachta indica A. Juss</i>	Meliaceae	Vembu
11.	<i>Cissus quadrangularis L</i>	Vitaceae	Pirandai
12.	<i>Citrus medica L</i>	Rutaceae	Elumichai
13.	<i>Eclipta prostrata L.</i>	Asteraceae	Karisalankanni
14.	<i>Justicia adhatoda L.</i>	Acanthaceae	Adathoda
15.	<i>Melia azedarach L</i>	Meliaceae	Malai veambu
16.	<i>Phyllanthus niruri L</i>	Phyllanthaceae	Keezhanelli
17.	<i>Smilax zeylanica L.</i>	Smilacaceae	Kaatukodi

3.6.5. The vegetation in the RF / PF areas, ecologically sensitive areas etc.

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. No Wildlife Sanctuary in the study area. In addition, No Biosphere Reserves, Wildlife corridors, or, Tiger / Elephant reserves within 10 km of the project area. No protected (PF) forests either in the mine lease area or in the buffer zone. Thus, no forest land is involved in any manner.

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.

Thus, no forest land is involved in any manner. 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.

3.7. 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. There are no rare, endangered, threatened (RET) and endemic species present in the core area.

3.7.1. Fauna Composition in the Core Zone

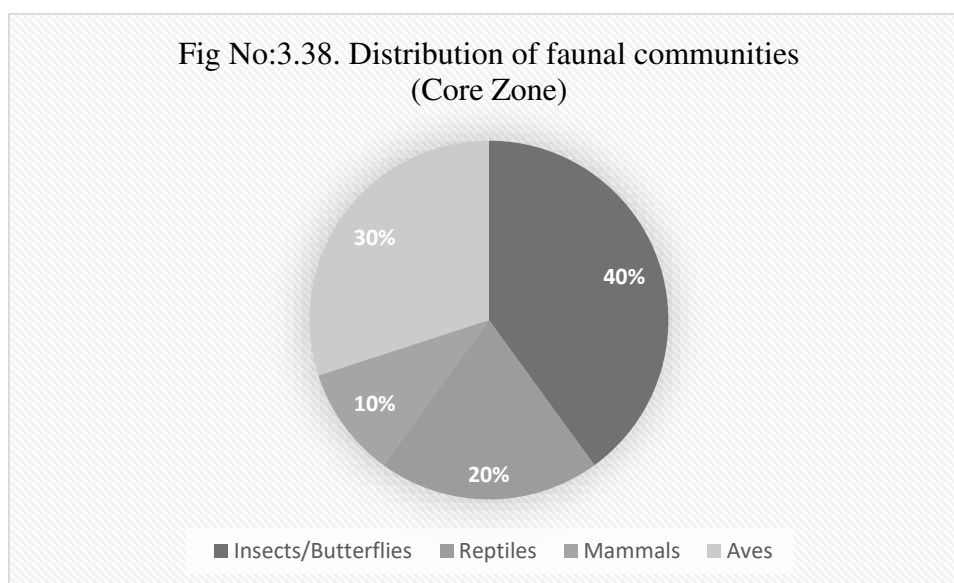
Core zone fauna samplings were conducted between 6.00 am to 8.00 am in three locations. A total of 10 varieties of species were observed in the Core zone of Kundiyanthandalam Village, Rough stone and gravel quarry (Table No.3.58) among them numbers of Insects/ Butterflies 4, Reptiles 2, Mammals 1, and Avian 3. A total of 10 species have been recorded from the core mining lease area. None of these species are threatened or endemic in the study area and surroundings. There is no Schedule I species and 6 species are under Schedule IV according to the Indian Wildlife Act 1972. A total of 3 species of bird were sighted in the mining lease area. There are no critically endangered, endangered, vulnerable, and endemic species were observed. Details of fauna in the core zone with the scientific name were mentioned in Table No. 3.58.

Table No: 3.27. Fauna in the Core zone of Kundiyanthandalam Village, Rough stone and gravel quarry (Primary data)

SL.	Common	Family Name	Scientific Name	Schedule WPA1972
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No	Name			
Insects/Butterflies				
1.	Striped tiger	Nymphalidae	<i>Danaus plexippus</i>	Schedule IV
2.	Common Tiger	Nymphalidae	<i>Danaus genutia</i>	Schedule IV
3.	Grasshopper	Acrididae	<i>Hieroglyphus sp</i>	NL
4.	Common Tiger	Nymphalidae	<i>Danaus genutia</i>	NL
Reptiles				
1.	Garden lizard	Agamidae	<i>Calotes versicolor</i>	NL
2.	Common skink	Scincidae	<i>Mabuya carinatus</i>	NL
Mammals				
1.	Common rat	Muridae	<i>Rattus rattus</i>	Schedule IV
Aves				
1.	Black drongo	Dicruridae	<i>Dicrurus macrocercus</i>	Schedule IV
2.	Common myna	Sturnidae	<i>Acridotheres tristis</i>	Schedule IV
3.	Sunbird	Nectariniidae	<i>Cinnyris asiaticus</i>	Schedule IV

(Sources: Species observation in the field study)



3.7.2. Fauna Composition in the Buffer Zone

The Buffer zone fauna samplings were conducted between 6.00 am to 8.00 am and 2.30 pm to 6.30 pm in different locations. 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. There is no reserve forest present in the project site. 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 Red-whiskered Bulbul, Asian Koel, House crow, Black drangos, Crows, Pond heron etc.

The list of Mammals (*directly sighted animals & Secondary data) is given in table No.3.59. The list of bird species recorded during the field survey and literature from the study area are given in Table 3.60. The list of reptilian species recorded during the field survey and literature from the study area is given in Table 3.61. The list of insect species recorded during the field survey and literature from the study area are given in Table 3.62. The list of Butterflies species recorded during the field survey and literature from the study area are given in Table 3.63. 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 67 species recorded were from the buffer zone area. Based on habitat classification the majority of species were birds 25, followed by Butterflies 15, Reptiles 10, Insects 5, Mammals 8, and Amphibians 4. There are four Schedule II species, two species are under the schedule III and thirty-nine species are under Schedule IV according to the Indian Wildlife Act 1972. A total of 25 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, and four amphibians was observed during the extensive field visit *Sphaerothera breviceps*, *Euphlyctis hexadactylus*, *Bufo melanostictus*, etc. There is no Schedule I Species in the study area. There are no critically endangered, endangered, vulnerable, and endemic species were observed.

**Table No. 3.28. List of Fauna & Their Conservation Status,
Mammals: (*directly sighted animals & Secondary data)**

Sl. No	Scientific Name	Common Name/English Name	Schedule list WPA 1972
1.	<i>Herpestes edwardsi</i>	Indian Grey Mongoose	Schedule II
2.	<i>Mus booduga</i>	Little Indian field mouse	Schedule IV
3.	<i>Bandicota bengalensis</i>	Indian mole-rat	Schedule IV
4.	<i>Mus musculus</i>	House mouse	Schedule IV
5.	<i>Funambulus palmarum</i>	Common Palm Squirrel	Schedule IV
6.	<i>Rattus rattus</i>	Black rat	Schedule IV
7.	<i>Bandicota indica</i>	Rat	Schedule IV
8.	<i>Lepus nigricollis</i>	Indian Hare	Schedule IV

Table No. 3.29. Listed birds (Primary data and Secondary data)

Sl. No	Scientific Name	Common Name	Schedule list WPA 1972
1.	<i>Alcedo atthis</i>	Common Kingfisher	Schedule IV
2.	<i>Copsychus fulicatus</i>	Indian robin	Schedule IV
3.	<i>Corvus splendens</i>	House crow	Schedule V
4.	<i>Dicrurus macrocercus</i>	Black Drongo	Schedule IV
5.	<i>Halcyon smyrnensis</i>	White-breasted kingfisher	Schedule IV
6.	<i>Bubulcus ibis</i>	Cattle Egret	Schedule IV
7.	<i>Hypsipetes madagascariensis</i>	Black bulbul	Schedule IV
8.	<i>Columba livia</i>	Rock pigeon	Schedule IV
9.	<i>Acridotheres tristis</i>	Common myna	Schedule IV
10.	<i>Psittacula krameri</i>	Rose ringed parakeet	Schedule IV
11.	<i>Coturnix coturnix</i>	Grey quail	Schedule IV
12.	<i>Passer domesticus</i>	House Sparrow	Schedule IV
13.	<i>Pycnonotus cafer</i>	Red vented Bulbul	Schedule IV
14.	<i>Accipiter badius</i>	Shikra	Schedule IV
15.	<i>Cuculus canorus</i>	Cuckoo	Schedule IV
16.	<i>Merops orientalis</i>	Small green bee eater	Schedule IV
17.	<i>Nectarinia minima</i>	Small sunbird	Schedule IV
18.	<i>Ardeola grayii</i>	Pond Heron	Schedule IV
19.	<i>Spilopelia chinensis</i>	Spotted dove	Schedule IV
20.	<i>Egretta garzetta</i>	Little Egret	Schedule IV
21.	<i>Apus apus</i>	Common swift	Schedule IV
22.	<i>Ardea cinerea</i>	Grey heron	Schedule IV
23.	<i>Megalaima zeylanica</i>	Brown-headed barbet	Schedule IV

24.	<i>Eudynamys scolopacea</i>	Koel	Schedule IV
25.	<i>Coracias benghalensis</i>	Indian roller	Schedule IV

Table No 3.30. List of Reptiles either spotted or reported from the study area.
 (*indicates direct observations & Secondary data)

SI. No	Scientific Name	Common Name/English Name	Schedule list WPA 1972
1.	<i>Calotes versicolor</i>	Oriental garden lizard	NL
2.	<i>Hemidactylus flaviviridis</i>	House lizards	Schedule IV
3.	<i>Naja naja</i>	Indian cobra	Sch II (Part II)
4.	<i>Ahaetulla nasuta</i>	Green vine snake	Schedule IV
5.	<i>Ptyas mucosa</i>	Rat snake	Sch IV (Part II)
6.	<i>Bungarus caeruleus</i>	Common krait	Schedule IV
7.	<i>Mabuya carinatus</i>	Common skink	NL
8.	<i>Vipera russeli</i>	Russell's viper	Sch II (Part II)
9.	<i>Nerodia piscator</i>	Fresh water snake	Sch III (Part II)
10.	<i>Groemyda bijuga</i>	Fresh water tortoise	Sch III (Part II)

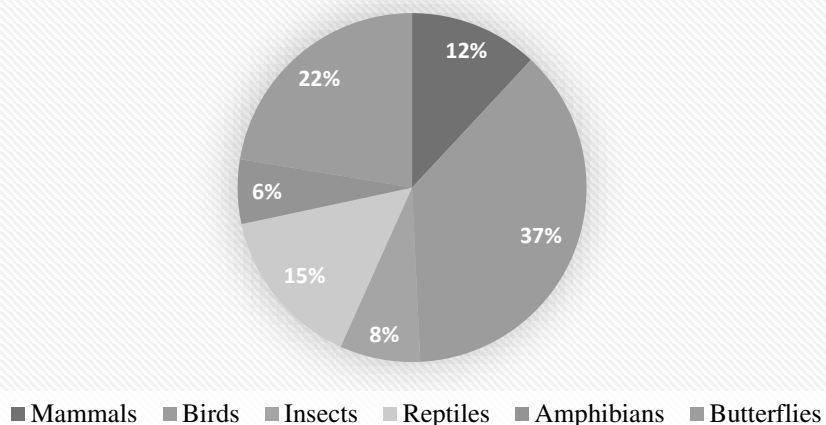
Table No. 3.31. List of insects either spotted or reported from the study area

SI. No	Scientific Name	Common Name	Schedule list WPA 1972
1.	<i>Apis cerana</i>	Indian honey bee	-
2.	<i>Hamitermes silvestri</i>	Termite	NE
3.	<i>Hieroglyphus sp</i>	Grasshopper	NL
4.	<i>Camponotus Vicinus</i>	Ant	NL
5.	<i>Ceratogomphus pictus</i>	Dragonfly	-

Table No. 3.32. List of Butterflies reported from the study area and Secondary data

SI. No	Scientific Name	Common Name	Schedule
1.	<i>Papilio clytia</i>	Common mime	-
2.	<i>Euploea core</i>	Euploea core	-
3.	<i>Pachliopta aristolochiae</i>	Common rose	-
4.	<i>Papilio polytes</i>	Common mormon	-
5.	<i>Spialia galba</i>	Indian Skipper	-
6.	<i>Danaus genutia</i>	Common tiger	-
7.	<i>Pachliopta hector</i>	Crimson rose	-
8.	<i>Eurema brigitta</i>	Eurema brigitta	-
9.	<i>Hypolimnas bolina</i>	Hypolimnas bolina	-
10.	<i>Castalius rosimon</i>	Common Pierrot	-
11.	<i>Curetis thetis</i>	Indian Sunbeam	-
12.	<i>Troides minos</i>	Southern birdwing	-
13.	<i>Papilio demoleus</i>	Lime Butterfly	-
14.	<i>Ariadne merione</i>	Common Castor	-
15.	<i>Neptis hylas</i>	Neptis hylas	-

