DRAFT ENVIRONMENTAL IMPACT ASSESSMENT

&

ENVIRONMENT MANAGEMENT PLAN

FOR OBTAINING

Environmental Clearance under EIA Notification – 2006
Schedule Sl. No. 1 (a) (i): Mining Project

"B1" CATEGORY– MINOR MINERAL – CLUSTER – PATTA LAND - FRESH QUARRY

Cluster Extent – 6.56.5 Ha

(2 Proposed + 1 Existing Quarries)

Extent – 3.86.0 Ha

Project Proponent

Thiru. N. Dharmalingam,

S/o. Nadeshagounder,

No. 398, Bajanai Koil Street, Sithalapakkam Village,

Arasanipalai Post, Vembakkam Taluk,

Tiruvannamalai District – 631 702.

THIRU. N. DHARMALINGAM ROUGH STONE AND GRAVEL QUARRY

PROJECT LOCATION	PROPOSED PRODUCTION
S.F.Nos.: 27/1, 2, 3, 4, 28/1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 28/11A, Sithalapakkam Village, Vembakkam Taluk, Tiruvannamalai District, Tamil Nadu.	**Reserves:** 6,04,110 m^3 of Rough Stone, 1,18,372 m^3 of Weathered rock & 63,956 m^3 of Gravel Peak Production = 1,40,375m^3 of Rough Stone, 49,692 m^3 of Weathered rock, 27,606 m^3 of Gravel Proposed Depth = 50m bgl

File No.11814, ToR Identification: TO25B0108TN5235140N Dated: 07.04.2025

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: infogeoexploration@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.

Baseline Monitoring Period

MARCH TO MAY 2025

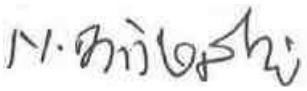
MAY 2025

UNDERTAKING

I, Thiru. N. Dharmalingam given undertaking that this EIA & EMP report prepared for our Rough Stone and Gravel Quarry situated in S.F. No 27/1, 2, 3, 4, 28/1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 28/11A, over an extent of 3.86.0 Ha in Sithalapakkam Village, Vembakkam Taluk, Tiruvannamalai District based on the ToR issued by the State Level Environmental Impact Assessment Authority (SEIAA), Tamil Nadu vide File No.11814 ToR Identification: TO25B0108TN5235140N Dated: 07.04.2025.

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. N. Dharmalingam

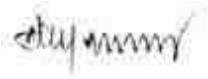
Place: Tiruvannamalai
Dated:

DECLARATION

I Dr.P. Thangaraju – EIA Coordinator declare that the EIA & EMP report for the Rough Stone and Gravel Quarry S.F. No 27/1, 2, 3, 4, 28/1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 28/11A, over an extent of 3.86.0 Ha in Sithalapakkam 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. P.Thangaraju
Managing Partner

M/s. Geo Exploration and Mining Solutions

Place: Salem
Dated:

For easy represantation 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	Thiru. N.Dharmalingam, S/o. Nadesh Gounder, No. 398, Bajanai Kovil Street, Arasanipalai post, Chithalapakkam Village, Vembakkam Taluk, Tiruvannamalai District –	Chithalapakkam	27/1, 2, 3, 4, 28/1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 28/11A,	3.86.0	File No.11814 ToR Identification: TO25B0108TN5235140 N Dated: 07.04.2025.
P2	Thiru G. Manavalan, S/o,Govindanaidu,No.22,Gan gaiamman Kovil street, Urapakkam, Chengalpattu District-603 210	Chithalapakkam	29/1A	0.69.0	-
			TOTAL EXTENT	**4.55.0 ha**	
EXISTING QUARRIES					
CODE	**Name of the Owner**	**Village**	**S.F. Nos**	**Extent in Ha**	**Status**
E-1	Thiru G. Manavalan, S/o,Govindanaidu, No.294, Perumal Koilstreet,Thenagkulam Village,Valajapath Taluk,Kancheepuram.	Chithalapakkam	28/12& 28/13	2.01.5	17.11.2021 to 16.11.2031
			TOTAL EXTENT	**2.01.5ha**	
ABANDONED QUARRY					
CODE	**Name of the Owner**	**Village**	**S.F. Nos**	**Extent in Ha**	**Status**
A-1	Thiru Ganesh Kaskar, Executive Director, RMC ready mix (India), SIDCO Industrial Estate, Thirumudivakkam,Chennai	Chithalapakkam	16/2B,16/8,17/2,8 ,9,10,11,12,13,14, 15,16A,16B,18/1, 2,3A,3B,3C34,5,6 ,7,8,9,10,11 & 13	**4.23.5**	14.07.2014 to 13.07.2019
A-2	Thiru E. Muthukrishnan	Chithalapakkam	16/6,16/7 & 17/1	**1.26.0**	22.11.2018 to 23.11.2023
A-3	R.Elumalai	Magaral-B	694/3I,694/3N,69 4/3H & 694/3O	**0.77.5**	02.03.2015 to 01.03.2020
A-4	K.Samiyappan	Magaral-B	702/2	**2.02.50**	30.06.2018 to 29.06.2023
			TOTAL EXTENT	**8.29.50**	
			TOTAL CLUSTER EXTENT	**6.56.50**	

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

TERMS OF REFERENCE (ToR) COMPLIANCE

Thiru.N.Dharmalingam

File No.11814 TOR Identification No. TO25B0108TN5235140N Dated:07.04.2025

SPECIFIC CONDITIONS		
1	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.
2	The Boundary pillars to be erected as per the mine rules and the evidence should be submitted along with the EIA report.	**Noted & agreed.** PP confirm that the boundary pillars have been erected as per mining rules. The evidence will be submitted along with the in this EIA report.
3	Since waterbodies are situated nearby, the PP shall carry out the hydrological study including the details of waterflow pattern to determine the impacts of the mining operation in the waterbodies.	**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
4	The details of enumeration of structures including schools, colleges, primary health centres should be submitted along with the EIA report	**Noted & agreed.**
5	The structures within the radius of (i) 50 m, (ii) 100 m, (iii) 200 m and (iv) 300 m & upto 1km 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. and spell out the mitigation measures to be proposed for the protection of the above structures, if any during the quarrying operations	**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
6	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.
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 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 & agreed.** PP agreed to conduct an extensive study on the cumulative environmental effects of both existing and proposed quarries, which encompasses activities such as drilling and

		blasting, as well as loading and hauling, on the adjacent village.
10	The PP shall prepare a conceptual working plan accommodating the inclusion of haul road accessibility keeping the benches intact, by ensuring the slope stability of the working benches to be constructed and existing quarry wall.	**Noted & agreed.** The Project Proponent (PP) agreed to prepare a detailed conceptual working plan that incorporates haul road accessibility while maintaining the integrity of the working benches. The plan will ensure slope stability of both the proposed benches to be constructed and the existing quarry walls.
11	The PP shall install the CCTV camera for the continuous surveillance of mining activity & furnish the photographic/videographic evidence along with the EIA report.	**Noted & agreed.** The Project Proponent agreed to installing CCTV cameras to ensure continuous surveillance of mining activities. Photographic and videographic evidence generated through the surveillance system will be systematically recorded and will be submitted during the appraisal meeting.
2.SEAC STANDARD CONDITIONS		
1	In the case of existing/operating mines, a letter obtained from the concerned AD (Mines) shall be submitted and it shall include the following: (i) Original pit dimension (ii) Quantity achieved Vs EC Approved Quantity (iii) Balance Quantity as per Mineable Reserve calculated. (iv) Mined out Depth as on date Vs EC Permitted depth (v) Details of illegal/illicit mining (vi) Violation in the quarry during the past working. (vii) Quantity of material mined out outside the mine lease area (viii) Condition of Safety zone/benches (ix) Revised/Modified Mining Plan showing the benches of not exceeding 6 m height and ultimate depth of not exceeding 50m.	Fresh lease
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	**Noted and agreed**

	reserve etc., up to a radius of 25 km from the proposed site.	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 Thiru.N.Dharmalingam
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– 6,19,725 m^3 Peak Production – 1,51,680 m^3 Proposed Depth – 50m bgl
19	The Project Proponent shall provide the Organization chart indicating the appointment of various statutory officials and other competent persons to be appointed as per the provisions of the Mines Act'1952 and the MMR, 1961 for carrying out the quarrying operations scientifically and systematically in order to ensure safety and to protect the environment.	**Noted and agreed.** The PP provided Organization chart indicating the appointment of various statutory officials and other competent persons to be appointed as per the provisions of the Mines Act'1952 and the MMR, 1961
20	The Project Proponent shall conduct the hydro-geological study considering the contour map of the water table detailing the number of groundwater pumping & open wells, and surface water bodies such as rivers, tanks, canals, ponds, etc. within 1 km (radius) along with the collected water level data for both monsoon and non-monsoon seasons from the PWD / TWAD so as to assess the impacts on the wells due to mining activity. Based on actual monitored data, it may clearly be shown whether working will intersect groundwater. Necessary data and documentation in this regard may be provided.	**Noted and agreed** The hydro-geological study was conducted to evaluate the possible impact on the ground water table. No significant impacts are anticipated on the water bodies around the project area. Details are discussed under Chapter No. 3,
21	The proponent shall furnish the baseline data for the environmental and ecological parameters with regard to surface water/ground water quality, air quality, soil quality & flora/fauna including traffic/vehicular movement study	**Noted and agreed** Baseline Data were collected for One Season (Summer) March to May 2025 as per CPCB Notification and MoEF & CC Guidelines. Details in Chapter No. 3
22	The Proponent shall carry out the Cumulative impact study due to mining operations carried out in the quarry specifically with reference to the specific environment in terms of soil health, biodiversity, air pollution, water pollution, climate change and flood control & health impacts. Accordingly, the Environment Management plan should be prepared keeping the concerned quarry and the surrounding habitations in the mind.	**Noted and agreed** The Cumulative impact study due to mining operations is explained in chapter - 7
23	Rain water harvesting management with recharging details along with water balance (both monsoon & non-monsoon) be submitted.	Noted and agreed
24	Land use of the study area delineating forest area, agricultural land, grazing land, wildlife sanctuary, national park, migratory routes of fauna, water bodies, human settlements and other ecological features should be indicated. Land use plan of the mine lease area should be prepared to encompass preoperational, operational	**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

	and post operational phases and submitted. Impact, if any, of change of land use should be given.	
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 1930 nos of trees in the 7.5m safety barrier and village roads.
33	Taller/one-year-old Saplings raised in appropriate size of bags, preferably eco-friendly bags should be planted as per the advice of local forest authorities/botanist/Horticulturist with regard to site specific choices. The proponent shall earmark the greenbelt area with GPS coordinates all along the boundary of the project site with at least 3 meters wide and in between blocks in an organized manner	**Noted and agreed** No trees within the project site. it is proposed to plant 1930 Nos of Trees in the safety barrier and Village roads.

34	A Disaster Management Plan shall be prepared and included in the EIA/EMP Report for the complete life of the proposed quarry (or) till the end of the lease period	**Noted and agreed** Disaster management Plan details in Chapter-7
35	A Risk Assessment and management Plan shall be prepared and included in the EIA/EMP Report for the complete life of the proposed quarry (or) till the end of the lease period	**Noted and agreed** A Risk Assessment and management Plan Chapter- 7
36	Occupational Health impacts of the Project should be anticipated and the proposed preventive measures spelt out in detail. Details of pre-placement medical examination and periodical medical examination schedules should be incorporated in the EMP. The project specific occupational health mitigation measures with required facilities proposed in the mining area may be detailed.	**Noted and agreed** Occupational Health impacts chapter- 10
37	Public health implications of the Project and related activities for the population in the impact zone should be systematically evaluated and the proposed remedial measures should be detailed along with budgetary allocations.	**Noted and agreed** No Public Health Implications anticipated due to this project. Details of CER are discussed under Chapter 8
38	The Socio-economic studies should be carried out within a 5 km buffer zone from the mining activity. Measures of socio-economic significance and influence to the local community proposed to be provided by the Project Proponent should be indicated. As far as possible, quantitative dimensions may be given with time frames for implementation.	**Noted and agreed** It is explained in Chapter -3
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/TNPCB.	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- 7.05km-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	No major trees within the project area.

	trees should be numbered and action suggested for protection	
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 – 12.5 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 9 open wells and 9 bore wells within the radius of 1km from the project area, Hydrogeological study has been conducted by the resistivity method
20	Erosion Control measures	Noted & agreed
21	Detailed study shall be carried out in regard to impact of mining around the proposed mine lease area on the nearby Villages, Water-bodies/ Rivers, & any ecological fragile areas.	Details in Chapter 2
22	The project proponent shall study impact on fish habitats and the food WEB/ food chain in the water body and Reservoir	Details in Chapter 2 and 4 impact of bio diversity
23	The project proponent shall study and furnish the details on potential fragmentation impact on natural environment, by the activities.	Noted & agreed
24	The project proponent shall study and furnish the impact on aquatic plants and animals in water bodies and possible scars on the landscape, damages to nearby caves, heritage site, and archaeological sites possible land form changes visual and aesthetic impacts.	Noted & agreed. Detailed under Chapter 3.
25	The Terms of Reference should specifically study impact on soil health, soil erosion, the soil physical, chemical components and microbial components	Details in Chapter 3 Soil environment.
26	The Environmental Impact Assessment should study on wetlands, water bodies, rivers streams, lakes and farmer sites	Details in Chapter 3 Water environment.
27	The EIA shall include the impact of mining activity on the following: a) Hydrothermal/Geothermal effect due to destruction in the Environment. b) Bio-geochemical processes and its foot prints including environmental stress. c) Sediment geochemistry in the surface streams.	**Noted and agreed** There are 9 open wells and 9 bore wells within the radius of 1km from the project area, Hydrogeological study has been conducted by the resistivity method
Energy		
28	The measures taken to control Noise, Air, Water, Dust Control and steps adopted to efficiently utilise the Energy shall be furnished.	**Noted and agreed** Details in Chapter 3 environmental monitoring details.
Climate Change		
29	The Environmental Impact Assessment shall study in detail the carbon emission and also suggest the measures to mitigate carbon emission including development of carbon sinks and temperature reduction including control of other emission and climate mitigation activities	**Noted and agreed** Details of carbon emission and mitigation activities are given in the Chapter No.4
30	The Environmental Impact Assessment should study impact on climate change, temperature rise, pollution and above soil & below soil carbon stock, soil health and physical, chemical &	**Noted and agreed** Details in Chapter-3 for meteorological and climate/weather data representation of graphs.

	biological soil features	
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 – 1,51,680 m^3 Depth – 50m bgl Mine Lease area – 3.86.0 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 1,51,680 m^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 Summer season March to May 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 though 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

Sno	**ML. project Land use**	**Area under Surface Rights(ha**	**Area Under Mining Rights(ha)**	**Area under Both (ha)**
1	Agriculture Land			
2	Forest Land			
3	Grazing Land			
4	Settlements			
5	Others (Specify)			

S.No	**Details**	**Area (Ha)**
1	Buildings	
2	Infrastructure	
3	Roads	
4	Others (Specify)	
	Total	

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,

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)
Area Under Quarry	Nil	3.22.0	3.10.0
Site Services	Nil	0.01.0	0.01.0
Roads	Nil	0.02.0	0.02.0
Green Belt	Nil	0.38.0	0.38.0
Unutilized Area	3.86.0	0.23.0	0.35.0
Grand Total	**3.86.0**	**3.86.0**	**3.86.0**

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 laborartory and NABET accreditation of the consultant to be provided.

Baseline Data were collected for Summer Season March to May 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 74-76m below ground level. ultimate depth is 50 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 breaku p 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: 3.0 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-3and 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 – 12.5 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 – 7.05 km – South East Total Mine Lease area 3.86.0ha 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 the EIA Notification 1994 came into force, w.r.t. the highest production achieved prior to 1994.	**Not applicable.** This is not a violation category project. This proposal falls under B1 Category
2	A copy of the document in support of the fact that the Proponent is the rightful lessee of the mine should be given.	The applied land for quarrying is a Patta Land. Document is enclosed along with Approved Mining Plan as Annexure Volume 1.

3	All documents including approved mine plan, EIA and Public Hearing should be compatible with one another in terms of the mine lease area, production levels, waste generation and its management, mining technology etc. and should be in the name of the lessee.	**Noted & agreed.**
4	All corner coordinates of the mine lease area, superimposed on a High-Resolution Imagery/ toposheet, topographic sheet, geomorphology and geology of the area should be provided. Such an Imagery of the proposed area should clearly show the land use and other ecological features of the study area (core and buffer zone).	Map showing – Project area is with adjacent quarries details is enclosed in Figure No1.1 Project area boundary coordinates superimposed on Toposheet – Figure No. 1.1A Toposheet of the project area covering 10km radius – Figure No. 1.2 Geology map of the project area covering 10km radius - Figure No. 2.11
5	Information should be provided in Survey of India Toposheet in 1:50,000 scale indicating geological map of the area, geomorphology of land forms of the area, existing minerals and mining history of the area, important water bodies, streams and rivers and soil characteristics.	**Map showing –** Geology map of the project area covering 10km radius - Figure No. 2.11 Geomorphological features are incorporated in the Toposheet map covering 10km radius around the project area Figure No. 2.12
6	Details about the land proposed for mining activities should be given with information as to whether mining conforms to the land use policy of the State; land diversion for mining should have approval from State land use board or the concerned authority.	The applied area was inspected by the officers of Department of Geology along with revenue officials and found that the land is fit for quarrying under the policy of State Government.
7	It should be clearly stated whether the proponent Company has a well laid down Environment Policy approved by its Board of Directors? If so, it may be spelt out in the EIA Report with description of the prescribed operating process/procedures to bring into focus any infringement/deviation/ violation of the environmental or forest norms/conditions? The hierarchical system or administrative order of the Company to deal with the environmental issues and for ensuring compliance with the EC conditions may also be given. The system of reporting of non-compliances / violations of environmental norms to the Board of Directors of the Company and/or shareholders or stakeholders at large, may also be detailed in the EIA Report.	The proponent has framed their Environmental Policy and the same is discussed in the Chapter No 10.1.
8	Issues relating to Mine Safety, including subsidence study in case of underground mining and slope study in case of open cast mining, blasting study etc. should be detailed. The proposed safeguard measures in each case should also be provided.	It is an opencast quarrying operation proposed to operate in Mechanized method. The rough stone formation is a hard, compact and homogeneous body. The height and width of the bench will be maintained as 5m with 90^0 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.
9	The study area will comprise of 10 km zone around the mine lease from lease periphery and the data contained in the EIA such as waste generation etc., should be for the life of the mine / lease period.	**Noted & agreed.** The study area considered for this study is 10 km radius and all data contained in the EIA report such as waste generation etc., is for the Life of the Mine / lease period.
10	Land use of the study area delineating forest area, agricultural land, grazing land, wildlife sanctuary, national park, migratory routes of fauna, water bodies, human settlements and other ecological features should be indicated. Land use plan of the mine lease area should be prepared to encompass preoperational, operational and post operational phases and submitted. Impact, if any, of change of land use should be given.	Land use and land cover of the study area is discussed in Chapter No. 3. Land use plan of the project area showing pre-operational, operational and post-operational phases are discussed in Chapter No. 2, Table No 2.3

11	Details of the land for any Over Burden Dumps outside the mine lease, such as extent of land area, distance from mine lease, its land use, R&R issues, if any, should be given	**Not Applicable.** There is no waste anticipated during this quarry operation. The entire quarried out rough stone will be transported to the needy customers. No Dumps is proposed outside the lease area.
12	A Certificate from the Competent Authority in the State Forest Department should be provided, confirming the involvement of forest land, if any, in the project area. In the event of any contrary claim by the Project Proponent regarding the status of forests, the site may be inspected by the State Forest Department along with the Regional Office of the Ministry to ascertain the status of forests, based on which, the Certificate in this regard as mentioned above be issued. In all such cases, it would be desirable for representative of the State Forest Department to assist the Expert Appraisal Committees.	**Not Applicable.** There is no Forest Land involved in the proposed project area. The proposed project area is a Patta land. Approved Mining Plan is enclosed as Annexure Volume 1.
13	Status of forestry clearance for the broken up area and virgin forestland involved in the Project including deposition of net present value (NPV) and compensatory afforestation (CA) should be indicated. A copy of the forestry clearance should also be furnished.	**Not Applicable.** The proposed project area does not involve any Forest Land.
14	Implementation status of recognition of forest rights under the Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 should be indicated.	**Not Applicable.** The project doesn't attract Recognition of Forest Rights Act, 2006.
15	The vegetation in the RF / PF areas in the study area, with necessary details, should be given.	No Reserve Forest within the Study Area.
16	A study shall be got done to ascertain the impact of the Mining Project on wildlife of the study area and details furnished. Impact of the project on the wildlife in the surrounding and any other protected area and accordingly, detailed mitigative measures required, should be worked out with cost implications and submitted.	**Not Applicable.** There are No National Parks, Biosphere Reserves, Wildlife Corridors, and Tiger/Elephant Reserves within 10 km Radius from the periphery of the project area.
17	Location of National Parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, Ramsar site Tiger/ Elephant Reserves/(existing as well as proposed), if any, within 10 KM of the mine lease should be clearly indicated, supported by a location map duly authenticated by Chief Wildlife Warden. Necessary clearance, as may be applicable to such projects due to proximity of the ecologically sensitive areas as mentioned above, should be obtained from the Standing Committee of National Board of Wildlife and copy furnished	**Not Applicable.** There are no National Parks, Biosphere Reserves, Wildlife Corridors, and Tiger/Elephant Reserves within 10 km Radius from the periphery of the project area.
18	A detailed biological study of the study area [core zone and buffer zone (10 KM radius of the periphery of the mine lease)] shall be carried out. Details of flora and fauna, endangered, endemic and RET Species duly authenticated, separately for core and buffer zone should be furnished based on such primary field survey, clearly indicating the Schedule of the fauna present. In case of any scheduled-I fauna found in the study area, the necessary plan along with budgetary provisions for their conservation should be prepared in consultation with State Forest and Wildlife Department and details furnished. Necessary allocation of funds for implementing the same should be made as part of the project cost.	Detailed biological study of the study area [core zone and buffer zone (10 km radius of the periphery of the mine lease)] was carried out and discussed under Chapter No. 3. There is no schedule I species of animals observed within study area as per Wildlife Protection Act 1972 as well as no species is in vulnerable, endangered or threatened category as per IUCN. There is no endangered red list species found in the study area.
19	Proximity to Areas declared as 'Critically Polluted' or the Project areas likely to come under the 'Aravalli Range', (attracting court restrictions for mining operations), should also be indicated and where so required, clearance	**Not Applicable.** Project area / Study area is not declared in 'Critically Polluted' Area and does not come under 'Aravalli Range.

	certifications from the prescribed Authorities, such as the SPCB or State Mining Department should be secured and furnished to the effect that the proposed mining activities could be considered.	
20	Similarly, for coastal Projects, A CRZ map duly authenticated by one of the authorized agencies demarcating LTL. HTL, CRZ area, location of the mine lease 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 Summer Season March to May 2025 as per CPCB Notification and MoEF & CC Guidelines. Details in Chapter No. 3.
23	Air quality modelling should be carried out for prediction of impact of the project on the air quality of the area. It should also take into account the impact of movement of vehicles for transportation of mineral. The details of the model used and input parameters used for modelling should be provided. The air quality contours may be shown on a location map clearly indicating the location of the site, location of sensitive receptors, if any, and the habitation. The wind roses showing pre-dominant wind direction may also be indicated on the map.	Air Quality Modelling for prediction of incremental GLC's of pollutant was carried out using AERMOD Model. Details in Chapter No. 4,
24	The water requirement for the Project, its availability and source should be furnished. A detailed water balance should also be provided. Fresh water requirement for the Project should be indicated.	Total Water Requirement for this project is given in the chapter No 2, Table No 2.13.
25	Necessary clearance from the Competent Authority for drawl of requisite quantity of water for the Project should be provided.	Water for dust suppression, greenbelt development and domestic use will be obtained from accumulated rainwater/seepage water in mine pits. Drinking water will be sourced from the approved water vendors, No 2, Table No 2.13.

26	Description of water conservation measures proposed to be adopted in the Project should be given. Details of rainwater harvesting proposed in the Project, if any, should be provided.	The rain water collected in the pits after spell of rain will be used for greenbelt development and dust suppression.
27	Impact of the Project on the water quality, both surface and groundwater, should be assessed and necessary safeguard measures, if any required, should be provided.	Impact Studies and Mitigation Measures of Water Quality discussed in Chapter No. 4.
28	Based on actual monitored data, it may clearly be shown whether working will intersect groundwater. Necessary data and documentation in this regard may be provided. In case the working will intersect 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 74-76m below ground level. The ultimate depth of this projects is 50m 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 95m AMSL Ultimate depth of the mine is 51m AMSL Water level in the area is 74-76m BGL
30	Information on site elevation, working depth, groundwater table etc. Should be provided both in AMSL and BGL. A schematic diagram may also be provided for the same.	Progressive greenbelt development plan has been prepared and discussed along with Recommended Species details are given in the Chapter 4, Table No.4.9
31	A time bound Progressive Greenbelt Development Plan shall be prepared in a tabular form (indicating the linear and quantitative coverage, plant species and time frame) and submitted, keeping in mind, the same will have to be executed up front on commencement of the Project. Phase-wise plan of plantation and compensatory afforestation should be charted clearly indicating the area to be covered under plantation and the species to be planted. The details of plantation already done should be given. The plant species selected for green belt should have greater ecological value and should be of good utility value to the local population with emphasis on local and native species and the species which are tolerant to pollution.	Traffic density survey was carried out to analyse the impact of Transportation in the study area as per IRC guidelines 1961 and it is inferred that there is no much significant impact due to the proposed transportation from the project area. Details in Chapter 2.
32	Impact on local transport infrastructure due to the Project should be indicated. Projected increase in truck traffic as a result of the Project in the present road network (including those outside the Project area) should be worked out, indicating whether it is capable of handling the incremental load. Arrangement for improving the infrastructure, if contemplated (including action to be taken by other agencies such as State Government) should be covered. Project Proponent shall conduct Impact of Transportation study as per Indian Road Congress Guidelines.	Infrastructure & other facilities will be provided to the Mine Workers after the grant of quarry lease and the same has been discussed in the Chapter No.2. .
33	Details of the onsite shelter and facilities to be provided to the mine workers should be included in the EIA Report.	Discussed in chapter No 2.
34	Conceptual post mining land use and Reclamation and Restoration of mined out areas (with plans and with adequate number of sections) should be given in the EIA report.	Details in Chapter 10.
35	Occupational Health impacts of the Project should be anticipated and the proposed preventive measures spelt out in detail. Details of pre-placement medical examination and periodical medical examination	Details in Chapter 10.

	schedules should be incorporated in the EMP. The project specific occupational health mitigation measures with required facilities proposed in the mining area may be detailed.	
36	Public health implications of the Project and related activities for the population in the impact zone should be systematically evaluated and the proposed remedial measures should be detailed along with budgetary allocations.	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

LIST OF TABLES

LIST OF FIGURES

1.INTRODUCTION

1.0 PREAMBLE

Project History: -

The project proponent N. Dharmalingam applied for Rough Stone and Gravel Quarry over an extent of 3.86.0 Ha in S.F. No 27/1, 2, 3, 4, 28/1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 28/11A, Sithalapakkam Village, Vembakkam Taluk, Tiruvannamalai District.

- Proponent applied for Rough Stone and Gravel Quarry lease on 19.12.2023
- Precise area communication letter was issued by the District Collector vide Rc. No. 543/Mines/2024, Dated: 30.12.2024
- The Mining plan has been prepared by the Qualified person and got approval vide Letter Rc. No. 543/Mines/2023, Dated: 24.01.2025
- The Mining plan has been approved for the quantity of 6,04,110 m^3 of Rough Stone, 1,18,372$m^3$of Weathered Rock & 63,956m^3 Gravel up to the depth of 50 m 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 - 2 proposal and 1 Exiting quarry forming Cluster Category {Total Extent of the Cluster is 6.56.5 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/522715/2025. dated: 06.02.2025 and obtained Terms of Reference File no.11814 Tor Identification No: TO25B0108TN5235140N Dated 07.04.2025

Based on the ToR Baseline Monitoring study has been carried out for one season ie (**Summer Season**)., **March 2025 to May 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

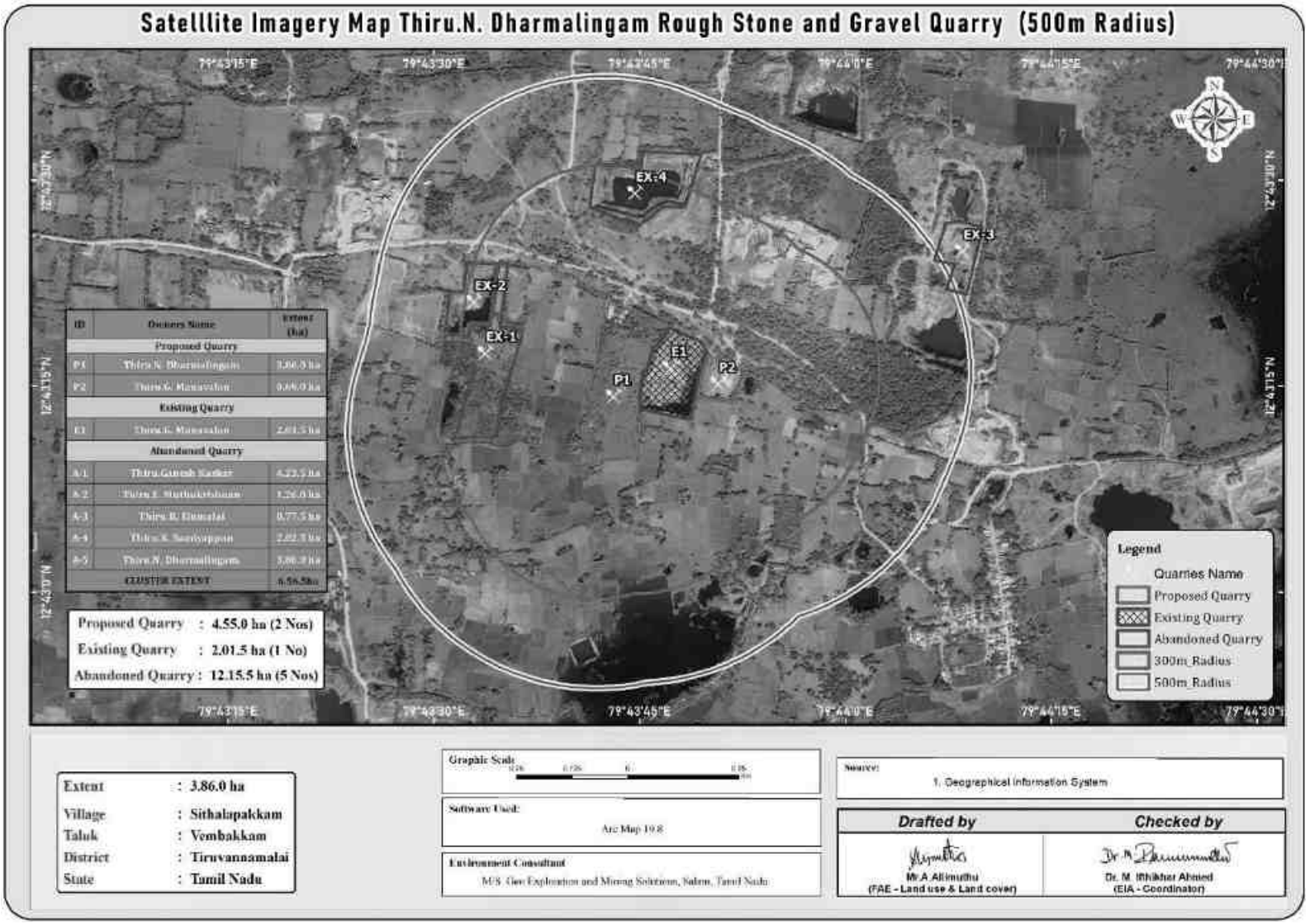
The Ministry of Environment and Forests, Govt. of India, through its EIA notification S.O. 1533(E) of 14th September 2006 and its subsequent amendments as per Gazette Notification S.O. 1889 of 20thApril 2022, Mining Projects are classified under two categories i.e. A (> 250 Ha) and B (≤ 250 Ha), and 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	Thiru.N.Dharmalingam
Address	S/o. Nadeshagounder, No. 398, Bajanai Koil Street, Sithalapakkam Village, Arasanipalai Post, Vembakkam Taluk, Tiruvannamalai District – 631 702
Mobile	+91 89258 46064
Email	dharmalingammines@gamil.com
Status	Individual

1.2.2 Identification of Project

TABLE 1.2: SALIENT FEATURES OF THE PROPOSED PROJECT

Name of the Project	Thiru.N.Dharmalingam Rough Stone and Gravel Quarry		
S.F. No.	27/1, 2, 3, 4, 28/1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 28/11A		
Extent	3.86.0 ha		
Village,Taluk and District	Sithalapakkam Village, Vembakkam Taluk, Tiruvannamalai District.		
Land Type	It is a patta lands, registered in the name of the applicant Thiru. N.Dharmalingam vide patta Nos.454		
Toposheet No	57 P/10		
Latitude between	12° 42' 09.24"N to 12° 42' 21.32"N		
Longitude between	79° 43' 40.30"E to 79° 43' 46.62"E		
Elevation of the area	95m AMSL		
Lease period	5 Years		
Mining Plan period	5 years		
Proposed Depth of Mining	50m bgl (2m Gravel+4m Weathered Rock + 44m Rough Stone)		
Geological Resources	Rough Stone in m^3	Weathered Rock in m^3	Gravel m^3
	25,09,000	1,54,400	77,200
Mineable Reserves	6,19,725	1,18,372	63,956
Year wise Production for five years as per ToR	6,04,110	1,18,372	63,956
Peak Production	1,40,375	49,692	27,606
Ultimate Pit Dimension	294m (L) X 112m (W) X 51m (D) BGL		
Water Level in the region	74-76m bgl		
Method of Mining	Opencast Mechanized Mining Method involving drilling and Controlled blasting using Slurry Explosives		
Topography	The lease applied area is flat terrain. The area has gentle sloping towards Southern side and altitude of the area is 95m above from Mean Sea level. The area is covered by quaternary formation of gravel having an average thickness of 2m,4m weathered rock and followed by Massive Charnockite which is clearly inferred from the nearby existing quarry pit.		
Machinery proposed	Hand Jack Hammer	4 Nos	
	Wagon Drill Machine	2 Nos	
	Compressor	1 No	
	Water Sprinkling Tanker	1 No	
	Excavator with Bucket	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	35Nos	
Project Cost	Rs. 4,58,59,000/-	
EMP Cost	Rs. 19,00,000/-	
Total Project cost	Rs. 4,77,59,000/-	
CER Cost	Rs. 5,00,000/-	
Nearby Water Bodies	Vaikkal	10m Safety North
	Tank	260m SE
	Tangalkulam	260m SW
	Cheyyar	2km SE
	Palar	6.5km NE
	Mamandur Tank	7.2km NW
Greenbelt Development Plan	Proposed to plant 1930 Nos of trees.The plantation will be developed around the project site and nearby village roads	
Proposed Water Requirement	3.0 KLD	
Nearest Habitation	700m – South East	
Nearest Reserve Forest	Marudham R.F – 7.0 Km – SE (Source - TNGIS)	
Nearest Wild Life Sanctuary	Karikili Birds Sanctuary – 12.5 Km – SE Vedanthangal Birds Sanctuary + 5km Safety distance – 18km - 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 1,40,375m^3 maximum in a year (468m^3 per day/ 39 Tippers per day considering 12m^3 per load). The depth of the mining is 50m bgl.

1.3.2 Location of the Project

- The project site is located in Sithalapakkam Village, Vembakkam Taluk and Tiruvannamalai District.
- Lease applied area located about 89.5 km Northeast of Tiruvannamalai town, 16km Southeast of Vembakkam and 800 km Northwestern side of the Sithalapakkam village.