Fig No:3.39. Distribution Of Faunal Communities
(Buffer Zone)



Livestock like cattle, buffalo, goat, poultry, duck and pig are reared for dairy products, meat, and egg and for agriculture purpose. Majority of cattle and buffalo are of local variety. Backyard poultry farms are mostly common in this area; however, some commercial poultry farms are also recorded in the study area. The study area is marked with moderate population of flora and fauna. With reference to the Wildlife Protection Act 1972 total number of wildlife tabulated in this study can be characterized as given in the Table 3.64.



a. *Calotes versicolor*



b. *Corvus splendens*



c. *Zizina Otis indica*



d. *Ceratogomphus pictus*



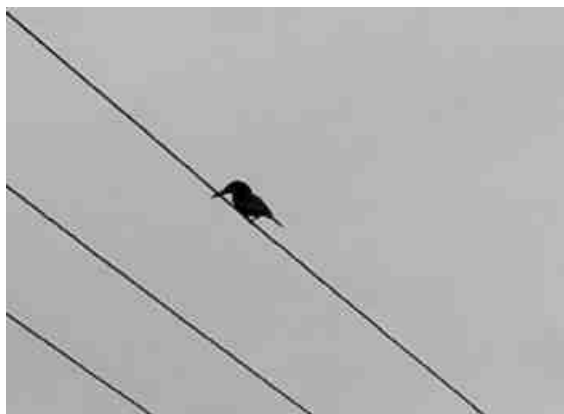
e. *Sympetrum fonscolombii*



f. *Dicrurus macrocercus*



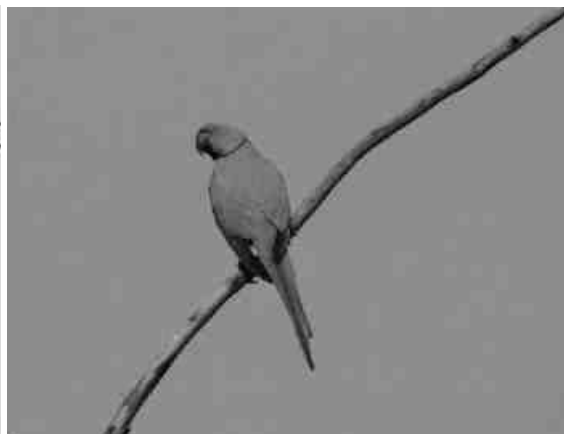
g. *Danainae*



h. *Alcedo atthis*



i. *Picidae*



j. *Psittacula krameri*



k. *Merops orientalis*



l. *Acridotheres tristis*

Fig No: 3.33. Species observation in the field study (Buffer Zone)**Table No 3.64 Description of Flora & Fauna**

S. No	Type of Species	Name	Local Name
Flora			
1.	Endangered species	None	None
2.	Threatened species	None	None
3.	Near Threatened species	None	None
4.	Vulnerable species	None	None
Fauna			
5.	Endangered species	None	None
6.	Threatened species	None	None
7.	Near Threatened species	None	None
8.	Vulnerable species	None	None
9.	Migratory Corridors & Flight Paths	No corridors & flight paths	-
10.	Breeding & Spawning grounds	None	-
11.	Invasive Alien species	None	None

3.8. Aquatic Ecology

Mining activities will not have an impact on aquatic ecosystems because no effluent discharge from the Rough stone and gravel quarry is planned. There are no natural perennial surface water bodies, such as marshes, rivers, streams, lakes, or agricultural sites, inside the mining lease area. The study region contains a few seasonal bodies of water. There is no aquatic flora and, aquatic fauna. Hence, it does not harbour any significant aquatic life. Therefore, the project is not likely to affect the aquatic ecology. Aquatic weeds are found to be growing everywhere in 10 km radius area, in every water bog, pond, etc. Tyche 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.

3.8.1. Objectives of Aquatic Studies

- ❖ Generating data through actual field collection in these locations over the study period;
- ❖ Impacts on aquatic fauna/flora
- ❖ Consulted with locals to obtain knowledge about aquatic flora and animals.

3.8.2. Macrophytes

The macrophytes observed within the study area are tabulated in Table No 3.66

Table No.3.34 Description of Macrophytes

Sl. No	Scientific name	Common Name	Vernacular Name (Tamil)	IUCN Red List of Threatened Species
1.	<i>Eichornia crassipe</i>	Water hyacinth	Agayatamarai	NA
2.	<i>Aponogeton natans</i>	Floating lace plant	Kottikizhnagu	NA
3.	<i>Nymphaea nouchali</i>	Blue water lily	Nellambal	LC
4.	<i>Carex cruciata</i>	Cross Grass	Koraipullu	NA
5.	<i>Cyperus exultates</i>	Tall Flat Sedge	Koraikizhangu	LC

Sources: Species observation in the field study

3.8.3. Aquatic Faunal Diversity

Amphibian species like the common Indian Burrowing frog, and green pond frog, and etc. were sighted near the water bodies located in the study area.

Table No. 3.35. List of Amphibians either spotted or reported from the study area

SI. No	Scientific Name	Common Name/English Name	Schedule list wildlife Protection act 1972
1.	<i>Sphaerotheca breviceps</i>	Indian Burrowing frog	Schedule IV
2.	<i>Euphlyctis hexadactylus</i>	Green pond frog	Schedule IV
3.	<i>Bufo lanostictus</i>	Indian Toad	Schedule IV
4.	<i>Euphlyctis cynophlyctis</i>	Skipper	Schedule IV

3.8.4. Fishes

Fish is commonly found in all types of natural water bodies and very common source of food in Eastern South India. The local fishermen were enquired and also the secondary resources were reviewed to collect information on the fishes found in the study area. Few common species are; Catla, Mrigal, Ticto barb, Greenstripe barb, Roho and Pool barb etc., Species of fish reported in the study area are given in table 3.68. During the field investigation, all of the lakes were quite dry. Only the lakes gather fish data.

Table No 3.36. Based on Actual Sighting, based on inputs from locals and Perused from Secondary Data

S. No	Common name	Scientific name	Family
1.	Mrigal	<i>Cirrhinus mrigala</i>	Chordata
2.	Rohu	<i>Labeo rohita</i>	Cyprinidae
3.	Catfish	<i>Siluriformes</i>	Diplomystidae
4.	Greenstripe barb	<i>Puntius vittatus</i>	Cyprininae

Sources:

Invasive Alien Species | IUCN

<https://www.inaturalist.org/places/tiruvannamalai>

<https://ebird.org/region/IN-TN-TV>

https://www.inaturalist.org/check_lists/35268-Tiruvannamalai-Check-List

Ali, S. (2002). The Book of Indian Birds (13th revised edition). Oxford University Press, New Delhi. 326pp.

Ali, S and Ripley, S.D. 1969. Handbook of the Birds of India and Pakistan together with those of Nepal, Sikkim, Bhutan and Ceylon, 3. Stone Curlews to Owls. Oxford University Press, Bombay, 327pp.

Bird Life International 2012. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.

3.9. Findings/Results

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

S.No	Ecological sensitive habitat	Direction and Distance from the project site
1.	National Parks/ Wildlife Sanctuary/ Biosphere reserves/ Elephant Reserve/ Any Other Reserve	Nil
2.	Reserved Forests	Nil
3.	Wildlife Corridors & Routes	No notified wildlife corridors are present in 10 km vicinity.
4.	Wetlands / Water bodies	-
5.	Ramsar Site	Nil

6.	Important Bird Habitats	Nil
7.	Breeding/nesting areas of endangered species	Not present
8.	Mangroves	None

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.

3.10. 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

There is no Approved habitation/ village within the radius of 300m from the project area. Socio-economic study is an essential part of environmental study. It includes demographic structure of the area, provision of basic amenities viz., housing, education, health and medical services, occupation, water supply, sanitation, communication, transportation, prevailing diseases pattern as well as feature like temples, historical monuments etc., at the baseline level. This will help in visualizing and predicting the possible impact depending upon the nature and magnitude of the project.

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

3.6.1 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 Administrative Setup of Tiruvannamalai District

Tiruvannamalai district is divided into 12 taluks. The taluks are further divided into 18 blocks, which further divided into 860 villages. In 2011, Tiruvannamalai had population of 24,64,875 of which male and female were 12,35,889 and 12,28,986 respectively. In 2001 census, Tiruvannamalai had a population of 21,86,125 of which males were 10,95,859 and remaining 10,90,266 were females. Tiruvannamalai District population constituted 3.42 % of total Maharashtra population. In 2001 census, this figure for Tiruvannamalai District was at 3.50 % of Maharashtra population.

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

3.6.4 Study area

As per the Population Census 2011, there are total 170 families residing in the village Kundiyanthandalam. The **total population of Kundiyanthandalam is 703** out of which 351 are males and 352 are females thus the **Average Sex Ratio of Kundiyanthandalam is 1003**. In Kundiyanthandalam village population of children with age 0-6 is 71 which makes up 10.10 % of total population of village. Average Sex Ratio of Kundiyanthandalam village is 1003 which is higher than Tamil Nadu state average of 996. Child Sex Ratio for the Kundiyanthandalam as per census is 972, higher than Tamil Nadu average of 943. Kundiyanthandalam village has lower literacy rate compared to Tamil Nadu. In 2011, literacy rate of Kundiyanthandalam village was 74.68 % compared to 80.09 % of Tamil Nadu. In Kundiyanthandalam Male literacy stands at 83.17 % while female literacy rate was 66.25 %.

TABLE 3.37 – POPULATION CHARACTERISTICS AROUND 10KM RADIUS

S.No	Name of the Village	No. of Households	Total Population	Population Male	Population female	SC Population Male	SC Population female	Total Literates Male	Total Literates Female	Total Illiterates Male	Total Illiterates Female
1.	Abdullapuram	624	2594	1312	1282	230	233	1132	1028	180	254
2.	Adavapakkam	185	765	396	369	258	241	270	195	126	174
3.	Akkur	754	2896	1454	1442	293	290	1086	862	368	580
4.	Alisoor	461	1751	892	859	158	166	627	466	265	393
5.	Andithangal	109	406	206	200	5	5	158	119	48	81
6.	Arasanipalai	287	1155	581	574	208	210	417	321	164	253
7.	Arpakkam	731	2937	1475	1462	808	818	993	801	482	661
8.	Asoor	323	1234	609	625	363	378	457	365	152	260
9.	Avalur	992	3960	1948	2012	119	121	1322	1055	626	957
10.	Bagavanthapuram	182	777	386	391	0	0	241	172	145	219
11.	Arasanipalai	287	1155	581	574	208	210	417	321	164	253
12.	Chithathur	657	2654	1284	1370	276	311	889	751	395	619
13.	Dharmacheri	32	103	55	48	0	0	33	30	22	18
14.	Dharmacheri	32	103	55	48	0	0	33	30	22	18
15.	Elanagar	468	1725	879	846	54	57	599	404	280	442
16.	Elayanarvelur	299	1079	544	535	273	281	352	291	192	244
17.	Erivoy	222	905	454	451	9	17	314	261	140	190
18.	Ezhacheri	491	2080	1065	1015	399	371	729	506	336	509
19.	Girijapuram	61	243	122	121	0	0	91	64	31	57
20.	Hanumanthandalam	311	1278	625	653	120	128	481	336	144	317
21.	Hariharapakkam	263	1094	565	529	0	0	332	227	233	302
22.	Irumaram	59	223	104	119	104	118	76	58	28	61
23.	Iyangarkulam	766	3012	1526	1486	158	143	1164	920	362	566
24.	Kalakattur	664	2539	1288	1251	25	34	810	658	478	593
25.	Kaliyampoondi	458	2426	1265	1161	507	473	943	752	322	409
26.	Kalur	786	3129	1560	1569	256	264	1110	835	450	734
27.	Kambarajapuram	380	1527	766	761	139	134	553	391	213	370
28.	Kamugampallam	49	217	107	110	0	0	78	49	29	61
29.	Kanagampakkam	55	231	126	105	0	0	97	49	29	56
30.	Kanikiluppai	187	771	380	391	310	308	285	232	95	159
31.	Kannikulam	172	727	372	355	214	207	265	188	107	167
32.	Karanai	139	677	351	326	345	321	250	176	101	150
33.	Karuveppampoondi	436	1652	846	806	434	410	638	519	208	287
34.	Kavampair	179	682	339	343	172	171	244	183	95	160
35.	Kavanthandalam	461	1619	796	823	192	200	548	422	248	401

36.	Kilottivakkam	315	1320	660	660	386	399	547	477	113	183
37.	Kilputhur	53	170	80	90	1	0	56	43	24	47
38.	Kizhnaickanpalayam	141	544	264	280	133	150	193	158	71	122
39.	Kolathur	139	508	243	265	190	212	159	147	84	118
40.	Koozhamandal	409	1750	882	868	50	49	707	539	175	329
41.	Koyambakkam	61	255	132	123	132	123	98	90	34	33
42.	Kundiyanthandalam	170	703	351	352	182	199	262	210	89	142
43.	Kunnavakkam	315	1259	643	616	341	329	487	362	156	254
44.	Kuranganilmuttam	187	702	365	337	297	276	289	201	76	136
45.	Kuruvimalai	388	1508	769	739	14	10	501	385	268	354
46.	Magaral	709	2834	1399	1435	895	882	940	814	459	621
47.	Mahajanampakkam	407	1707	892	815	397	348	701	495	191	320
48.	Malayankulam	630	2390	1218	1172	480	457	828	610	390	562
49.	Mamandur	1021	4287	2155	2132	196	194	1679	1260	476	872
50.	Manampathy	1663	6447	3189	3258	331	331	2494	2207	695	1051
51.	Mangal	174	767	377	390	204	203	297	228	80	162
52.	Marudham	473	1893	950	943	183	189	770	575	180	368
53.	Mathur	509	2147	1066	1081	148	143	795	587	271	494
54.	Melpakkam	163	581	272	309	27	34	189	159	83	150
55.	Melputhur	116	430	214	216	146	154	152	111	62	105
56.	Menallur	363	1444	711	733	322	328	508	439	203	294
57.	Murukkeri	115	485	258	227	0	0	173	108	85	119
58.	Naickenpettai	527	2106	1072	1034	40	45	775	664	297	370
59.	Namandi	318	2031	1185	846	283	259	946	485	239	361
60.	Narasamangalam	392	1703	856	847	3	4	613	432	243	415
61.	Nariambakkam	12	35	14	21	0	0	10	14	4	7
62.	Nariyambudur	7	20	11	9	0	0	6	2	5	7
63.	Nelveli	165	667	322	345	280	297	220	183	102	162
64.	Nemili	135	585	301	284	144	142	197	141	104	143
65.	Neyyativakkam	323	1360	666	694	316	366	513	383	153	311
66.	Ozhugarai	322	1240	613	627	249	239	415	282	198	345
67.	Padappam	73	284	136	148	114	125	112	112	24	36
68.	Pallavaram	423	1743	865	878	200	184	643	501	222	377
69.	Pavoor	308	1370	688	682	530	520	438	405	250	277
70.	Perumanallur	117	438	203	235	5	7	148	129	55	106
71.	Perumpulimedu	153	565	288	277	0	0	226	160	62	117
72.	Perunagar	1346	5499	2823	2676	1081	987	1979	1487	844	1189
73.	Poonaitthangal	80	277	132	145	0	0	112	97	20	48
74.	Pudupalayam	214	853	407	446	228	246	335	327	72	119
75.	Pulivoy	128	491	237	254	105	112	184	140	53	114
76.	Punjarasanthangal	350	1425	734	691	111	113	489	364	245	327
77.	Punnai	194	707	338	369	128	136	269	216	69	153
78.	Puthali	266	1032	510	522	377	389	376	298	134	224
79.	Ravathanallur	851	3260	1631	1629	542	556	1219	1031	412	598

80.	Seeyamangalam	144	564	281	283	165	144	190	160	91	123
81.	Sembulam	39	148	66	82	23	31	52	52	14	30
82.	Seniyanallur	91	373	183	190	0	0	133	89	50	101
83.	Silambakkam	114	461	244	217	0	0	173	97	71	120
84.	Sirunallur	136	563	267	296	140	175	185	151	82	145
85.	Sothiyampakkam	288	1185	599	586	189	186	468	311	131	275
86.	Suruttal	304	1266	659	607	5	2	507	337	152	270
87.	Thalaiyillillaperumbakkam	0	0	0	0	0	0	0	0	0	0
88.	Thammanur	526	2116	1088	1028	330	337	712	519	376	509
89.	Thangi	229	922	464	458	170	177	328	237	136	221
90.	Thimmaiyanpettai	767	2948	1461	1487	18	19	1163	981	298	506
91.	Thinayampoondi	262	1103	571	532	463	430	389	317	182	215
92.	Thriupulivanam	478	1821	892	929	166	190	625	516	267	413
93.	Ukkal	611	2434	1209	1225	194	190	948	764	261	461
94.	Ukkamperumbakkam	293	1243	597	646	264	294	464	408	133	238
95.	Vada Mavanthal	456	1930	972	958	108	120	760	574	212	384
96.	Vadakalpakkam	291	1222	628	594	310	295	483	343	145	251
97.	Valathottam	287	1182	592	590	191	200	443	353	149	237
98.	Valluvapakkam	275	1107	552	555	166	168	426	341	126	214
99.	Vayalakkavoor	341	1429	752	677	440	369	526	364	226	313
100.	Vazhavandal	115	444	229	215	40	28	166	112	63	103
101.	Vedal	217	906	463	443	3	4	279	211	184	232
102.	Vengacheri	195	753	379	374	1	0	263	172	116	202
103.	Vengaram	48	176	89	87	42	44	62	34	27	53
104.	Villivalam	442	1731	856	875	154	172	584	452	272	423
105.	Vitchanthangal	254	1016	517	499	175	168	369	265	148	234

TABLE 3.38– OCCUPATIONAL CHARACTERISTICS AROUND 10KM RADIUS

S.No	Name of the Village	Total Worker Population Male	Total Worker Population Female	Main Working Population Male	Main Working Population Female	Main Cultivator Population Male	Main Cultivator Population Female	Main Agricultural Labourers Population Male	Main Agricultural Labourers Population Female	Non Working Population Male	Non Working Population Female
1	Abdullapuram	763	337	729	272	15	3	53	94	549	945
2	Adavapakkam	247	194	241	191	17	3	109	157	149	175
3	Akkur	845	635	650	401	254	138	118	134	609	807
4	Alisoor	601	369	599	362	51	39	420	294	291	490
5	Andithangal	148	100	148	100	92	64	13	15	58	100
6	Arasanipalai	305	161	261	106	81	1	117	83	276	413
7	Arpakkam	819	450	782	335	122	7	207	229	656	1012
8	Asoor	317	227	297	201	38	12	156	147	292	398
9	Avalur	1099	927	1022	719	219	56	377	513	849	1085
10	Bagavanthapuram	237	108	236	105	84	32	53	44	149	283
11	Chellaperumpulimedu	148	101	147	100	60	39	46	49	129	167
12	Chithathur	791	500	694	194	64	4	246	77	493	870
13	Chozhavaram	440	323	418	303	126	67	73	158	230	323
14	Dharmacheri	38	40	37	40	4	2	24	33	17	8
15	Elanagar	574	321	132	20	3	0	4	2	305	525
16	Elayanarvelur	349	202	336	139	38	13	115	87	195	333
17	Erivoy	249	195	233	165	20	13	44	99	205	256
18	Ezhacheri	655	479	654	476	192	67	244	340	410	536
19	Girijapuram	75	81	73	75	23	22	20	28	47	40
20	Hanumanthandalam	388	301	341	83	133	27	80	27	237	352
21	Hariharapakkam	367	320	360	303	12	9	107	213	198	209
22	Irumaram	64	65	11	4	1	0	1	0	40	54
23	Iyangarkulam	890	537	846	413	15	4	42	49	636	949
24	Kalakattur	897	728	771	550	163	105	163	180	391	523
25	Kaliyampoondi	596	143	467	103	5	1	315	43	669	1018
26	Kalur	981	582	887	417	288	138	146	171	579	987
27	Kambarajapuram	460	358	430	301	43	14	171	236	306	403
28	Kamugampallam	63	6	60	5	10	0	5	3	44	104
29	Kanagampakkam	84	50	36	16	3	2	0	0	42	55
30	Kanikiluppai	240	236	238	231	29	1	150	217	140	155
31	Kannikulam	232	33	232	32	65	1	102	26	140	322
32	Karanai	235	215	235	215	85	57	79	156	116	111
33	Karuveppampoondi	467	320	464	318	35	6	303	285	379	486
34	Kavampair	227	156	198	120	29	18	91	85	112	187
35	Kavanthandalam	524	332	458	273	153	42	208	205	272	491
36	Kilottivakkam	369	232	306	134	11	3	22	31	291	428

37	Kilputhur	48	42	48	41	6	0	20	31	32	48
38	Kizhnaickanpalayam	198	193	62	39	5	6	14	22	66	87
39	Kolathur	131	71	119	59	13	2	77	50	112	194
40	Koozhamandal	525	293	477	249	219	52	91	157	357	575
41	Koyambakkam	76	73	76	73	10	7	46	58	56	50
42	Kundiyanthandalam	200	54	76	21	3	1	1	1	151	298
43	Kunnavakkam	352	205	310	163	47	3	162	143	291	411
44	Kuranganilmuttam	247	203	247	203	17	16	171	174	118	134
45	Kuruvimalai	510	319	490	220	26	3	24	26	259	420
46	Magaral	821	680	287	140	39	14	94	88	578	755
47	Mahajanampakkam	553	360	547	345	173	45	116	246	339	455
48	Malayankulam	719	433	692	396	237	44	320	317	499	739
49	Mamandur	1367	1124	1021	724	371	257	174	297	788	1008
50	Manampathy	1883	803	1704	588	176	76	271	238	1306	2455
51	Mangal	180	29	110	12	6	0	72	5	197	361
52	Marudham	569	549	560	541	262	234	132	249	381	394
53	Mathur	670	526	637	467	196	131	133	210	396	555
54	Melpakkam	180	190	33	10	0	0	0	0	92	119
55	Melputhur	131	87	131	87	14	5	74	74	83	129
56	Menallur	418	166	323	135	44	23	117	53	293	567
57	Murukkeri	177	138	169	126	19	8	102	90	81	89
58	Naickenpettai	623	261	596	229	16	9	9	5	449	773
59	Namandi	431	350	430	347	77	60	177	242	754	496
60	Narasamangalam	547	431	540	407	104	84	171	228	309	416
61	Nariambakkam	10	10	10	10	5	1	4	9	4	11
62	Nariyambudur	5	4	5	4	1	0	3	4	6	5
63	Nelveli	196	154	38	14	7	1	2	1	126	191
64	Nemili	183	132	155	108	63	36	40	50	118	152
65	Neyyadivakkam	432	220	416	176	124	59	113	60	234	474
66	Ozhugarai	355	189	273	119	100	14	66	74	258	438
67	Padappam	82	48	69	17	7	0	18	7	54	100
68	Pallavaram	561	302	472	176	137	35	101	86	304	576
69	Pavoor	413	194	410	191	75	10	160	105	275	488
70	Perumanallur	165	154	113	103	12	13	33	50	38	81
71	Perumpulimedu	176	148	163	97	74	35	42	43	112	129
72	Perunagar	1604	966	762	392	181	141	98	91	1219	1710
73	Poonaihangal	89	19	82	17	12	1	36	8	43	126
74	Pudupalayam	264	192	263	191	36	8	104	142	143	254
75	Pulivoy	161	118	160	117	14	4	90	99	76	136
76	Punjarasanthangal	430	325	422	287	8	7	81	110	304	366
77	Punnai	244	252	224	240	9	9	140	187	94	117
78	Puthali	333	239	274	126	29	3	135	100	177	283
79	Ravathanallur	1049	714	815	449	238	114	221	196	582	915
80	Seeyamangalam	167	89	130	45	1	0	6	4	114	194
81	Sembulam	53	37	22	4	7	0	1	0	13	45

82	Seniyanallur	120	114	100	25	52	7	8	5	63	76
83	Silambakkam	144	53	142	52	122	34	12	13	100	164
84	Sirukalathur	0	0	0	0	0	0	0	0	0	0
85	Sirunallur	172	130	165	126	43	24	49	78	95	166
86	Sothiyampakkam	377	334	374	330	112	59	81	200	222	252
87	Suruttal	437	325	411	188	83	21	168	141	222	282
88	Thammanur	623	459	538	345	255	147	96	44	465	569
89	Thangi	269	170	264	149	29	11	41	85	195	288
90	Thimmaianpettai	843	213	686	161	5	0	1	0	618	1274
91	Thinayampoondi	366	321	143	115	56	46	67	65	205	211
92	Thriupulivanam	553	285	542	273	64	10	199	181	339	644
93	Ukkal	784	629	749	325	385	10	125	249	425	596
94	Ukkamperumbakkam	360	184	188	51	63	21	4	3	237	462
95	Vada Mavanthal	561	307	436	247	7	8	149	164	411	651
96	Vadakalpakkam	388	348	295	213	7	3	122	163	240	246
97	Valathottam	380	235	374	233	74	2	53	116	212	355
98	Valluvapakkam	327	226	319	217	9	3	31	46	225	329
99	Vayalakkavoor	421	242	395	230	88	52	163	130	331	435
100	Vazhavandal	128	104	33	15	5	1	8	5	101	111
101	Vedal	285	249	281	229	13	10	50	112	178	194
102	Vengacheri	217	138	151	26	45	1	10	3	162	236
103	Vengaram	52	10	52	10	32	4	13	5	37	77
104	Villivalam	510	338	488	272	81	40	182	174	346	537
105	Vitchanthal	294	159	173	66	26	20	15	19	223	340

3.6.5 Basic Amenities

A better network of physical infrastructure facilities (well-built roads, rail links, irrigation, power and telecommunication, information technology, market-network and social infrastructure support, viz., health and education, water and sanitation, veterinary services and co-operative) is essential for development of the rural economy.