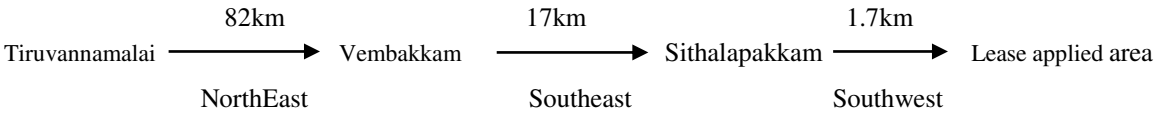
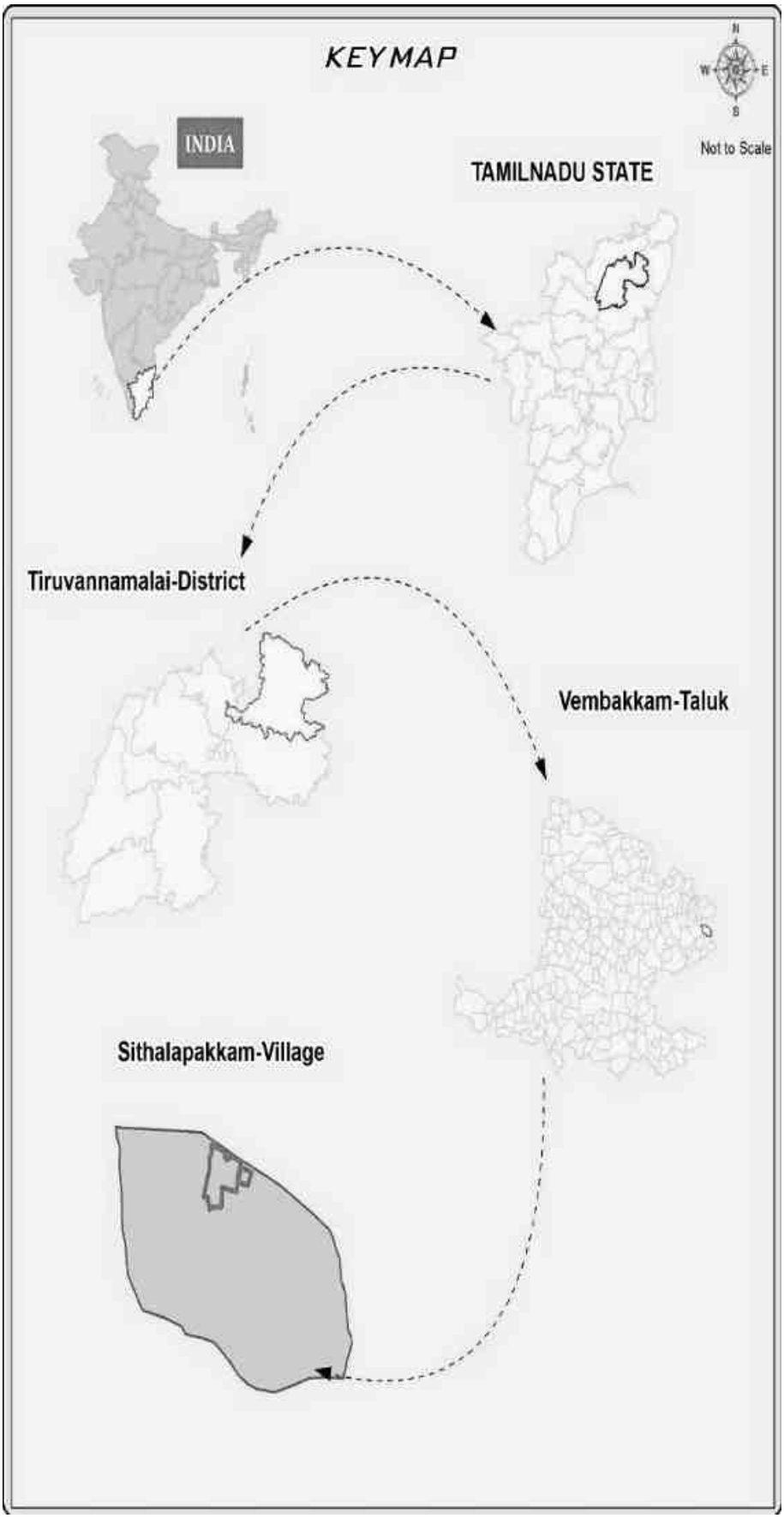


FIGURE 1.2 LOCATION MAP OF THE PROJECT SITE



Source: Survey of India Toposheet 57-P/10

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

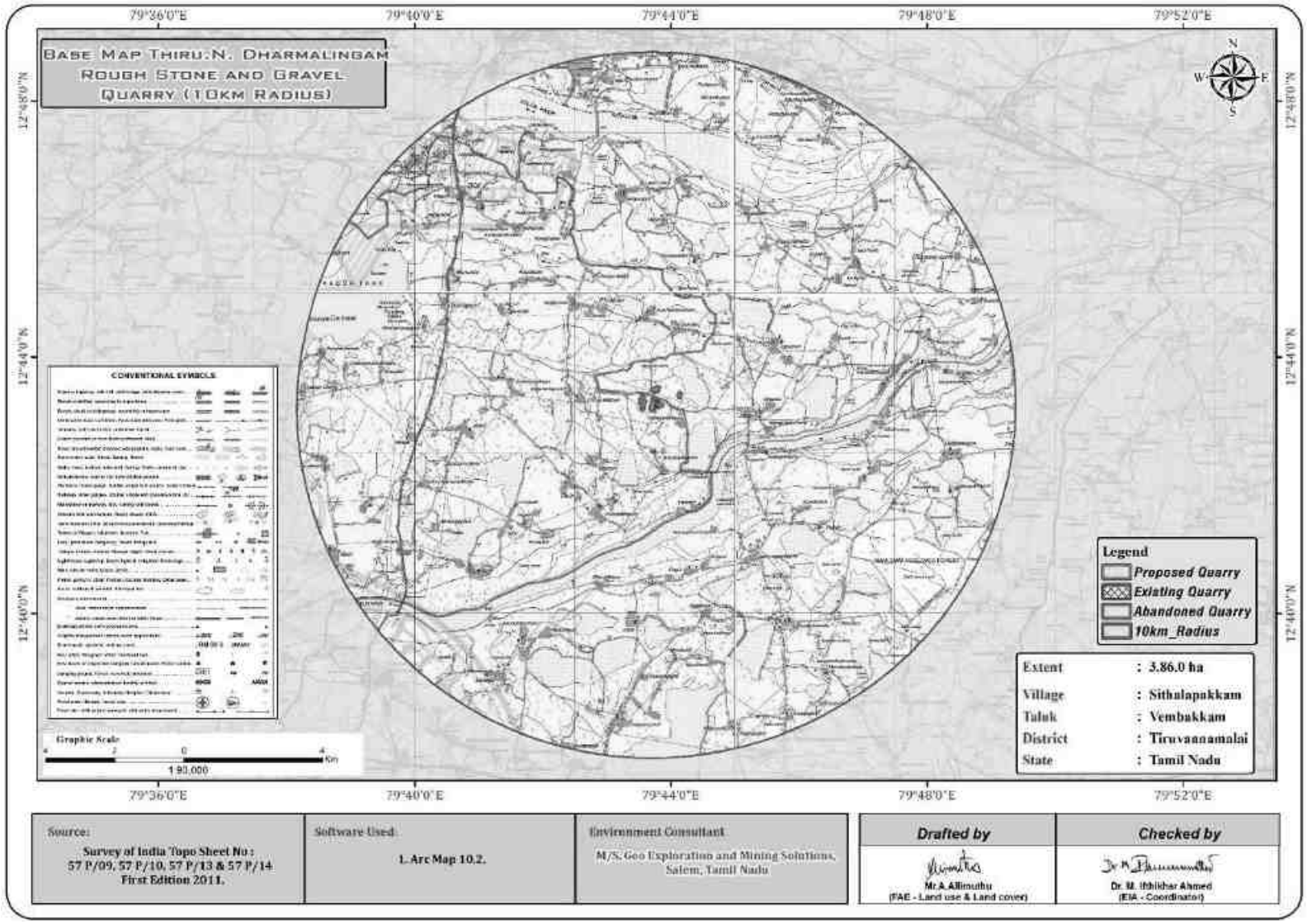
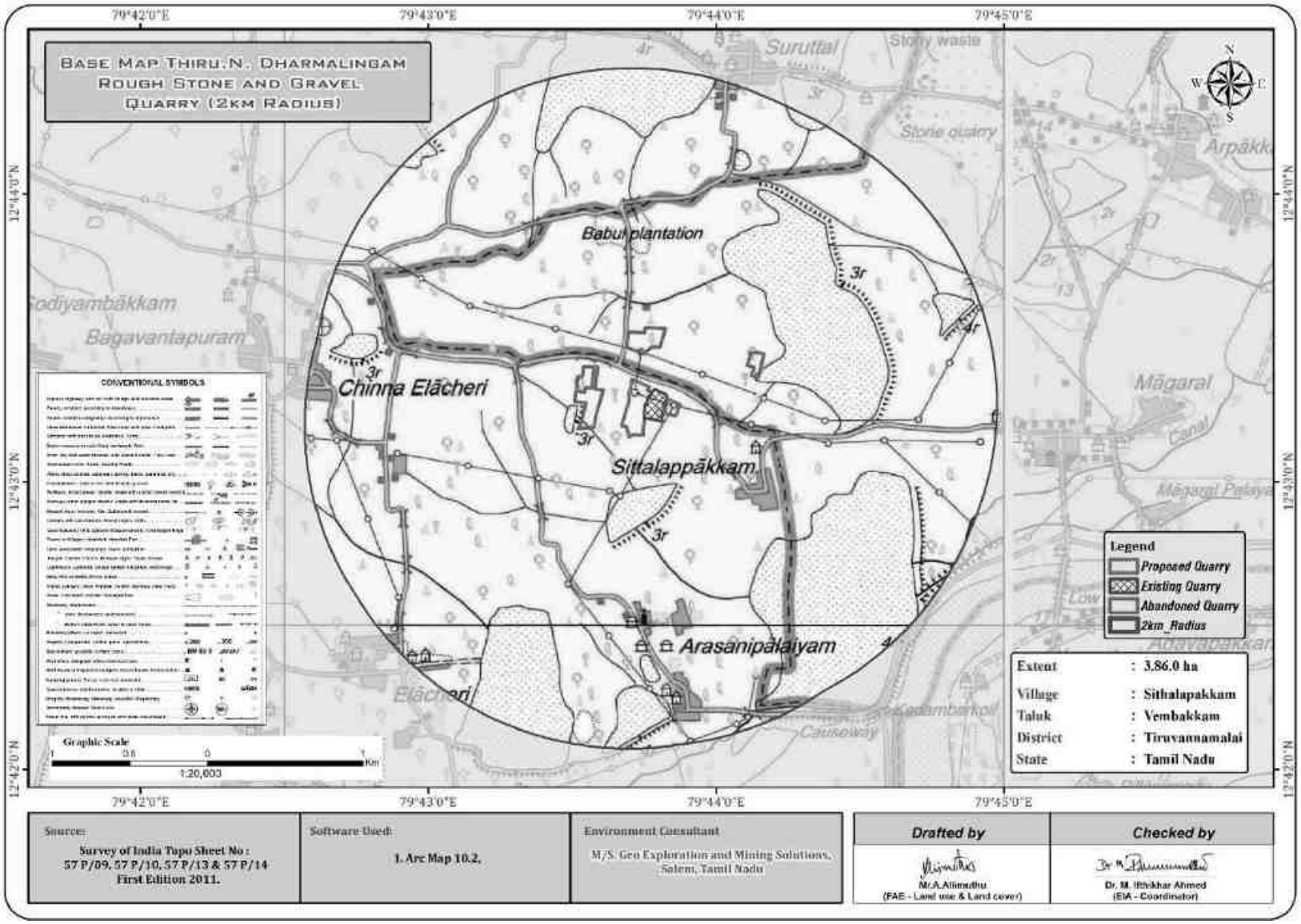


FIGURE 1.4: TOPOSHEET MAP OF THE STUDY AREA 2KM RADIUS



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 19.12.2023
- Precise area communication letter was issued by the District Collector vide Rc. No. 543/Mines/2024, Dated: 30.12.2024
- The Mining Plan was prepared by Recognized Qualified Person and approved by Assistant Director, Geology and Mining, Tiruvannamalai District, vide Rc. No. 543/Mines/2023, Dated: 24.01.2025
- 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/522715/2025. dated: 06.02.2025

SCOPING:

- The proposal was placed in 538th SEAC meeting held on 01.03.2025 and the committee recommended for issue of ToR.
- The proposal was considered in 803thSEIAA meeting held on 01.04.2025 and issued Terms of Reference File no.11814 Tor Identification No: TO25B0108TN5235140N Dated 07.04.2025

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.11814 Tor Identification No: TO25B0108TN5235140N Dated 07.04.2025. 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 (March to May 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)	7 locations – data monitored once for 24 hours during EIA study
6	Soil Characteristics	Physical and Chemical Parameters	Once at 6 locations during study period
7	Land use	Existing land use for different categories	Based on Survey of India topographical sheet and satellite imagery and primary survey.
8	Socio-Economic Aspects	Socio-economic and demographic characteristics, worker characteristics	Based on primary survey and secondary sources data like census of India 2011.

9	Hydrology	Drainage pattern of the area, nature of streams, aquifer characteristics, recharge and discharge areas	Based on data collected from secondary sources as well as hydro-geology study report prepared.
10	Risk assessment and Disaster Management Plan	Identify areas where disaster can occur by fires and explosions and release of toxic substances	Based on the findings of Risk analysis done for the risk associated with mining.

Source: Field Monitoring Data

1.8.1 Regulatory Compliance & Applicable Laws/Regulations for Proposed Quarry

- Application for Quarrying Lease as per Tamil Nadu Minor Mineral Concession Rules, 1959.
- Obtained Precise Area Communication Letter as per Tamil Nadu Minor Mineral Concession Rules, 1959 for Preparation of Mining Plan and obtaining Environmental Clearance.
- The Mining Plan has been approved under Rule 41 & 42 as amended of Tamil Nadu Minor Mineral Concession Rules, 1959.
- Environment Protection Act, 1986
- EIA Notification, 2006.
- Water (Prevention and control of Pollution) act, 1974
- Air (Prevention and control of Pollution) act, 1981
- Terms of Reference File no.11814 Tor Identification No: TO25B0108TN5235140N Dated 07.04.2025
- **********

2. PROJECT DESCRIPTION

2.0 GENERAL

The Proposed Rough Stone Quarry requires Environmental Clearance. There are 2 proposed and 1 existing quarries forming a cluster; calculated as per MoEF & CC Notification S.O. 2269(E) Dated 1st July 2016 and the total extent of cluster is 6.56.5 ha.

As the extent of cluster are more than 5 ha, the proposal falls under B1 Category as per the Order Dated: 04.09.2018 & 13.09.2018 passed by Hon'ble National Green Tribunal, New Delhi in O.A. No. 173 of 2018 & O.A. No, 186 of 2016 and MoEF & CC Office Memorandum F. No. L-11011/175/2018-IA-II (M) Dated: 12.12.2018, and requirement for EIA, EMP and Public Consultation for obtaining Environmental Clearance.

2.1 DESCRIPTION OF THE PROJECT

The proposed 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 LOCATION OF THE PROJECT

- The project site is located in Sithalapakkam Village, Vembakkam Taluk and Tiruvannamalai District.
- Lease applied area located about 89.5 km Northeast of Tiruvannamalai town, 16km Southeast of Vembakkam and 800 km Northwestern side of the Sithalapakkam village.

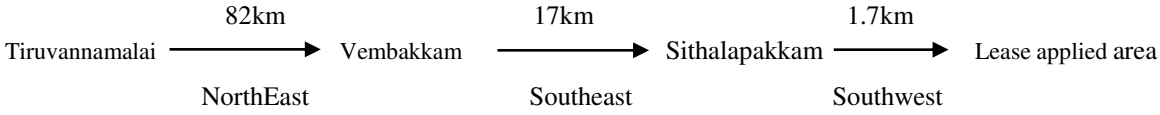


TABLE 2.1: SITE CONNECTIVITY

Nearest Roadway	National Highway (NH-132B) Kancheepuram – Chengalpattu – 10km – North East State Highway (SH-118A) Kancheepuram –Uthiramerur – 2.6km – East
Nearest Village	Sithalapakkam – 780m – South East
Nearest Town	Kancheepuram – 12.5km – North west
Nearest Railway Station	Kancheepuram Railway Station – 12.5km – North West
Nearest Airport	Chennai Airport – 55km – North East
Seaport	Chennai - 72.0km – NE

Source: Survey of India Toposheet

TABLE 2.2: CO-ORDINATES – PROJECT BOUNDARY

BOUNDARY CO-ORDINATES

S.N.	LATITUDE	LONGITUDE
1	12° 43' 09.24"N	79° 43' 41.87"E
2	12° 43' 11.49"N	79° 43' 41.36"E
3	12° 43' 11.65"N	79° 43' 40.30"E
4	12° 43' 13.86"N	79° 43' 40.99"E
5	12° 43' 15.11"N	79° 43' 41.28"E
6	12° 43' 15.42"N	79° 43' 41.48"E
7	12° 43' 16.94"N	79° 43' 41.90"E
8	12° 43' 17.45"N	79° 43' 41.99"E
9	12° 43' 18.03"N	79° 43' 41.84"E
10	12° 43' 18.53"N	79° 43' 41.87"E
11	12° 43' 20.60"N	79° 43' 42.57"E
12	12° 43' 20.69"N	79° 43' 42.29"E
13	12° 43' 21.32"N	79° 43' 42.48"E
14	12° 43' 19.80"N	79° 43' 46.12"E
15	12° 43' 19.00"N	79° 43' 45.69"E
16	12° 43' 18.49"N	79° 43' 46.62"E
17	12° 43' 17.67"N	79° 43' 46.02"E
18	12° 43' 17.62"N	79° 43' 45.93"E
19	12° 43' 16.15"N	79° 43' 45.50"E
20	12° 43' 16.13"N	79° 43' 45.27"E
21	12° 43' 13.95"N	79° 43' 44.98"E
22	12° 43' 12.89"N	79° 43' 45.10'E
23	12° 43' 10.37"N	79° 43' 44.82"E
24	12° 43' 09.90"N	79° 43' 44.91"E
25	12° 43' 09.64"N	79° 43' 44.78"E
26	12° 43' 09.64"N	79° 43' 44.56"E
27	12° 43' 09.74"N	79° 43' 44.28"E
28	12° 43' 09.70"N	79° 43' 42.42"E

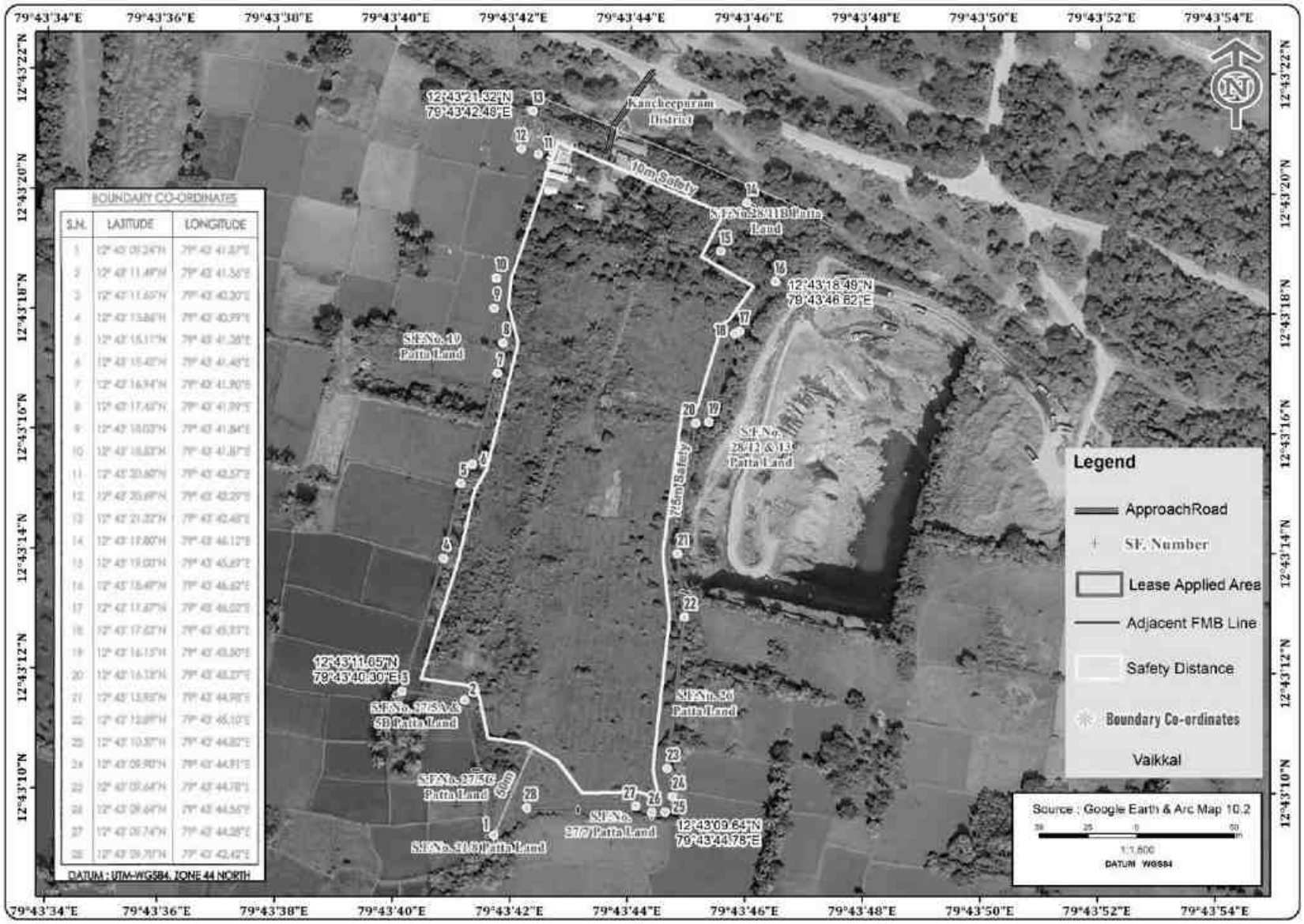
DATUM : UTM-WGS84, ZONE 44 NORTH

Source: Approved Mining Plan

FIGURE 2.1: TOPOGRAPHICAL VIEW OF PROJECT AREA

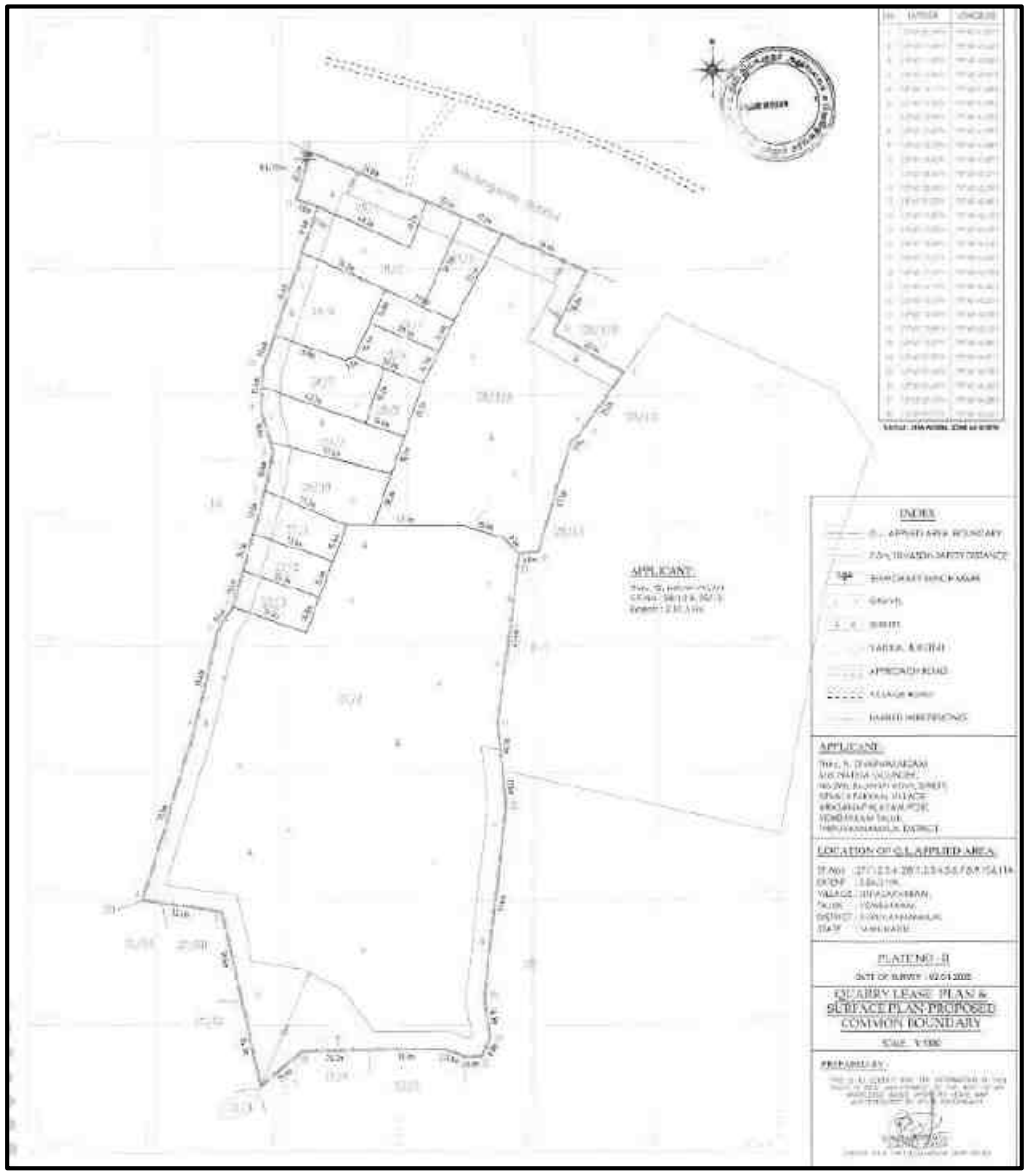
FIGURE 2.2: PHOTOGRAPHS OF GREENBELT & FENCING

FIGURE 2.3: GOOGLE IMAGE OF THE PROJECT AREA



Source: Google Earth Imagery

FIGURE 2.4: QUARRY LEASE PLAN / SURFACE PLANN



Source: Approved Mining Plan

FIGURE 2.5: VILLAGE MAP SUPERIMPOSED ON GOOGLE EARTH IMAGE

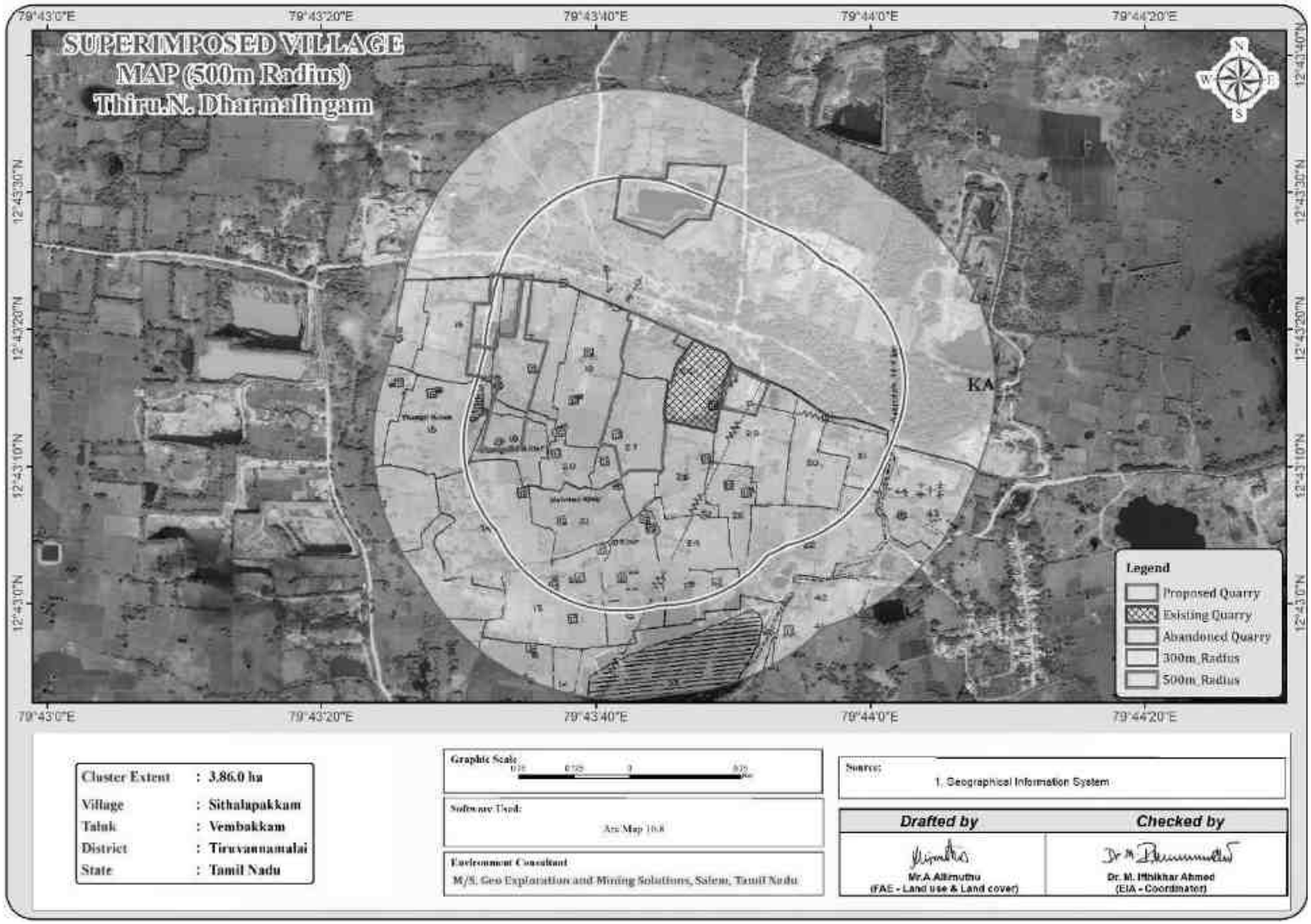


FIGURE 2.6: IMAGE SHOWING SURFACE FEATURES AROUND 10 KM RADIUS

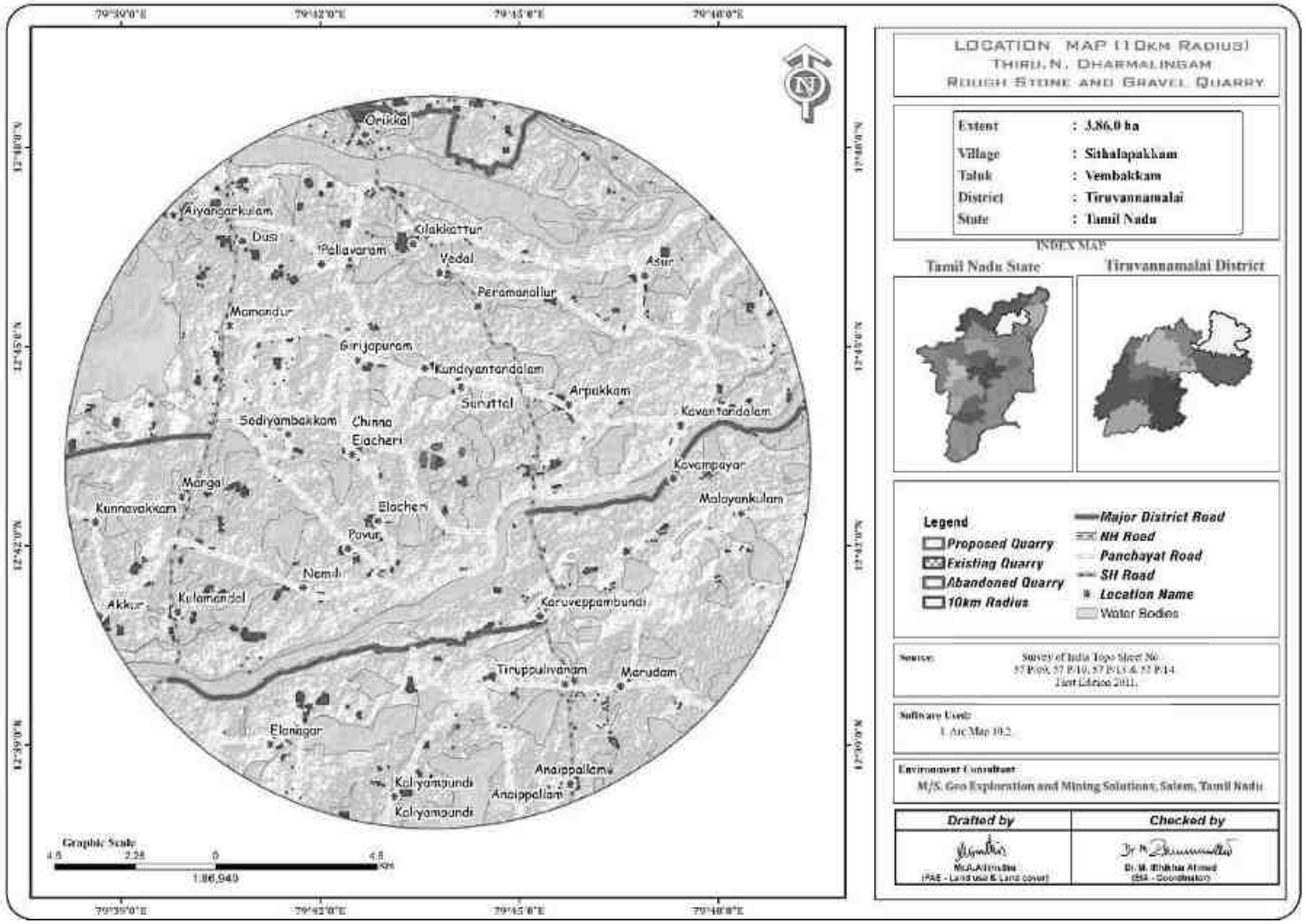


FIGURE 2.7: IMAGE SHOWING SURFACE FEATURES AROUND 5 KM RADIUS

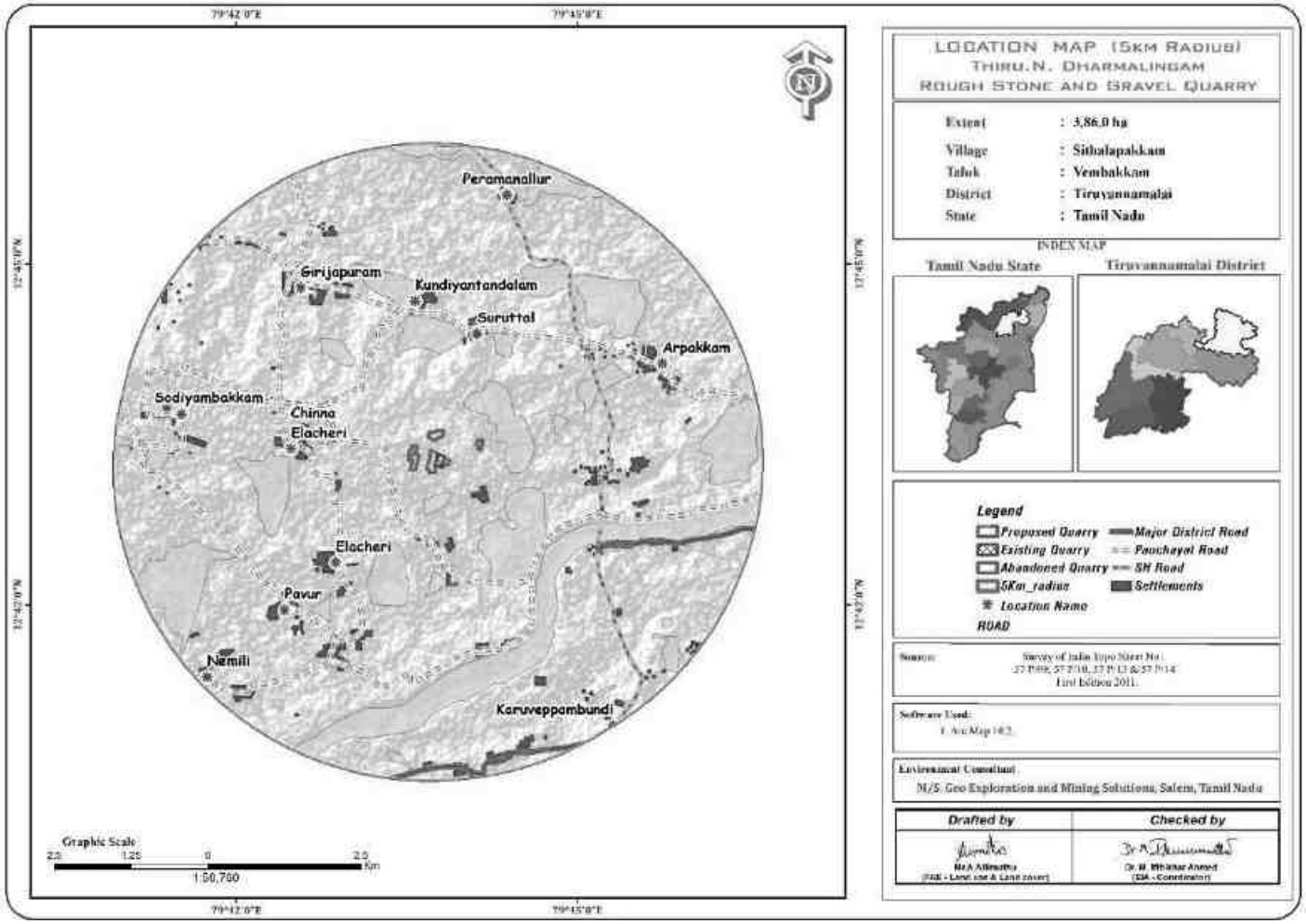
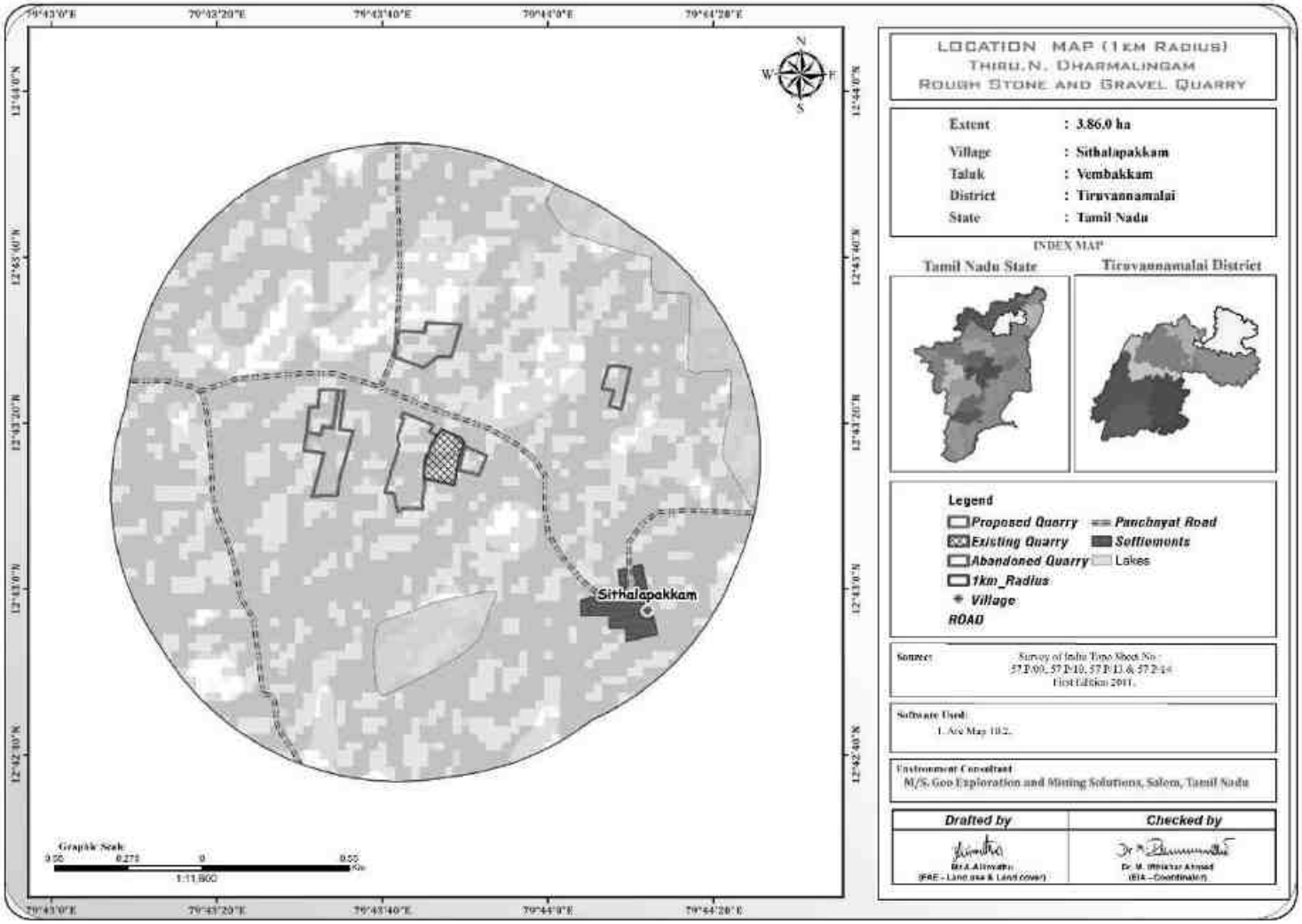