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

All basic amenities Education (higher education, colleges, universities, Medical college, Transport facilities, Railway station, Bus station area available in the district headquarters. Tiruvannamalai at a distance of 90km – South west)

3.6.6 Recommendation and Suggestion

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

3.6.7 Conclusion

The socio-economic study of surveyed villages gives a clear picture of its population, average household size, literacy rate and sex ratio etc. It is also found that a part of population is suffering from lack of permanent job to run their day-to-day life. Their expectation is to earn some income for their sustainability on a long-term basis.

The proposed project will aim to provide preferential employment to the local people there by improving the employment opportunity in the area and in turn the social standards will improve.

The nearby villages within 5kms radius have PHC, Anganwadi school, Post office, Telegram, Government and Private school, bus connectivity besides.

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

- 3.16.0 Ha of the land will be under mining since the Permanent or temporary change on land use and land cover will occur
- 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 cause the siltation of water course

4.1.2 Mitigation Measures

- The 3.16.0 Ha of the land will be converted into temporary reservoir which will full fill the water scarcity in the drought season and the nearby agriculture land will have benefitted by the supply of water
- About 2025 Nos of trees will be planted in the lease area and approach road will retain the eco system
- The mining activity will be gradual confined in blocks and excavation will be undertaken progressively along with other mitigative measures like phase wise development in the production
- Construction of garland drains all around the quarry pits and construction of silt trap 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.,
- Fencing will be constructed before starting the mining operation and it will be maintained in the conceptual stage Security will be posted round the clock, to prevent inherent entry of the public and cattle.

4.1.3 Soil Environment

4.1.4 Impact on Soil Environment

- Removal of vegetation cover
- Soil Erosion in the project site during rainy season due to quarry operation

4.1.5 Mitigation Measures

- Garland drains will be constructed all around the project boundary to prevent surface flows from entering the quarry. 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 (Silt pond). 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 and gravel quarrying operation. The entire quarried out materials will be utilized (100%).

4.2 WATER ENVIRONMENT

4.2.1 Anticipated Impact

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

-
- The sewage from soak pit may percolate to the ground water table and contaminate it.
 - Surface drainage may be affected due to Mining
 - Abstraction of water may lead to depletion of water table
 - 2.1 KLD water will be utilized for the quarrying operation

4.2.2 Mitigation Measures

- Water for the quarrying operation such as sprinkling on haul roads, Greenbelt development will be sourced from the lower part of the mine pit which is specifically allotted to collect the rain water.
- 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 settling 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.
- Periodic (every 6 months 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.

4.3 AIR ENVIRONMENT

4.3.1. Anticipated Impact

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

4.3.1.1. Modelling of Incremental Concentration from all Proposed Projects

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.

Prediction of impacts on air environment has been carried out taking into consideration cumulative production all the quarries fall in the Cluster. Air environment and net increase in emissions by Open pit source modelling in AERMOD Software AERMOD 9.61.

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

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 4.1: ESTIMATED EMISSION RATE

PM ₁₀			
Activity	Source type	Value	Unit
Drilling	Point Source	0.112329777	g/s
Blasting	Point Source	0.004326024	g/s
Mineral Loading	Point Source	0.047170498	g/s
Haul Road	Line Source	0.002510684	g/s/m
Overall Mine	Area Source	0.073772545	g/s
SO ₂			
Activity	Source type	Value	Unit
Overall Mine	Area Source	0.001928909	g/s
NO _x			

Overall Mine	Area Source	0.000172931	g/s
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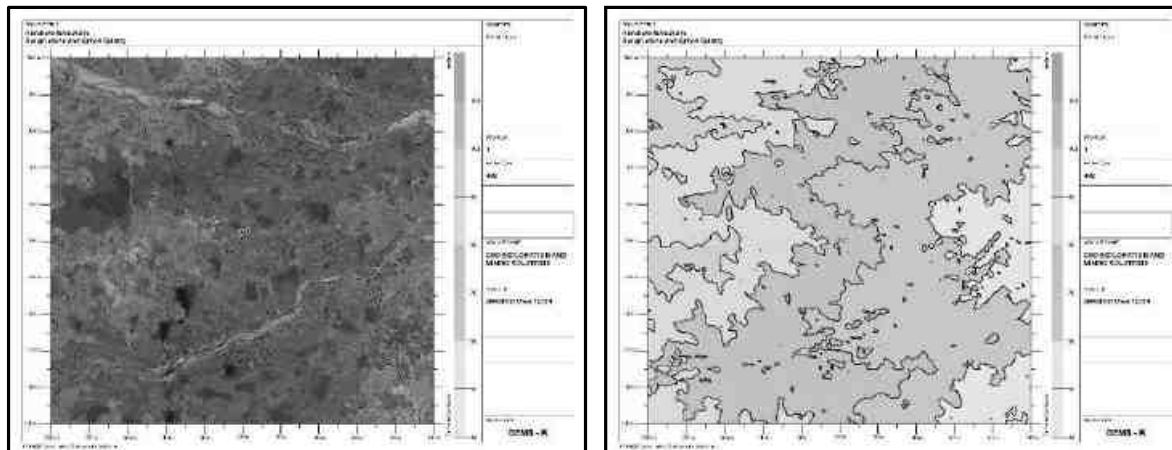
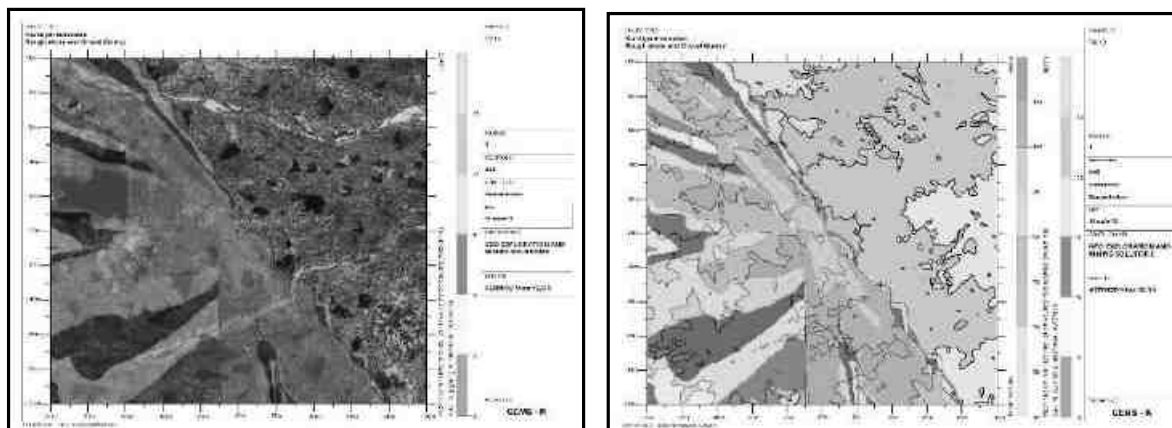
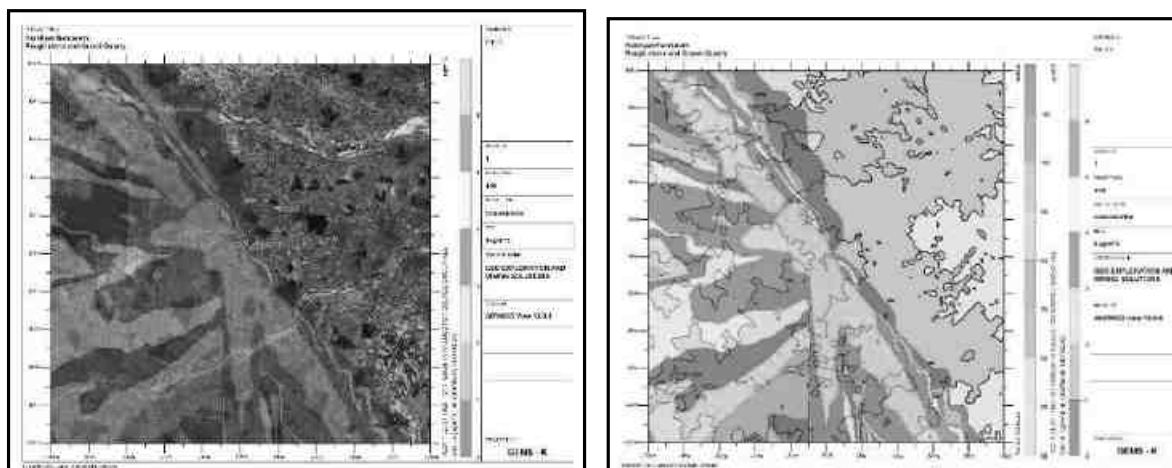
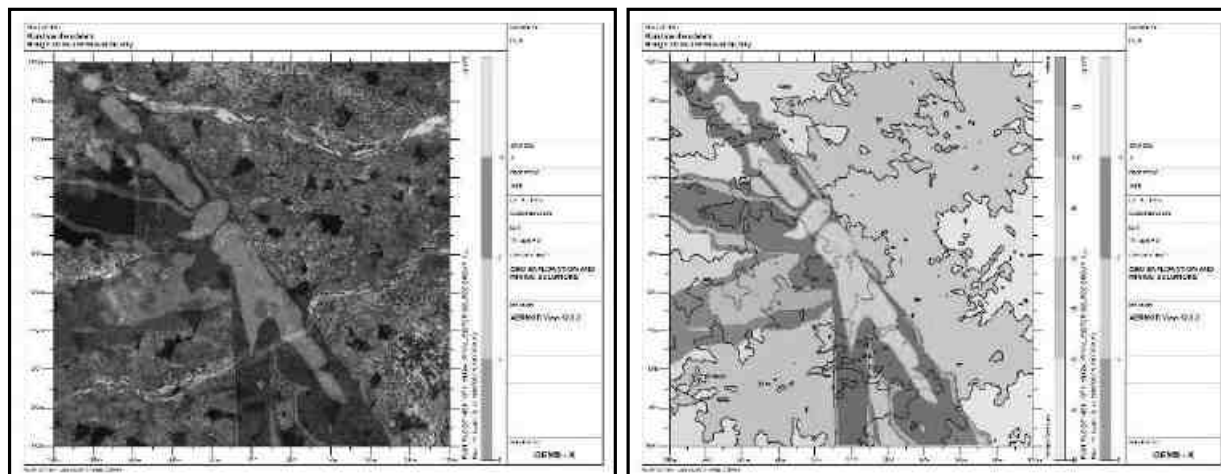
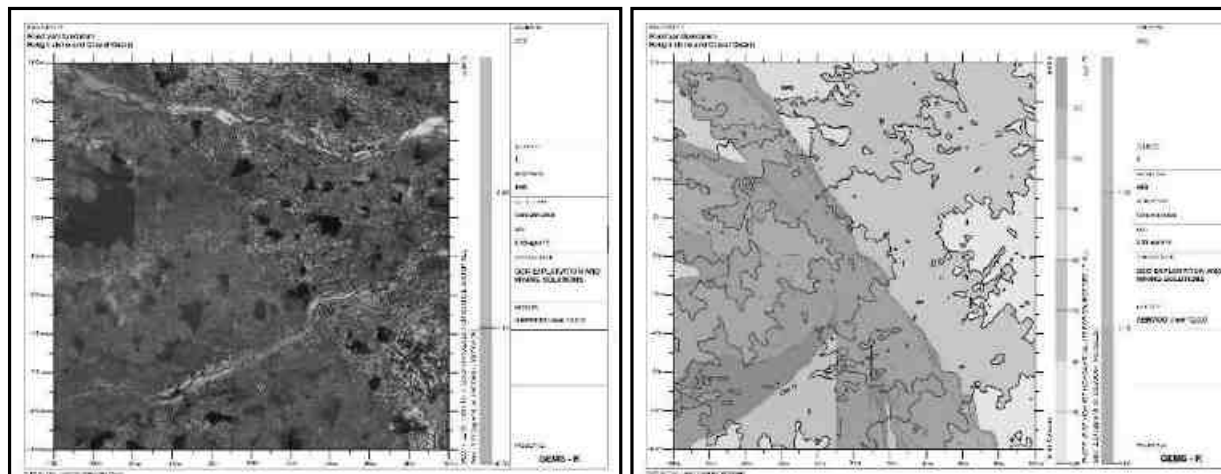
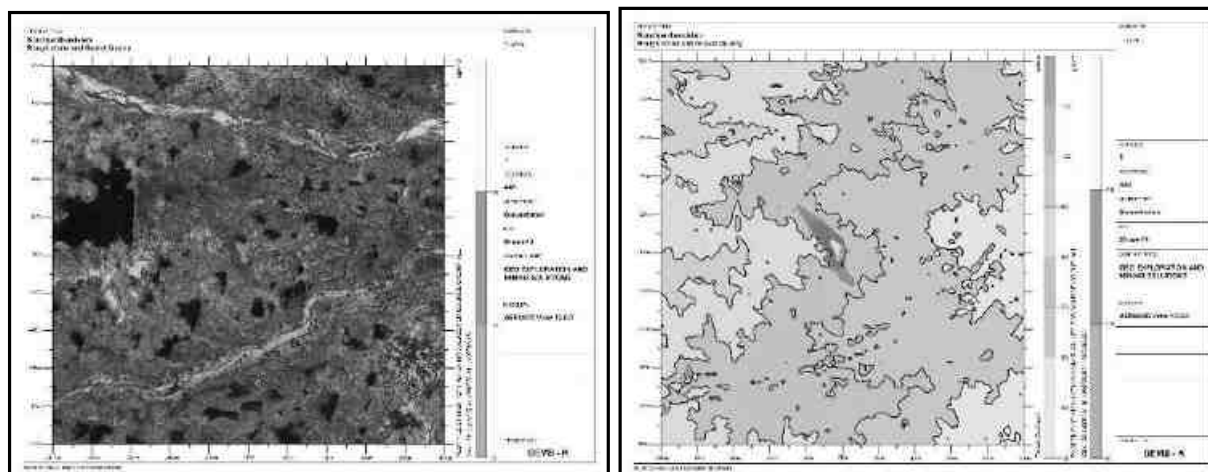
FIGURE 4.1: AERMOD TERRAIN MAP**FIGURE 4.2: PREDICTED INCREMENTAL CONCENTRATION OF PM₁₀****FIGURE 4.3: PREDICTED INCREMENTAL CONCENTRATION OF PM_{2.5}**

FIGURE 4.4: PREDICTED INCREMENTAL CONCENTRATION OF NO_x**FIGURE 4.5: PREDICTED INCREMENTAL CONCENTRATION OF SO₂****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 4.2: 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	12°43'43.48"N 79°43'2.05"E	-79	-87	44.3	15.85	60.15
AAQ2	12°43'49.46"N 79°43'3.11"E	-46	91	40.8	15.42	56.22
AAQ3	12°43'51.74"N 79°43'17.19"E	310	137	40.2	0	40.2
AAQ4	12°42'54.62"N 79°40'39.28"E	-4408	-1605	43.0	13.10	56.1
AAQ5	12°43'58.51"N 79°45'50.04"E	5012	369	44.1	0	44.1
AAQ6	12°39'53.01"N 79°43'21.08"E	499	-7202	43.6	14.61	58.21
AAQ7	12°46'34.41"N 79°43'11.82"E	-1951	4959	43.7	0	43.7

TABLE 4.3: 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	12°43'43.48"N 79°43'2.05"E	-79	-87	23.3	8.90	32.2
AAQ2	12°43'49.46"N 79°43'3.11"E	-46	91	21.2	8.50	29.7
AAQ3	12°43'51.74"N 79°43'17.19"E	310	137	21.4	8.10	29.5
AAQ4	12°42'54.62"N 79°40'39.28"E	-4408	-1605	21.7	7.00	28.7
AAQ5	12°43'58.51"N 79°45'50.04"E	5012	369	21.7	0	21.7
AAQ6	12°39'53.01"N 79°43'21.08"E	499	-7202	20.2	8.31	28.51
AAQ7	12°46'34.41"N 79°43'11.82"E	-1951	4959	22.0	0.94	22.94

TABLE 4.4: 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	12°43'43.48"N 79°43'2.05"E	-79	-87	6.7	2.29	8.99
AAQ2	12°43'49.46"N 79°43'3.11"E	-46	91	5.7	2.25	7.95
AAQ3	12°43'51.74"N 79°43'17.19"E	310	137	5.8	0	5.8
AAQ4	12°42'54.62"N 79°40'39.28"E	-4408	-1605	5.8	1.72	7.52
AAQ5	12°43'58.51"N 79°45'50.04"E	5012	369	7.2	0	7.2
AAQ6	12°39'53.01"N 79°43'21.08"E	499	-7202	6.4	2.20	8.6
AAQ7	12°46'34.41"N 79°43'11.82"E	-1951	4959	6.3	0	6.3

TABLE 4.5: 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	12°43'43.48"N 79°43'2.05"E	-79	-87	22.4	11.71	34.11
AAQ2	12°43'49.46"N 79°43'3.11"E	-46	91	21.6	11.28	32.88
AAQ3	12°43'51.74"N 79°43'17.19"E	310	137	24.2	0	24.2
AAQ4	12°42'54.62"N 79°40'39.28"E	-4408	-1605	22.8	5.31	28.11
AAQ5	12°43'58.51"N 79°45'50.04"E	5012	369	23.2	0	23.2
AAQ6	12°39'53.01"N 79°43'21.08"E	499	-7202	21.8	10.00	31.8
AAQ7	12°46'34.41"N 79°43'11.82"E	-1951	4959	22.1	0	22.1

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. Mitigation Measures

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

Advantages of Wet Drilling: -

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

Blasting –

- Establish time of blasting to suit the local conditions and water sprinkling on blasting face
- Avoid blasting i.e., when temperature inversion is likely to occur and strong wind blows towards residential areas
- Controlled blasting includes Adoption of suitable explosive charge and short delay detonators, adequate stemming of holes at collar zone and restricting blasting to a particular time of the day i.e. at the time lunch hours, controlled charge per hole as well as charge per round of hole
- Before loading of material water will be sprayed on blasted material
- Dust mask will be provided to the workers and their use will be strictly monitored

Haul Road & Transportation –

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

-
- It will be ensured that all transportation vehicles carry a valid PUC certificate
 - Grading of haul roads and service roads to clear accumulation of loose materials

Green Belt –

- 2025 Nos of trees will be planted through this project in the lease area and village roads (Approach Road) 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 within 300m radius from the project site. 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.

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

Where:

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

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

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

4.4.1 Anticipated Impact

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 4.7: 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

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

The total noise to be produced by mining machineries 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 4.8: PREDICTED NOISE INCREMENTAL VALUES

Location ID	N1	N2	N3	N4	N5	N6	N7
Maximum Monitored Value (Day) dB(A)	41.6	40.7	45.5	41.5	41.1	46.3	43.1
Incremental Value dB(A)	60.1	60.1	46.3	25.6	24.6	27.5	26.7
Total Predicted Noise level dB(A)	60.2	60.1	48.9	41.6	41.2	46.4	43.2

The incremental noise level is found within the range of 60.1 dB (A) in Core Zone and 24.6 – 46.3 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 Mitigation Measures

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;
- 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)

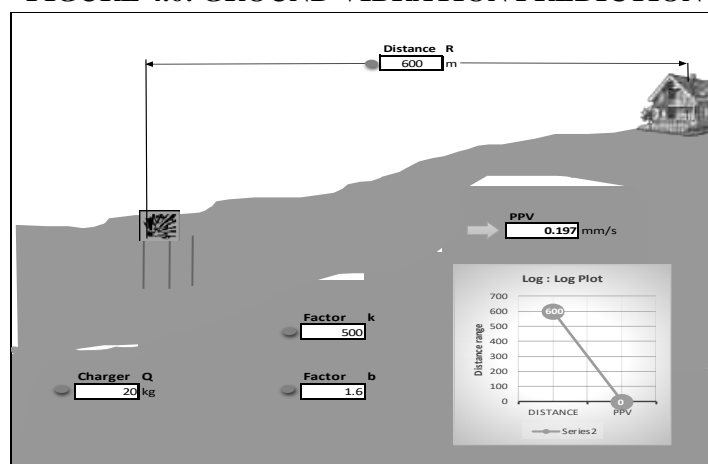
B = constant related to the rock and site (usually 1.6)

R = distance from charge (m)

TABLE 4.9: PREDICTED PPV VALUES DUE TO BLASTING

Maximum Charge in kgs	Nearest Habitation in m	PPV in m/ms
20	600-SW	0.197

FIGURE 4.6: GROUND VIBRATION PREDICTION



From the above graph, the charge per blast of 20 kg 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 2kg 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 Mitigation Measures

- It is proposed to carry out blasting operation 20kg per round so that the vibration will be minimal
- The mining operation will be carried out without deep hole drilling, 25mm small dia cartridge will be utilized for the blasting
- The blasting operations in the project site 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.
- 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. Impact on the Biological Environment

4.5.1. Anticipated Impact on agricultural land associated with flora

1. Dust particle settles on neighbouring agricultural land, it is located about 100m on the south west side. Mostly dust emission from nearby crusher unit and during operation and minerals are transported in approach roads.
2. Dust deposition on leaf observed on nearby lease boundary local plant species which may result in decline the rate of photosynthesis and retards the plant growth.

4.5.2 Mitigation Measures

4.5.2.1. 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 plant, 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. 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 3 m x 3 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.

4.5.3.4. Selection of Plant Species for Green Belt Development

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. Green belt is plantation of trees for reducing the air pollution as they absorb both gaseous and particulate pollutant, thus removing them from atmosphere. Green plants form a surface capable of absorbing air pollutants and forming sinks for pollutants. It improves the aesthetic value of local environment. Under present project, green belts have been planned with emphasis on creating biodiversity; enhance natural surroundings and mitigating pollution. Regional tree saplings in eco-friendly bags like *Pterocarpus marsupium*, *Pongamia pinnata*, *Limonia acidissima*, and *Cassia roxburghii* will be planted along the Lease boundary and avenues as well as over non-active dumps with intervals 3m in between with the GPS Coordinates. The greenbelt development plan aims to overall improvement in the environmental conditions of the region Native plant species will be preferred.

- The species should be wind-firm and deep-rooted.
- The species should form a dense canopy.
- Fast-growing plants will be planted
- Species tolerance to air pollution like SO₂ and NO₂ should be preferred.
- Plants having large leaf area index will be considered
- Soil improving plants (Nitrogen fixing rapidly decomposable leaf litter).
- Attractive appearance with good flowering and fruit-bearing.
- Birds and insects attract tree species.
- Roadsides will be planted with local vegetation.

Table No 4.1. List of plant species proposed for Greenbelt development

S. No	Scientific name	Tamil Name
1	<i>Aegle marmelos</i>	Vilva maram
2	<i>Albizia lebbbeck</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
7	<i>Ficus hispida</i>	Aththi maram
8	<i>Borassus flabellifer</i>	Panai-maram
9	<i>Madhuca longifolia</i>	Illupai maram

(*Source: Term of Reference-ToR)

Table No 4.2.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>Syzygium cumini</i>	Naval maram
5	<i>Tamarindus indica</i>	Puliyamaram
6	<i>Mangifera indica</i>	Manga maram
7	<i>Delonix regia</i>	Neruppu Kondrai
8	<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.

4.5.4. Anticipated Impact on Fauna

- Noise generation due to vehicle may affect avifauna.
- The lease area is not inhabited by any wild life, as there is no forest cover, hence there will not be any effect on migration or extinction of wildlife.
- There is no National Park, Biosphere Reserve, Wildlife corridors, and Tiger/Elephant Reserve found within 10 km radius of the project site.

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

- The major river and lake along the project sites doesn't have a rich biodiversity and almost all the species of both fauna and flora listed are either least concerned or not evaluated.
- There is no impact on fish habitats and the food WEB/ food chain in the water body and Reservoir.

Table No. 4.3. Overall Ecological impact assessments of Kundiyanthandalam Village, Rough stone and gravel quarry, Vembakkam Taluk, Tiruvannamalai District and Tamil Nadu.

S.No	Attributes	Assessment
	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	Nil
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.

(*Source: EIA Guidance Manual-Mining and Minerals, 2010)

TABLE 4.12: RECOMMENDED SPECIES FOR GREENBELT DEVELOPMENT PLAN

Sl.No	Name of the plant (Botanical)	Family Name	Common Name	Habit
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1	<i>Azadirachta indica</i>	Meliaceae	Neem, Vembu	Tree
2	<i>Albiziafalcatoria</i>	Fabaceae	Tamarind, Puliymaram	Tree
3	<i>Polyalthialongifolia</i>	Annonaceae	Kattumaram	Tree
4	<i>Borassus Flabellifer</i>	Arecaceae	Palmyra Palm	Tree

The 7.5m Safety distance along the boundary has been identified to be utilized for subsequent Afforestation. However, the afforestation should always be carried out in a systematic and scientific manner. Regional trees like Neem, Pongamia, Pinnata will be planted along the Lease boundary and avenue plantation will be carried out in the project site. The rate of survival expected to be 80% in this area. Greenbelt development Plan is given in

TABLE 4.13: GREENBELT DEVELOPMENT PLAN

Year	No. of tress proposed to be planted	Area to be covered in m ²	Name of the species
I	2025	The safety zone along the boundary barrier has been identified to be utilized for Greenbelt development and along village roads.	Neem, Vilvam, Panai, Ashokha etc.,

4.6 SOCIO ECONOMIC

4.6.1 Anticipated Impact

- 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 Mitigation Measures

- 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, 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.