FIGURE 2.8: IMAGE SHOWING SURFACE FEATURES AROUND 1 KM RADIUS



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)	Area at the end of lease period (Ha) as proposed common Boundary	Area at the end of lease period (Ha) as leaving safety & benches
Area Under Quarry	Nil	3.22.0	3.10.0
Site Services	Nil	0.01.0	0.01.0
Roads	Nil	0.02.0	0.02.0
Green Belt	Nil	0.38.0	0.38.0
Unutilized Area	3.86.0	0.23.0	0.35.0
Grand Total	**3.86.0**	**3.86.0**	**3.86.0**

Source: Approved Mining

2.2.2 Size or Magnitude of Operation

TABLE 2.4: RESOURCES AND RESERVES

PARTICULARS	DETAILS		
	Rough Stone in m^3	Weathered Rock in m^3	Gravel in m^3
Geological Resources	25,09,000	1,54,400	77,200
Mineable Reserves	6,19,725	1,18,372	63,956
Production for five-year plan period as per ToR	6,04,110	1,18,372	63,956
Peak Production	1,40,375	49,692	27,606
Mining Plan Period / Lease Applied Period	5 Years		
Number of Working Days	300 Days		
Production per day	468	165	92
No of Lorry loads ($12m^3$ per load)	39	14	8
Total Depth of Mining	50m (2m Gravel+ 4m Weathered Rock +44m Rough stone) below ground level.		

Source: Approved mining plan.

2.3 GEOLOGY

2.3.1 Regional Geology

Tiruvannamalai District mainly comprises of rocks of Archaeon 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 fluviatile, 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 biotiteas accessories.

Migmatite Complex is represented by hornblende-biotitegneiss,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:

AGE		FORMATION
Recent	-	Quaternary formation (Gravel + Weathered Rock)
---------Unconformity----------		
Archaean	-	Charnockite
		Peninsular Gneiss complex

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 lease applied area is flat terrain. The area has gentle sloping towards Southern side and altitude of the area is 95m above from Mean Sea level. The area is covered by quaternary formation of gravel having an average thickness of 2m,4m weathered rock and followed by Massive Charnockite which is clearly inferred from the nearby 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 Cheyyartaluks. Palar rising near Nandidurg in Mysore enters Vellore district passing through Gudiyatham, Walajah and Arakonamtaluks 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 Chengamtaluk before entering in to 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 brakish 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 m2 /day and storativity varies between 2.84x10.5-5 and 8.9x10-3. The transmissivity of sedimentary formation varies from 21 to 748 m^2 /day and storativity is in the order of 2.75x10-3

.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 2.9: REGIONAL GEOLOGY MAP

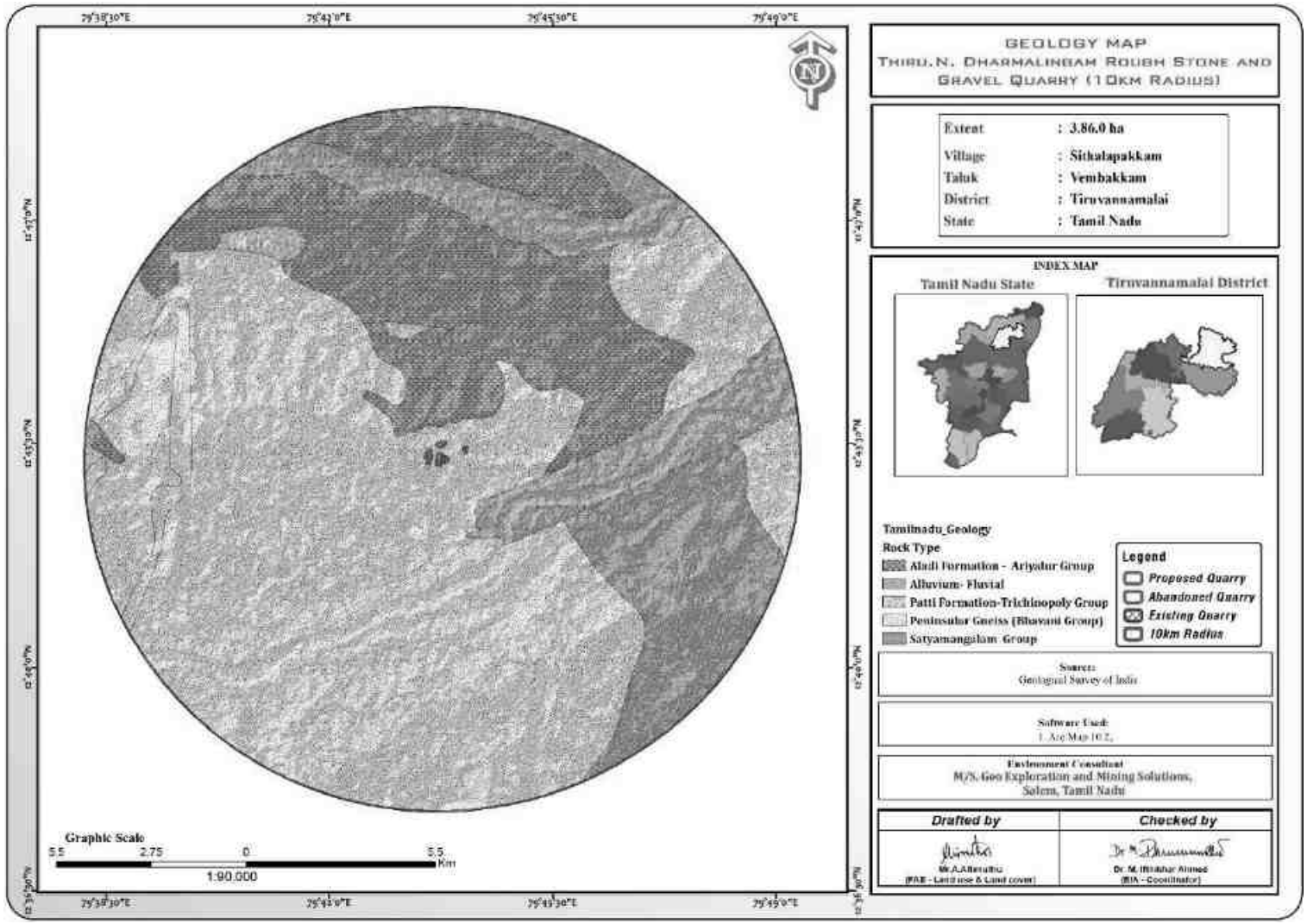
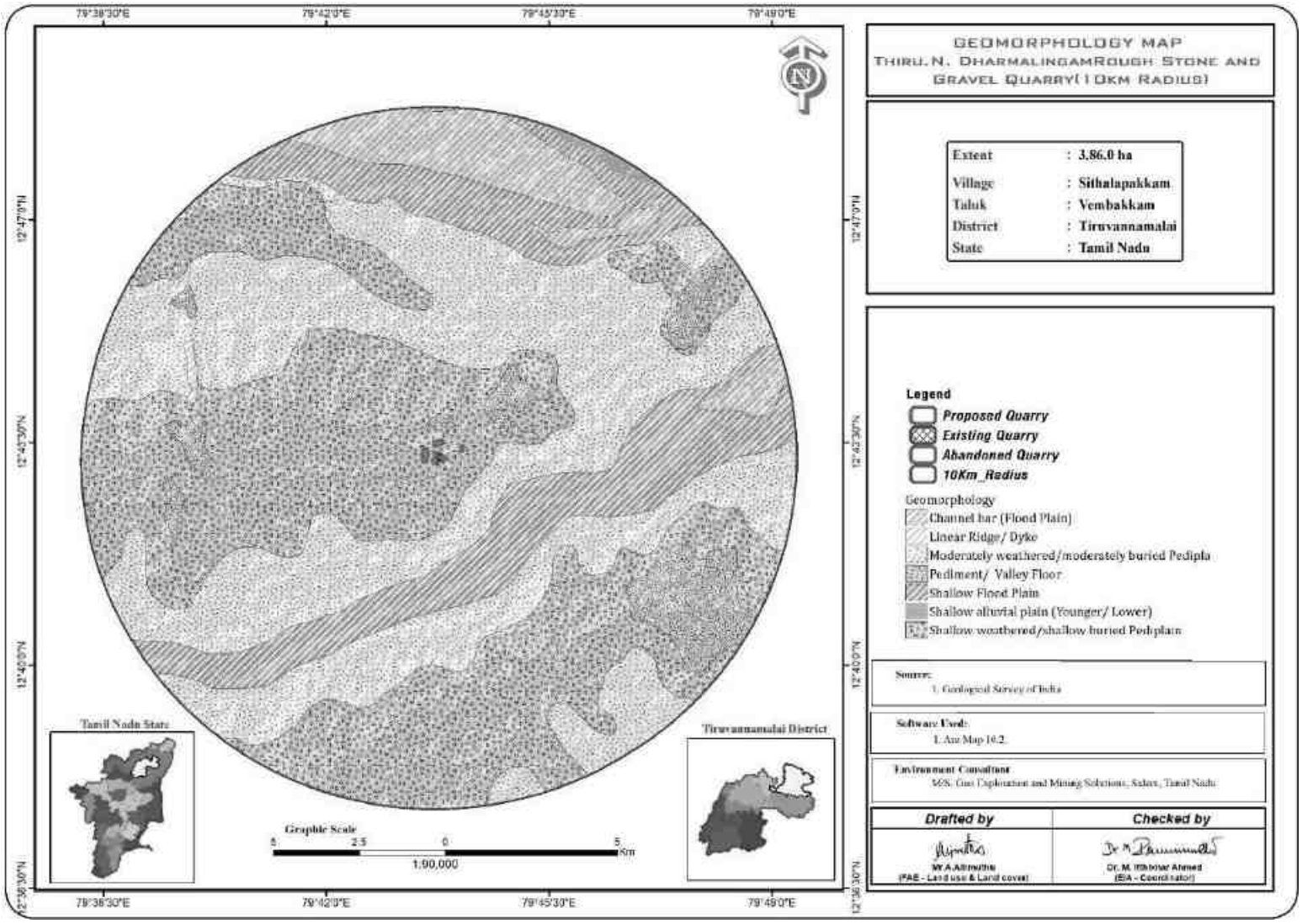


FIGURE 2.10: GEOMORPHOLOGY MAP



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	Weathered Rock m^3	Gravel m^3
Geological Resource in m^3	25,09,000	1,54,400	77,200
Mineable Resource in m^3	6,19,725	1,18,372	63,956
Year wise production for Five-year plan period as per ToR	6,04,110	1,18,372	63,956

Source: Approved Mining Plan

TABLE 2.6: YEAR-WISE PRODUCTION PLAN FOR FIVE YEARS

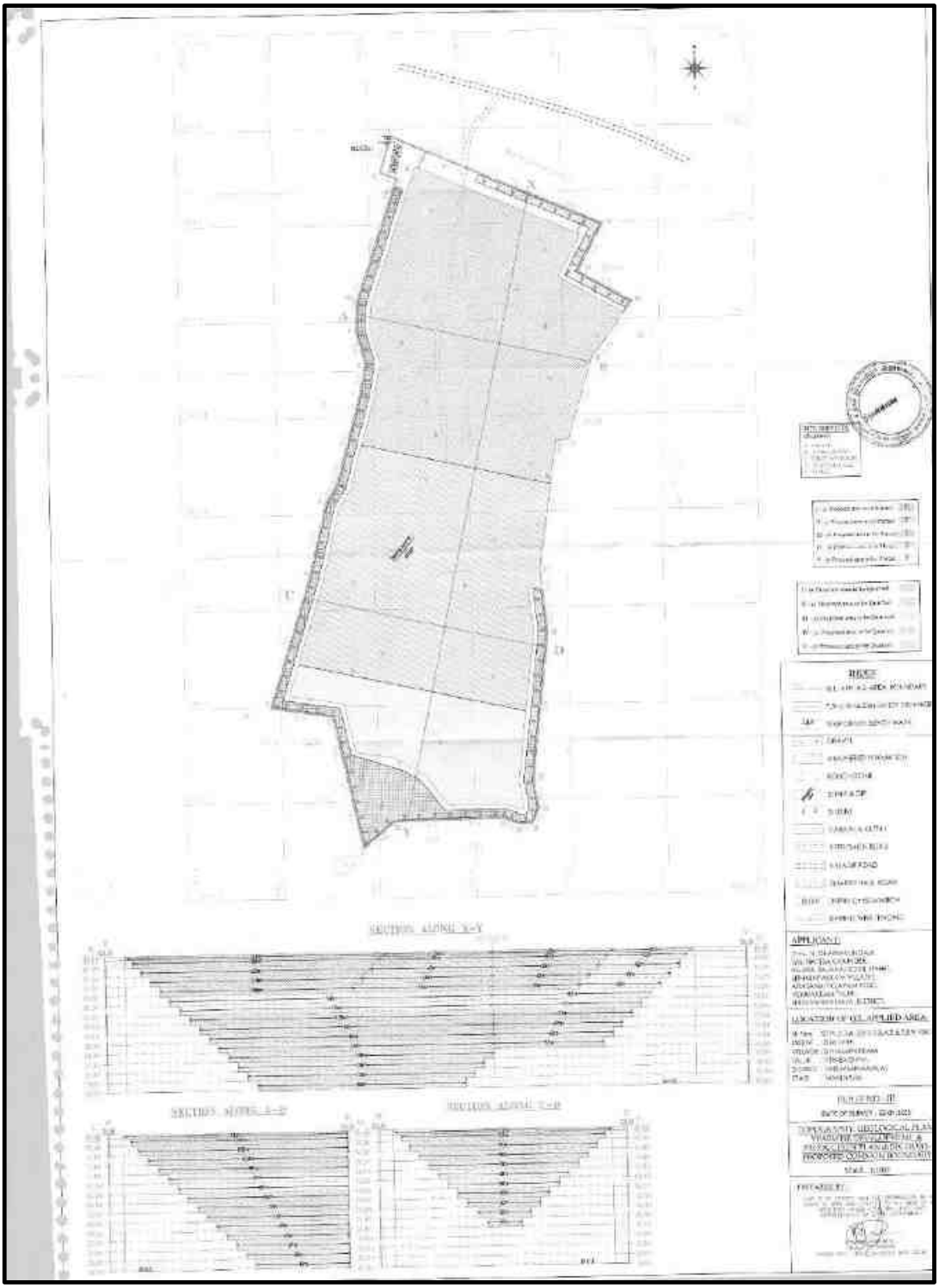
YEAR	ROUGH STONE (m^3)	WEATHERED ROCK (m^3)	GRAVEL (m^3)
I	97050	49692	27606
II	125060	25856	13054
III	105560	42824	23296
IV	140375	-	-
V	151680	-	-
TOTAL	**6,19,725**	**1,18,372**	**63,956**

Source: Approved Mining Plan

Disposal of Waste

The overburden in the form of Gravel formation is about 63,956m^3 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 2.11: TOPOGRAPHY, GEOLOGICAL, YEAR-WISE DEVELOPMENT PRODUCTION PLAN AND SECTIONS



Source: Approved Mining Plan

Conceptual Mining Plan/ Final Mine Closure Plan

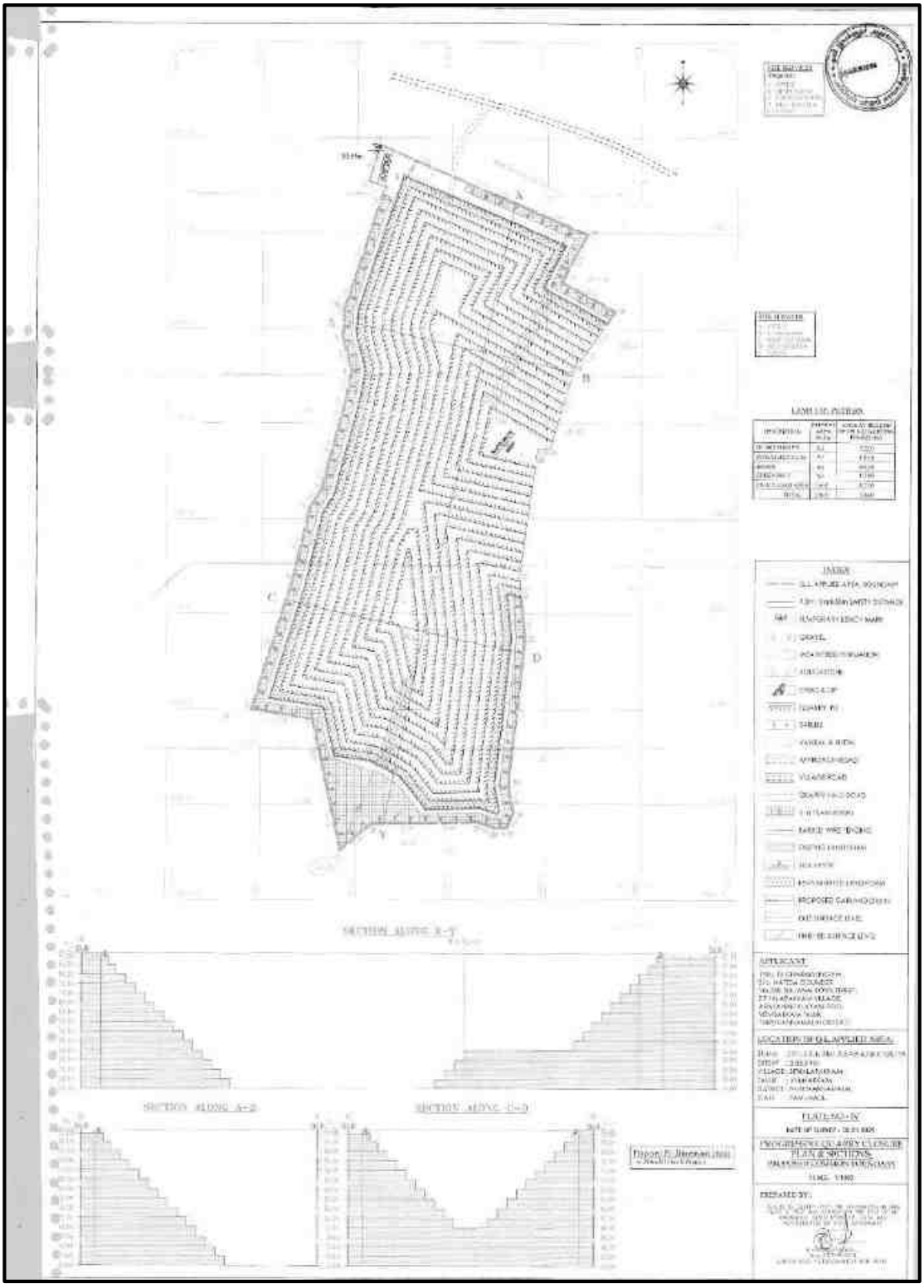
The ultimate pit size is designed based on certain practical parameters such as economical depth of mining, safety zones, permissible area, etc.

TABLE 2.7: ULTIMATE PIT DIMENSION

Pit	Length (Max) (m)	Width (Max) (m)	Depth (Max)
	294	112	51m bgl

Source: Approved Mining Plan

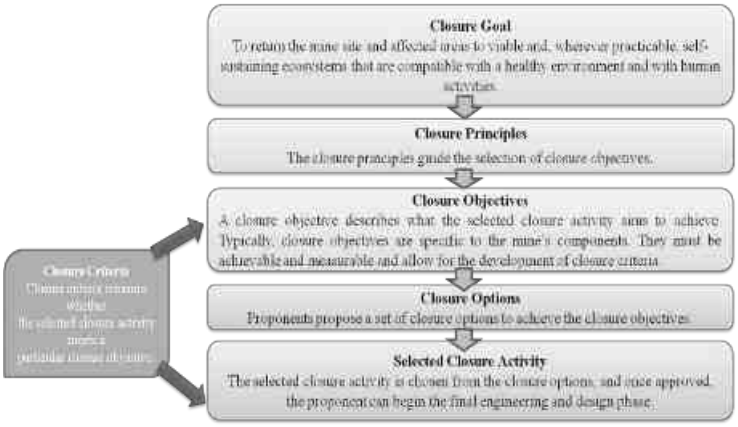
FIGURE 2.12: CLOSURE PLAN AND SECTIONS



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 60^0.

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	–	1.0m
Burden	–	0.75 m
Depth of hole	–	1.5 m
Charge per hole	–	0.50 – 0.75kg
Powder factor	–	6.0 tonnes/kg
Diameter of hole	–	32-35 mm
Peak production Capacity	=	$468m^3$ of Rough stone per day
Spacing X Burden X Depth	=	1.0m X 0.75m X 1.5m = $1.125m^3$
	=	$1.125m^3$ X 2.6 (Bulk Density) = 2.925Ts per hole

hence for the peak production of $468m^3$ (1216Ts) = 415Nos of holes to be drilled per day

Explosives per hole = ½ kg hence 208 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 have made agreement with authorized explosives agencies for carrying out blasting activities and competent person as per DGMS guidelines will be employed for safety and supervision of overall quarrying activities.

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

2.5.2 Extent of Mechanization

TABLE 2.8 PROPOSED MACHINERY DEPLOYMENT

S.NO.	TYPE	NOS	SIZE/CAPACITY	MOTIVE POWER
1	Hand Jack hammers	4	1.2m to 2.0m	Compressed air
	Wagon Drill Machine	2	3m to 10m	Diesel Drive
	Water sprinkling Tanker	1	10,000 L	Diesel Drive
2	Compressor	1	400psi	Diesel Drive
3	Excavator with Bucket and Rock Breaker	2	300 HP	Diesel Drive
4	Tippers	4	30 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. Sithalapakkam Panchayat Road
2. Kanchipuram-Uthiramerur SH 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	Sithalapakkam Panchayat Road	770m West	Panchayat Road

TS2	Kanchipuram-Uthiramerur SH Road	2.8km NE	SH 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	210	630	150	150	280	140	920

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	35	105

FIGURE.2.13: MINERAL TRANSPORTATION ROUTE MAP

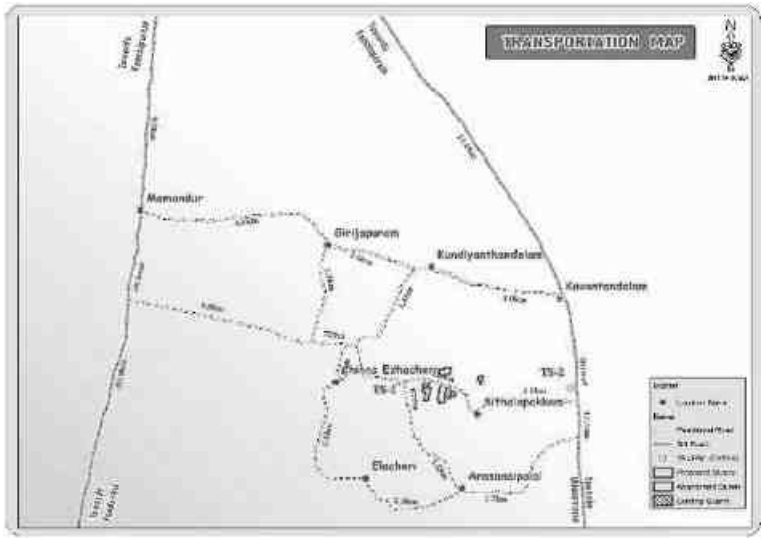


TABLE 2.12: SUMMARY OF TRAFFIC VOLUME

Route	Existing Traffic volume in PCU	Incremental traffic due to the project	Total traffic volume	Hourly Capacity in PCU as per IRC – 1960guidelines
Sithalapakkam Panchayat Road	415	105	520	1200
Kanchipuram-Uthiramerur SH Road	920	105	1025	1500

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	1.0KLD	From the existing pit or from the water vendors
Green Belt	1.5KLD	From the existing pit or from the water vendors
Sanitation & Drinking	0.5KLD	Approved water vendors.
Total	**3.0 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 25m^3 of Broken up Rough stone per hour and 60m^3 of Gravel per hour.

Peak production of Rough stone = 257m^3

Peak production of Gravel = 38m^3

Type of machinery	Working hours	Average Diesel consumption/ Hour	Quantity of Diesel in Ltrs
Working hours of Excavator (Aprx)	468m^3/25m^3 =19 Hrs (Rough stone)	22 Ltrs	418
Compressor	Working hours per day 3 Hrs	8 Ltrs	24
Tippers, Motor pumps to drain water	Occasionally		20
Total Diesel Consumption			**462**

The Maximum diesel consumption is around 462 Ltrs per day considering the peak production of Rough Stone.

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 Rs.4,77,59,000/-.

2.8 EMPLOYMENT REQUIREMENT:

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

TABLE 2.14: PROPOSED MANPOWER DEPLOYMENT

Designation	No of persons
Mines Manager	1
Geologist	1
Mines Foreman	1
Mate/Blaster	1
Wagon Drill Operator	2
Jack hammer operator	8
Excavator 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
		1st	2nd	3rd	4th	5th	
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 March to May 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 **Summer season** i.e., **March to May 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, PM_{10} and SO_2, 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/Automatic 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 Feb 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

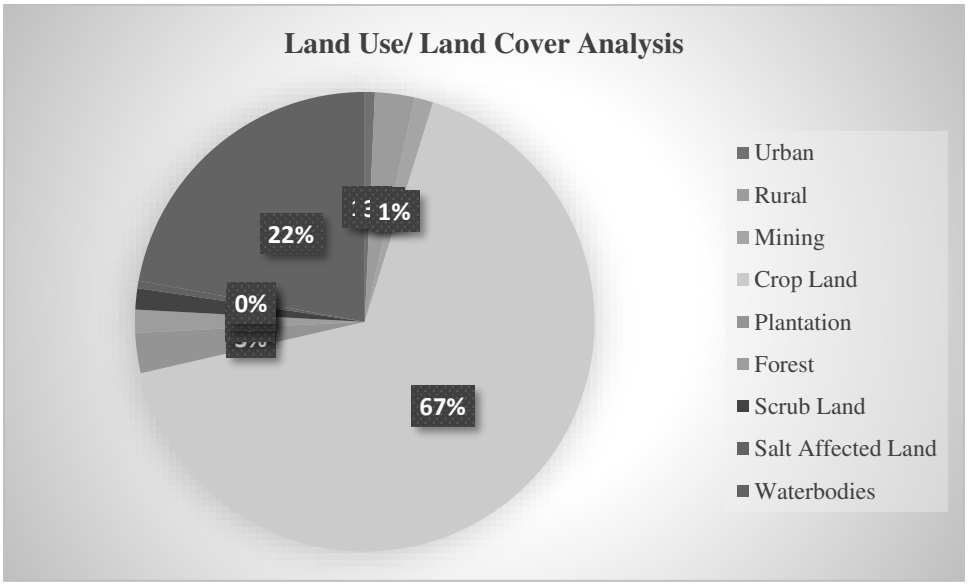
A visual interpretation technique has been adopted for land use classification based on the keys suggested in the chapter – V of the guidelines issued by NNRMS Bangalore & Level III classification with 1:50,000 scale for the preparation of land use mapping. Land use pattern of the area was studied through 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	231.81	0.71
2	Builtup Rural	911.53	2.79
3	Builtup Mining	428.76	1.31
	AGRICULTURAL LAND		
4	Crop Land	21731.98	66.60
5	Plantation	919.58	2.82
	BARREN/WASTE LANDS		
8	Scrub Land	484.96	1.49
9	Salt Affected Area	170.85	0.52
	FOREST		
10	Forest	529.43	1.62
	WETLANDS/ WATER BODIES		
11	Waterbodies	7224.11	22.14
TOTAL		**32633.01**	**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 69.42% followed by Built-up Lands – 3.5%, Scrub land – 1.49%, and Water bodies 22.14%.

The total mining area within the study area is 428.76 ha i.e., 1.31%. The cluster area of 6.56.5 ha contributes about 1.53% 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 90m 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

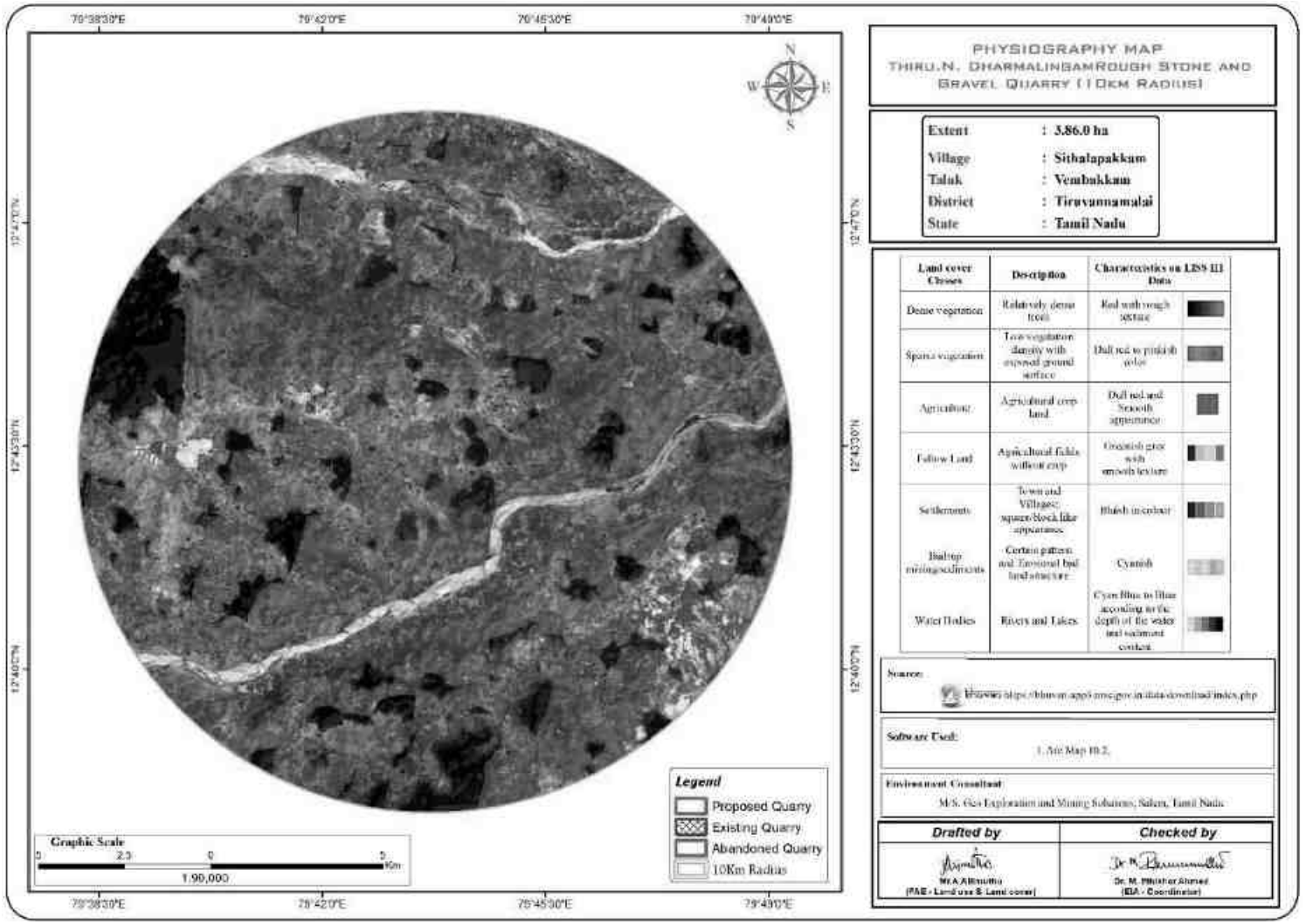
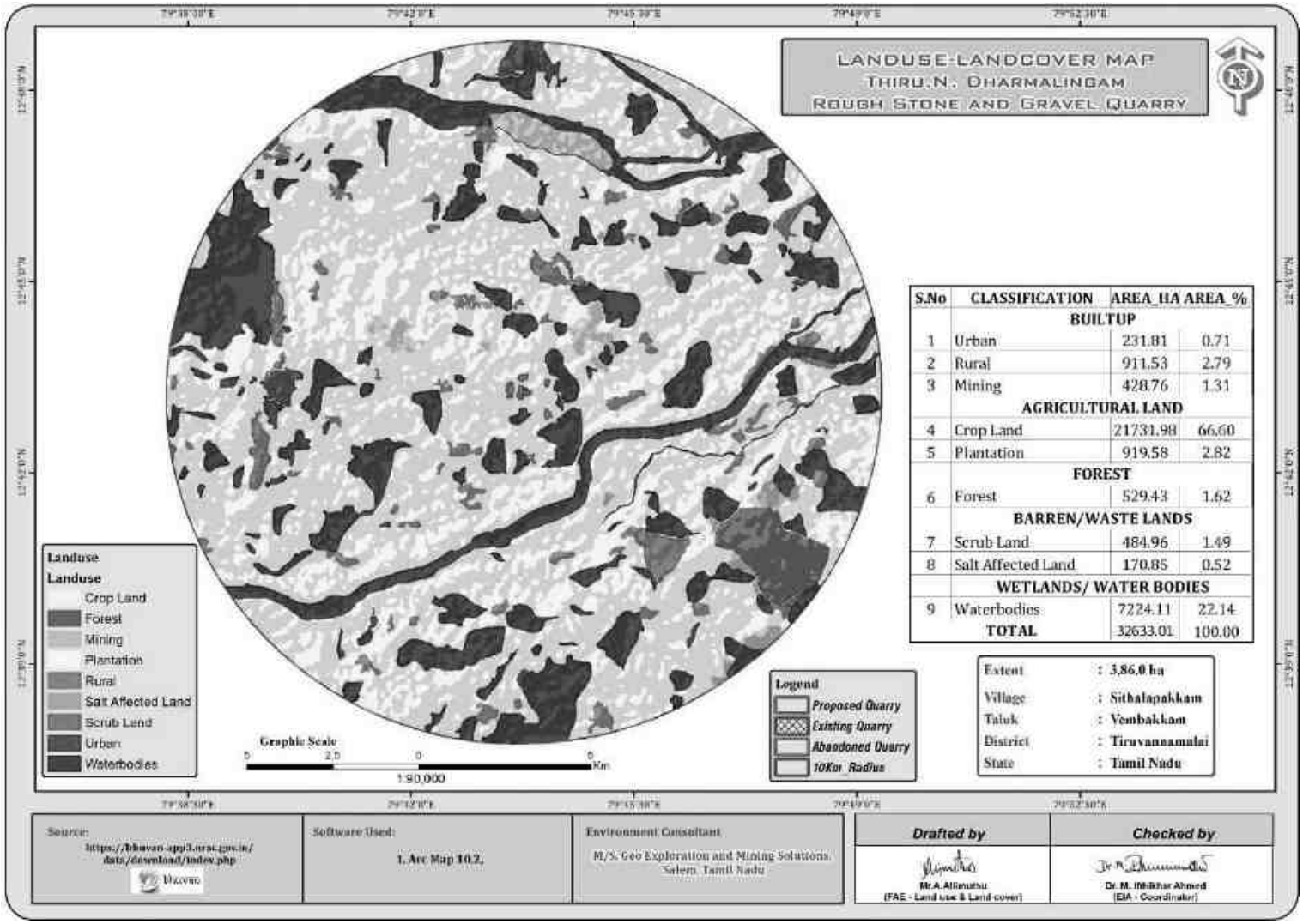


FIGURE 3.3: LAND USE LAND COVER MAP 10KM RADIUS



S.No	CLASSIFICATION	AREA_HA	AREA_%
	BUILTUP		
1	Urban	231.81	0.71
2	Rural	911.53	2.79
3	Mining	428.76	1.31
	AGRICULTURAL LAND		
4	Crop Land	21731.98	66.60
5	Plantation	919.58	2.82
	FOREST		
6	Forest	529.43	1.62
	BARREN/WASTE LANDS		
7	Scrub Land	484.96	1.49
8	Salt Affected Land	170.85	0.52
	WETLANDS/ WATER BODIES		
9	Waterbodies	7224.11	22.14
	TOTAL	32633.01	100.00

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 Vedanthangal Birds Sanctuary	12.5km - SE 18.0km – South East
2	Reserve Forest	Marudham R.F	7.05 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	Vaikkal	10m Safety North
2	Tank	260m SE
3	Tangalkulam	260m SW
4	Cheyyar	2km SE
5	Palar	6.5km NE
6	Mamandur Tank	7.2km 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	Core Zone	Project Area	12°43'12.47"N79°43'44.17"E
2	S-2	Sithalapakkam	800m SE	12°42'52.78"N 79°44'8.93"E
3	S-3	Vazhathottam	6.5km NW	12°46'40.37"N 79°42'28.47"E
4	S-4	Azhisoor	6km SW	12°39'58.60"N 79°43'28.83"E
5	S-5	Mathur	5.3km West	12°42'55.33"N 79°40'44.04"E
6	S-6	Kavanthandalam	6.3km East	12°43'21.58"N 79°47'11.92"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 3.4: SOIL SAMPLING LOCATIONS AROUND 10 KM RADIUS

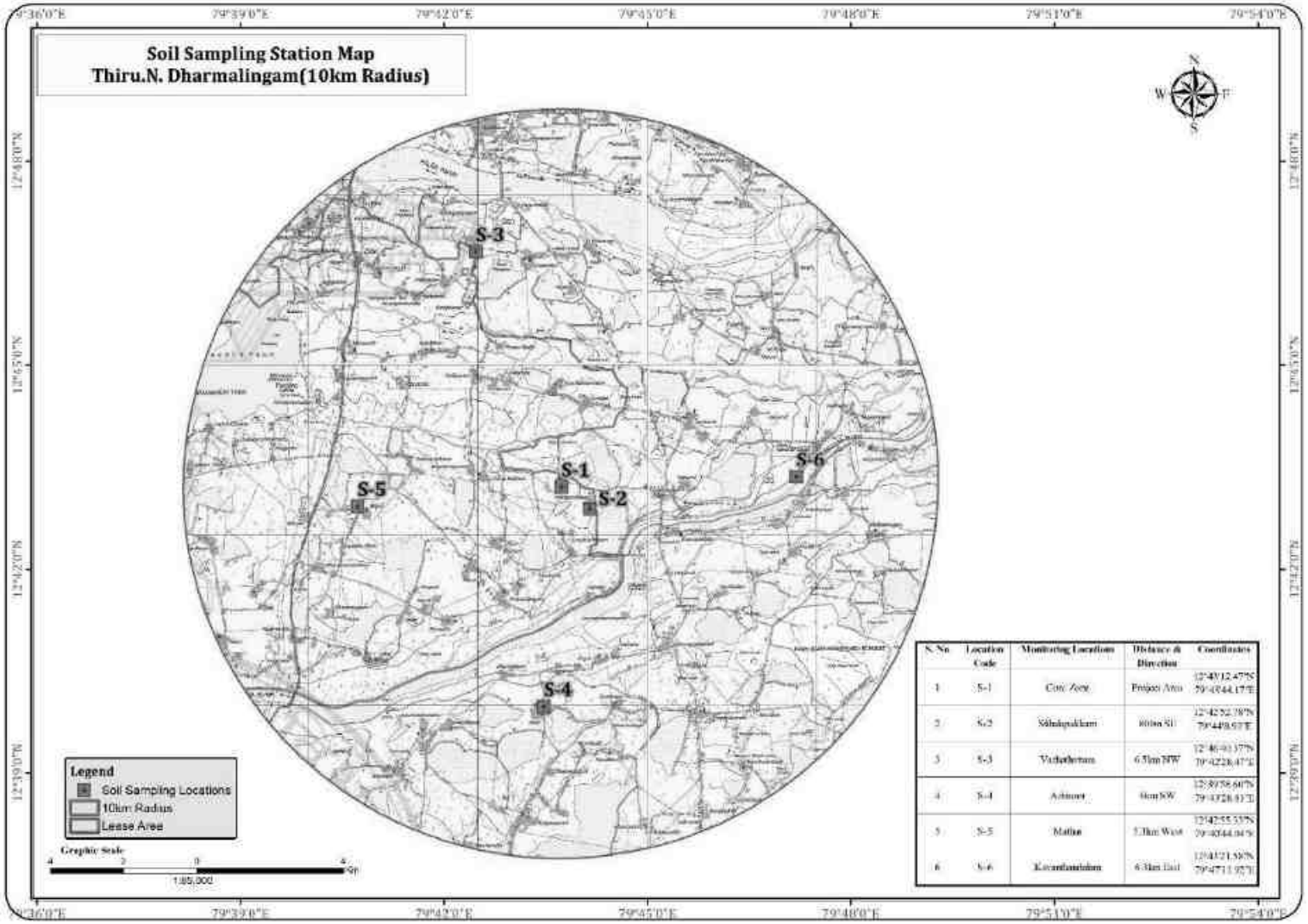


FIGURE 3.5: SOIL MAP

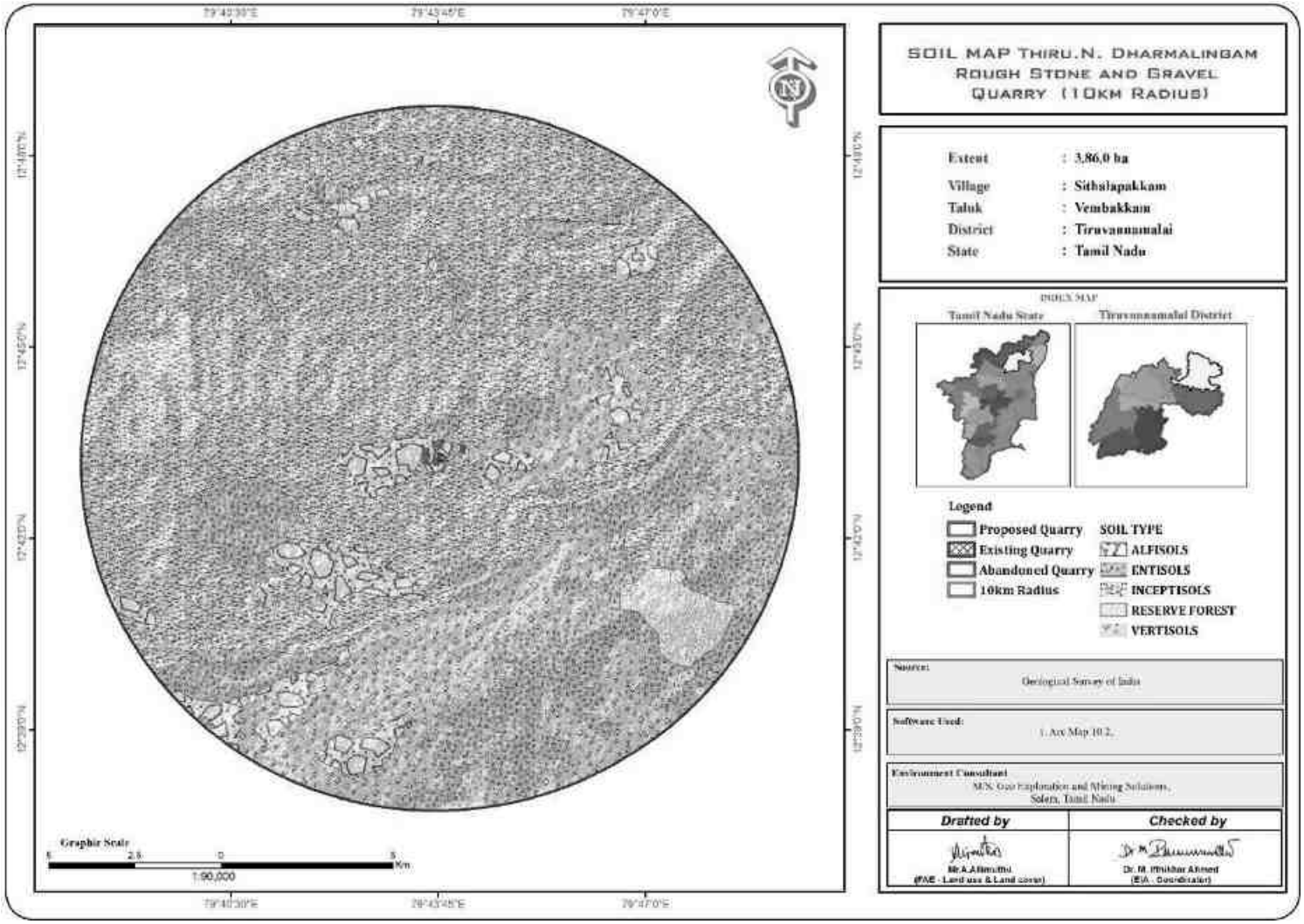


TABLE 3.6: SOIL QUALITY OF THE STUDY AREA

Sl. No	Test Parameters	Test Method	Unit	S1 Core Zone	S2 Sithalapakkam	S3 Vazhathottam	S4 Azhisoor	S5 Mathur	S6 Kavanthandalam
1	pH @ 25°C	IS 2720 Part 26 - 1987 (Reaff:2016)	-	8.71	8.11	8.59	8.26	8.85	8.88
2	Conductivity @ 25°C	IS 14767 - 2000 (Reaff : 2016)	µmhos/cm	510 µmhos/cm	435 µmhos/cm	559 µmhos/cm	415 µmhos/cm	396 µmhos/cm	410 µmhos/cm
3	Water Holding Capacity	By Gravimetric Method	%	46.8 %	47.1 %	48.0 %	46.5. %	46.8 %	48.8 %
4	Bulk Density	By Cylindrical Method	g/cm^3	1.05 g/cm^3	1.05 g/cm^3	1.07 g/cm^3	1.01 g/cm^3	1.01 g/cm^3	1.13 g/cm^3
5	Porosity	By Gravimetric Method	%	47.1 %	48.4 %	47.4 %	47.4 %	47.1 %	47.7 %
6	Calcium as Ca	Food and Agriculture organization of the united Nation Rome 2007 : 2018	mg/kg	20.8 mg/kg	20.8 mg/kg	21.5 mg/kg	25.6 mg/kg	30.7 mg/kg	28.0 mg/kg
7	Magnesium as Mg	GLCS/SOP/S/021	mg/kg	11.5 mg/kg	17.1 mg/kg	14.1 mg/kg	18.2 mg/kg	21.5 mg/kg	22.5 mg/kg
8	Chloride as Cl	APHA 23rd Edn 2019 4500 Cl B	mg/kg	10.3 mg/kg	22 mg/kg	20 mg/kg	19.7 mg/kg	18 mg/kg	16.4 mg/kg
9	Soluble Sulphate as SO4	IS 2720 Part 27 : 1977 (Reaff:2015)	%	0.0018 %	0.0025 %	0.0016 %	0.0022 %	0.0029 %	0.0029 %
10	Total Phosphorus as P	IS 10158 : 1982 (Reaff: 2019)	mg/kg	4.4 mg/kg	1.16 mg/kg	6.1 mg/kg	7.02 mg/kg	6.01 mg/kg	3.19 mg/kg
11	Total Nitrogen as N	IS 14684 : 1999 (Reaff:2019)	mg/kg	400 mg/kg	444.3 mg/kg	412.8 mg/kg	425.5 mg/kg	395.8 mg/kg	522.2 mg/kg
12	Organic Matter	IS : 2720 Part 22: 1972 (Reaff: 2015)	%	1.22 %	1.52 %	2.14 %	1.67 %	2.03 %	1.76 %
13	Organic Carbon	IS : 2720 Part 22: 1972 (Reaff: 2015)	%	0.71 %	0.88 %	1.24 %	0.97 %	1.18 %	1.02 %
14	Texture :	Gravimetric Method	-	-	-	-	-	-	-
	Clay		%	32.5 %	33.3 %	34.1 %	33.8 %	33.5 %	32.5 %
	Sand		%	26.2 %	31.4 %	29.5 %	32.2 %	34.2 %	34.2 %
	Silt		%	41.3 %	35.3 %	36.4 %	34.0 %	35.3 %	33.3 %
15	Manganese as Mn	USEPA 3050 B – 1996 &	mg/kg	8.9 mg/kg	12.5 mg/kg	8.18 mg/kg	3.88 mg/kg	11.7 mg/kg	2.2 mg/kg

16	Zinc as Zn	USEPA 6010 C - 2000	mg/kg	5.1 mg/kg	5.1 mg/kg	5.09 mg/kg	8.2 mg/kg	4.13 mg/kg	4.25 mg/kg
17	Boron as B		mg/kg	1.15 mg/kg	2.5 mg/kg	5.13 mg/kg	1.26 mg/kg	7.05 mg/kg	0.73 mg/kg
18	Potassium as K		mg/kg	30.1 mg/kg	45.7 mg/kg	32.3 mg/kg	35.4 mg/kg	44.2 mg/kg	50.1 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	1.25	2.02	1.59	4.25	8.08	1.21
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	1.01 mg/kg	0.81 mg/kg	0.96 mg/kg	1.05 mg/kg	1.01 mg/kg	0.78 mg/kg
23	Iron as Fe		mg/kg	20.5 mg/kg	24.3 mg/kg	4.25 mg/kg	7.56 mg/kg	2.15 mg/kg	8.22 mg/kg
24	Cation Exchange Capacity	USEPA 9080 – 1986	meq/100g of soil	44.05 meq/100g of soil	36.1 meq/100g of soil	44.09 meq/100g of soil	44.4 meq/100g of soil	42.2 meq/100g of soil	40.1 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 (32.5 % to 34.1%) to Sandy Loam Soil and Bulk Density of Soils in the study area varied between 1.01 -1.13 g/cm^3. The Water Holding Capacity is found to be medium i.e., ranging from 46.5- 48.8%.

Chemical Characteristics –

- The nature of soil is slightly alkaline to strongly alkaline with pH range 8.11 to 8.88
- The available Nitrogen content range between 395.8 to 522.2 mg/kg
- The available Phosphorus content range between 1.16 to 7.02 mg/kg
- The available Potassium range between 30.1 to 50.1 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 3.7: WATER SAMPLING LOCATIONS

S.NO	CODE	LOCATIONS	DISTANCE & DIRECTION	CO-ORDINATES
SURFACE WATER				
1	SW1	Mamandur Lake	7km NW	12°44'10.27"N 79°39'47.00"E
2	SW2	Cheyyaru River	2km SE	12°42'30.17"N 79°44'43.93"E
GROUND WATER				
3	WW-1	Near Project Area	420m East	12°43'12.06"N 79°43'59.29"E
4	WW-2	Mathur	5.3km West	12°42'57.62"N 79°40'38.48"E
5	BW-1	Near Project Area	460m NW	12°43'29.36"N 79°43'29.75"E
6	BW-2	Azhisoor	6km SW	12°39'55.88"N 79°43'28.58"E

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

FIGURE 3.6: WATER SAMPLING LOCATIONS AROUND 10 KM RADIUS

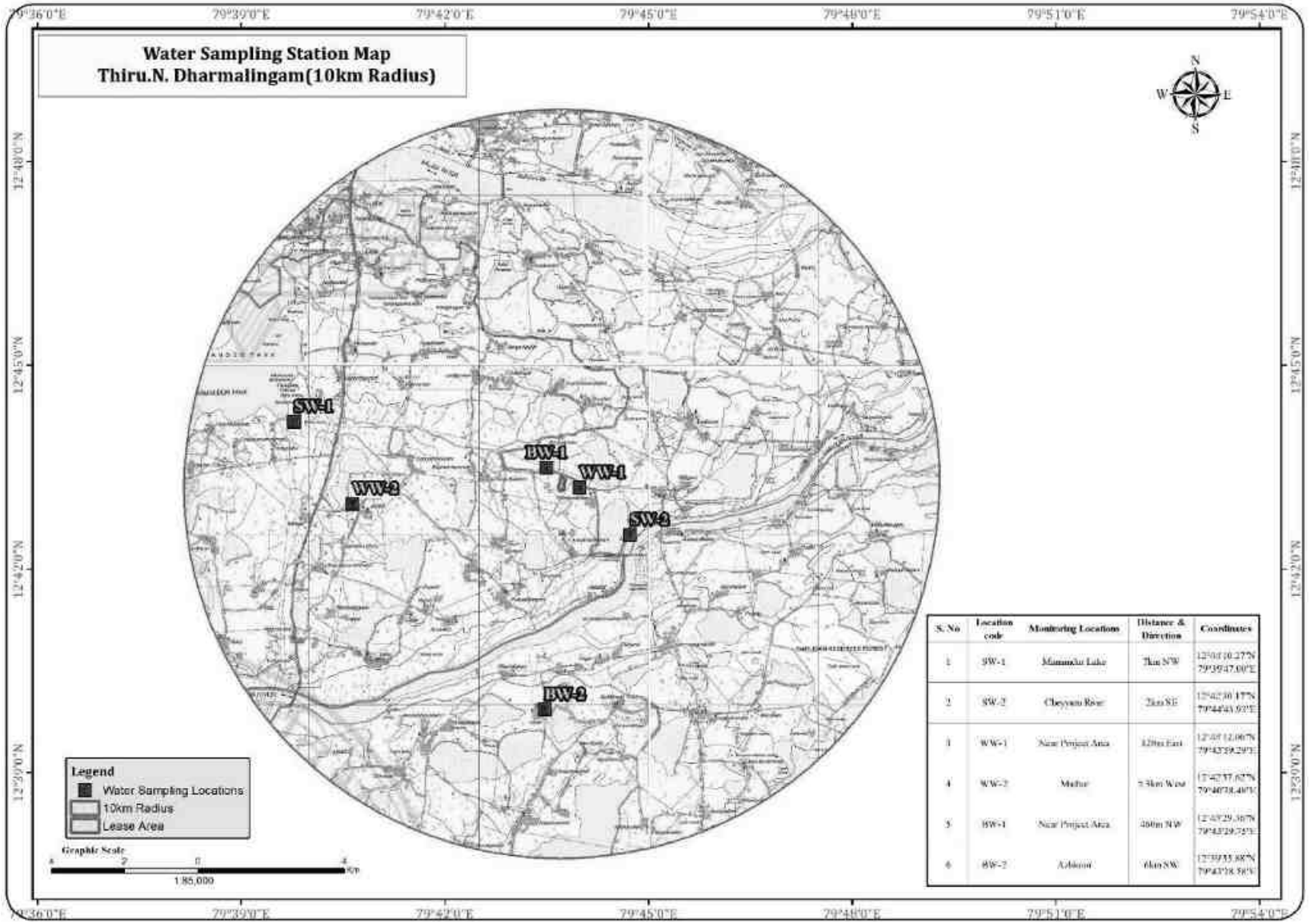


TABLE 3.8: GROUND WATER SAMPLING RESULTS

S.NO	Parameter	BW-1 Near Project area	BW-2 Azhisoor	WW-1 Near Project Area	WW-2 Mathur
1	Color	5	5	5	5
2	Odour	Agreeable	Agreeable	Agreeable	Agreeable
3	pH@ 25ºC	7.33	7.39	6.97	7.55
4	Electrical Conductivity @ 25ºC	725 µmhos/cm	907 µmhos/cm	885 µmhos/cm	734 µmhos/cm
5	Turbidity	1.0 NTU	1 NTU	1.0 NTU	1.0 NTU
6	Total Dissolved Solids	428 mg/l	535 mg/l	522 mg/l	433 mg/l
7	Total Hardness as $CaCO_3$	156.22 mg/l	180.41 mg/l	175.42 mg/l	135.97 mg/l
8	Calcium as Ca	25.7 mg/l	28.8 mg/l	30.1 mg/l	25.0 mg/l
9	Magnesium as Mg	22.4 mg/l	26.4 mg/l	24.4 mg/l	17.9 mg/l
10	Total Alkalinity	150 mg/l	166 mg/l	174.1 mg/l	126 mg/l
11	Chloride as Cl^-	71.2 mg/l	124.1 mg/l	142 mg/l	93 mg/l
12	Sulphate as SO_4^-	50.0 mg/l	71.5 mg/l	38.7 mg/l	60 mg/l
13	Iron as Fe	0.12 mg/l	0.28 mg/l	0.22 mg/l	0.15 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	0.24 mg/l	0.20 mg/l	0.15 mg/l	0.16 mg/l
16	Nitrates as NO_3	4.05 mg/l	4.13 mg/l	5.19 mg/l	6.45 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_6H_5OH	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 H2S	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	130 MPN/100ml	110 MPN/100ml	100 MPN/100ml	110 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 3.9: SURFACE WATER SAMPLING RESULTS

Sl. No.	Parameter	Unit	RESULT	
			SW1- Mamandur Lake	SW2- Cheyyar River
1	Colour	Hazen	5 Hazen	10 Hazen
2	Odour	-	Agreeable	Agreeable
3	pH@ 25ºC	-	7.09	7.96
4	Electrical Conductivity @ 25°C	µs/cm	651 µmhos/cm	864 µmhos/cm
5	Turbidity	NTU	5.66 NTU	4.4 NTU
6	Total Dissolved Solids	mg /l	384 mg/l	510 mg/l
7	Total Hardness as $CaCO_3$	mg/l	154.54 mg/l	163.14 mg/l
8	Calcium as Ca	mg/l	27.5 mg/l	28.8 mg/l
9	Magnesium as Mg	mg/l	20.9 mg/l	22.2 mg/l
10	Total Alkalinity as $CaCO_3$	mg/l	149 mg/l	150 mg/l
11	Chloride as Cl^-	mg/l	110.3 mg/l	124 mg/l
12	Sulphate as SO_4^-	mg/l	68.1 mg/l	67.3 mg/l
13	Iron as Fe	mg/l	0.31 mg/l	0.13 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	0.24 mg/l	0.11 mg/l
16	Nitrates as NO_3	mg/l	10.6 mg/l	9.5 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_6H_5OH	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	12.8 mg/l	14.2 mg/l
32	Chemical Oxygen Demand	mg/l	40 mg/l	50 mg/l
33	Dissolved Oxygen	mg/l	5.2 mg/l	4.9 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	1.5 mg/l	1.57 mg/l
36	Sulphide as H2S	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	20.5 mg/l	22.9 mg/l
40	Total Coliform	MPN/100ml	540 MPN/100ml	440 MPN/100ml
41	Escherichia coli	MPN/100ml	190 MPN/100ml	180 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 7.09-7.96 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 384 to 510 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 110.3 to 124mg/l. Nitrates varied from 9.5 to 10.6 mg/l, while sulphates varied from 60 to 71.5 mg/l.

Ground Water

The pH of the water samples collected ranged from 6.97 to 7.55 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 428 to 535mg/l in all samples. Total hardness varied between 135.97 to 180.41 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 74-76m bgl. The maximum depth proposed out of proposed project is 50m 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 = 11.4m to 13.8m bgl

The water level in the bore well is varies from = 73.6 to 75.8m 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 73-78m 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 3.10: SUMMER SEASON WATER LEVEL OF OPEN WELLS 1 KM RADIUS

S.NO	LABEL	LONGITUDE	LATITUDE	Mar-25	Apr-25	May-25
1	OW1	79° 43' 59.3899" E	12° 43' 12.0081" N	12.4	13.2	13.8
2	OW2	79° 43' 54.5107" E	12° 42' 46.4352" N	12.1	12.9	13.5
3	OW3	79° 43' 34.7823" E	12° 42' 33.6473" N	11.5	12.3	12.9
4	OW4	79° 43' 25.1748" E	12° 42' 58.8902" N	11.4	12.2	12.8
5	OW5	79° 43' 03.4836" E	12° 43' 20.5270" N	12	12.8	13.4
6	OW6	79° 42' 51.5728" E	12° 43' 15.6523" N	12.2	13	13.6
7	OW7	79° 43' 58.6046" E	12° 43' 43.3148" N	11.7	12.5	13.1
8	OW8	79° 43' 51.5237" E	12° 44' 07.1380" N	11.5	12.3	12.9
9	OW 9	79° 44' 43.5445" E	12° 43' 19.9645" N	11.7	12.5	13.1

Source: Onsite monitoring data

FIGURE 3.7: OPEN WELL CONTOUR MAP MARCH to MAY 2025

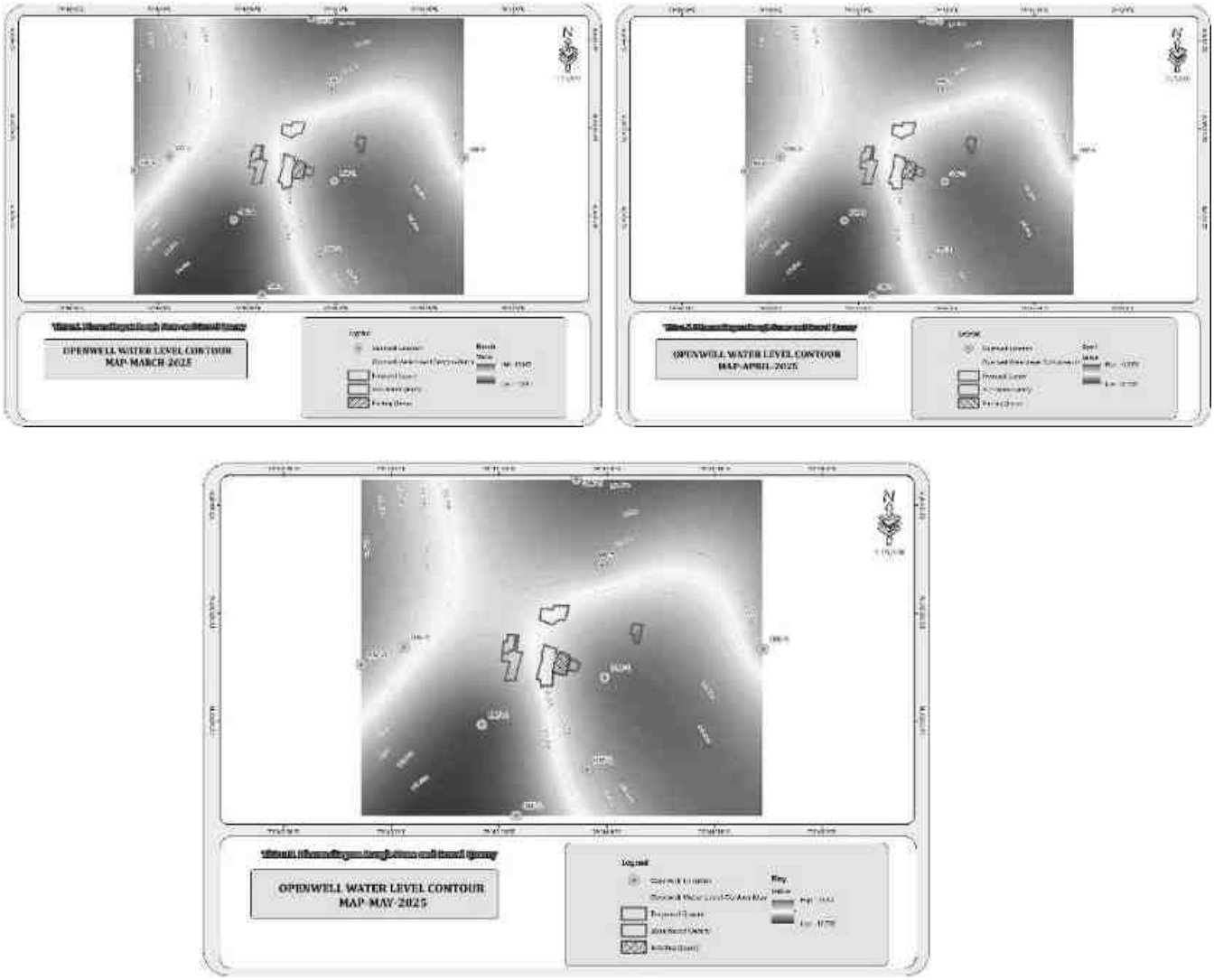
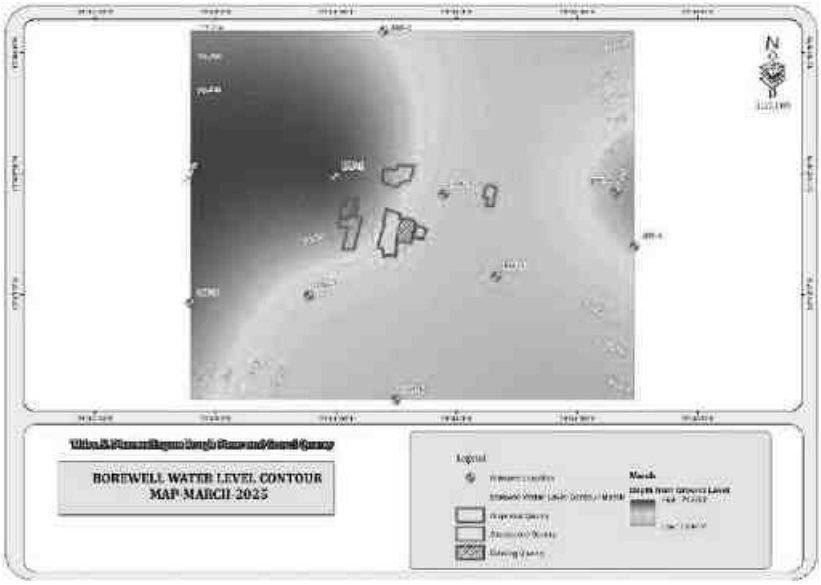


TABLE 3.11: SUMMER SEASON WATER LEVEL OF BOREWELLS 1 KM RADIUS

S.NO	LABEL	LONGITUDE	LATITUDE	Mar-25	Apr-25	May-25
1	BW1	79° 43' 29.6975" E	12° 43' 29.3110" N	74.6	75.4	75.8
2	BW2	79° 43' 41.9163" E	12° 44' 05.5947" N	74	74.8	75.2
3	BW3	79° 43' 56.8395" E	12° 43' 24.8846" N	73.8	74.6	75
4	BW4	79° 44' 44.3134" E	12° 43' 11.9289" N	74.1	74.9	75.3
5	BW5	79° 44' 09.8376" E	12° 43' 04.4420" N	73.7	74.5	74.9
6	BW6	79° 43' 44.8268" E	12° 42' 33.7605" N	73.6	74.4	74.8
7	BW7	79° 43' 23.2476" E	12° 42' 59.7597" N	73.9	74.7	75.1
8	BW8	79° 42' 53.6849" E	12° 42' 57.8268" N	74.4	75.2	75.6
9	BW9	79° 44' 39.6383" E	12° 43' 25.5116" N	74.2	75	75.4