4.8 MINE WASTE MANAGEMENT

No waste is anticipated, the entire mined out material will be sold to needy crushers and customers.

4.9 MINE CLOSURE

The ultimate depth of the mine is 37m bgl and the life of the mine is 10 years, after completion of mining operation the following action will be taken in the project site as a part of Mine closure plan

- The total Mined out land would be around 1.72.0 Ha this land will be converted into temporary water reservoir which will facilitate to collect the rain water
 - The stagnant water will be supplied to the nearby agriculture land during drought seasons
 - Fencing will be re constructed around the pit after closure, the warning/ danger display board will be placed on all the sides of the project site
-

-
- The un utilized area and haul roads will be converted as plantation area, fruit bearing trees will be planted to retain the eco system of the area
 - Final Mine closure plan will be prepared and submitted to the concerned authority

Mine closure plan is the most important environmental requirement in mining project. 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.

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 discharge 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

The surrounding areas already undergone quarrying operation, there are 4 Crushers within the radius of 1km. Most of the quarries in the regions are abandoned and lease expired quarries. Hence this quarry will feed the Rough stone material to the crushing units.

The Rough Stone and Gravel Quarry Project for excavation of Rough Stone, which is site specific. The proposed mining lease areas have following advantages: -

- The mineral deposit occurs in a non-forest area.
- There is no habitation within the project area; hence no R & R issues exist.
- There is no river, stream, nallah and water bodies in the applied mine lease areas.
- 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 – III, 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

The existing quarries in the area operated by Opencast Mechanised 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 has been selected for 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 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 the project proponent. A comprehensive monitoring mechanism has been devised for monitoring of impacts due to this 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 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.

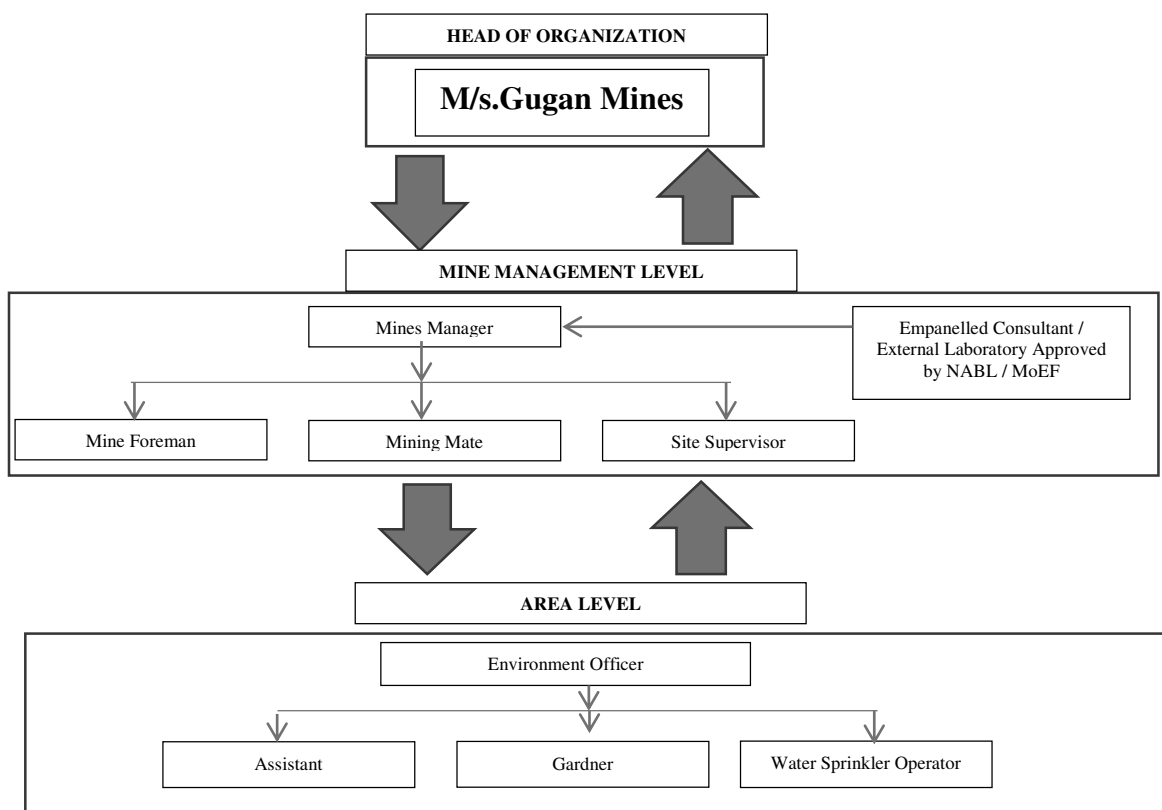
An Environment monitoring cell (EMC) will be constituted to monitor the implementation of EMP and other environmental protection measures in all the proposed quarries.

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

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	Depth in bgl
5	Noise	2 Locations (1 Core & 1 Buffer)	Hourly – 1 Day	Once in 6 months	Leq, Lmax, Lmin, Leq Day & Leq Night
6	Vibration	At the nearest habitation (in case of reporting)	–	During blasting Operation	Peak Particle Velocity
7	Soil	2 Locations (1 Core & 1 Buffer)	–	Once in six months	Physical and Chemical Characteristics
8	Greenbelt	Within the Project Area	Daily	Monthly	Maintenance

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 for each Proposed Project.

TABLE 6.3 ENVIRONMENT MONITORING PROGRAM BUDGET

S.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 Cluster Mine Management Coordinator and Respective 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	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

		Operator of truck leaving his cabin when it is loaded.	
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 III. The area is far away from the sea hence the disaster due to heavy floods and tsunamis are not anticipated

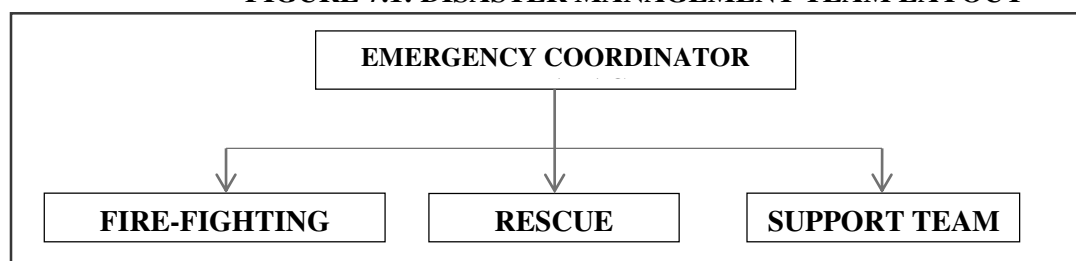
The Disaster Management Plan is aimed to ensure safety of life, protection of environment, protection of installation, restoration of production and salvage operations in this same order of priorities.

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. 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.

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	Village	S.F. Nos	Extent in Ha	Status
P1	M/s.Gugan Mines, No.5, Arpakkam Road, Arpakkam, Walajabad Taluk, Kancheepuram District	Kundiyanthandal am	182/1A, 182/1B1,182 /B2, 182/2, 183,184,185 & 186/2	4.05.0	File No.11675 ToR Identification: TO25B0108TN5991919 N Dated:03.03.2025.
	TOTAL EXTENT			4.05.0	
EXISTING QUARRIES					
CODE	Name of the Owner	Village	S.F. Nos	Extent in Ha	Status
E-1	Thiru.K.Chandrasekaran, S/o. Kathirvel, No.301, Madhurayan Pettai Street, Mamandur Village, Vembakkam Taluk, Tiruvannamalai District.	Kundiyanthanda lam	163/1A,163/ 1B,163/2,16 3/3,163/4,16 3/7,163/8A,1 63/9,163/10 A,163/10B & 163/11	1.97.5	02.12.2021 to 01.12.2031
E-2	Thiru.R.Nethaji, S/o. Ramadoss, No.79, Jain Street, Arpakkam, Walajabad Taluk, Kancheepuram District.	Kundiyanthanda lam	176/1A,176/ 1B,176/1C,1 76/2A,176/2 B,176/3A,17 6/3B,176/3C ,176/3D,176/ 3E,176/3F,1 76/3G& 176/4B	2.45.0	06.12.2021 to 05.12.2031
E-3	M/s.Buvaneshwari Blue Metals, No.8A, Plot No.56, 5 th Street , Lazar Nagar, Kamaraj Nagar, Avadi, Chennai	Kundiyanthanda lam	180/1I1,181/ 1I2,181/1J1, 181/1J2,181/ 1L1,181/1L2 ,181/1M1, 181/1N1, 181/1N2, 181/1O1,181 /1O2,181/1O 3,181/1O4,1 81/1P,181/1 Q1,181/1Q2 & 181/Q3	2.05.5	23.02.2022 to 22.02.2032
E-4	Thiru.A. Dhasarathan, S/o.Annakotti,No.39, Erikkarai Street, Thiruparuthikunram Village, Sevilimedu, Kanchipuram District.	Kundiyanthanda lam	186/1,190/2 B1 & 1902B2	2.88.5	15.07.2022 to 14.07.2032

E-5	Thiru K. Moorthi, S/o.Kannaiyan, No.299, Mandabam Junction, Arpakkam Village, Kanchipuram District.	Kundiyanthanda lam & Poonathangal Village	162/9,162/1 0B,163/5,16 3/6,163/10C, 163/12,163/ 13A,163/13 B,163/13C,1 63/13D,163/ 13E,163/13F , 163/14A,181 /1D1, 181/1D2,181 /1E1,181/1E 2& 181/1E3 in Kundiyantha ndalam & 117/14 & 117/15 in Poonathang al Village	3.68.0	08.02.2023 to 07.02.2033
TOTAL EXTENT				13.04.5 ha	
ABANDONED QUARRY					
A-1	Thiru M. Sudharsan, Pl.No.37, Parvathi Nagar, 3 rd street, Madampakkam, Chennai.	Kundiyanthanda lam	178/1B2,178 /1C1,178/1C 2,178/1D1,1 78/1D1,178/ 1D2, 178/1D4,181 /1C1,181/1C 2 & 181/1G1	3.25.0	17.09.2018 to 16.09.2023
A-2	Thiru.A. Aron Samuvel S/o.Arockiyathan, No.15, Sessa Nagar, Poovirnthavalli, Chennai-600 056	Kundiyanthanda lam	176/6A,176/ 6B,176/7A,1 76/7B,176/7 C,176/9A & 176/9B	1.83.5	17.09.2018 to 16.09.2023
A-3	Thiru. E. Paneerselvam S/o. Elumalai, 89, Vanniya mettu St, Arpakkam Village, Kanchipuram District	Kundiyanthanda lam	187/3	1.43.0	14.09.2017 to 13.09.2022
TOTAL CLUSTER EXTENT				17.09.5	

- 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 Project	M/s.Gugan Mines Rough Stone and Gravel Quarry
S.F. No.	182/1a, 1b1,1b2,2, 183, 184,185 and 186/2
Extent	4.05.0 ha
Village,Taluk and District	Kundiyanthandalam Village, Vembakkam Taluk, Tiruvannamalai District.
Land Type	It is a patta lands, registered in the name of the Thiru.V.Venkateshan, Thiru.J.Mathankumar, Thiru.P.Lokesh , Thiru.M.Karthik vide patta Nos.869,734,863,879,875 & 872
Toposheet No	57 P/10

Latitude between	12° 43' 42.35"N to 12° 43' 50.05"N	
Longitude between	79° 42' 58.59"E to 79° 43' 11.68"E	
Elevation of the area	97m AMSL	
Lease period	5 Years	
Mining Plan period	5 years	
Proposed Depth of Mining	49m bgl (4m Gravel + 45m Rough stone)	
Geological Resources	Rough Stone in m ³	Gravel m ³
	18,21,960	1,61,952
Mineable Reserves	5,92,560	1,21,188
Year wise Production for first five years	5,92,560	1,21,188
Peak Production	1,32,110	51,688
Ultimate Pit Dimension	Pit – 1: 140m (L) X 233m (W) X 49m BGL(D) Pit – 2: 64m (L) X 53m (W) X 24m BGL(D)	
Water Level in the region	59-63m bgl	
Method of Mining	Opencast Mechanized Mining Method involving drilling and Controlled blasting using Slurry Explosives	
Topography	The lease applied area is plain terrain. The area has gentle sloping towards Northeastern side and altitude of the area is 97m above from Mean Sea level. The area is covered by 4m thickness of Gravel and followed by Massive Charnockite which is clearly inferred from the surface outcrops & nearby existing quarry pit.	
Machinery proposed	Jack Hammer	4 Nos
	Compressor	1 Nos
	Excavator with Bucket and Rock Breaker	2 Nos
	Wagon Drill Machine	2 Nos
	Tippers	4 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	35 Nos	
Project Cost	Rs. 4,85,51,000/-	
EMP Cost	Rs. 19,30,000/-	
Total Project cost	Rs. 5,04,81,000/-	
CER Cost	Rs. 5,00,000/-	
Nearby Water Bodies	Kuttai	210m-NW
	Tank	480m-SW
	Tank	530m-NW
	Odai	700m-NW
	Tank	1km-NE
	cheyyaru River	3.7km-SE
	Palar River	6.3km-NE
	Kuttai	210m-NW
Greenbelt Development Plan	Proposed to plant 2025 Nos of trees considering 500 Nos of trees/ Ha criteria The plantation will be developed around the project site and nearby village roads	