Source: Onsite monitoring data

FIGURE 3.8: BOREWELL CONTOUR MAP – MARCH to MAY 2025



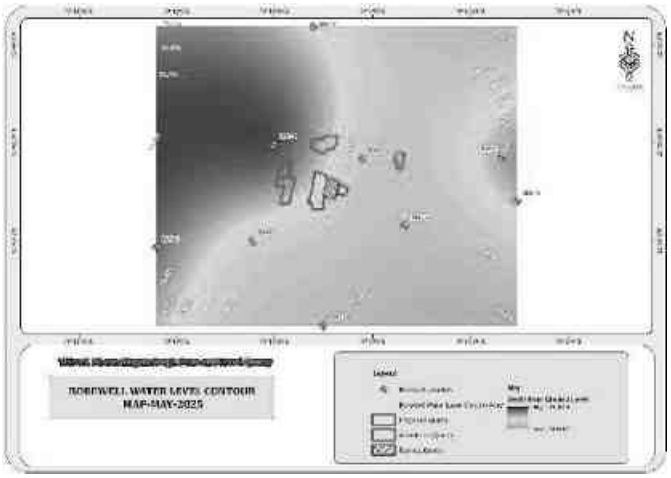
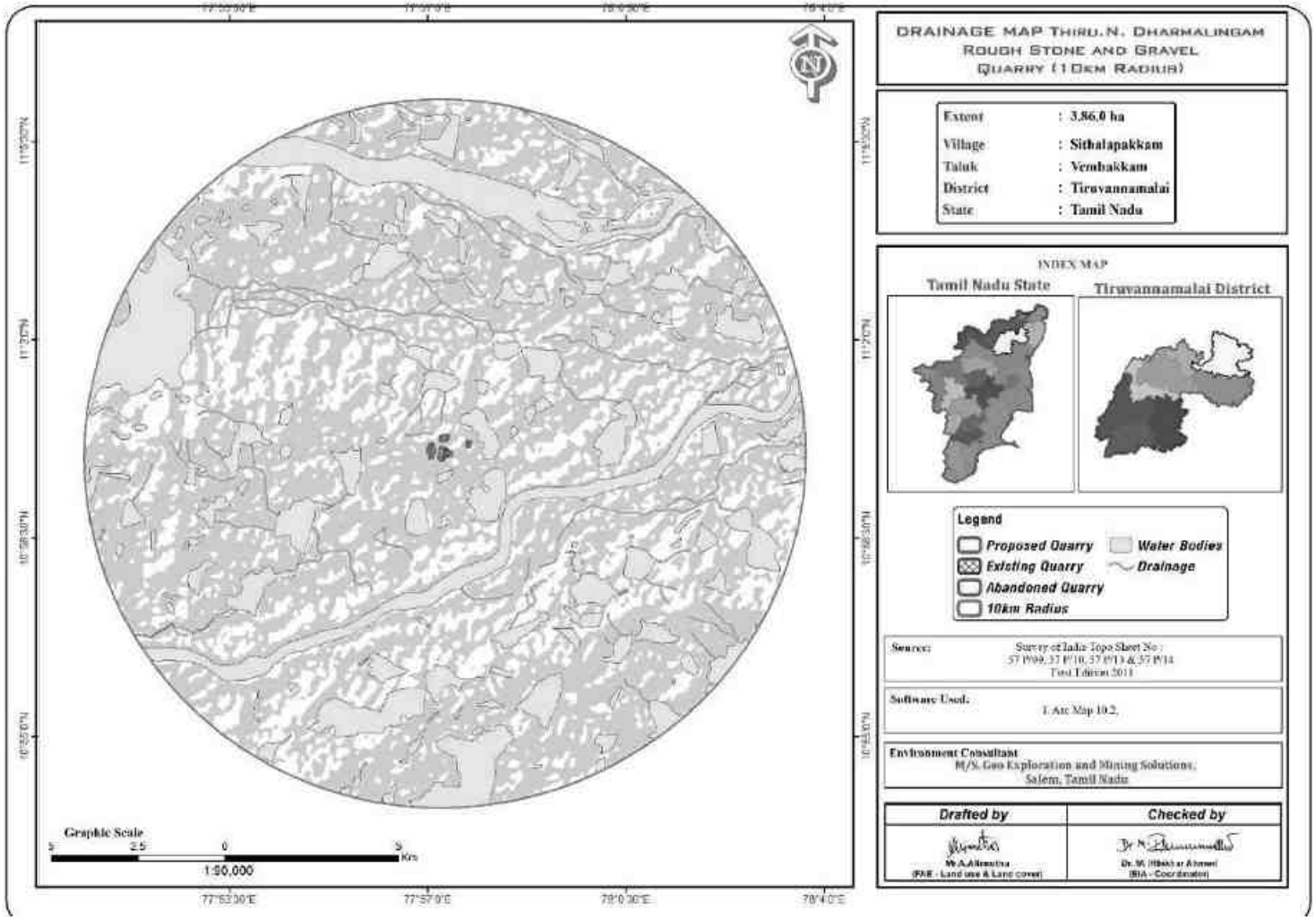
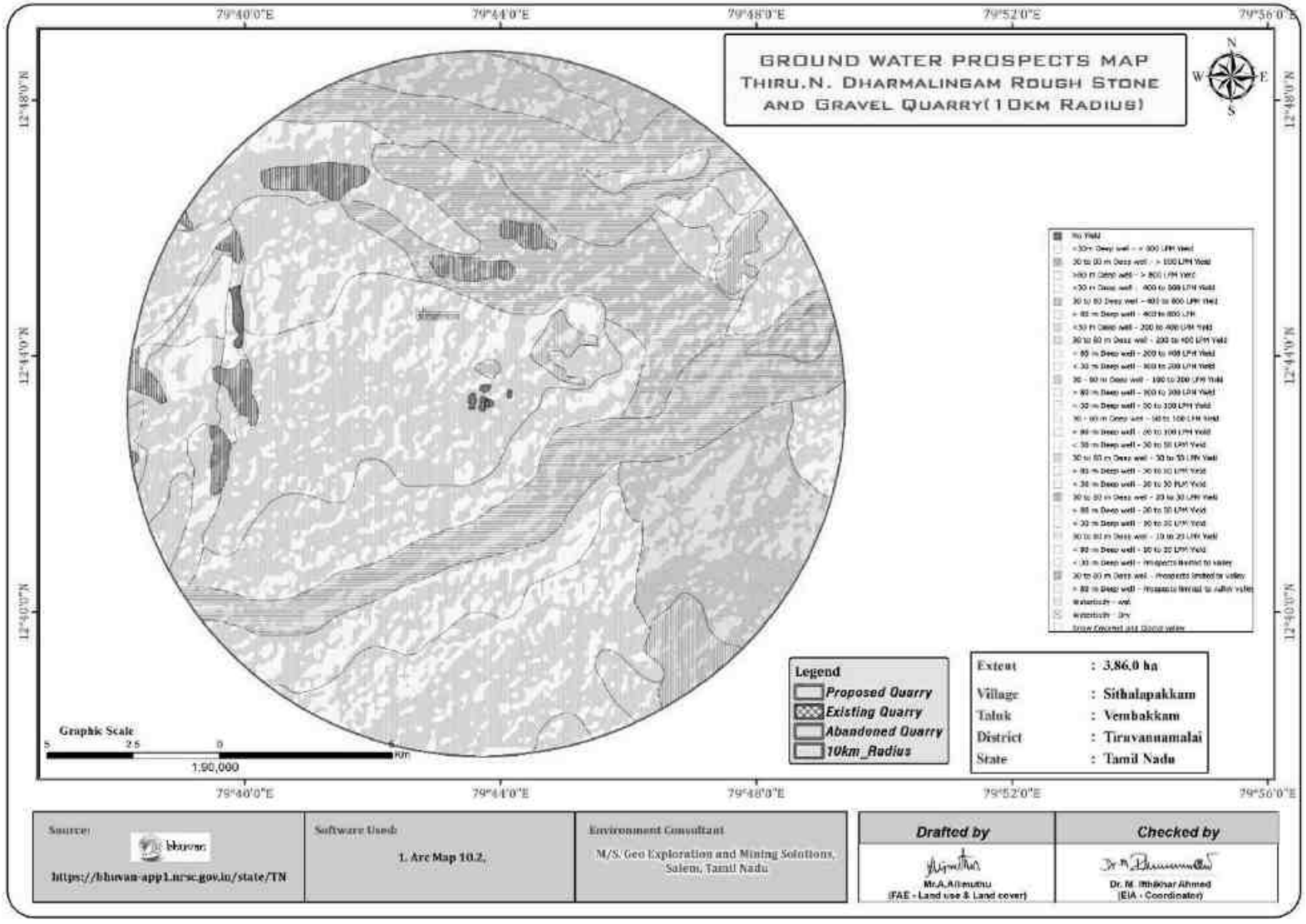


FIGURE 3.9: DRAINAGE MAP AROUND 10 KM RADIUS FROM PROJECT SITE



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

FIGURE 3.10: 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 farm of Pseudo-section that gives an approximate of the subsurface resistivity. This technique is used for the inversion of Schlumberger VES data to predict the layer parameter namely layer resistivity and Geo electric layer thickness. The main goal of the present study is to search the vertical in homogeneities that is consistent with the measured data.

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

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

ΔV = potential difference between receiving electrodes

G = Geometric Factor.

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

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

ρr = Resistivity of Rocks

ρw = Resistivity of water in pores of rock

F = Formation Factor

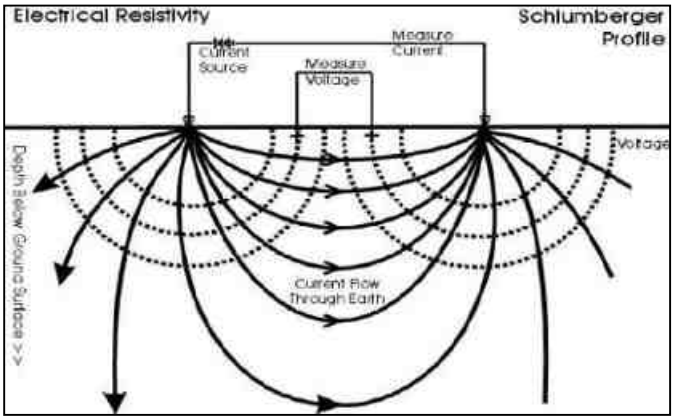
$\emptyset$ = Fractional pore volume

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 nose ration can be enhanced by $\sqrt{N}$ where N is the number of stacked readings. This SSR meter in which running averages of measurements [1, (1+2)/2, (1+2+3)/3 … (1+2...+16/16)] up to the chosen stacks are displayed and the final average is stored automatically, in memory utilizing the principles of stacking to achieve the benefit of high signals to noise ratio. Based on these above significations the signal stacking resistivity meter was used for (VES) Vertical Electric Resistivity Sounding.

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 50m 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 project 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 3.12: 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 3.13: METEOROLOGICAL DATA RECORDED AT SITE

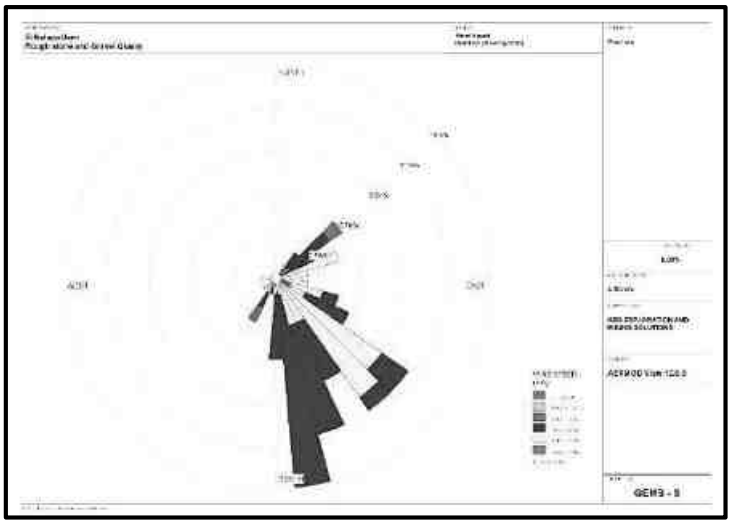
S.No	Parameters		Mar-2025	Apr-2025	May-2025
1	Temperature (^{0}C)	Max	29.48	31.4	32.64
		Min	26.41	27.8	26.34
		Avg	27.94	29.6	29.49
2	Relative Humidity (%)	Avg	72.53	71.02	68.69
3	Wind Speed (m/s)	Max	5.46	4.54	5.99
		Min	2	2.65	2.21
		Avg	3.73	3.59	4.1
4	Cloud Cover (OKTAS)		0-8	0-8	0-8
5	Wind Direction		SE,ESE	SSE,SE	S,SSW

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 Chennai. A comparison of site data generated during the three months with that of IMD, Chennai. Wind rose diagram of the study site is depicted in Figure. 3.13 Predominant downwind direction of the area during study season is –North west to South East.

FIGURE 3.11: 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 SE, SSE, ESE
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 27.94 to 29.6 °C
5. Relative humidity ranging from 68.69 to 72.53 %

6. The monitoring was carried out continuously for three months. (March to May 2025)

3.3.2 Methodology and Objective

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

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

3.3.3 Sampling and Analytical Techniques

TABLE 3.14: METHODOLOGY AND INSTRUMENT USED FOR AAQ ANALYSIS

Parameter	Method	Instrument
PM2.5	Gravimetric Method Beta attenuation Method	Fine Particulate Sampler Make – Thermo Environmental Instruments – TEI 121
PM10	Gravimetric Method Beta attenuation Method	Respirable Dust Sampler Make –Thermo Environmental Instruments – TEI 108
SO2	IS-5182 Part II (Improved West & Gaeke method)	Respirable Dust Sampler with gaseous attachment
NOx	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 3.15: 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/m3)	Annual Avg.* 24 hours**	50.0 80.0	20.0 80.0
2	Nitrogen Dioxide (µg/m3)	Annual Avg. 24 hours	40.0 80.0	30.0 80.0
3	Particulate matter (size less than 10µm) PM10 (µg/m3)	Annual Avg. 24 hours	60.0 100.0	60.0 100.0
4	Particulate matter (size less than 2.5 µm PM2.5 (µg/m3)	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 2025 – May 2025. The

baseline data of ambient air has been generated for PM_{10}, $PM_{2.5}$, Sulphur Dioxide (SO_2) & Nitrogen Dioxide (NO_2) 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 ± 0.5m above the ground level at each monitoring station, for negating the effects of wind-blown ground dust. The equipment was placed at open space free from trees and vegetation which otherwise act as a sink of pollutants resulting in lower levels in monitoring results.

3.3.5 Ambient Air Quality Monitoring Stations

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

TABLE 3.16: AMBIENT AIR QUALITY (AAQ) MONITORING LOCATIONS

S. No	Location Code	Monitoring Locations	Distance & Direction	Coordinates
1	AAQ-1	Core Zone	Project Area	12°43'9.65"N 79°43'42.08"E
2	AAQ-2	Core Zone	Project Area	12°43'18.03"N 79°43'45.62"E
3	AAQ-3	Sithalapakkam	780m SE	12°42'57.01"N 79°44'7.28"E
4	AAQ-4	Vazhathottam	6.5km NW	12°46'42.47"N 79°42'29.32"E
5	AAQ-5	Azhisoor	6km SW	12°40'1.28"N 79°43'27.85"E
6	AAQ-6	Mathur	5.3km West	12°42'53.64"N 79°40'43.87"E
7	AAQ-7	Kavanthandalam	6.3km East	12°43'21.83"N 79°47'12.32"E

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

FIGURE 3.12: AMBIENT AIR QUALITY LOCATIONS AROUND 10 KM RADIUS

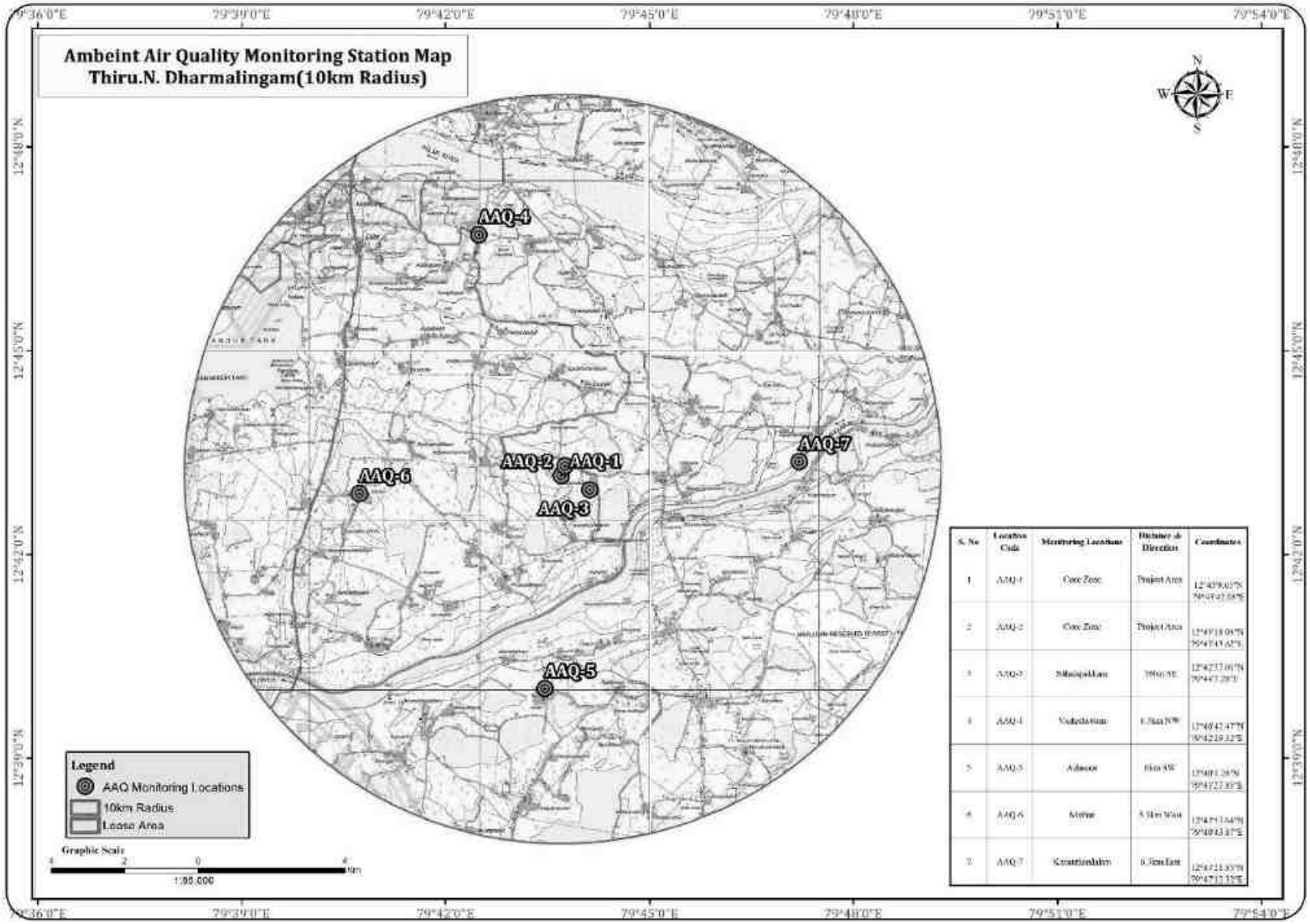


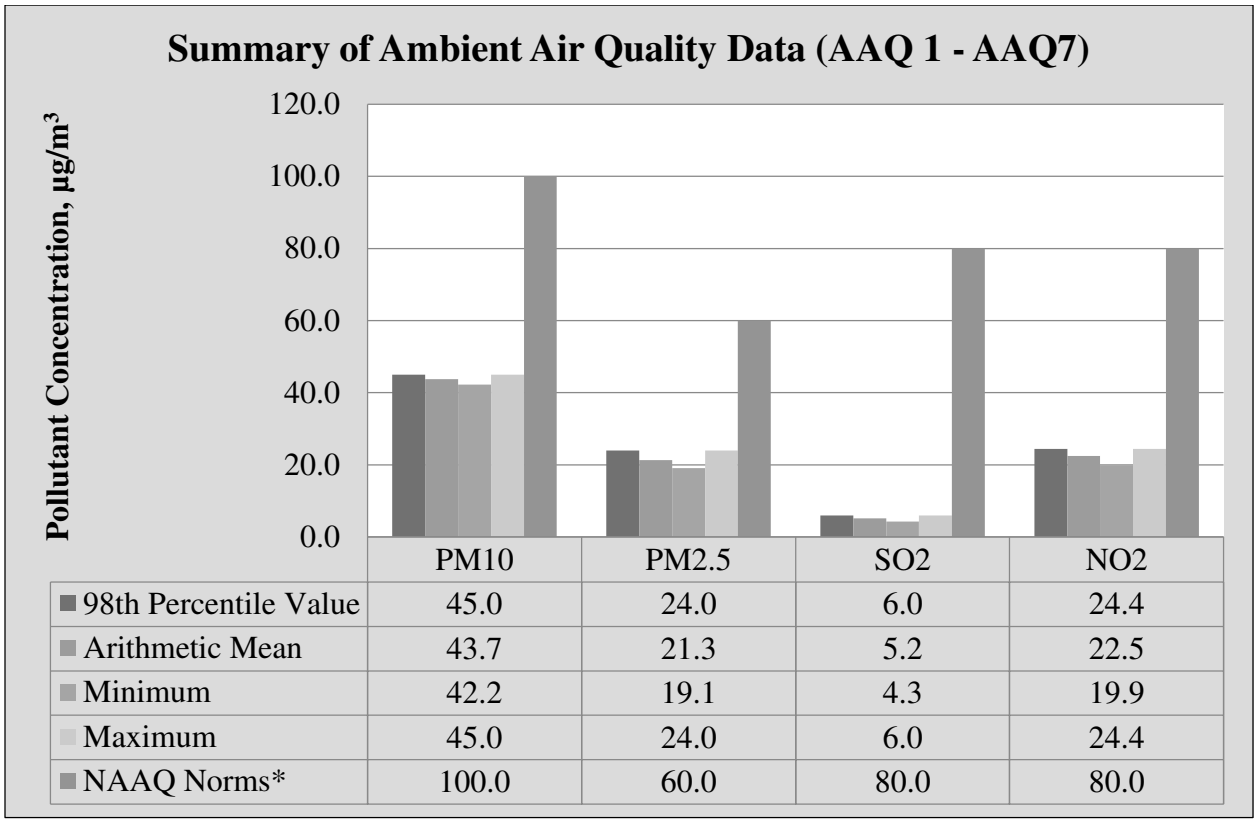
TABLE 3.17: SUMMARY OF AAQ 1 to AAQ 7

PM_{10}	**AAQ1**	**AAQ2**	**AAQ3**	**AAQ4**	**AAQ5**	**AAQ6**	**AAQ7**
Arithmetic Mean	43.0	43.1	43.7	43.5	43.6	43.6	43.5
Minimum	41.7	41.5	42.4	42.2	42.2	42.2	42.1
Maximum	44.4	44.9	45.0	45.1	45.0	45.0	45.0
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	19.8	20.2	21.0	20.7	21.0	21.3	20.7
Minimum	18.1	18.5	19.0	19.1	19.2	18.5	19.0
Maximum	21.5	21.4	23.1	23.3	24.0	24.1	23.5
NAAQ Norms	**60.0**	**60.0**	**60.0**	**60.0**	**60.0**	**60.0**	**60.0**
SO_2	**AAQ1**	**AAQ2**	**AAQ3**	**AAQ4**	**AAQ5**	**AAQ6**	**AAQ7**
Arithmetic Mean	5.2	5.3	5.0	4.9	5.1	4.8	4.9
Minimum	4.5	4.5	4.0	4.1	4.1	4.0	4.1
Maximum	6.0	6.0	6.1	6.0	5.9	6.0	6.0
NAAQ Norms	**80.0**	**80.0**	**80.0**	**80.0**	**80.0**	**80.0**	**80.0**
NO_2	**AAQ1**	**AAQ2**	**AAQ3**	**AAQ4**	**AAQ5**	**AAQ6**	**AAQ7**
Arithmetic Mean	20.2	20.2	22.1	23.1	23.0	22.9	22.7
Minimum	19.1	19.0	19.1	22.0	22.1	22.0	22.0
Maximum	21.2	22.1	24.9	24.1	24.1	24.4	24.0
NAAQ Norms	**80.0**	**80.0**	**80.0**	**80.0**	**80.0**	**80.0**	**80.0**

TABLE 3.18: ABSTRACT OF AMBIENT AIR QUALITY DATA

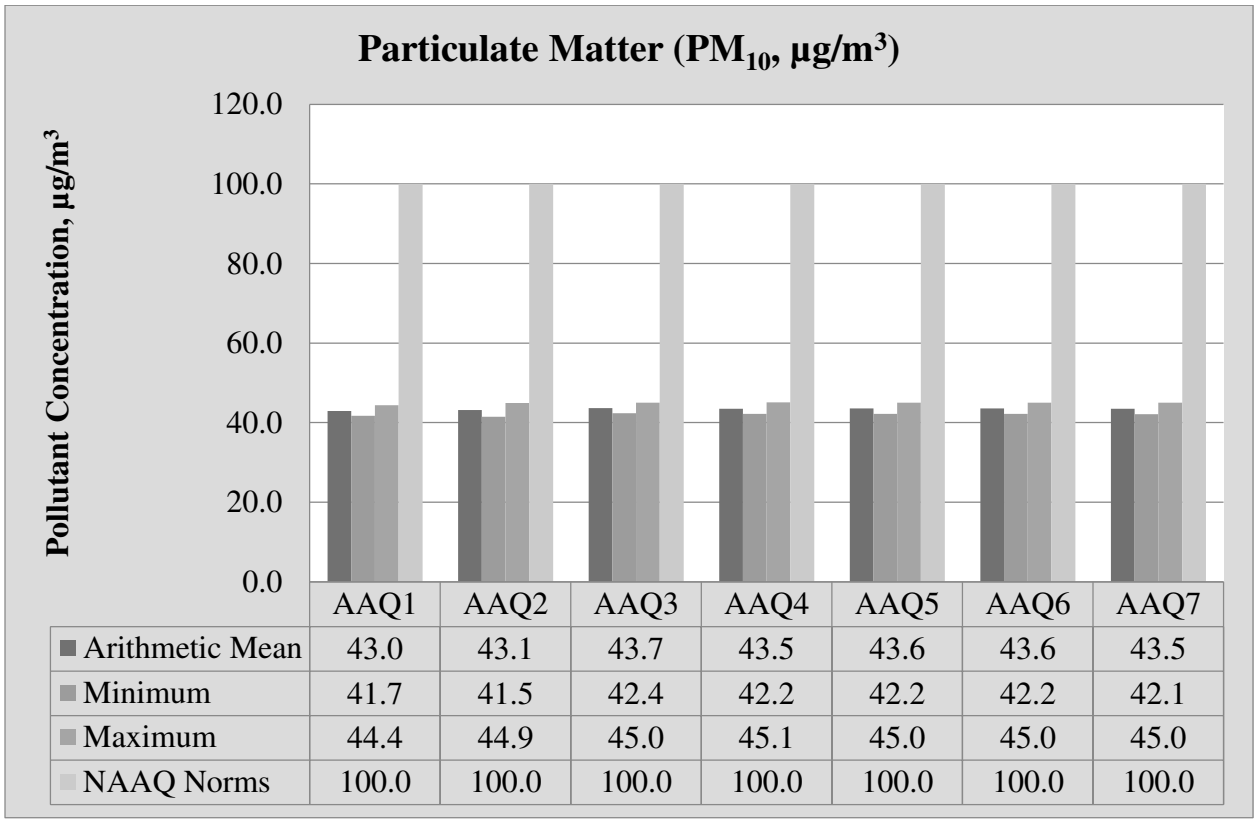
1	**Parameter**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**NO_2**
2	No. of Observations	260	260	260	260
3	10^{th} Percentile Value	42.2	19.1	4.3	19.9
4	20^{th} Percentile Value	42.7	19.7	4.5	20.4
5	30^{th} Percentile Value	42.9	19.9	4.7	21.0
6	40^{th} Percentile Value	43.1	20.4	4.9	22.1
7	50^{th} Percentile Value	43.3	20.7	5.0	22.4
8	60^{th} Percentile Value	43.6	20.9	5.2	22.9
9	70^{th} Percentile Value	44.0	21.4	5.4	23.1
10	80^{th} Percentile Value	44.4	22.1	5.6	23.3
11	90^{th} Percentile Value	44.8	22.8	5.9	23.9
12	95^{th} Percentile Value	45.0	23.3	6.0	24.0
13	98^{th} Percentile Value	45.0	24.0	6.0	24.4
14	Arithmetic Mean	43.7	21.3	5.2	22.5
15	Geometric Mean	43.7	21.2	5.2	22.4
16	Standard Deviation	1.0	1.6	0.6	1.5
17	Minimum	42.2	19.1	4.3	19.9
18	Maximum	45.0	24.0	6.0	24.4
19	**NAAQ Norms***	**100.0**	**60.0**	**80.0**	**80.0**

FIGURE 3.13: BAR DIAGRAM OF SUMMARY OF AAQ 1 – AAQ7



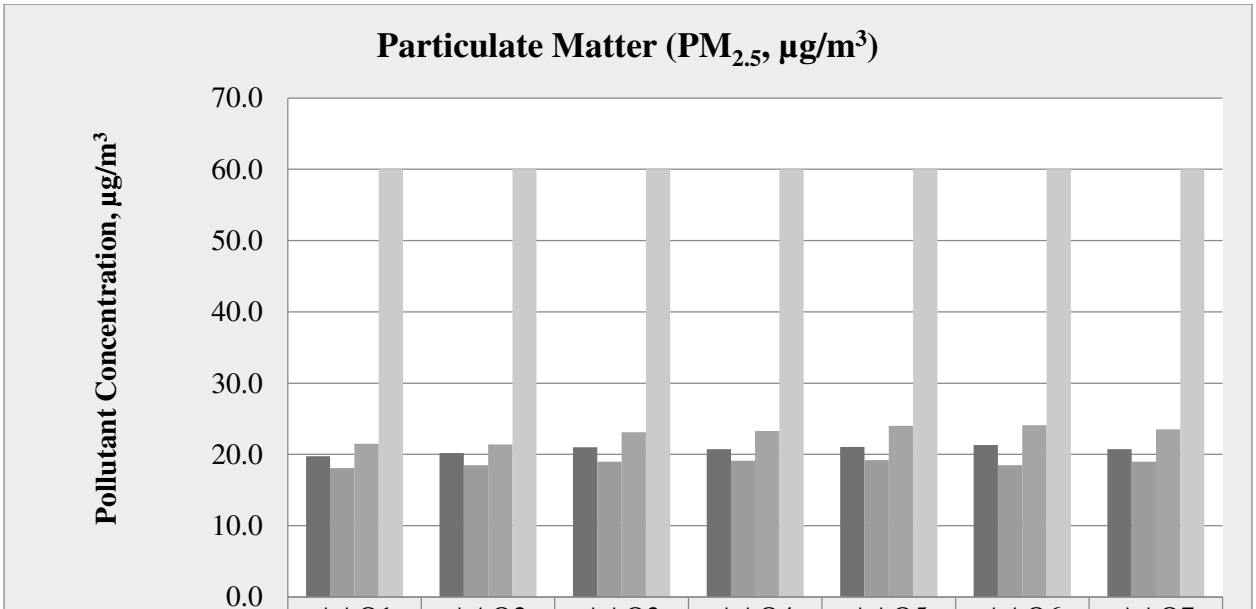
	PM10	PM2.5	SO2	NO2
98th Percentile Value	45.0	24.0	6.0	24.4
Arithmetic Mean	43.7	21.3	5.2	22.5
Minimum	42.2	19.1	4.3	19.9
Maximum	45.0	24.0	6.0	24.4
NAAQ Norms*	100.0	60.0	80.0	80.0

FIGURE 3.14: BAR DIAGRAM OF PARTICULATE MATTER PM_{10}



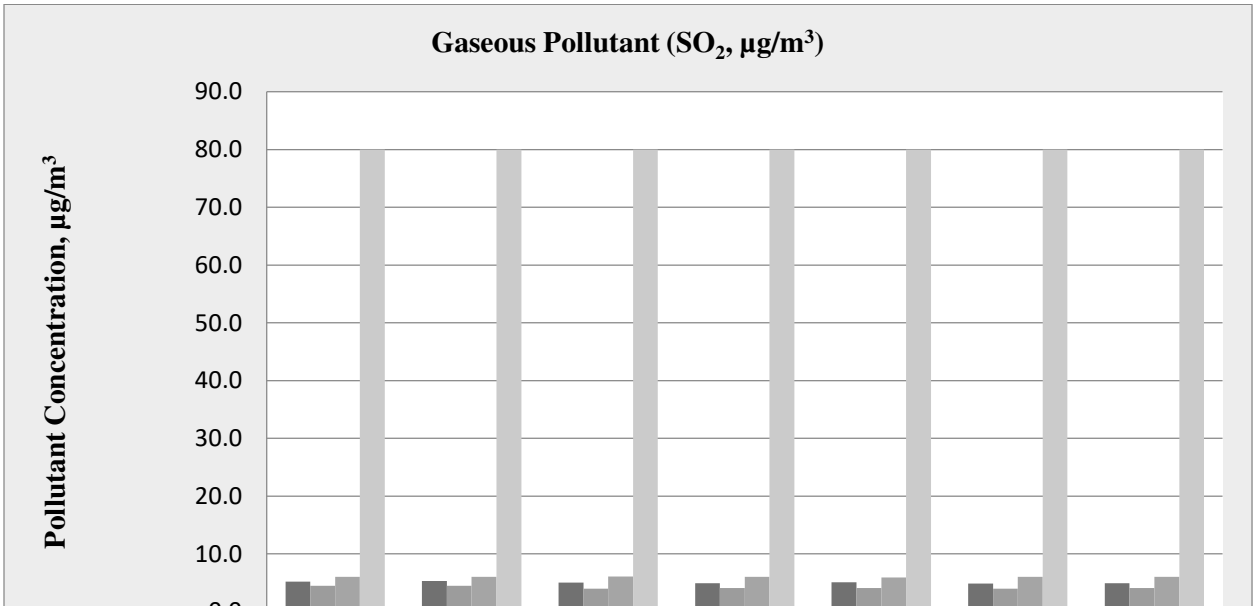
	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7
Arithmetic Mean	43.0	43.1	43.7	43.5	43.6	43.6	43.5
Minimum	41.7	41.5	42.4	42.2	42.2	42.2	42.1
Maximum	44.4	44.9	45.0	45.1	45.0	45.0	45.0
NAAQ Norms	100.0	100.0	100.0	100.0	100.0	100.0	100.0

FIGURE 3.15: BAR DIAGRAM OF PARTICULATE MATTER $PM_{2.5}$



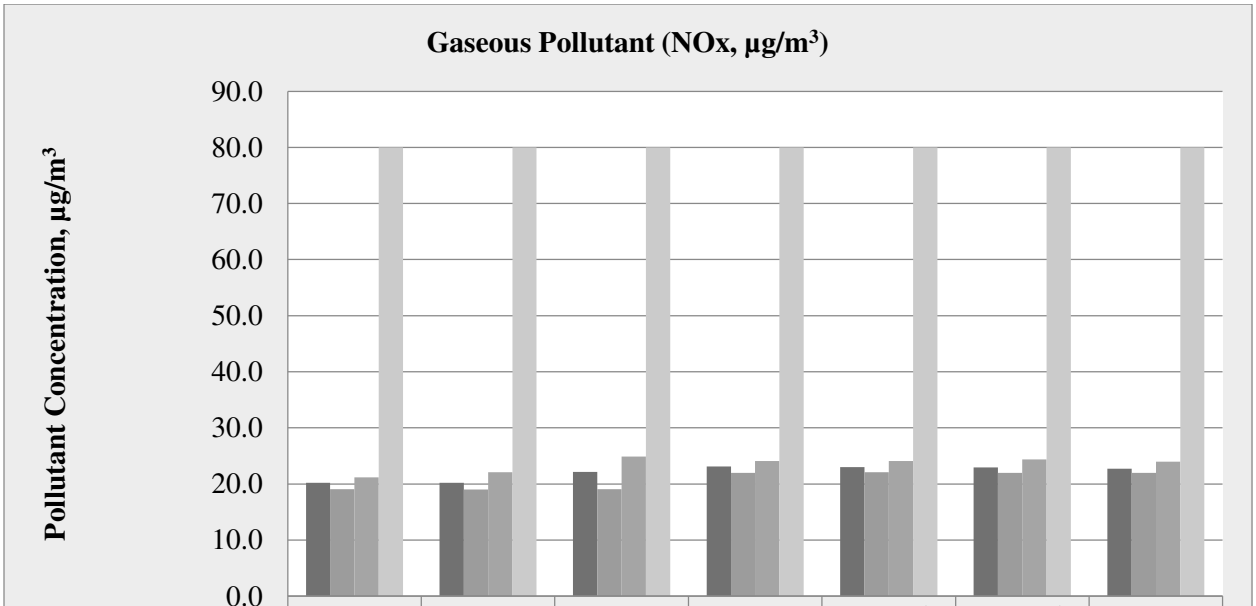
	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7
Arithmetic Mean	19.8	20.2	21.0	20.7	21.0	21.3	20.7
Minimum	18.1	18.5	19.0	19.1	19.2	18.5	19.0
Maximum	21.5	21.4	23.1	23.3	24.0	24.1	23.5
NAAQ Norms	60.0	60.0	60.0	60.0	60.0	60.0	60.0