Proposed Water Requirement	2.1 KLD
Nearest Habitation	600m – South west
Nearest Reserve Forest	Marudham R.F – 8.2 Km – SE (Source - TNGIS)
Nearest Wild Life Sanctuary	Karikili Birds Sanctuary – 14 Km – SE Vedanthangal Birds Sanctuary + 5km Safety distance – 20km - SE

Source: Approved Mining Plan

TABLE 7.7: SALIENT FEATURES OF PROPOSAL “E1”

Name of the Mine	Thiru. K. Chandrasekaran Rough Stone & Gravel Quarry	
Land Type	Patta Land	
S.F. Nos	163/1A, 163/1B, 163/2, 163/3, 163/4, 163/7, 163/8A, 163/9, 163/10A, 163/10B & 163/11	
Village	Kundiyanthandalam Village	
Extent	1.97.5 ha	
Geological Reserves	Rough Stone	Gravel
	7,66,160 m ³	57,462 m ³
Mineable Reserves	Rough Stone	Gravel
	1,54,025 m ³	31,899 m ³
Mining Plan Period / Lease Period	5 Years	
Ultimate Pit Dimension	Pit – I 127 m (L) * 105 m (W) * 43 m (D)	
Toposheet No	57 P/10	
Latitude	12°43'59.73" N 12°44'06.66" N	
Longitude	79°43'01.36" E 79°43'06.10" E	
Machinery proposed	Jack Hammer	8
	Compressor	2
	Hydraulic Excavator	1
	Tipplers	3
Blasting	Usage of Slurry Explosive with MSD detonators	
Manpower Deployment	29 Nos	
Total Project Cost	Project Cost	Rs. 28, 86,825/-
	EMP Cost	Rs. 3,80,000/-
	Total	Rs. 32,66,825/-

Source: Approved Mining Plan

TABLE 7.8: SALIENT FEATURES OF PROPOSAL “E2”

Name of the Quarry	Thiru. R.Nethaji Rough Stone & Gravel Quarry	
Toposheet No	57- P/10	
Latitude between	12°43'52.00"N to 12°43'57.88"N	
Longitude between	79°43'16.02"E to 79°43'23.25"E	
Geological Resources	Rough Stone in m ³	Gravel m ³
	1326400	37,800
Mineable Reserves	Rough Stone in m ³	Gravel m ³
	258975	40610
Year-wise production	Rough Stone in m ³	Gravel m ³
	258975	40610
Ultimate Pit Dimension	127 (L) * 81 (W) * 38 (D)	
Method of Mining	Opencast Mechanized Mining Method involving drilling and blasting	
Machinery proposed	Jack Hammer	4 Nos
	Compressor	1 No
	Hydraulic Excavator	1 No
	Tipplers	2 Nos

Proposed Manpower Deployment	16
Project Cost	41.65 lakhs

Source: Approved Mining Plan

TABLE 7.7: SALIENT FEATURES OF PROPOSAL “E3”

Name of the Mine	M/s.Bhuvaneswari Blue Metals	
Geological Resources	Rough Stone & Gravel	
	7,66,840 m ³	40,360 m ³
Mineable Reserves	Rough Stone	Gravel
	3,02,309 m ³	30,956m ³
Mining Plan Period / Lease Period	5 Years	
Ultimate Pit Dimension	100 m (L) * 112 m (W) * 40 m (D)	
Toposheet No	57-P/10	
Latitude between	12°43'48.1"N to 12°43'53.6"N	
Longitude between	79°43'02.02"E to 79°43'08.09"E	
Highest Elevation	100 m AMSL	
Machinery proposed	Jack Hammer	4 Nos
	Compressor	1 No
	Hydraulic Excavator	1 No
	Tippers	5 Nos
Blasting	Usage of Slurry Explosive with MSD detonators	
Manpower Deployment	15 Nos	
Total Project Cost	Total Project	Rs. 39, 80,250/-

Source: Approved Mining Plan

TABLE 7.8: SALIENT FEATURES OF PROPOSAL “E4”

Name of the Mine	Thiru. A. Dasarathan Rough Stone & Gravel Quarry			
Geological Resources	Rough Stone		Gravel	
	12,98,250 m ³		57,700	
Mineable Reserves	Rough Stone		Gravel	
	4,60,700 m ³		46,462 m ³	
Mining Plan Period / Lease Period	5 Years			
Ultimate Pit Dimension	Pit I	243 m (L)	101 m (W)	42 m (D)
Toposheet No	57-P/10			
Latitude between	12°43'42.20"N to 12°4351.08"N			
Longitude between	79°42'54.37"E to 79°42'59.68"E			
Highest Elevation	104 m AMSL			
Machinery proposed	Jack Hammer		8 Nos	
	Compressor		2 Nos	
	Excavator with Bucket and Rock Breaker		2 Nos	
	Tippers		4 Nos	
Blasting	Usage of Slurry Explosive with MSD detonators			
Manpower Deployment	32 Nos			
Total Project Cost	Project cost		Rs 48,39,015/-	
	EMP Cost		Rs 3, 80,000/-	
	Total		Rs 52,19,015/-	

Source: Approved Mining Plan

TABLE 7.7: SALIENT FEATURES OF PROPOSAL “E5”

Name of the Mine	Thiru. K. Moorthy Rough Stone and Gravel Quarry
Toposheet No	58-P/10

Latitude Between	12°43'53.51"N to 12°44'01.45"N	
Longitude Between	79°42'54.86"E to 79°43'05.68"E	
Highest Elevation	88 m AMSL	
Proposed Depth of Mining	22m	
Water Level in the surrounds area	52 – 57m bgl	
Method of Mining	Opencast Mechanized Mining Method involving drilling and blasting	
Topography	The lease applied area is flat terrain. The gradient is gentle towards Northwest side and altitude of the area is 88m above from Mean sea level. The area is covered by 2m thickness of Gravel and followed by Massive Charnockite which is clearly inferred from nearby quarry pit.	
Machinery Proposed	Jack Hammer	4
	compressor	1
	Excavator bucket & Rock breaker attached	1
	Tippers	3
Proposed 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.	
Manpower Proposed	21 Nos	
Mining Plan Period / Lease Period	5Years/10Years	
Ultimate Pit Dimension	Pit-I	156m (L) x 38m (W) x 17m (D)
	Pit-II	61m (L) x 48m (W) x 22m (D)
	Pit-III	67m (L) x 168m (W) x 32m (D)
Nearby Water Bodies	Kuttai	50m Safety
	Varadi Kuttai	50m Safety
	Tank	270m NW
	Tank	1km North East
	Kuttai	1.2km North east
	Tank	1.4km North East
500 m Radius Quarries	Proposed Quarries – 6 No (20.68.94 ha) Existing Quarries – 5 No (9.96.5ha)	
Project Cost	Rs. 62,85,000/-	
CER Cost @ 2% of Project Cost	Rs 1,26,000/-	
Greenbelt Development Plan	Proposed to plant 1800 trees in Safety Zone, approach and village roads	
Nearest Reserve Forest	Nil	
Proposed Water Requirement	4.0 KLD	
Nearest Habitation	800m SW	
	Rough Stone in m³	Gravel in m³
Geological Resources in m ³	11,04,000	73,600
Mineable Reserves in m ³	2,73,800	38,404

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 7.11: 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	592560	118512	395	33
Total	592560	118512	395	33
E1	154025	30805	103	9

E2	258975	51795	173	14
E3	302309	60462	202	17
E4	460700	92140	307	26
E5	273800	54760	183	15
Total	1449809	289962	968	81
Grand Total	2042369	408474	1363	114

TABLE 7.12: 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	121188	40396	135	11
Total	121188	40396	135	11
PROPOSED PRODUCTION OF GRAVEL				
E1	31899	10633	35	3
E2	40610	13537	45	4
E3	30956	10319	34	3
E4	46462	15487	52	4
E5	38404	12801	43	4
Total	188331	62777	209	18
Grand Total	309519	103173	344	29

On a cumulative basis considering the proposed quarries, it can be seen that the overall production of Rough Stone is 1363m³ per day and overall production of Gravel is 344m³ per day with a capacity of 114 trips of Rough Stone per day and 29 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 3 years 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 3 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 7.14: 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	0.078815466	g/s
	Blasting	Point Source	0.000735651	g/s
	Mineral Loading	Point Source	0.042169729	g/s
	Haul Road	Line Source	0.00249146	g/s/m
	Overall Mine	Area Source	0.055785960	g/s
Estimated Emission Rate for SO ₂	Overall Mine	Area Source	0.000618734	g/s
Estimated Emission Rate for NO _x	Overall Mine	Area Source	0.000032978	g/s
EMISSION ESTIMATION FOR QUARRY "E1"				
Estimated Emission Rate for PM ₁₀	Activity	Source type	Value	Unit
	Drilling	Point Source	0.086066941	g/s
	Blasting	Point Source	0.001142342	g/s
	Mineral Loading	Point Source	0.042852338	g/s
	Haul Road	Line Source	0.00249308	g/s/m

	Overall Mine	Area Source	0.052402218	g/s
Estimated Emission Rate for SO ₂	Overall Mine	Area Source	0.000725525	g/s
Estimated Emission Rate for NO _x	Overall Mine	Area Source	0.000033235	g/s
EMISSION ESTIMATION FOR QUARRY “E2”				
Estimated Emission Rate for PM ₁₀	Activity	Source type	Value	Unit
	Drilling	Point Source	0.059504712	g/s
	Blasting	Point Source	0.000180456	g/s
	Mineral Loading	Point Source	0.038389275	g/s
	Haul Road	Line Source	0.002485795	g/s/m
	Overall Mine	Area Source	0.042293051	g/s
Estimated Emission Rate for SO ₂	Overall Mine	Area Source	0.000230059	g/s
Estimated Emission Rate for NO _x	Overall Mine	Area Source	0.000006799	g/s
EMISSION ESTIMATION FOR QUARRY “E3”				
Estimated Emission Rate for PM ₁₀	Activity	Source type	Value	Unit
	Drilling	Point Source	0.059504712	g/s
	Blasting	Point Source	0.001142342	g/s
	Mineral Loading	Point Source	0.042852338	g/s
	Haul Road	Line Source	0.00249308	g/s/m
	Overall Mine	Area Source	0.002497184	g/s
Estimated Emission Rate for SO ₂	Overall Mine	Area Source	0.065517489	g/s
Estimated Emission Rate for NO _x	Overall Mine	Area Source	0.00105998	g/s
EMISSION ESTIMATION FOR QUARRY “E4”				
Estimated Emission Rate for PM ₁₀	Activity	Source type	Value	Unit
	Drilling	Point Source	0.097923864	g/s
	Blasting	Point Source	0.002177996	g/s
	Mineral Loading	Point Source	0.044241262	g/s
	Haul Road	Line Source	0.002497184	g/s/m
	Overall Mine	Area Source	0.065517489	g/s
Estimated Emission Rate for SO ₂	Overall Mine	Area Source	0.00105998	g/s
Estimated Emission Rate for NO _x	Overall Mine	Area Source	0.000078234	g/s
EMISSION ESTIMATION FOR QUARRY “E5”				
Estimated Emission Rate for PM ₁₀	Activity	Source type	Value	Unit
	Drilling	Point Source	0.087446953	g/s
	Blasting	Point Source	0.001236909	g/s
	Mineral Loading	Point Source	0.042365900	g/s
	Haul Road	Line Source	0.002491902	g/s/m
	Overall Mine	Area Source	0.053051726	g/s
Estimated Emission Rate for SO ₂	Overall Mine	Area Source	0.00067037	g/s
Estimated Emission Rate for NO _x	Overall Mine	Area Source	0.000031737	g/s

Source: Emission Calculation

TABLE 7.15: INCREMENTAL & RESULTANT GLC WITHIN CLUSTER

PM₁₀ in µg/m³	
Background	44.7
Incremental	14.82
Resultant	59.52
NAAQ Norms	100 µg/m³
PM_{2.5} in µg/m³	

Background	20.5
Incremental	6.90
Resultant	27.4
NAAQ Norms	60 µg/ m³
So2 in µg/m³	
Background	6.3
Incremental	1.79
Resultant	8.09
NAAQ Norms	80 µg/ m³
No2 in µg/m³	
Background	21.3
Incremental	9.85
Resultant	31.15
NAAQ Norms	80 µg/ m³

Noise Environment –

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

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

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

Where:

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

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

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

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 7.16: 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)
Habitation Near P1	48.2	47.3	46.3	55
Habitation Near E1	36.5	48.1	48.4	
Habitation Near E2	37.5	48.2	48.3	
Habitation Near E3	36.8	49.2	49.1	
Habitation Near E4	37.4	48.5	48.6	
Habitation Near E5	35.4	47.4	47.7	

Source: Lab Monitoring Data

The incremental noise level is found within the range of 48.1 – 47.3 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 4 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 4 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 nearby the mining areas and may cause injury to persons or damage to the structures. Nearest Habitations from 4 mines respectively are as in below Table 7.21.