FIGURE 3.16: BAR DIAGRAM OF GASEOUS POLLUTANT SO_2



	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7
Arithmetic Mean	5.2	5.3	5.0	4.9	5.1	4.8	4.9
Minimum	4.5	4.5	4.0	4.1	4.1	4.0	4.1
Maximum	6.0	6.0	6.1	6.0	5.9	6.0	6.0
NAAQ Norms	80.0	80.0	80.0	80.0	80.0	80.0	80.0

FIGURE 3.17: BAR DIAGRAM OF GASEOUS POLLUTANT NO_x



	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7
Arithmetic Mean	20.2	20.2	22.1	23.1	23.0	22.9	22.7
Minimum	19.1	19.0	19.1	22.0	22.1	22.0	22.0
Maximum	21.2	22.1	24.9	24.1	24.1	24.4	24.0
NAAQ Norms	80.0	80.0	80.0	80.0	80.0	80.0	80.0

3.3.6 Interpretations & Conclusion

As per monitoring data, PM_{10} ranges from 43.0 µg/m^3 to 43.7 µg/m^3, $PM_{2.5}$ data ranges from 19.8 µg/m^3 to 21.3 µg/m^3, SO_2 ranges from 4.8 µg/m^3 to 5.3 µg/m^3 and NO_2 data ranges from 20.2 µg/m^3 to 23.1 µg/m^3. 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 3.19: DETAILS OF SURFACE NOISE MONITORING LOCATIONS

S. No	Location Code	Monitoring Locations	Distance & Direction	Coordinates
1	N1	Core Zone	Project Area	12°43'9.97"N 79°43'43.63"E
2	N2	Core Zone	Project Area	12°43'20.11"N 79°43'43.72"E
3	N3	Sithalapakkam	780m SE	12°42'57.98"N 79°44'7.55"E
4	N4	Vazhathottam	6.5km NW	12°46'42.49"N 79°42'29.07"E
5	N5	Azhisoor	6km SW	12°39'54.32"N 79°43'31.99"E
6	N6	Mathur	5.3km West	12°42'50.87"N 79°40'44.71"E
7	N7	Kavanthandalam	6.3km East	12°43'22.81"N 79°47'14.16"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,

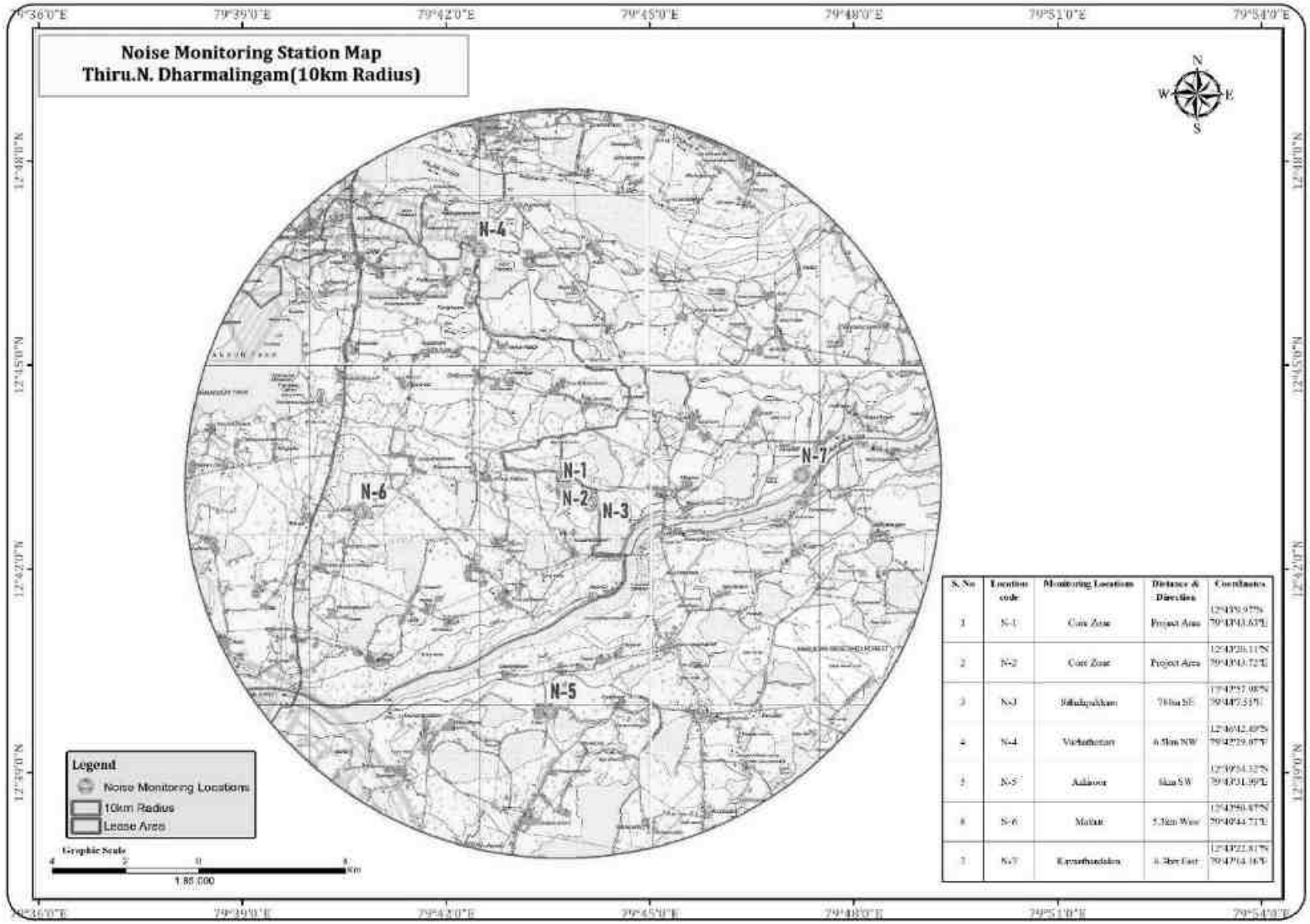
$Leq = 10 \text{ Log } L / T\sum (10Ln/10)$

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 3.18: NOISE MONITORING STATIONS AROUND 10 KM RADIUS



3.4.3 Analysis of Ambient Noise Level in the Study Area

The Digital Sound pressure level has been measured by a sound level meter (Model: HTC SL-1352)

An analysis of the different Leq data obtained during the study period has been made. Variation was noted during the day-time as well as night-time. The results are presented in below Table 3.32.

Day time: 6:00 hours to 22.00 hours.

Night time: 22:00 hours to 6.00 hours.

TABLE 3.20: AMBIENT NOISE QUALITY RESULT

S. No	Locations	Noise level (dB (A) Leq)		Ambient Noise Standards
		Day Time	Night Time	
1	Core Zone	38.9	34.0	**Industrial Day Time- 75 dB (A) Night Time- 70 dB (A)**
2	Core Zone	36.3	34.3	
3	Sithalapakkam	39.8	36.0	**Residential Day Time– 55 dB (A) Night Time- 45 dB (A)**
4	Vazhathottam	44.0	35.0	
5	Azhisoor	37.2	35.2	
6	Mathur	39.7	36.5	
7	Kavanthandalam	36.0	34.8	

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

FIGURE 3.19: DAY TIME NOISE LEVELS IN CORE AND BUFFER ZONE

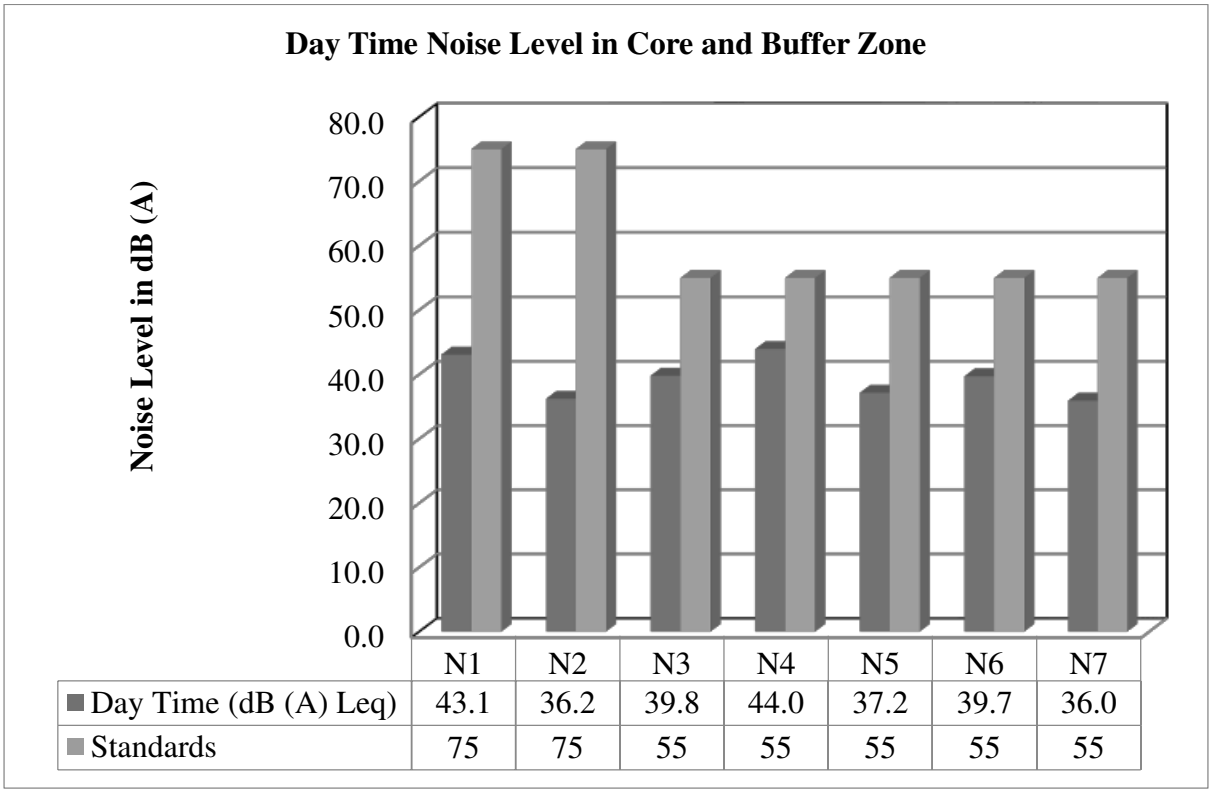
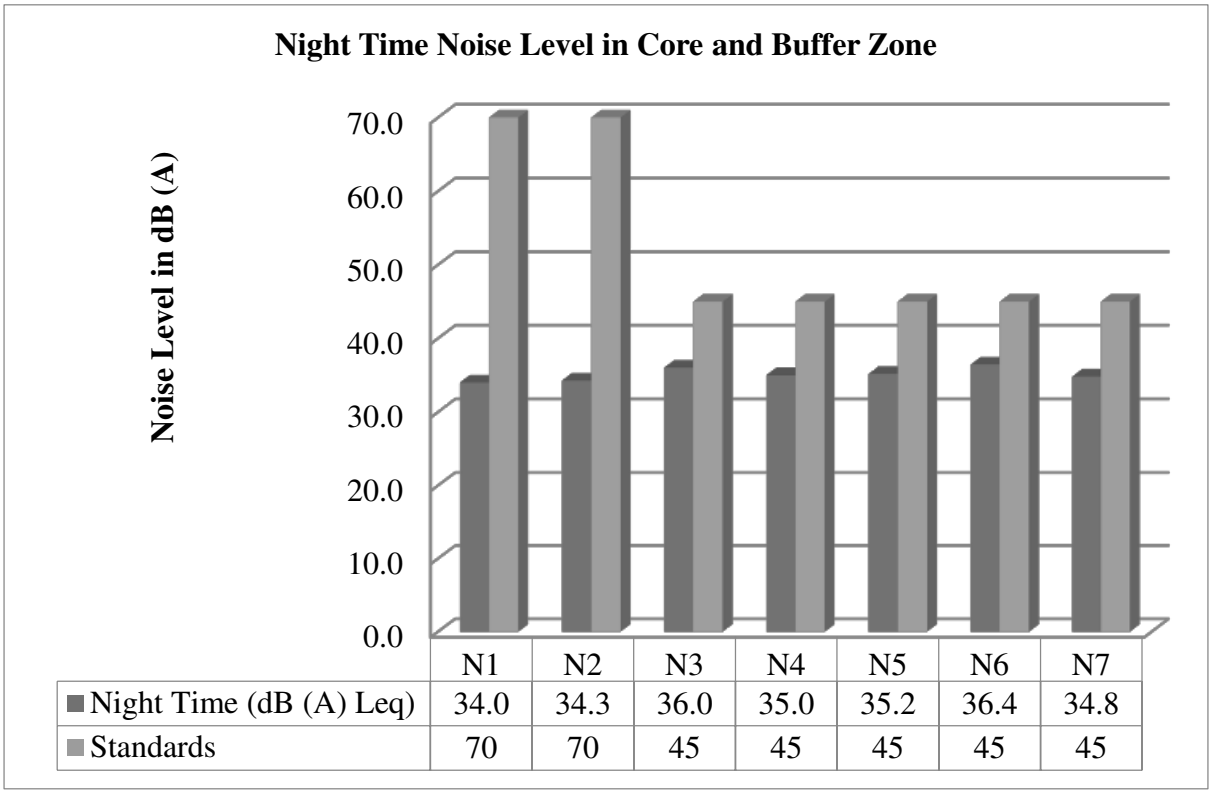


FIGURE 3.20: NIGHT TIME NOISE LEVELS IN CORE AND BUFFER ZONE



	N1	N2	N3	N4	N5	N6	N7
Night Time (dB (A) Leq)	34.0	34.3	36.0	35.0	35.2	36.4	34.8
Standards	70	70	45	45	45	45	45

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 36.2-43.1 dB (A) Leq and during night time were from 34.0-34.3 dB (A) Leq. Noise levels recorded in buffer zone during day time were from 36.0 to 44.0 dB (A) Leq and during night time were from 34.8 to 36.4 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 3.86.0 Ha 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

a) 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.

b) Identification and listing of flora and fauna which are important as per the Wildlife (Protection) Act 1972.

c) 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.

d) To identify the impacts of mining on agricultural lands and how it affects.

e) Proper collection of information about wildlife Sanctuaries/ national parks/ biosphere reserves of the project area.

f) 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 ordinates. Presence of mammals was recorded by direct and indirect signs. All possible transects were taken for birds and butterflies. Birds and butterflies were classified into species level. Recorded bird species were identified to species level using standard books (Ali & Ripley 1987, Grimmett et al., 2016).

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 up 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 9 followed by Shrubs 5, Trees 3, and Climbers 1. Details of flora with the scientific name were mentioned in Table No. 3.22. The result of the core zone of flora studies shows that Fabaceae and Arecaceae are the main dominating species in the study area mentioned in Table No.3.22. No species found as threatened category.

TABLE NO: 3.21. FLORA IN THE CORE ZONE OF SITHALAPAKKAM VILLAGE, ROUGH STONE AND GRAVEL QUARRY (PRIMARY DATA)

SI. No	English Name	Vernacular Name	Scientific Name	Family Name
Trees				
1.	Mesquite	Mullu maram	Prosopis juliflora	Fabaceae
2.	Asian Palmyra palm	Panai maram	Borassus flabellifer	Arecaceae
3.	Neem	Vembu	Azadirachta indica	Meliaceae
Shrubs				
1.	Lantana	Unni chedi	Lantana camara	Verbenaceae
2.	Milk Weed	Erukku	Calotropis gigantea	Apocynaceae
3.	Coromandel Boxwood	Kaarai	Canthium coromandelicum	Rubiaceae
4.	Wild date palm	Eacham	Phoenix pusilla	Arecaceae

5.	Indian fig opuntia	Sapathikalli	Opuntia ficus-indica	Cactaceae
Herbs				
1.	Coat buttons	Thatha poo	Tridax procumbens	Asteraceae
2.	Shrimp plant	Thavasi murunga	Justicia tranquebariensis	Acanthaceae
3.	Pignut	Nattapoochedi	Hyptis suaveolens	Lamiaceae
4.	Flannel Weed	Sida mutti	Sida cordifolia	Malvaceae
5.	Carrot grass	Parttiniyam	Parthenium hysterophorus	Asteraceae
6.	Bindii	Nerunji mullu	Tribulus terrestris	Zygophyllaceae
7.	Chritsmas Bush	Poom pul	Chromolaena odorata	Asteraceae
8.	Holy basil	Thulasi	Ocimum tenuiflorum	Lamiaceae
9.	Prickly chaff flower	Nayuruv	Achyranthes aspera	Amaranthaceae
Climbers				
10.	Stemmed vine	Perandai	Cissus quadrangularis	Vitaceae

(**Source**s: Species observation in the field study)

FIGURE NO. 3.21: GRAPH SHOWING % DISTRIBUTION OF FLORAL LIFE FORMS (CORE ZONE)

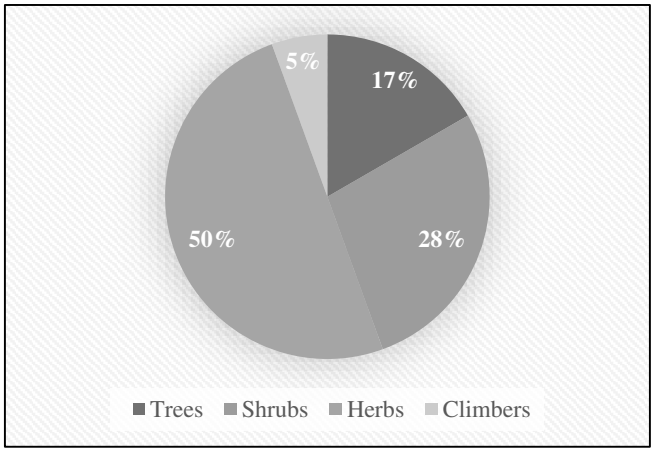
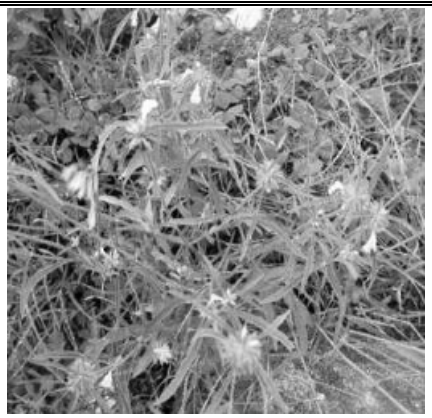


FIGURE NO: 3.22. FLORA SPECIES OBSERVATION IN THE CORE ZONE AREA

a. Ziziphus mauritiana

b. Lantana camara

c. Azadirachta indica



d. Leucas aspera

e. Prosopis juliflora

f. Cissus quadrangularis

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.3.23.

TABLE NO: 3.22. 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	9
2.	Coconut	Thennai maram	Cocos nucifera	6
3.	Mesquite	Mullumaram	Prosopis juliflora	38
4.	Neem	Vembu	Azadirachta indica	20
5.	Asian Palmyra palm	Panai maram	Borassus flabellifer	46

(**Sources**: Species observation in the field study)

TABLE NO: 3.23. FLORA IN BUFFER ZONE OF SITHALAPAKKAM 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.	Wild Date Palm	Icham	Phoenix sylvestris	Arecaceae
3.	Indian siris	Vaaga	Albizia lebbeck (L.) Willd	Fabaceae
4.	Blue gum	Thayala maram	Eucalyptus	Myrtaceae
5.	Alangium salviifolium	Azhinja maram	Alangium salviifolium	Cornaceae
6.	Banana tree	Vazhaimaram	Musa acuminata	Musaceae
7.	Neem	Vembu	Azadirachta indica	Meliaceae
8.	Tamarind	Puliyamaram	Tamarindus indica	Legumes
9.	Mesquite	Mullu maram	Prosopis juliflora	Fabaceae
10.	Coral Tree	Kalyana murungai	Erythrina variegata	Papilionoide
11.	Bamboo	Moonghil	Bambusa bambo	Poaceae
12.	Yellow flame tree	Perunkondrai	Peltophorum pterocarpum	Fabaceae
13.	Indian ash tree	Odhiya maram	Lannea coromandelica	Anacardiaceae
14.	Indian almond	Padam maram	Terminalia catappa	Combretaceae
15.	Asian Palmyra palm	Panai maram	Borassus flabellifer	Arecaceae
16.	Indian ash tree	Odiya maram	Lannea coromandelica	Anacardiaceae
17.	Lemon	Ezhumuchaipalam	Citrus lemon	Rutaceae
18.	Bidi leaf tree	Thiruvathi Plant	Bauhinia racemosa	Fabaceae
19.	Rusty Acacia	Parambai	Acacia ferruginea	Mimosaceae
20.	Mango	Manga	Mangifera indica	Anacardiaceae
21.	Peepal	Arasanmaram	Ficus religiosa	Moraceae
22.	Custard apple	Seethapazham	Annona reticulata	Annonaceae
23.	Chinaberry	Malai vembu	Melia azedarach L.	Meliaceae
24.	Monkey pod tree	Thungumoonchi	Samanea saman	Fabaceae
25.	Teak	Thekku	Tectona grandis	Verbenaceae
26.	Indian gooseberry	Nelli	Emblica officinalis	Phyllanthaceae
27.	Henna	Marudaani	Lawsonia inermis	Lythraceae
28.	Madras thorn	Kudukapuli	Pithecellobium dulce	Fabaceae
29.	Malayan Cherry	Ten Pazham	Muntingia calabura	Muntingiaceae
30.	Pomegranate	Mathulai	Punica granatum	Lythraceae
31.	Jamun Fruit Plant	Naval maram	Syzygium cumini	Myrtaceae

32.	Banyan tree	Alamaram	Ficus benghalensis	Moraceae
33.	Chinese chaste tree	Nochi	Vitex negundo	Verbenaceae
34.	Indian Jujube	Ilanthai	Ziziphus jujuba	Rhamnaceae
35.	Millettia pinnata	Pongam oiltree	Pongamia pinnata	Fabaceae
36.	Coconut	Thennai maram	Cocos nucifera	Arecaceae
37.	Guava	Koyya	Psidium guajava	Myrtaceae
38.	Pala indigo	Pala maram	Wrightia tinctoria	Apocynaeceae
39.	Portia tree	Poovarasan	Thespesia populnea	Malvaceae
40.	Drumstick tree	Murunga maram	Moringa oleifera	Moringaceae
41.	Papaya	Pappali maram	Carica papaya L	Caricaceae
42.	Jackfruit	Palamaram	Artocarpus heterophyllus	Moraceae
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.	Coromandel Boxwood	Kaarai	Canthium coromandelicum	Rubiaceae
7.	Triangular spruge	Chaturakalli	Euphorbia antiquorum	Euphorbiaceae
8.	Night shade plan	Sundaika	Solanum torvum	Solanaceae
9.	-	Odankodi	Hippocratea indica	Odankodi
10.	Wild karanda	Kilaa	Carissa spinarum	Apocynaceae
11.	Broom creeper	Kattukodi	Cocculus hirsutus	Menispermaceae
12.	Solanum pubescens	Malaisundai	Solanum pubescens Willd	Solanaceae
13.	Thorn apple	Oomathai	Datura stramonium	Solanaceae
14.	Shoe flower	Chemparuthi	Hibiscu rosa-sinensis	Malvaceae
15.	Puriging nut	Kattamanakku	Jatropha curcas	Euphorbiaceae
16.	Touch-me-not	Thottalchinungi	Mimosa pudica	Mimosaceae
17.	Chinese chastetree	Nalla nochi	Vitex negundo L	Verbinaceae
18.	Jackal jujube	Suraimullu	Ziziphus oenoplia	Rhamnaceae
19.	Malabar catmint	Pei veratti	Anisomeles malabarica	Lamiaceae
20.	Indian mallow	Thuthi	Abutilon indicum	Meliaceae
21.	Bush Morning Glory	Neiveli Kattamani	Ipomoea carnea	Convolvulaceae
22.	Carray Cheddle	Kaarai	Canthiumparviflorum	Rubiaceae
23.	Lantana	Unni chedi	Lantana camara	Verbenaceae
24.	Flame of the Woods	Idlipoo	Xoracoc cinea	Rubiaceae
25.	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.	Chritsmas Bush	Poom pul	Chromolaena odorata	Asteraceae
5.	Aloe barbadensis	Katrazhai	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	Kolinchi	Tephrosia purpurea	Fabaceae
11.	Black creeper	-	Justicia prostrata	Acanthacea
12.	Ban Tulsi	Melakai poondu	Croton bonplandianus	Euphorbiaceae
13.	Commelina benghalensis	Kanavazha	Commelina benghalensis	Commelinaceae
14.	Asthma-plant	Amman pacharisi	Euphorbia hirta	Euphorbiaceae
15.	Indian doab	Arugampul	Cynodon dactylon	Poaceae
16.	Spiny amaranth	Mullu keerai	Amaranthus spinosus	Amaranthaceae
17.	Chilli	Milakai	Capsicum annuum	Solanaceae
18.	Flannel Weed	Sida mutti	Sida cordifolia	Malvaceae
19.	Indian Copperleaf	Kuppaimeni	Acalypha indica	Euphorbiaceae
20.	Madagascar Periwinkle	Nithykalyani Podi	Catharanthus roseus	Apocynaceae
21.	Marsh barbel	Neermulli	Hygrophila auriculata	Acanthaceae
22.	Yellow-fruit nightshade	Kandakathirika	Solanum surattense	Solanales
23.	Asian spiderflower	Naaikaduku	Cleome viscosa L	Cleomaceae
24.	Tomato	Thakkali	Solanum lycopersicum	Solanaceae
25.	White dammar	Mookutipoondu	Vicoa indica	Asteraceae
26.	Cleome viscosa	Nai kadugu	Celome viscosa	Capparidaceae
27.	Bindii	Nerunji mullu	Tribulus terrestris	Zygophyllaceae
28.	Bara Gokhru	Yanainerunjil	Pedalium murex	Pedaliaceae
29.	Digeria muricata	Thoiya keerai	Digeria muricata	Amaranthaceae
30.	False daisy	Karisalankanni	Eclipta alba	Asteraceae
31.	Sessile Joyweed	Ponnakanni	Alternanthera sessilis	Amaranthaceae
32.	Pignut	Nattapoochedi	Hyptis suaveolens	Lamiaceae
33.	Field beans	Avarai	Hyacinth Beans	Fabaceae
34.	Common leucas	Thumbai	Leucas aspera	Lamiaceae
35.	Holy basil	Thulasi	Ocimum tenuiflorum	Lamiaceae
36.	Coat buttons	Thatha poo	Tridax procumbens	Asteraceae

37.	Indian mint	Karpura valli	Coleus amboinicus	Lamiaceae
38.	Europeanblack nightshade	Manathakkali	Solanumnigrum	Solanaceae
39.	Bright eyes	Nithiyakalyani	Catharanthus roseus	Apocynaceae
40.	Carrot grass	Parttiniyam	Parthenium hysterophorus	Asteraceae
41.	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	Mudakrttan	Cardiospermum halicacabum	Sapindaceae
6.	Bitter apple	Peikkumatti	Citrullus colocynthis	Cucurbitaceae
7.	Butterfly pea	Sangu poo	Clitoria ternatea	Fabaceae
8.	Betel	Vetrilai	Piper betle	Piperaceae
9.	Pointed gourd	Kovakkai	Trichosanthes dioica	Cucurbitaceae
10.	Wild bitter	Pavarkai	Momordica charantia	Cucurbitaceae
11.	Bottle Guard	Sorakkai	Lagenaria siceraria	Cucurbitaceae
12.	White pumpkin	Poosanaikkaai	Cucurbitaceae	Cucurbitaceae
13.	Wild jasmine	Malli	Jasminum augustifolium	Oleaceae
14.	Nut grass	Korai	Cyperus rotandus	Poaceae
15.	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.	Needle Grass	Thodappam	Aristida adscensionis	Poaceae
5.	Eragrostis	Pullu	Eragrostis ferruginea	Poaceae
6.	Needle Grass	-	Aristida funiculata	Poaceae
7.	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 (130) varieties among them Trees 42, Herbs 41, Shrubs 25, Climbers/Creepers 15, and Grasses 7 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.3.25. 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 3.25 and their % distribution is shown in Figure no 3.26.

TABLE NO: 3.24 NUMBER OF FLORAL LIFE FORMS IN THE STUDY AREA

S. No	Plant Life Form	Number of Species
1	Trees	42
2	Shrubs	25
3	Herbs	41
4	Climber/Creepers	15
6	Grasses	7
Total No. of Species		**130**

FIGURE NO. 3.23: GRAPH SHOWING % DISTRIBUTION OF FLORAL LIFE FORMS (BUFFER ZONE)

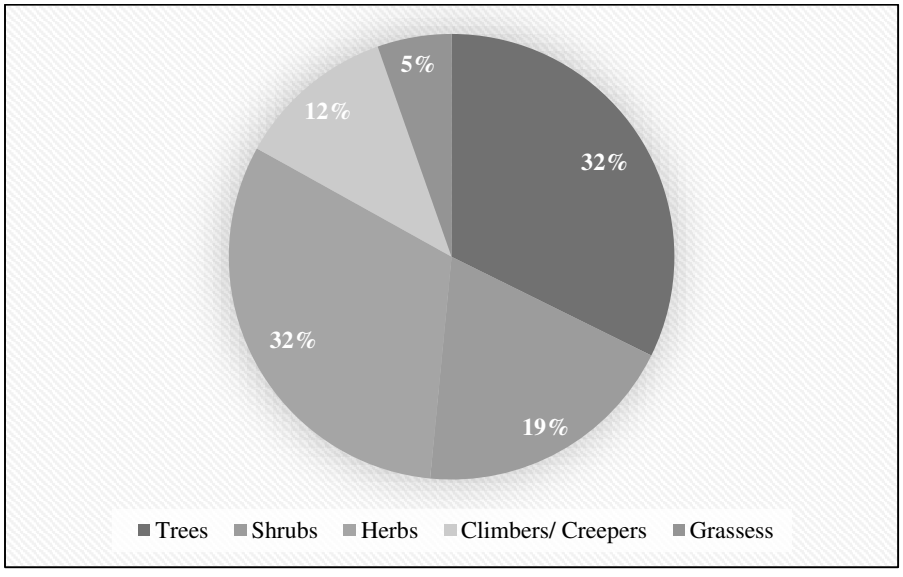


FIGURE NO: 3.24. FLORA SPECIES OBSERVATION IN THE BUFFER ZONE AREA

a. Lantana camara

b. Jatropha curcas

c. Calotropis gigantea

d. Musa acuminata

e. Borassus flabellifer

f. Borassus flabellifer

g. Phoenix sylvestris

h. Mangifera indica

i. Cissus quadrangularis

j. Datura stramonium

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, Thurinjalaru 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 'Sithalapakkam' village, (15km) Tiruvannamalai district, Tamilnadu. This study aimed to identify plants collected for medicinal and other purposes by the local people of the villa A total of 22 and more plant species were observed in this study. These plant species, belonging to 16 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. 3.25. MEDICINAL AND ECONOMIC IMPORTANCE

S. No	Botanical name	Family	Vernacular name
1.	*Abrus precatorius L.*	Fabaceae	Gundumani
2.	*Abutilon indicum (Link) Sweet.*	Malvaceae	Thuthi
3.	*Acalypha indica L*	Euphorbiaceae	Kuppaimeni
4.	*Achyranthes aspera L*	Amaranthaceae	Naaiuruvi
5.	*Aegle marmalos (L.) Corrêa.*	Rutaceae	Vilvam
6.	*Aloe vera (L.) Burm.f.*	Asphodelaceae	Sotrukkatrazhai
7.	*Alternanthera sessilis (L.)*	Amaranthaceae	Ponnaankanni
8.	*Amaranthus spinosa L.*	Amaranthaceae	Mullu keerai
9.	*Andrographis paniculata (Burm.f.) Wall. ex Nees.*	Acanthaceae	Nila vembu, Siriyaa nangai
10.	*Argemone mexicana L.*	Papaveraceae	Kudiyotti
11.	*Azadirachta indica A. Juss*	Meliaceae	Vembu
12.	*Cassia tora L.*	Caesulpinaceae	Thagarai
13.	*Cissus quadrangularis L*	Vitaceae	Pirandai
14.	*Citrus medica L*	Rutaceae	Elumichai
15.	*Cuscuta reflexa Roxb*	Convolvulaceae	Ammaiyar koonthal
16.	*Eclipta prostrata L.*	Asteraceae	Karisalankanni
17.	*Hemidesmus indicus (L.) R.Br.*	Apocynaceae	Apocynaceae
18.	*Justicia adhatoda L.*	Acanthaceae	Adathoda
19.	*Melia azedarach L*	Meliaceae	Malai veambu
20.	*Phyllanthus niruri L*	Phyllanthaceae	Keezhanelli

21.	*Sida cordifolia L.*	Malvaceae	Nilathuthi
22.	*Smilax zeylanica L.*	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 Sithalapakkam Village, Rough stone and gravel quarry among them numbers of Insects/ Butterflies 5, Reptiles 4, Mammals 2, and Avian 8. A total of 19 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 13 species are under Schedule IV according to the Indian Wildlife Act 1972. A total of 8 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. 3.27.

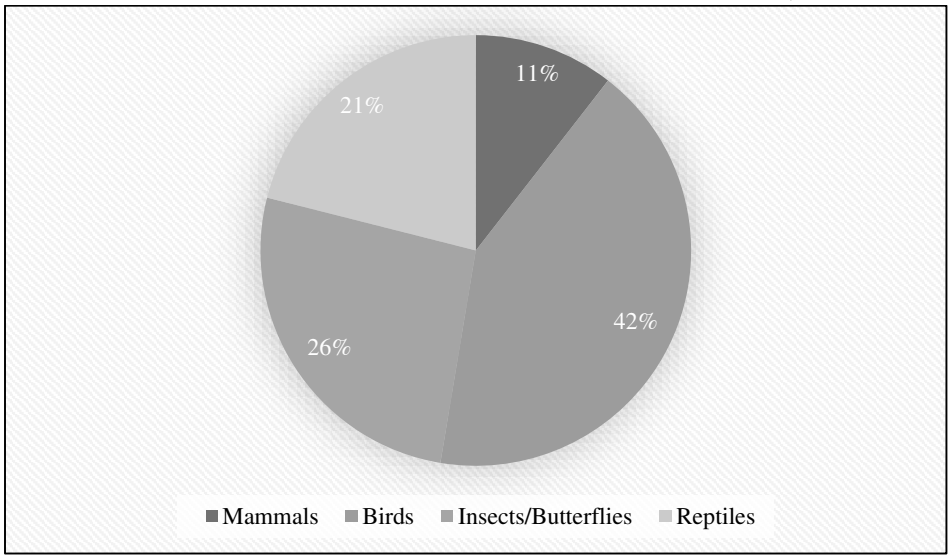
TABLE NO: 3.26. FAUNA IN THE CORE ZONE OF SITHALAPAKKAM VILLAGE, ROUGH STONE AND GRAVEL QUARRY (PRIMARY DATA)

SI. No	Common Name	Family Name	Scientific Name	Schedule WPA1972
Insects/Butterflies				
1.	Striped tiger	Nymphalidae	*Danaus plexippus*	Schedule IV
2.	Common Tiger	Nymphalidae	*Danaus genutia*	Schedule IV
3.	Grasshopper	Acrididae	*Hieroglyphus sp*	NL
4.	Common Tiger	Nymphalidae	*Danaus genutia*	NL
5.	Termite	Blattodea	*Hamitermes silvestri*	NE
Reptiles				

1.	Garden lizard	Agamidae	*Calotes versicolor*	NL
2.	Common skink	Scincidae	*Mabuya carinatus*	NL
3.	Rat snake	Colubridae	*Ptyas mucosa*	Sch II (Part II)
4.	Green vine snake	Colubridae	*Ahaetulla nasuta*	Schedule IV
Mammals				
1.	Indian Field Mouse	Muridae	*Mus booduga*	Schedule IV
2.	Common rat	Muridae	*Rattus rattus*	Schedule IV
Aves				
1.	Black drongo	Dicruridae	*Dicrurus macrocercus*	Schedule IV
2.	Common myna	Sturnidae	*Acridotheres tristis*	Schedule IV
3.	Sunbird	Nectariniidae	*Cinnyrisasiaticus*	Schedule IV
4.	Shikra	Laniidae	*Laniusexcubitor*	Schedule IV
5.	House crow	Corvidae	*Corvussplendens*	Schedule V
6.	Koel	Cucalidae	*Eudynamys*	Schedule IV
7.	Cattle egret	Ardeidae	*Bubulcus ibis*	Schedule IV
8.	Rose-ringed parkeet	Psittaculidae	*Psittacula krameri*	Schedule IV

(Sources: Species observation in the field study)

FIGURE NO:3.25. DISTRIBUTION OF FAUNAL COMMUNITIES (CORE ZONE)



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.3.28. The list of bird species recorded during the field survey and literature from the study area are given in Table 3.29. The list of reptilian species recorded during the field survey and literature from the study area is given in Table 3.30. The list of insect species recorded during the field survey and literature from the study area are given in Table 3.31. The list of Butterflies species recorded during the field survey and literature from the study area are given in Table 3.32. 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 Sphaerotheca breviceps, Euphlyctis hexadactylus, Bufomelanostictus, 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. 3.27. LIST OF FAUNA & THEIR CONSERVATION STATUS, MAMMALS: (*DIRECTLY SIGHTED ANIMALS & SECONDARY DATA)

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

TABLE NO. 3.28. LISTED BIRDS (PRIMARY DATA AND SECONDARY DATA)

SI. No	Scientific Name	Common Name	Schedule list WPA 1972
1.	Alcedo atthis	Common Kingfisher	Schedule IV
2.	Copsychus fulicatus	Indian robin	Schedule IV
3.	Corvus splendens	House crow	Schedule V
4.	Dicrurus macrocercus	Black Drongo	Schedule IV
5.	Halcyon smyrnensis	White-breasted kingfisher	Schedule IV
6.	Bubulcus ibis	Cattle Egret	Schedule IV
7.	Hypsipetes madagascariensis	Black bulbul	Schedule IV
8.	Columba livia	Rock pigeon	Schedule IV
9.	Acridotheres tristis	Common myna	Schedule IV

10.	Psittacula krameri	Rose ringed parakeet	Schedule IV
11.	Coturnix coturnix	Grey quail	Schedule IV
12.	Passer domesticus	House Sparrow	Schedule IV
13.	Pycnonotus cafer	Red vented Bulbul	Schedule IV
14.	Accipiter badius	Shikra	Schedule IV
15.	Cuculus canorus	Cuckoo	Schedule IV
16.	Merops orientalis	Small green bee eater	Schedule IV
17.	Nectarinia minima	Small sunbird	Schedule IV
18.	Ardeola grayii	Pond Heron	Schedule IV
19.	Spilopelia chinensis	Spotted dove	Schedule IV
20.	Egretta garzetta	Little Egret	Schedule IV
21.	Apus apus	Common swift	Schedule IV
22.	Ardea cinerea	Grey heron	Schedule IV
23.	Megalaima zeylanica	Brown-headed barbet	Schedule IV
24.	Eudynamys scolopacea	Koel	Schedule IV
25.	Coracias benghalensis	Indian roller	Schedule IV

TABLE NO 3.29. 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.	Calotes versicolor	Oriental garden lizard	NL
2.	Hemidactylus flaviviridis	House lizards	Schedule IV
3.	Naja naja	Indian cobra	Sch II (Part II)
4.	Ahaetulla nasuta	Green vine snake	Schedule IV
5.	Ptyas mucosa	Rat snake	Sch IV (Part II)
6.	Bungarus caeruleus	Common krait	Schedule IV
7.	Mabuya carinatus	Common skink	NL
8.	Vipera russseli	Russell's viper	Sch II (Part II)
9.	Nerodia piscator	Fresh water snake	Sch III (Part II)
10.	Groemyda bijuga	Fresh water tortoise	Sch III (Part II)

TABLE NO. 3.30. LIST OF INSECTS EITHER SPOTTED OR REPORTED FROM THE STUDY AREA

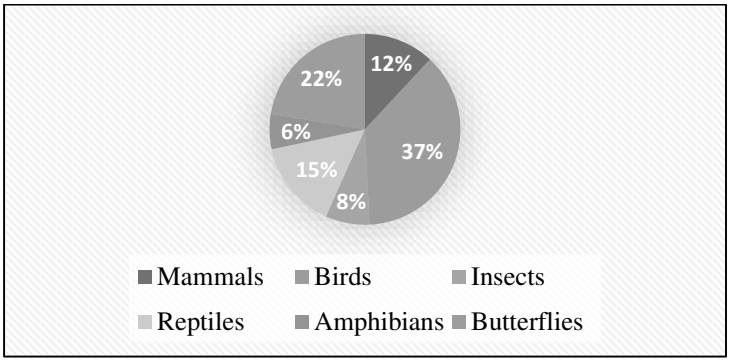
SI. No	Scientific Name	Common Name	Schedule list WPA 1972
1.	Apis cerana	Indian honey bee	-
2.	Hamitermes silvestri	Termite	NE
3.	Hieroglyphus sp	Grasshopper	NL
4.	Camponotus Vicinus	Ant	NL
5.	Ceratogomphus pictus	Dragonfly	-

TABLE NO. 3.31. LIST OF BUTTERFLIES REPORTED FROM THE STUDY AREA AND SECONDARY DATA

SI. No	Scientific Name	Common Name	Schedule
1.	Papilio clytia	Common mime	-
2.	Euploea core	Euploea core	-
3.	Pachliopta aristolochiae	Common rose	-
4.	Papilio polytes	Common mormon	-
5.	Spialia galba	Indian Skipper	-
6.	Danaus genutia	Common tiger	-
7.	Pachliopta hector	Crimson rose	-
8.	Eurema brigitta	Eurema brigitta	-
9.	Hypolimnas bolina	Hypolimnas bolina	-

10.	Castalius rosimon	Common Pierrot	-
11.	Curetis thetis	Indian Sunbeam	-
12.	Troides minos	Southern birdwing	-
13.	Papilio demoleus	Lime Butterfly	-
14.	Ariadne merione	Common Castor	-
15.	Neptis hylas	Neptis hylas	-

FIGURE NO:3.26. 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 3.33.

FIGURE NO: 3.27. SPECIES OBSERVATION IN THE FIELD STUDY (BUFFER ZONE)

a. Calotes versicolor

b. Corvussplendens

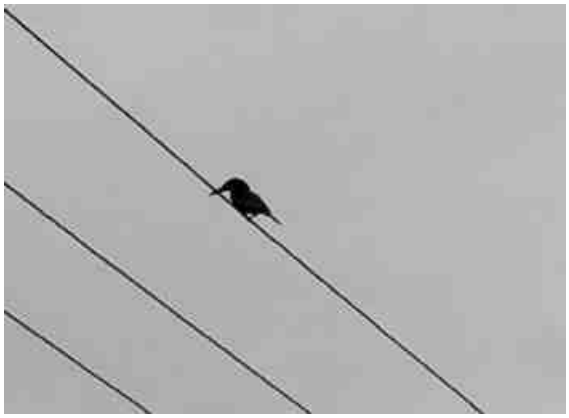
c. Zizina Otis indica

d. Ceratogomphus pictus

e. Sympetrum fonscolombii

f. Dicrurus macrocercus

g. Danainae



h. Alcedo atthis

i. Picidae

j. Psittacula krameri

k. Meropsorientalis

l. Acridotheres tristis

TABLE NO: 3.32 CHARACTERIZATION OF FAUNA IN THE STUDY AREA (AS PER W.P ACT, 1972)

S. No	Schedule of Wildlife Protection Act 1972	No. of species	Remark
1.	Schedule I	0	-
2.	Schedule II	4	-
3.	Schedule III	2	-
4.	Schedule IV	39	-
5.	Schedule V	1	-
6.	Schedule VI	0	-

FIGURE NO: 3.28. SCHEDULE OF WILDLIFE PROTECTION ACT 1972

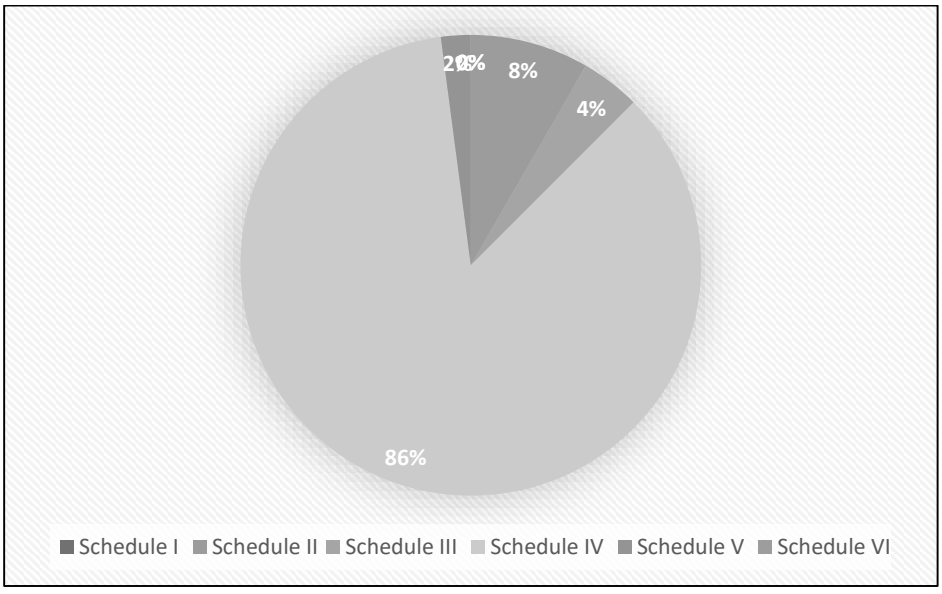


TABLE NO 3.33 DESCRIPTION OF FLORA & FAUNA

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

A comprehensive Central Legislation Namely Wild Life (Protection) Act was enforced in 1972 to provide protection to wild animals. Schedule-I of this act contains the list of rare and endangered species, which are completely protected throughout the country. The list of wild animals and their conservation status as per Wild Life Act (1972) presented in Table 3.65 are the species recorded/reported from the study area, out of which 4 species belongs to schedule-II, 2 species belong to schedule-III, 1 species belongs to Schedule-V and rest of the species belongs to schedule-IV of Wildlife Protection Act, 1972. And there is no Invasive alien species (IAP) in the study area.

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 faun. 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 3.35.

TABLE NO.3.34 DESCRIPTION OF MACROPHYTES

Sl. No	Scientific name	Common Name	Vernacular Name (Tamil)	IUCN Red List of Threatened Species
1.	Eichornia crassipe	Water hyacinth	Agayatamarai	NA
2.	Aponogetonnatans	Floating lace plant	Kottikizhnagu	NA
3.	Nymphaea nouchali	Blue water lily	Nellambal	LC
4.	Typha angustifolia	Sambu	Narrowleaf cattail	LC
5.	Carex cruciata	Cross Grass	Koraipullu	NA
6.	Cyperus exultates	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.	Sphaerotheca breviceps	Indian Burrowing frog	Schedule IV
2.	Euphlyctis hexadactylus	Green pond frog	Schedule IV
3.	Bufomelanostictus	Indian Toad	Schedule IV
4.	Euphlyctiscynophlyctis	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 Easterner 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 3.37. 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.	Ticto barb	Pethia ticto	Cyprinidae
2.	Mrigal	Cirrhinus mrigala	Chordata
3.	Rohu	Labeo rohita	Cyprinidae
4.	Catfish	Siluriformes	Diplomystidae
5.	Greenstripe barb	Puntius vittatus	Cyprininae
6.	Pool barb	Puntius sophore	Cyprinidae

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

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.

STRUCTURE STUDY IN 300m RADIUS

There are no structures within the radius of 300m from the project site.

FIGURE 3.29. STRUCTURE MAP 300m RADIUS

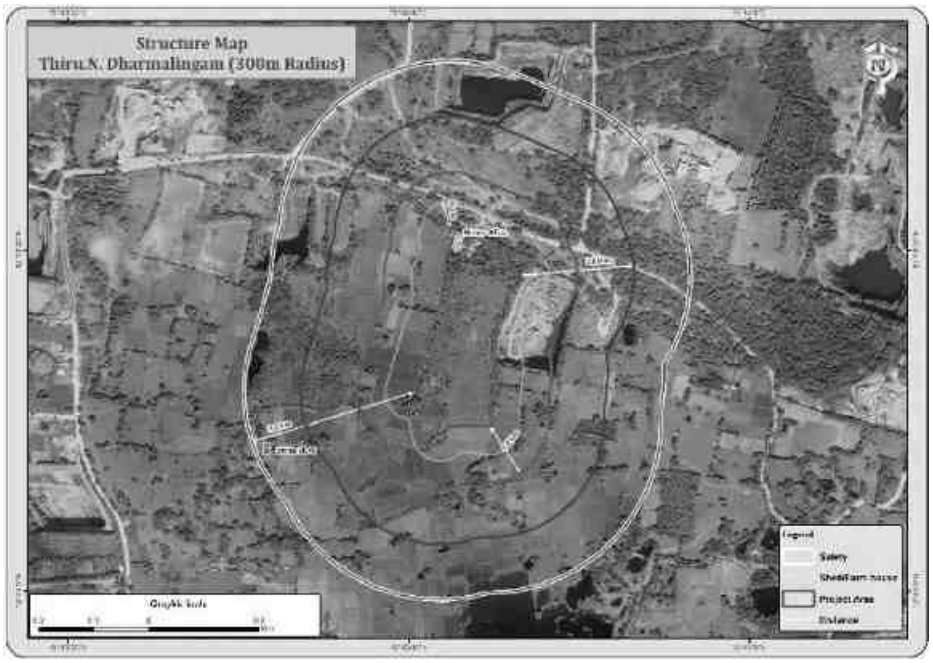


TABLE NO 3.37. ENUMERATION OF STRUCTURES FROM 0 - 300M RADIUS

Enumeration of Structure from 0 – 300m Radius						
Structure Numbers	**Distance & Direction from the project site**	**Structure Details and Usage Purpose**	**Type of Structure Structures (Kutcha/ Brick/ Cement/ RCC/ Framed Structures)**	**No. of Occupants**	**Structure belongs to owner (Yes/No)**	**Remarks**
1	Lease area	Mines Office	RCC and Sheet Structure	Nil	Yes	Used to store mines documents
2	280m – SW	Shed	Tiled Structure	Nil	No	Used to Store for Agriculture goods – No stay

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

3.6.2 Scope of Work

- To study the Socio-economic Environment of the area from the secondary sources;
- Data Collection & Analysis
- Prediction of project impact
- Mitigation Measures

3.6.3 District Profile

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:

SITHALAPAKAM VILLAGE

Sithalapakam village is situated in Teshil Cheyyar, District Tiruvannamalai and in State of Tamil Nadu India. Village has population of 589 as per census data of 2011, in which male population is 284 and female population is 305. Total geographical area of Sithalapakam village is 182.72 Hectares. Population density of Sithalapakam is 3 persons per Hectares. Total number of house hold in village is 145.

Gram Panchayat name of the Sithalapakam village is Arasanipalai. CD Block name is Vembakkam and Teshil/Taluk or sub-district is Cheyyar. Data Reference year is 2009 of Census 2011. Sub District HQ Name is TIRUVETHIPURAM and Sub District HQ Distance is 35 Km from the village. District Head Quarter name is TIRUVANNAMALAI and its distance from the village is 130KM. Nearest Town of the Sithalapakam village is UTHIRAMERUR and nearest town distance is 17 km. Pincode of Sithalapakam village is 631702. As per census 2011 village code of village Sithalapakam is 631298.

Sex Ratio of Sithalapakam Village -Census 2011

As per the Census Data 2011 there are 1074 Females per 1000 males out of 589 total population of village. There are 1200 girls per 1000 boys under 6 years of age in the village

Literacy of Sithalapakam Village

Out of total population total 298 people in Sithalapakam Village are literate, among them 170 are male and 128 are female in the village. Total literacy rate of of Sithalapakam is 58.2%, for male literacy is 68.27% and for female literacy rate is 48.67%.

Worker's profile of Sithalapakam Village

Total working population of Sithalapakam is 277 which are either main or marginal workers. Total workers in the village are 277 out of which 160 are male and 117 are female. Total main workers are 138 out of which female main workers are 108 and male main workers are 30. Total marginal workers of village are 139.

TABLE 3.38: SITHALAPAKAM VILLAGE CENSUS 2011 DATA

Description	Census 2011 Data
Village Name	Sithalapakam
Teshil Name	Vembakkam
District Name	Tiruvannamalai
State Name	Tamil Nadu
Total Population	589
Total Area	183(Hectares)
Total No of House Holds	145

Total Male Population	284
Total Female Population	305
0-6 Age group Total Population	77
0-6 Age group Male Population	35
0-6 Age group Female Population	42
Total Person Literates	298
Total Male Literates	170
Total Male Literates	128
Total Person Illiterates	291
Total Male Illiterates	114
Total Male Illiterates	177
Scheduled Cast Persons	9
Scheduled Cast Males	3
Scheduled Cast Females	6
Scheduled Tribe Persons	0
Scheduled Tribe Males	0
Scheduled Tribe Females	0

Source:https://etrace.in/census/village/sithalapakam-cheyyar-district-tiruvannamalai-tamil-nadu-31298

TABLE 3.39 SITHALAIPAKAM WORKING POPULATION ---CENSUS 2011

	Total	**Male**	**Female**
Total Workers	277	160	117
Main Workers	138	108	30
Main Workers Cultivators	36	27	9
Agriculture Labourer	37	21	16
Household Industries	8	7	1
Other Workers	57	53	4
Marginal Workers	139	52	87
Non-Working Persons	312	124	188

Source: https://etrace.in/census/village/sithalapakam-cheyyar-district-tiruvannamalai-tamil-nadu-631298

TABLE 3.40: POPULATION DATA OF STUDY AREA

SI.No.	Village Name	No of House Holds	Total Population	Male	Female	Total Literate Population	Male Literate	Female Literate	Total Illiterate Population	Male Illiterate	Female Illiterate
1	Adavapakkam	185	765	396	369	499	258	241	8	6	2
2	Arasanipalai	287	1155	581	574	418	208	210	0	0	0
3	Arpakkam	731	2937	1475	1462	1626	808	818	320	171	149
4	Bagavanthapuram	182	777	386	391	0	0	0	7	3	4
5	Dharmacheri	32	103	55	48	0	0	0	0	0	0
6	Ezhacheri	491	2080	1065	1015	770	399	371	25	15	10
7	Girijapuram	61	243	122	121	0	0	0	0	0	0
8	Kalakattur	664	2539	1288	1251	59	25	34	172	89	83
9	Kannikulam	172	727	372	355	421	214	207	23	12	11
10	Karuveppampoondi	436	1652	846	806	844	434	410	19	12	7
11	Kizhnaickanpalayam	141	544	264	280	283	133	150	0	0	0
12	Kundiyanthandalam	170	703	351	352	381	182	199	0	0	0
13	Magaral	709	2834	1399	1435	1777	895	882	36	16	20
14	Mathur	392	1628	817	811	1022	494	528	0	0	0
15	Menallur	363	1444	711	733	650	322	328	0	0	0
16	Nemili	617	2788	1408	1380	958	485	473	38	20	18
17	Ozhugarai	322	1240	613	627	488	249	239	0	0	0
18	Pallavaram	423	1743	865	878	384	200	184	25	14	11
19	Pavoor	308	1370	688	682	1050	530	520	0	0	0
20	Perumanallur	117	438	203	235	12	5	7	18	7	11
21	Poonaithangal	80	277	132	145	0	0	0	0	0	0
22	Pudupalayam	214	853	407	446	474	228	246	0	0	0
23	Punnai	194	707	338	369	264	128	136	14	7	7
24	Seniyanallur	91	373	183	190	0	0	0	0	0	0
25	Silambakkam	114	461	244	217	0	0	0	11	5	6
26	Sirunallur	550	2163	1079	1084	791	394	397	10	5	5
27	Sothiyampakkam	288	1185	599	586	375	189	186	0	0	0
28	Suruttal	304	1266	659	607	7	5	2	2	0	2
29	Vadakalpakkam	291	1222	628	594	605	310	295	46	28	18
30	Vayalathur	117	505	257	248	313	158	155	7	3	4
31	Vazhavandal	115	444	229	215	68	40	28	104	58	46
32	Vedal	217	906	463	443	7	3	4	13	7	6
33	Vengacheri	195	753	379	374	1	1	0	45	20	25
34	Vengaram	48	176	89	87	86	42	44	0	0	0

TABLE 3.41: WORKERS PROFILE OF STUDY AREA

SI.No.	Village Name	Total Workers Population	Male Workers	Female Workers	Total Main Workers	Main Workers Male	Main Workers Female	Main Cultivation Workers	Main Agriculture Workers	Main Other Workers	Non-Worker Population
1	Adavapakkam	441	247	194	432	241	191	20	266	141	324
2	Arasanipalai	466	305	161	367	261	106	82	200	78	689
3	Arpakkam	1269	819	450	1117	782	335	129	436	529	1668
4	Bagavanthapuram	345	237	108	341	236	105	116	97	125	432
5	Dharmacheri	78	38	40	77	37	40	6	57	13	25
6	Ezhacheri	1134	655	479	1130	654	476	259	584	276	946
7	Girijapuram	156	75	81	148	73	75	45	48	38	87
8	Kalakattur	1625	897	728	1321	771	550	268	343	463	914
9	Kannikulam	265	232	33	264	232	32	66	128	64	462
10	Karuveppampoondi	787	467	320	782	464	318	41	588	147	865
11	Kizhnaickanpalayam	391	198	193	101	62	39	11	36	43	153
12	Kundiyanthandalam	254	200	54	97	76	21	4	2	90	449
13	Magaral	1501	821	680	427	287	140	53	182	189	1333
14	Mathur	837	528	309	625	403	222	31	21	565	791
15	Menallur	584	418	166	458	323	135	67	170	180	860
16	Nemili	1022	693	329	998	681	317	7	31	927	1766
17	Ozhugarai	544	355	189	392	273	119	114	140	137	696
18	Pallavaram	863	561	302	648	472	176	172	187	259	880
19	Pavoor	607	413	194	601	410	191	85	265	245	763
20	Perumanallur	319	165	154	216	113	103	25	83	105	119
21	Poonaithangal	108	89	19	99	82	17	13	44	39	169
22	Pudupalayam	456	264	192	454	263	191	44	246	150	397
23	Punnai	496	244	252	464	224	240	18	327	115	211
24	Seniyanallur	234	120	114	125	100	25	59	13	47	139
25	Silambakkam	197	144	53	194	142	52	156	25	13	264
26	Sirunallur	1317	696	621	416	251	165	23	278	107	846
27	Sothiyampakkam	711	377	334	704	374	330	171	281	250	474
28	Suruttal	762	437	325	599	411	188	104	309	182	504
29	Vadakalpakkam	736	388	348	508	295	213	10	285	204	486
30	Vayalathur	210	140	70	209	140	69	24	121	64	295
31	Vazhavandal	232	128	104	48	33	15	6	13	28	212
32	Vedal	534	285	249	510	281	229	23	162	320	372
33	Vengacheri	355	217	138	177	151	26	46	13	118	398
34	Vengaram	62	52	10	62	52	10	36	18	6	114

Source: www.censusindia.gov.in – Tamil Nadu Census of India – 2011

TABLE 3.42: EDUCATIONAL FACILITIES IN THE STUDY AREA

SI	Village Name	PPS		PS		MS		SS		SSS		DC		EC		MC		MI		PT		VTS		SSD	
		G	P	G	P	G	P	G	P	G	P	G	P	G	P	G	P	G	P	G	P	G	P	G	P
1	Adavapakkam	1	1	1	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
2	Arasanipalai	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
3	Arpakkam	1	1	1	2	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
4	Bagavanthapuram	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
5	Dharmacheri	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
6	Ezhacheri	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
7	Girijapuram	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
8	Kalakattur	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
9	Kannikulam	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2	2
10	Karuveppampoondi	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
11	Kizhnaickanpalayam	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
12	Kundiyanthandalam	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
13	Magaral	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
14	Mathur	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1
15	Menallur	1	2	1	2	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
16	Nemili	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
17	Ozhugarai	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
18	Pallavaram	1	2	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
19	Pavoor	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
20	Perumanallur	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
21	Poonaithangal	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
22	Pudupalayam	1	2	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
23	Punnai	1	2	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
24	Seniyanallur	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
25	Silambakkam	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
26	Sirunallur	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
27	Sothiyampakkam	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
28	Suruttal	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
29	Vadakalpakkam	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
30	Vayalathur	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
31	Vazhavandal	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
32	Vedal	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
33	Vengacheri	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
34	Vengaram	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2

Abbreviations: PPS-Pre-Primary School; SSS-Senior Secondary School; DC-Degree School; PT-Polytechnic; PS-Primary School; G-Government ; EC-Engineering College; VTS-Vocational School /ITI; MS-Middle School; P-Private; MC-Medical College; SSD-Special School For Disabled; SS-Secondary School; MI-Management College/Institute;
Note – 1 - Available within the village; 2 - Not available

TABLE 3.43: MEDICAL FACILITIES IN THE STUDY AREA

SI. No.	Village Name	CHC	PHC	PHSC	MCW	TBC	HA	HAM	D	VH	MHC	FWC	NGM-I/O
1	Adavapakkam	0	0	1	0	0	0	0	0	0	0	0	13
2	Arasanipalai	0	0	0	0	0	0	0	0	0	0	0	4
3	Arpakkam	0	0	1	0	0	0	0	0	0	0	0	7
4	Bagavanthapuram	0	0	0	0	0	0	0	0	0	0	0	2
5	Dharmacheri	0	0	0	0	0	0	0	0	0	0	0	5
6	Ezhacheri	0	1	1	1	1	0	0	1	1	0	1	0
7	Girijapuram	0	0	0	0	0	0	0	0	0	0	0	4
8	Kalakattur	0	0	1	0	0	0	0	0	1	0	0	10
9	Kannikulam	0	0	0	0	0	0	0	0	0	0	0	10
10	Karuveppampoondi	0	0	1	0	0	0	0	0	0	0	0	7
11	Kizhnaickanpalayam	0	0	0	0	0	0	0	0	0	0	0	4
12	Kundiyanthandalam	0	0	0	0	0	0	0	0	0	0	0	3
13	Magaral	0	0	1	0	0	0	0	0	1	0	0	7
14	Mathur	0	0	0	0	0	0	0	0	0	0	0	3
15	Menallur	0	0	0	0	0	0	0	0	0	0	0	3
16	Nemili	0	0	0	0	0	0	0	0	0	0	0	7
17	Ozhugarai	0	0	0	0	0	0	0	0	0	0	0	8
18	Pallavaram	0	0	0	0	0	0	0	0	0	0	0	8
19	Pavoor	0	0	0	0	0	0	0	0	0	0	0	2
20	Perumanallur	0	0	0	0	0	0	0	0	0	0	0	8
21	Poonaithangal	0	0	0	0	0	0	0	0	0	0	0	3
22	Pudupalayam	0	0	1	1	0	0	0	0	0	0	0	5
23	Punnai	0	0	0	0	0	0	0	0	0	0	0	3
24	Seniyanallur	0	0	0	0	0	0	0	0	0	0	0	3
25	Silambakkam	0	0	0	0	0	0	0	0	0	0	0	5
26	Sirunallur	0	0	0	0	0	0	0	0	0	0	0	5
27	Sothiyampakkam	0	0	0	0	0	0	0	0	0	0	0	3
28	Suruttal	0	0	1	1	0	0	0	0	0	0	0	5
29	Vadakalpakkam	0	0	1	0	0	0	0	0	0	0	0	6
30	Vayalathur	0	0	0	0	0	0	0	0	0	0	0	6
31	Vazhavandal	0	0	0	0	0	0	0	0	0	0	0	6
32	Vedal	0	0	0	0	0	0	0	0	0	0	0	3
33	Vengacheri	0	0	0	0	0	0	0	0	0	0	0	8
34	Vengaram	0	0	0	0	0	0	0	0	0	0	0	8

Abbreviations: CHC-Community Health Centre; TBC-TB Clinic; VH- Veternity Hospital; PHC-Primary Health Centre; HA-Aallopathic Hospital ; FWC-Family Welfare Centre; PHSC-Primary Health Sub Centre ; HAM-Alternative Medicine Hospital; MH-Mobile Health Clinic; MCW-Maternity and Child Welfare Centre; D-Dispensary; NGM-I/O-Non-Government Medical Facilities In & Out Patient Note – 1 - Available within the village; 2 - Not available a-facility available at <5kms, b-facility available at>10kms

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

3.6.5 Recommendation and Suggestion

- The main activities in the area are agriculture, quarry operation and Crushing units there are 6 Numbers of quarries operated in the region and now only 5 quarry is operating at present which is expired lease period in 2023 October. Hence starting up of new mine in this region is necessary at current scenario
- 5 number of Crushers operating within 1km and the demand of Rough stone is high to the crushing units 100 Nos of people depending upon the Crushing units in the area and crushers are meeting scarcity due to supply demand in the region.
- Due to the project about 25 Nos of people will benefitted directly due to employment and more than 50 Nos of people and Crushers will have benefitted through this project
- As part of CER activities proponent intends to spend Rs 5 Laksh for the improvement of School sanitation facilities, Greenbelt development and other needs.
- At the end of the life of the mine the mined-out pit will act as temporary reservoir, the collected rain water in the mine pit may utilized for the nearby agriculture lands.

Apart from the following general activities will be conducted

- Awareness program to be conducted to make the population aware to get education and a better livelihood.
- Vocational training programme can be organized to make the people self - employed, particularly for women and unemployed youth.
- On the basis of qualification and skills local community may be preferred. Long term and short-term employments can be generated.
- 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.

3.6.6 Summary & Conclusion

The socio-economic study of surveyed villages gives a clear picture of its population, average household size, literacy rate and sex ratio etc. It is also found that a part of population is suffering from lack of permanent job to run their day-to-day life. Their expectation is to earn some income for their sustainability on a long-term basis. The proposed project will aim to provide preferential employment to the local people there by improving the employment opportunity in the area and in turn the social standards will improve.

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

- 3.10.0 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 3.10.0 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 1930 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
- 3.0 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 setting tank of 15 m x 10m x 3m to remove suspended solids if any. This collected water will be judiciously used for dust suppression and such sites where dust likely to be generated and for developing green belt. The proponent will collect and judicially 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 Project

Wind erosion of the exposed areas and the air borne particulate matter generated by quarrying operation, and transportation are mainly PM_{10} & $PM_{2.5}$ and emissions of Sulphur dioxide (SO_2) & Oxides of Nitrogen (NOx) 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 PM_{10} was observed close to the source due to low to moderate wind speeds. Incremental value of PM_{10} was superimposed on the base line data monitored at the proposed site to predict total GLC of PM_{10} due to combined impacts

TABLE 4.1: ESTIMATED EMISSION RATE

PM_{10}			
Activity	**Source type**	**Value**	**Unit**
Drilling	Point Source	0.151028402	g/s
Blasting	Point Source	0.019006738	g/s
Mineral Loading	Point Source	0.050798854	g/s
Haul Road	Line Source	0.002542008	g/s/m
Overall Mine	Area Source	0.063830823	g/s
SO_2			
Activity	**Source type**	**Value**	**Unit**
Overall Mine	Area Source	0.003673071	g/s
NO_X			
Overall Mine	Area Source	0.000200133	g/s