TABLE 7.17: NEAREST HABITATION FROM EACH MINE

Location ID	Distance & Direction
Habitation Near P1	600m - SW
Habitation Near E1	1.2km
Habitation Near E2	1.5km
Habitation Near E3	800m
Habitation Near E4	560
Habitation Near E5	800m

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 7.18: GROUND VIBRATIONS AT 6 MINES

Location ID	Maximum Charge in kgs	Nearest Habitation in m	PPV in m/ms
P1	20	600m - SW	0.197
E1	20	1.2km	0.065
E2	20	1.5km	0.046
E3	20	800m	0.124
E4	20	560	0.220
E5	20	800m	0.124

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 6 mines shall contribute towards CER and the community shall develop.

TABLE 7.19: SOCIO ECONOMIC BENEFITS FROM 6 MINES

Location ID	Project Cost	CER
P1	50481000	Rs.5,00,000
E1	Rs. 32,66,825/-	Rs 65,300/-
E2	Rs 41, 65,000/-	Rs 83,300/-
E3	Rs. 39, 80,250/-	Rs 79,600/-
E4	Rs.52,19,015/-	Rs.1,04,380/-
E5	Rs.62,85,000/-	Rs.1,26,000 /-
Total	Rs. 2,29,16,090/-	Rs.9,58,580/-

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/-**
-

TABLE 7.20: EMPLOYMENT BENEFITS FROM 6 MINES

Description	Employment
P1	35
Total	35
E1	29
E2	16
E3	15
E4	32
E5	21
Total	113
Grand Total	148

A total of 35 people will get employment due to 1 proposed mines in cluster and 113 people are already employed at existing mines.

TABLE 7.21: GREENBELT DEVELOPMENT BENEFITS FROM 6 MINES

CODE	No of Trees proposed to be planted	Area Covered Sq.m	Name of the Species
P1	2025	The safety zone along the boundary barrier has been identified to be utilized for Greenbelt development	Neem, Vilvam, Panai, Ashokha etc.,
Total	2025		
E1	990		
E2	1225		
E3	1030		
E4	1445		
E5	1840		
Total	6530		
G.Total	8555		

Based on the Proposed Mining Plans it's anticipated that there shall growth of native species of Neem, Vilvam, Panai, Ashokha etc. in the Cluster at a rate of 8555 Trees Planted over a period of 5 Years with Survival Rate of 80% by proposed quarry.

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 7.22: 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

8.PROJECT BENEFITS

8.0 GENERAL

The Proposed Project for Quarrying Rough Stone and Gravel at Kundiyanthandalam Village aims to produce 5,92,560m³ Rough Stone over a period of 5 Years and Gravel 1,21,188 m³ for period of 3 years. This will enhance the socio-economic activities in the adjoining areas and will result in the following benefits.

- ▣ Increase in Employment Potential
- ▣ Improvement in Socio-Economic Welfare
- ▣ Improvement in Physical Infrastructure
- ▣ Improvement in Social infrastructure

8.1 EMPLOYMENT POTENTIAL

It is proposed to provide employment to about 35 persons for carrying out mining operations and give preference to the local people in providing employment in the three proposed quarries in the cluster. 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 proposed quarries are located in Kundiyanthandalam Village, Vembakkam Taluk and Tiruvannamalai 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 proposed mine.

- 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.,

CORPORATE SOCIAL RESPONSIBILITY

The 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.

CSR Cost Estimation

- CSR activities will be taken up in the Kundiyanthandalam 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

For the existing quarries 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.

Proponent intends to spent Rs 5,00,000/- towards CER for the Government School near the project site the details are given below:

TABLE 8.1 CER – ACTION PLAN

Activity	CER
• Renovation/ Construction of Existing Toilet • Providing Environmental Related books to the school Library • Carrying out plantation and maintenance in the school Ground • Any other requirements in consultation with the school Head master	Rs 5,00,000/-

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 M/s.Gugan Mines 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. 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
Refueling to be undertaken in a safe location, away from vehicle movement pathways & 100 m away of any watercourse Refueling activity to be under visual observation at all times. Drainage of refueling 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 overburden in the form of Gravel which will directly loaded into tippers for the filling and levelling of low-lying areas.

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 mines office. The quarrying operation is proposed upto a depth of 37 m BGL, the water table in the area is 57 m below ground level, hence the proposed project 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 assess 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. 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 1200 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

Year	No. of tress proposed to be planted	Area to be covered	Name of the species
I	2025	The plantation is along the safety distance, village road etc..	Neem, Panai, Vilvam, Ashoka etc.,

Source: Approved Mining plan

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 FOR THE PLANTSATION

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 –

The health status of workers in the mine will 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)					

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.
- 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.
- 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 as per Metalliferous Mines Regulation, 1961.

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 10.10: EMP BUDGET FOR PROPOSED PROJECT

Activities	Mitigation Measure	Provision for Implementation	Capital	Recurring
Air Environment	Compaction, gradation and drainage on both sides for Haulage Road	Rental Dozer & drainage construction on haul road @ Rs. 10,000/- per hectare; and yearly maintenance @ Rs. 10,000/- per hectare	40500	40500
	Fixed Water Sprinkling Arrangements + Water sprinkling by own water tankers	Fixed Sprinkler Installation and New Water Tanker Cost for Capital; and Water Sprinkling (thrice a day) Cost for recurring	800000	50000
	Muffle blasting – To control fly rocks during blasting	Blasting face will be covered with sand bags / steel mesh / old tyres / used conveyor belts	0	5000
	Wet drilling procedure / latest eco-friendly drill machine with separate dust extractor unit	Dust extractor @ Rs. 25,000/- per unit deployed as capital & @ Rs. 2500 per unit recurring cost for maintenance - 4 Units	100000	10000
	No overloading of trucks/tippers/tractors	Manual Monitoring through Security guard	0	5000
	Stone carrying trucks will be covered by tarpaulin	Monitoring if trucks will be covered by tarpaulin	0	10000
	Enforcing speed limits of 20 km/hr within ML area	Installation of Speed Governors @ Rs. 5000/- per Tipper/Dumper deployed - 4Units	20000	1000
	Regular monitoring of exhaust fumes as per RTO norms	Monitoring of Exhaust Fumes by Manual Labour	0	5000
	Regular sweeping and maintenance of approach roads for at least about 200 m from ML Area	Provision for 2 labours @ Rs.10,000/labour (Contractual) per Hectare	0	81000
	Installing wheel wash system near gate of quarry	Installation + Maintenance + Supervision	50000	20000

Noise Environment	Source of noise will be during operation of transportation vehicles, HEMM for this proper maintenance will be done at regular intervals.	Provision made in Operating Cost	0	0
	Oiling & greasing of Transport vehicles and HEMM at regular interval will be done	Provision made in Operating Cost	0	0
	Adequate silencers will be provided in all the diesel engines of vehicles.	Provision made in Operating Cost	0	0
	It will be ensured that all transportation vehicles carry a fitness certificate.	Provision made in Operating Cost	0	0
	Safety tools and implements that are required will be kept adequately near blasting site at the time of charging.	Provision made in OHS part	0	0
	Line Drilling all along the boundary to reduce the PPV from blasting activity and implementing controlled blasting.	Provision made in Operating Cost	0	0
	Proper warning system before blasting will be adopted and clearance of the area before blasting will be ensured.	Blowing Whistle by Mining Mate / Blaster / Compentent Person	0	0
	Provision for Portable blaster shed	Installation of Portable blasting shelter	50000	2000
	NONEL Blasting will be practiced to control Ground vibration and fly rocks	Rs. 30/- per 6 Tonnes of Blasted Material	0	1540656
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 for garland drain @ Rs. 10,000/- per Hectare with	40500	5000

		maintenance of Rs. 5,000/- per annum		
	2. Progressive Closure Activity Barbed Wire Fencing to quarry area will be provisioned.	Per Hectare fencing Cost @ Rs. 2,00,000/- with Maintenance of Rs 10,000/- per annum	810000	10000
	3. Progressive Closure Activity Green belt development - 500 trees per one hectare - Proposal for 2025 Trees - 760 Inside Lease Area & 1265 Outside Lease Area)	Site clearance, preparation of land, digging of pits / trenches, soil amendments, transplantation of saplings @ 200 per plant (capital) for plantation inside the lease area and @ 30 per plant maintenance (recurring)	152000	22800
		Avenue Plantation @ 300 per plant (capital) for plantation outside the lease area and @ 30 per plant maintenance (recurring)	379500	37950
	4. Implementation of Final Mine Closure Activity as per Approved Mining Plan on Last Year	Few activities already covered as progressive closure activities as greenbelt development, wire fencing, garland drain. *For Final Closure Activities 15% of the proposed closure cost will be spent during the final mine closure stage - Last Year	139500	0
	5. Contribution towards Green Fund. As per TNMMCR 1959, Rule 35 A	The Contribution towards Green Funds @ 10% of Seigniorage fee are indicated as part of EMP Budge and not necessarily implemented in the Project Site	5333040	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	50000
	Workers will be provided with Personal Protective Equipment's	Provision of PPE @ Rs. 4000/- per employee with recurring based on wear and tear (say, @ Rs. 1000/- per employee) - 35 Employees	140000	35000
	Health check up for workers will be provisioned	IME & PME Health check up @ Rs. 1000/- per employee	0	35000
	First aid facility will be provided	Provision of 2 Kits per Hectare @ Rs. 2000/-	0	8100
	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	Parking area with shelter and flags @ Rs. 50,000/- per hectare project and Rs. 10,000/- as maintenance cost	202500	10000
	Installation of CCTV cameras in the mines and mine entrance	Camera 4 Nos, DVR, Monitor with internet facility	30000	5000
	Implementation as per Mining Plan and ensure safe quarry working	Mines Manager (1 st Class / 2 nd Class / Mine Foreman) under regulation 34 / 34 (6) of MMR, 1961 and Mining Mate under regulation 116 of MMR, 1961 @ 40,000/- for	0	780000

		Manager & @ 25,000/- for Foreman / Mate		
CER	As per MoEF &CC OM 22-65/2017-IA.III Dated 25.02.2021	Detailed Description in following slides and Budget allocation is included as per MoeEF & CC OM	500000	0
TOTAL			3345000	2794006

*Marked cost is already discussed in the mining plan hence that is not included in the total Environmental Management plan cost Total Cost for the five years.

Year	Total Cost
1st	₹ 61,39,006/-
2nd	₹ 29,33,706/-
3rd	₹ 30,80,392/-
4th	₹ 32,34,411/-
5th	₹ 35,35,632/-

Total Cost for 5 years – **Rs.189 Lakhs**

Cost inflation 5% per annum

Note: This Environmental Management plan cost will vary according to the public consultation comments

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

This EIA & EMP report prepared for the proposed Rough Stone and Gravel Quarry project located in S.F. No 182/1A, 1B1, 1B2, 2, 183, 184, 185, 186/2, Kundiyanthandalam Village, Vembakkam Taluk and Tiruvannamalai District belongs to M/s.Gugan Mines the Project falls in the Cluster category consist of 1 Proposed, 5 Existing Quarries 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.

The proposed project is 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”.

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 December 2024 to February 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 nearly 35 people directly in the proposed projects and indirectly around 70 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 M/s.Gugan Mines Rough Stone and Gravel Quarry (Extent – 4.05.0 ha).

12. DISCLOSURE OF CONSULTANT

M/s.Gugan Mines have engaged with 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

This EIA/EMP for M/s.Gugan Mines Rough Stone & Gravel Quarry over an Extent of 4.05.0 ha in Kundiyanthandalam Village of Vembakkam Taluk, Tiruvannamalai District of Tamil Nadu is prepared as per the Generic Structure of EIA Guidelines manual. 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:

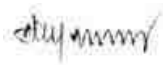
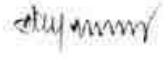


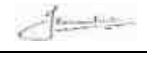
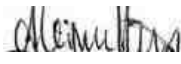
Period of Involvement: **August 2024 to till date**

Associated Team Member with EIA Coordinator:

1. **Mr.P. Viswanathan**
2. **Mr. M. Santhoshkumar**
3. **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>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 Cluster EIA/EMP for M/s.Gugan Mines Rough Stone & Gravel Quarry over an Extent of 4.05.0ha in Kundiyanthandalam Village of Vembakkam Taluk, Tiruvannamalai 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/RA 0276 Dated: 20-2-2023

Validity:

Valid till 06.08.2025