FIGURE 4.1: AERMOD TERRAIN MAP

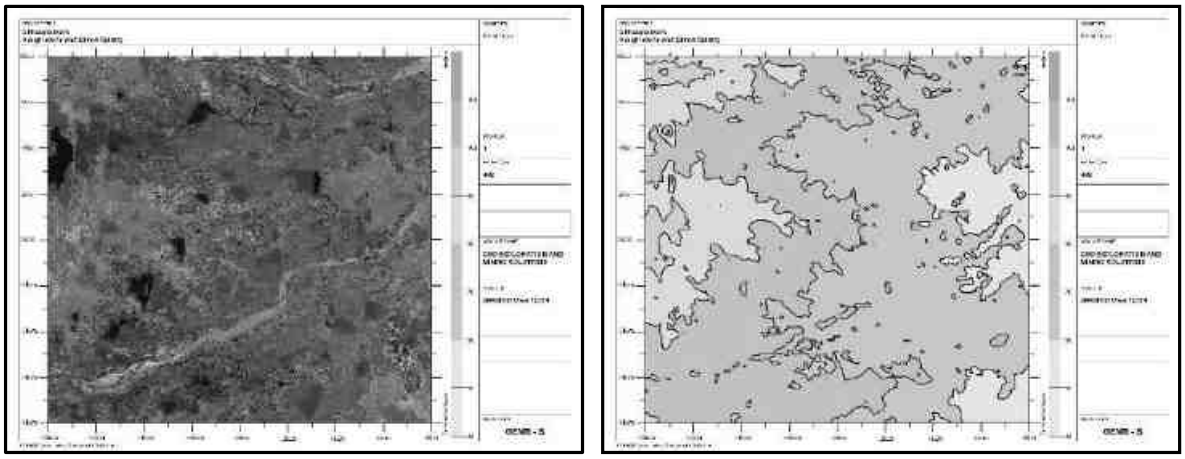


FIGURE 4.2: PREDICTED INCREMENTAL CONCENTRATION OF PM_{10}

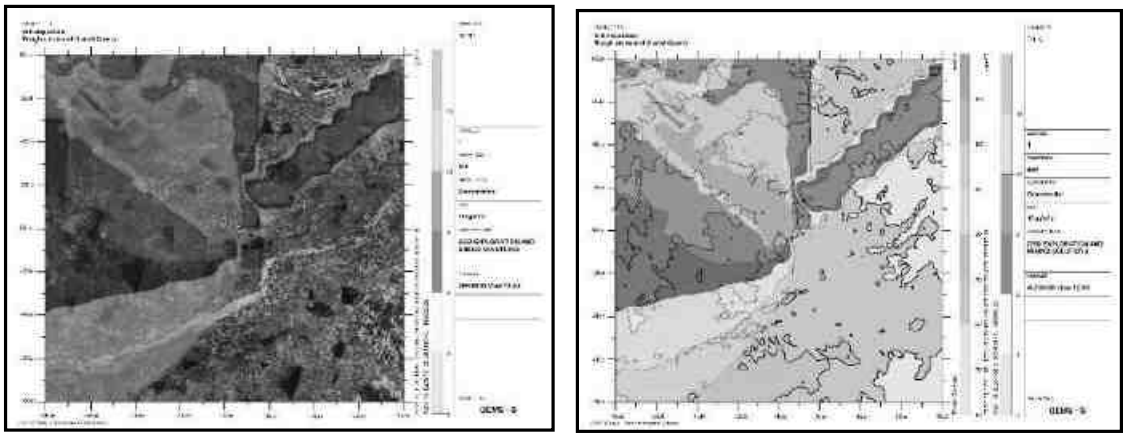


FIGURE 4.3: PREDICTED INCREMENTAL CONCENTRATION OF $PM_{2.5}$

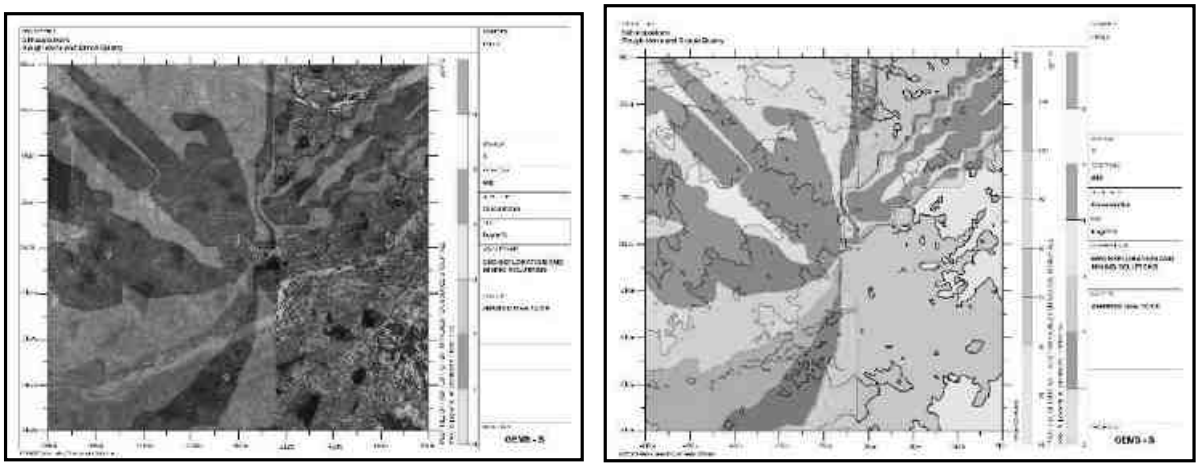


FIGURE 4.4: PREDICTED INCREMENTAL CONCENTRATION OF NO_X

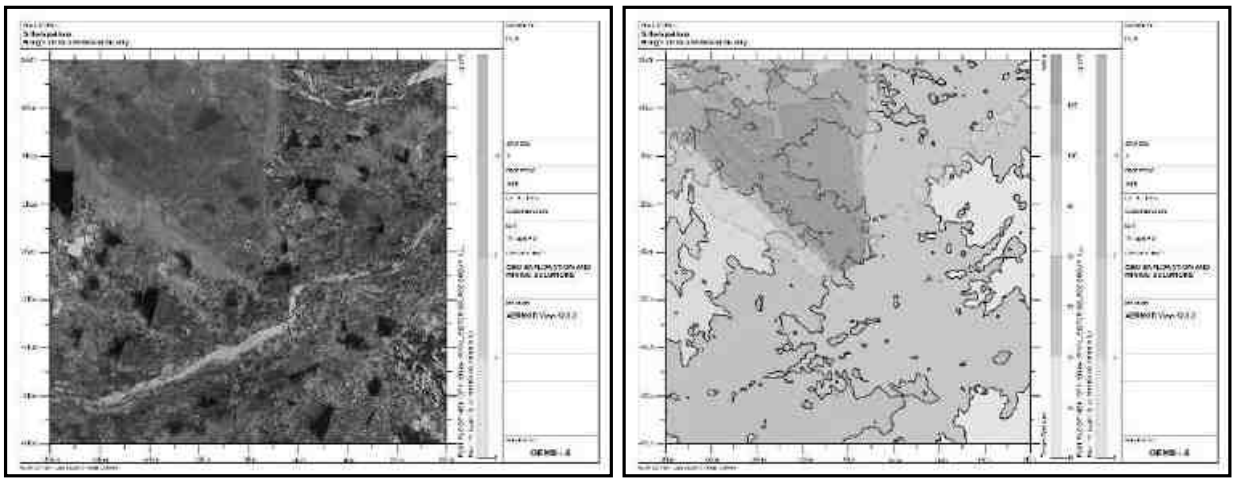


FIGURE 4.5: PREDICTED INCREMENTAL CONCENTRATION OF SO2

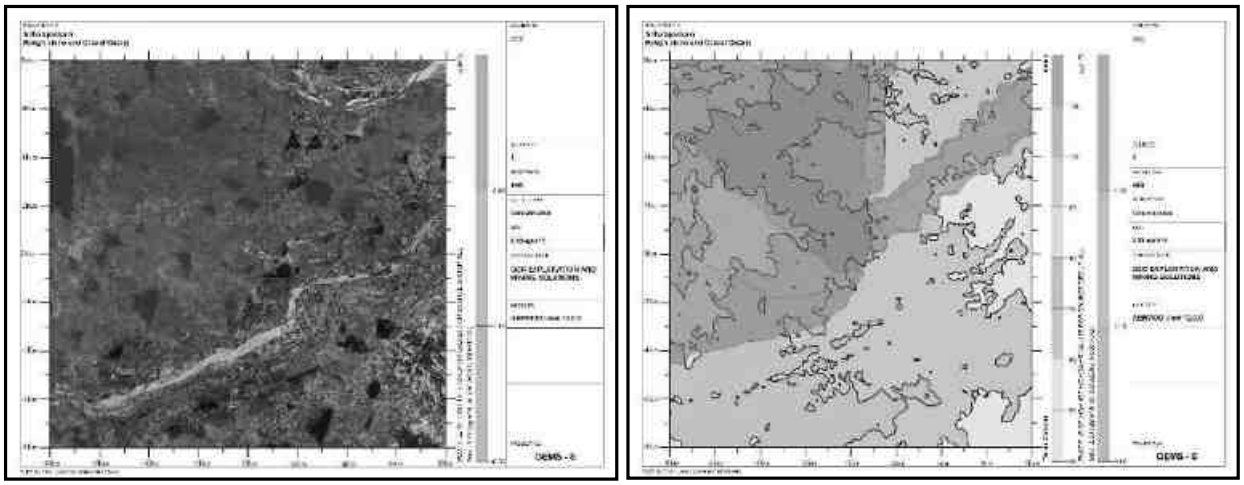
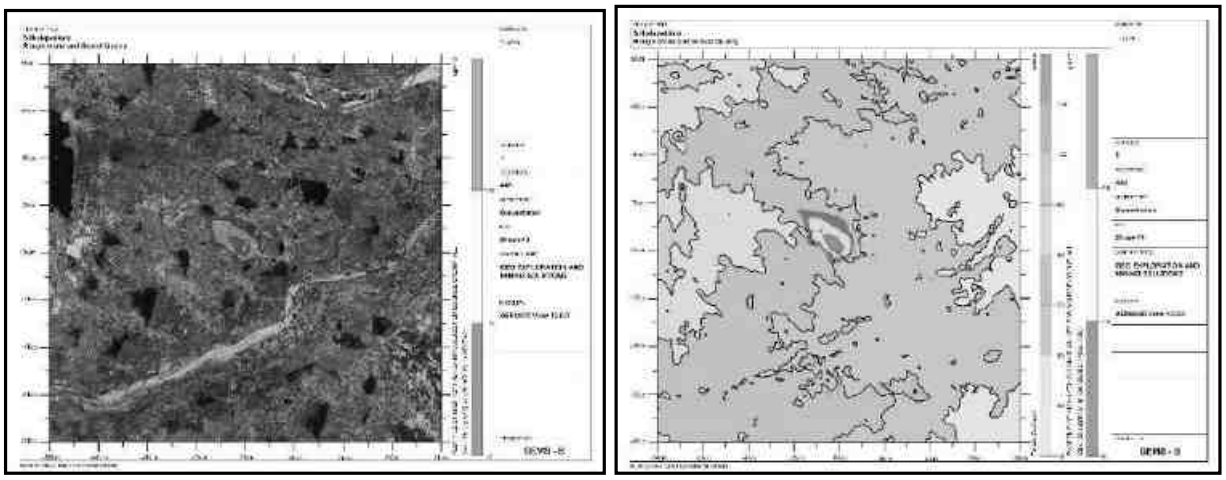


FIGURE 4.6: PREDICTED INCREMENTAL CONCENTRATION OF FUGITIVE DUST



4.3.2.1 Model Results

The post project Resultant Concentrations of PM_{10}, $PM_{2.5}$, SO_2 & NO_X (GLC) is given in Table below:

TABLE 4.2: INCREMENTAL & RESULTANT GLC OF PM_{10}

Station Code	Location	X Coordinate (m)	Y Coordinate (m)	Average Baseline PM_{10} ($\mu g/m^3$)	Incremental value of PM_{10} due to mining ($\mu g/m^3$)	Total PM_{10} ($\mu g/m^3$)
AAQ1	12°43'9.65"N 79°43'42.08"E	-43	-159	43.0	15.61	58.61
AAQ2	12°43'18.03"N 79°43'45.62"E	62	103	43.1	15.29	58.39
AAQ3	12°42'57.01"N 79°44'7.28"E	601	-357	43.7	0	43.7
AAQ4	12°46'42.47"N 79°42'29.32"E	-2248	6406	43.5	11.90	55.4
AAQ5	12°40'1.28"N 79°43'27.85"E	-474	-5979	43.6	0	43.6
AAQ6	12°42'53.64"N 79°40'43.87"E	-5446	-652	43.6	8.70	52.3
AAQ7	12°43'21.83"N 79°47'12.32"E	6324	213	43.5	0	43.5

TABLE 4.3: INCREMENTAL & RESULTANT GLC OF $PM_{2.5}$

Station Code	Location	X Coordinate (m)	Y Coordinate (m)	Average Baseline $PM_{2.5}$ ($\mu g/m^3$)	Incremental value of $PM_{2.5}$ due to mining ($\mu g/m^3$)	Total $PM_{2.5}$ ($\mu g/m^3$)
AAQ1	12°43'9.65"N 79°43'42.08"E	-43	-159	19.8	8.91	28.71
AAQ2	12°43'18.03"N 79°43'45.62"E	62	103	20.2	8.52	28.72
AAQ3	12°42'57.01"N 79°44'7.28"E	601	-357	21.0	8.13	29.13
AAQ4	12°46'42.47"N 79°42'29.32"E	-2248	6406	20.7	7.80	28.5
AAQ5	12°40'1.28"N 79°43'27.85"E	-474	-5979	21.0	1.33	22.33
AAQ6	12°42'53.64"N 79°40'43.87"E	-5446	-652	21.3	5.00	26.3
AAQ7	12°43'21.83"N 79°47'12.32"E	6324	213	20.7	0	20.7

TABLE 4.4: INCREMENTAL & RESULTANT GLC OF SO_2

Station Code	Location	X Coordinate (m)	Y Coordinate (m)	Average Baseline SO_2 ($\mu g/m^3$)	Incremental value due to mining ($\mu g/m^3$)	Total SO_2 ($\mu g/m^3$)
AAQ1	12°43'9.65"N 79°43'42.08"E	-43	-159	5.2	2.29	7.49
AAQ2	12°43'18.03"N 79°43'45.62"E	62	103	5.3	2.27	7.57
AAQ3	12°42'57.01"N 79°44'7.28"E	601	-357	5.0	0	5
AAQ4	12°46'42.47"N 79°42'29.32"E	-2248	6406	4.9	2.20	7.1
AAQ5	12°40'1.28"N 79°43'27.85"E	-474	-5979	5.1	0	5.1
AAQ6	12°42'53.64"N 79°40'43.87"E	-5446	-652	4.8	1.40	6.2
AAQ7	12°43'21.83"N 79°47'12.32"E	6324	213	4.9	0	4.9

TABLE 4.5: INCREMENTAL & RESULTANT GLC OF NOX

Station Code	Location	X Coordinate (m)	Y Coordinate (m)	Average Baseline NOx ($\mu g/m^3$)	Incremental value due to mining ($\mu g/m^3$)	Total NOx ($\mu g/m^3$)
AAQ1	12°43'9.65"N 79°43'42.08"E	-43	-159	20.2	11.70	31.9
AAQ2	12°43'18.03"N 79°43'45.62"E	62	103	20.2	11.20	31.4
AAQ3	12°42'57.01"N 79°44'7.28"E	601	-357	22.1	0	22.1
AAQ4	12°46'42.47"N 79°42'29.32"E	-2248	6406	23.1	6.77	29.87
AAQ5	12°40'1.28"N 79°43'27.85"E	-474	-5979	23.0	0	23
AAQ6	12°42'53.64"N 79°40'43.87"E	-5446	-652	22.9	0	22.9
AAQ7	12°43'21.83"N 79°47'12.32"E	6324	213	22.7	0	22.7

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 µg/m3 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 taurpaulin
- 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-metaled 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 –

- 1070 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.

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

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 4.6: 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 nose prediction modelling.

TABLE 4.7: 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 though 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:

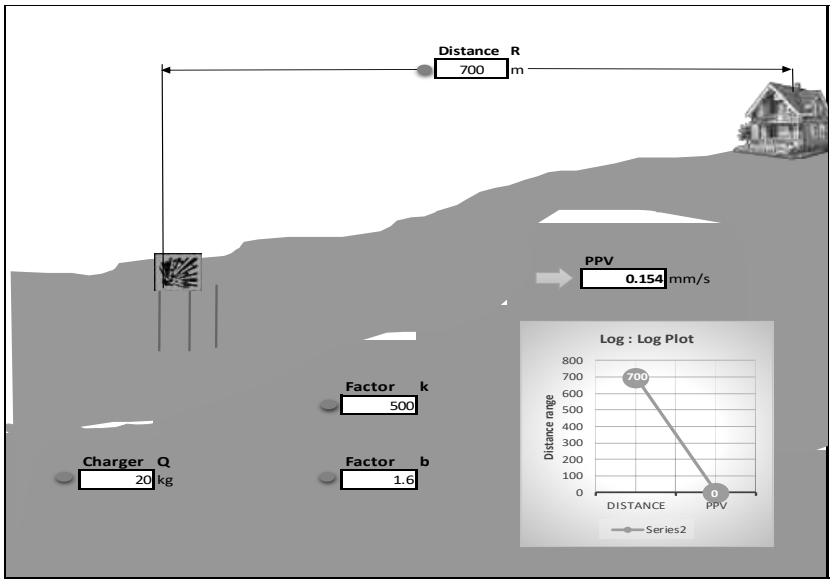
$$V = K\,[R/Q^{0.5}]^{-B}$$

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 4.8: PREDICTED PPV VALUES DUE TO BLASTING

Maximum Charge in kgs	Nearest Habitation in m	PPV in m/ms
20	700-SE	0.154

FIGURE 4.7: 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 20 kg and carry out blasting twice or thrice a day based on the onsite conditions under the supervision of competent person employed. However, as per statutory requirement control measures will be adopted to avoid the impacts due to ground vibrations and fly rocks due to blasting**.**

4.4.3.1 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 SO_2 and NO_2 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 insectsattract tree species.
- Roadsides will be planted with local vegetation.

TABLE NO 4.9. LIST OF PLANT SPECIES PROPOSED FOR GREENBELT DEVELOPMENT

S. No	Scientific name	Tamil Name
1	*Aegle marmelos*	Vilva maram
2	*Albizia lebbeck*	Vaagai maram
3	*Cassia fistula*	Konrai tree
4	*Lannea coromandelica*	Othiyam
5	*Limonia acidissima*	Vila maram

6	*Syzygium cumini*	Naval maram
7	*Ficus hispida*	Aththi maram
8	*Borassus flabellifer*	Panai-maram
9	*Madhuca longifolia*	Illupai maram

(***Source:** Term of Reference-ToR)

Table No 4.10. Species suitable for abatement of noise and dust pollution

S. No	Botanical name	Common name
1	*Azadirachta indica*	Vembhu maram
2	*Ficus religiosa*	Arasan maram
3	*Ficus hispida*	Aththi maram
4	*Syzygium cumini*	Naval maram
5	*Tamarindus indica*	Puliyamaram
6	*Mangifera indica*	Manga maram
7	*Delonix regia*	Neruppu Kondrai
8	*Cassia Fistula*	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 inthe water body and Reservoir.

Table No. 4.11. Overall Ecological impact assessments of SithalapakkamVillage, 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

SI.No	Name of the plant (Botanical)	Family Name	Common Name	Habit
1	*Azadirachta indica*	Meliaceae	Neem, Vembu	Tree
2	*Albiziafalcatoria*	Fabaceae	Tamarind, Puliyamaram	Tree
3	*Polyalthialongifolia*	Annonaceae	Kattumaram	Tree
4	*Borassus Flabellifer*	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	1930	The safety zone along the boundary barrier has been identified to be utilized for	Bamboo, Teak, Thailam etc.,

		Greenbelt development and along village roads.	

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 7 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.

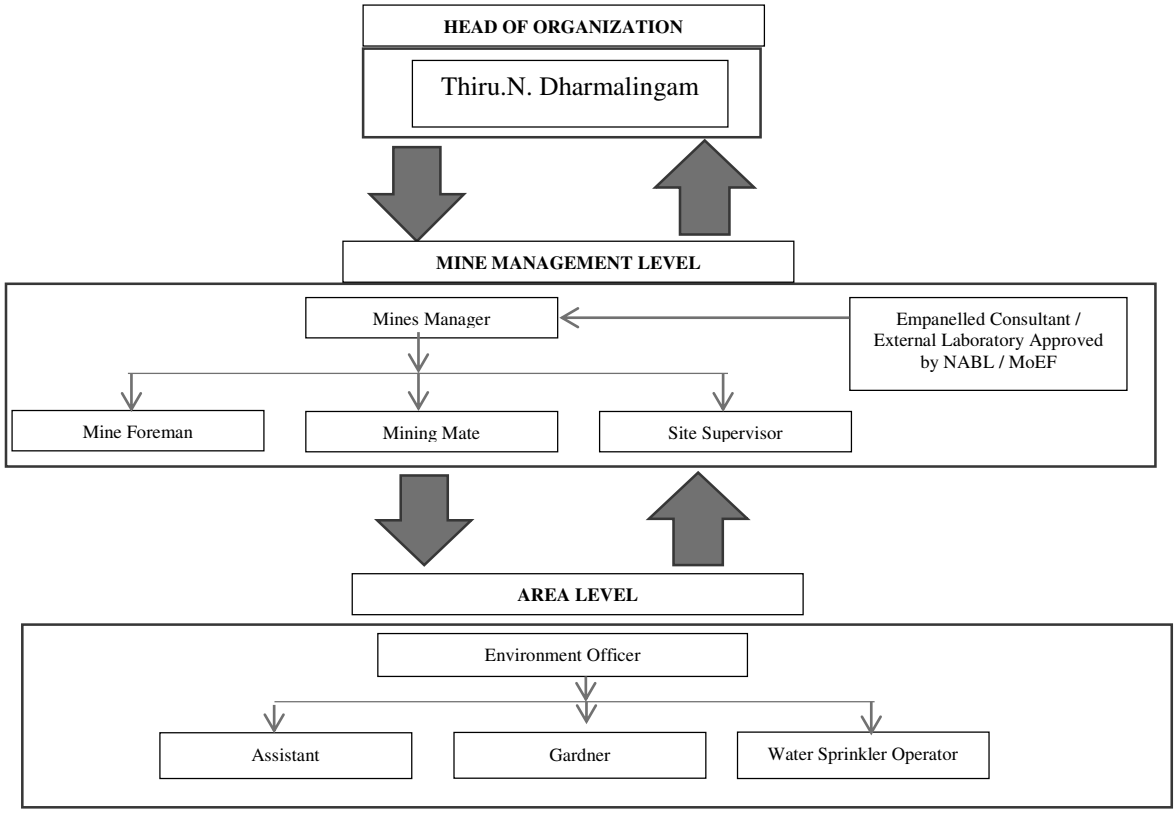
The responsibilities of this cell will be:

- 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 proposed project. 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

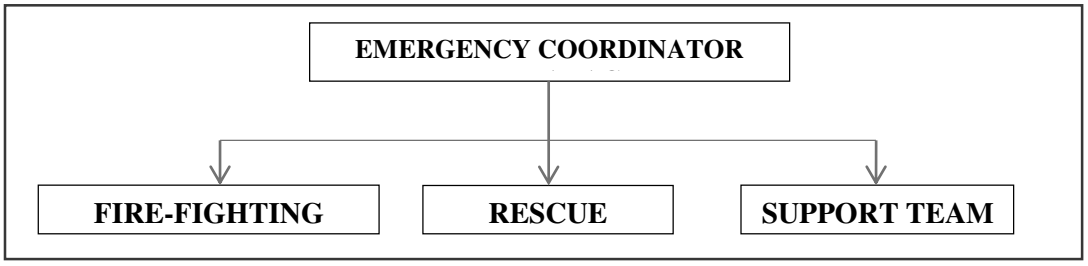
The Disaster Management Plan is aimed to ensure safety of life, protection of environment, protection of installation, restoration of production and salvage operations in this same order of priorities.

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	Thiru. N.Dharmalingam, S/o. Nadesh Gounder, No. 398, Bajanai Kovil Street, Arasanipalai post, Chithalapakkam Village, Vembakkam Taluk, Tiruvannamalai District –	Chithalapakkam	27/1, 2, 3, 4, 28/1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 28/11A,	3.86.0	File No.11814 ToR Identification: TO25B0108TN5235140 N Dated: 07.04.2025.
P2	Thiru G. Manavalan, S/o,Govindanaidu,No.22,Gangaiamman Kovil street, Urapakkam, Chengalpattu District-603 210	Chithalapakkam	29/1A	0.69.0	-
			TOTAL EXTENT	**4.55.0 ha**	
EXISTING QUARRIES					
CODE	**Name of the Owner**	**Village**	**S.F. Nos**	**Extent in Ha**	**Status**
E-1	Thiru G. Manavalan, S/o,Govindanaidu, No.294, Perumal Koilstreet,Thenagkulam Village,Valajapath Taluk,Kancheepuram.	Chithalapakkam	28/12& 28/13	2.01.5	17.11.2021 to 16.11.2031
			TOTAL EXTENT	**2.01.5ha**	
ABANDONED QUARRY					
CODE	**Name of the Owner**	**Village**	**S.F. Nos**	**Extent in Ha**	**Status**
A-1	Thiru Ganesh Kaskar, Executive Director, RMC ready mix (India), SIDCO Industrial Estate, Thirumudivakkam,Chennai	Chithalapakkam	16/2B,16/8,17/2,8 ,9,10,11,12,13,14, 15,16A,16B,18/1, 2,3A,3B,3C34,5,6 ,7,8,9,10,11 & 13	**4.23.5**	14.07.2014 to 13.07.2019
A-2	Thiru E. Muthukrishnan	Chithalapakkam	16/6,16/7 & 17/1	**1.26.0**	22.11.2018 to 23.11.2023
A-3	R.Elumalai	Magaral-B	694/3I,694/3N,69 4/3H & 694/3O	**0.77.5**	02.03.2015 to 01.03.2020
A-4	K.Samiyappan	Magaral-B	702/2	**2.02.50**	30.06.2018 to 29.06.2023
			TOTAL EXTENT	**8.29.50**	
			TOTAL CLUSTER EXTENT	**6.56.50**	

- **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	Thiru.N.Dharmalingam Rough Stone and Gravel Quarry		
S.F. No.	27/1, 2, 3, 4, 28/1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 28/11A		
Extent	3.86.0 ha		
Village,Taluk and District	Sithalapakkam Village, Vembakkam Taluk, Tiruvannamalai District.		
Land Type	It is a patta lands, registered in the name of the applicant Thiru. N.Dharmalingam vide patta Nos.454		
Toposheet No	57 P/10		
Latitude between	12° 42' 09.24"N to 12° 42' 21.32"N		
Longitude between	79° 43' 40.30"E to 79° 43' 46.62"E		
Elevation of the area	95m AMSL		
Lease period	5 Years		
Mining Plan period	5 years		
Proposed Depth of Mining	50m bgl (2m Gravel+4m Weathered Rock + 44m Rough Stone)		
Geological Resources	Rough Stone in m^3	Weathered Rock in m^3	Gravel m^3
	25,09,000	1,54,400	77,200
Mineable Reserves	6,19,725	1,18,372	63,956
Year wise Production for five years as per ToR	6,04,110	1,18,372	63,956
Peak Production	1,40,375	49,692	27,606
Ultimate Pit Dimension	294m (L) X 112m (W) X 51m (D) BGL		
Water Level in the region	74-76m bgl		
Method of Mining	Opencast Mechanized Mining Method involving drilling and Controlled blasting using Slurry Explosives		
Topography	The lease applied area is flat terrain. The area has gentle sloping towards Southern side and altitude of the area is 95m above from Mean Sea level. The area is covered by quaternary formation of gravel having an average thickness of 2m,4m weathered rock and followed by Massive Charnockite which is clearly inferred from the nearby existing quarry pit.		
Machinery proposed	Hand Jack Hammer	4 Nos	
	Wagon Drill Machine	2 Nos	
	Compressor	1 No	
	Water Sprinkling Tanker	1 No	
	Excavator with Bucket	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	35Nos		
Project Cost	Rs. 4,58,59,000/-		
EMP Cost	Rs. 19,00,000/-		
Total Project cost	Rs. 4,77,59,000/-		
CER Cost	Rs. 5,00,000/-		
Nearby Water Bodies	Vaikkal	10m Safety North	
	Tank	260m SE	

	Tangalkulam	260m SW
	Cheyyar	2km SE
	Palar	6.5km NE
	Mamandur Tank	7.2km NW
Greenbelt Development Plan	Proposed to plant 1930 Nos of trees.The plantation will be developed around the project site and nearby village roads	
Proposed Water Requirement	3.0 KLD	
Nearest Habitation	700m – South East	
Nearest Reserve Forest	Marudham R.F – 7.0 Km – SE (Source - TNGIS)	
Nearest Wild Life Sanctuary	Karikili Birds Sanctuary – 12.5 Km – SE Vedanthangal Birds Sanctuary + 5km Safety distance – 18km - SE	

Source: Approved Mining Plan

TABLE 7.7: SALIENT FEATURES OF PROPOSAL "E1"

Name of the Project	Thiru.G.Manavalan Rough Stone and Gravel Quarry	
S.F. No.	28/12 & 28/13	
Extent	2.01.5 ha	
Village,Taluk and District	Sithalapakkam Village, Vembakkam Taluk, Tiruvannamalai District.	
Land Type	It is a patta lands, registered in the name of P.J.R Blue Metals Private Limited vide patta No.330. The applicant has obtained consent from pattadhars	
Toposheet No	57 P/10	
Latitude between	12° 43' 12.55"N to 12° 43' 19.24"N	
Longitude between	79° 43' 44.98"E to 79° 43' 49.88"E	
Elevation of the area	78m AMSL	
Lease period	5 Years	
Mining Plan period	5 years	
Proposed Depth of Mining	43m bgl (2m Gravel + 41m Rough stone)	
Geological Resources	Rough Stone in m^3	Gravel m^3
	806000	60450
Mineable Reserves	279920	47979
Year wise Production for five years	279920	47979
Peak Production	68840	19089
Ultimate Pit Dimension	Pit I: 166m (L) X 105m (W) X 43m BGL (D	
Water Level in the region	58-62m 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 Eastern side and altitude of the area is 78m above from Mean Sea level. The area is covered by 2m thickness of Gravel and followed by Massive Charnockite which is clearly inferred from the nearby existing quarry pit.	
Machinery proposed	Jack Hammer	6 Nos
	Compressor	2 Nos
	Excavator with Bucket and Rock Breaker	1 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	30 Nos
Project Cost	Rs.45,81,000/-
EMP Cost	Rs. 3,80,000/-
Total Project cost	Rs. 49,61,000/-
CER Cost	Rs. 3,00,000/-
Greenbelt Development Plan	Proposed to plant 1000 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	660m – SE

Source: Approved Mining Plan

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

Air Environment –

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

TABLE 7.11: 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	6,04,110	120822	403	34
Total	**6,04,110**	**120822**	**403**	**34**
E1	279920	55,984	187	16
Total	**279920**	**55,984**	**187**	**16**
Grand Total	**884030**	**176,806**	**590**	**50**

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	63,956	21319	71	6
Total	**63,956**	**21319**	**71**	**6**
E1	47979	15993	53	4
Total	**47979**	**15993**	**53**	**4**
Grand Total	**111,935**	**37312**	**124**	**10**

On a cumulative basis considering the proposed quarries, it can be seen that the overall production of Rough Stone is 590m^3 per day and overall production of Gravel is 124m^3 per day with a capacity of 50 trips of Rough Stone per day and 10 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	0.117082688	g/s
	Blasting	Point Source	0.005322037	g/s
	Mineral Loading	Point Source	0.047930120	g/s
	Haul Road	Line Source	0.002515625	g/s/m
	Overall Mine	Area Source	0.073567250	g/s
Estimated Emission Rate for SO_2	Overall Mine	Area Source	0.002220223	g/s
Estimated Emission Rate for NOx	Overall Mine	Area Source	0.000192738	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 NOx	Overall Mine	Area Source	0.000033235	g/s

Source: Emission Calculation

TABLE 7.15: INCREMENTAL & RESULTANT GLC WITHIN CLUSTER

PM_{10} in µg/m^3	
Background	44.7
Incremental	14.82
Resultant	59.52
NAAQ Norms	**100 µg/m^3**
$PM_{2.5}$ in µg/m^3	
Background	20.5
Incremental	6.90
Resultant	27.4
NAAQ Norms	**60 µg/ m^3**
So2 in µg/m^3	
Background	6.3
Incremental	1.79
Resultant	8.09
NAAQ Norms	**80 µg/ m^3**
No2 in µg/m^3	
Background	21.3
Incremental	9.85
Resultant	31.15
NAAQ Norms	**80 µg/ m^3**

Noise Environment –

Noise pollution is mainly due to operation like drilling & blasting and plying of trucks & HEMM. Cumulative Noise modelling has been carried out considering blasting and compressor operation (drilling) and transportation

activities. Predictions have been carried out to compute the noise level at various distances around the different quarries within the 500 m radius.

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

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

Where:

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

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

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

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

Source data has been computed taking into account of all the machinery and activities used in the mining process.

TABLE 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	

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	700m – SE
Habitation Near E1	660m – SE

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

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

Where –
V = peak particle velocity (mm/s)
K = site and rock factor constant
Q = maximum instantaneous charge (kg)
B = constant related to the rock and site (usually 1.6)
R = distance from charge (m)

TABLE 7.18: GROUND VIBRATIONS AT 2 MINES

Location ID	Maximum Charge in kgs	Nearest Habitation in m	PPV in m/ms
P1	20	700m – SE	0.154
E1	20	660m – SE	0.169

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 2 MINES

Location ID	Project Cost	CER
P1	Rs. 4,77,59,000/-	Rs.3,00,000
E1	Rs. 49,61,000/-	Rs.1,00,000/-
Total	**Rs. 5,27,20,000/-**	**Rs.4,00,000/-**

As per para 6 (II) of the office memorandum, all the mines being a green field project & Capital Investment is ≤ 100 crores, they shall contribute 2% of Capital Investment towards CER as per directions of EAC/SEAC.

- Proposed Project shall fund towards CER – **Rs 3,00,000/-**

TABLE 7.20: EMPLOYMENT BENEFITS FROM 2 MINES

Description	Employment
P1	35
E1	30
Total	**65**

A total of 35 people will get employment due to 1 proposed mines in cluster and 30people are already employed at existing mines.

TABLE 7.21: GREENBELT DEVELOPMENT BENEFITS FROM 2 MINES

CODE	No of Trees proposed to be planted	Area Covered Sq.m	Name of the Species
P1	1930	The safety zone along the boundary barrier has been identified to be utilized for Greenbelt development	Bamboo, Teak, Thailam etc.,
E1	1000		
Total	**2930**		

Based on the Proposed Mining Plans it's anticipated that there shall growth of native species of Bamboo, Teak, Thailam etc. in the Cluster at a rate of 2930 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 Sithalapakkam Village aims to produce 6,04,110 m^3 Rough Stone over a period of 5 Years, 1,18,372$m^3$of Weathered Rock for Three years and Gravel 63,956 m^3 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 Sithalapakkam 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 Sithalapakkam 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 3,00,000/- towards CER for the Government School near the project site the details are given below:

TABLE 8.1 CER – ACTION PLAN

Activity	CER
• Construction of New Toilets and its Maintenance • Providing of Desk and Bench to the School	Rs 3,00,000/-

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 Thiru.N. Dharmalingam 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 50 m BGL, the water table in the area is 74-76 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 access the impact due to the mining activities and the efficacy of the adopted air pollution control measures	Mines Manager
Provision of Dust Mask to all workers	Mines Manager
Greenbelt development all along the periphery of the project area	Mines Manager

Source: Proposed by FAE's & EIA Coordinator

10.6. NOISE POLLUTION CONTROL

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

TABLE 10.5.: PROPOSED CONTROLS FOR NOISE ENVIRONMENT

CONTROL	RESPONSIBILITY
Development of thick greenbelt all along the Buffer Zone (7.5 Meters) of the project area to attenuate the noise and the same will be maintained	Mines Manager
Preventive maintenance of mining machinery and replacement of worn-out accessories to control noise generation	Mines Foreman
Deployment of mining equipment with an inbuilt mechanism to reduce noise	Mines Manager
Provision of earmuff / ear plugs to workers working in noise prone zones in the mines	Mining Mate
Provision of effective silencers for mining machinery and transport vehicles	Mines Manager
Provision of sound proof AC operator cabins to HEMM	Mines Manager
Sharp drill bits are used to minimize noise from drilling	Mines Foreman
Controlled blasting technologies are adopted by using delay detonators to minimize noise from blasting	Mines Manager
Annual ambient noise level monitoring are carried out in the project area and in surrounding villages to access 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 1000 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	1000	The plantation is along the safety distance, village road etc..	Bamboo, Teak, Thailam 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 PLANTSAITON

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	1st Year	2nd Year	3rd Year	4th Year	5th 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 per annum
Air Environment	Haul road maintenance & Water sprinkling	Lump sum fund allocation for daily maintenance of haul roads and thrice a day water sprinkling by fixed sprinklers or water tankers	0	50000
	Muffle blasting – To control fly rocks during blasting	Lump sum fund allocation Blasting face will be covered with sand bags / steel mesh / old tyres / used conveyor belts	0	5000
	Wet drilling procedure	Lump sum fund allocation for ensuring wet drilling by covering drill holes with wet gunny bags and spraying water while drilling	0	10000
	No overloading of trucks/tippers/tractors	Lump sum fund allocation Manual Monitoring through Security guard	0	5000
	Stone carrying trucks will be covered by tarpaulin	Lump sum fund allocation Manual Monitoring through Security guard	0	5000
	Enforcing speed limits of 20 km/hr within ML area	Lump sum fund allocation Manual Monitoring through Security guard	0	5000
	Regular monitoring of exhaust fumes as per RTO norms	Lump sum fund allocation Manual Monitoring through Security guard	0	5000
	Installing wheel wash system near gate of quarry	Installation + Maintenance + Supervision	50000	5000
Noise Environment	Source of noise will be during operation of transportation vehicles, HEMM for this proper maintenance will be done at regular intervals.	Provision made in Operating Cost	0	0
	Oiling & greasing of Transport vehicles and HEMM at regular interval will be done	Provision made in Operating Cost	0	0

	Adequate silencers will be provided in all the diesel engines of vehicles.	Provision made in Operating Cost	0	0
	It will be ensured that all transportation vehicles carry a fitness certificate.	Provision made in Operating Cost	0	0
	Safety tools and implements that are required will be kept adequately near blasting site at the time of charging.	Provision made in OHS part	0	0
	Line Drilling all along the boundary to reduce the PPV from blasting activity and implementing controlled blasting.	Provision made in Operating Cost	0	0
	Proper warning system before blasting will be adopted and clearance of the area before blasting will be ensured.	Blowing Whistle by Mining Mate / Blaster / Competent Person	0	0
	Provision for Portable blaster shed	Installation of Portable blasting shelter	50000	2000
	NONEL Blasting will be practiced to control Ground vibration and fly rocks	Rs. 30/- per 6 Tonnes of Blasted Material	0	0
Waste Management	Waste management (Spent Oil, Grease etc.,)	Provision for domestic waste collection and disposal through authorized agency	5000	20000
		Installation of dust bins	5000	2000
	Bio toilets will be made available outside mine lease on the land of owner itself	Provision made in Operating Cost	0	0
Mine Closure	1. Progressive Closure Activity - Surface Runoff management	Provision for garland drain @ Rs. 10,000/- per Hectare	5000	1000
	2. Progressive Closure Activity Barbed Wire Fencing to quarry area will be provisioned.	Provision made in Operating Cost	0	0
	3. Greenbelt development under safety zone during the mining plan period	Provision made in Operating Cost	0	0
Implementation of EC, Mining Plan & DGMS Condition	Size 6’ X 5’ with blue background and white letters as mentioned in MoM Appendix II by the SEAC TN	Fixed Display Board at the Quarry Entrance as permanent structure mentioning Environmental Conditions	10000	1000
	Air, Water, Noise and Soil Quality Sampling every 6 Months for Compliance Report of EC Conditions	Submission of 2 Half Yearly Compliance - Lab Monitoring Report as per CPCB norms	0	100000
	Workers will be provided with Personal Protective Equipment's	Lumpsum fund allocation	50000	15000

	Health checkup for workers will be provisioned	IME & PME Health checkup for all the employees will be covered batch wise.	0	50000
	First aid facility will be provided	Lumpsum fund allocation	0	5000
	Mine will have safety precaution signages, boards.	Provision for signages and boards made	10000	2000
	No parking will be provided on the transport routes. Separate provision on the south side of the hill will be made for vehicles /HEMMs. Flaggers will be deployed for traffic management	Lumpsum fund allocation	50000	10000
	Installation of CCTV cameras in the mines and mine entrance	Camera 4 Nos, DVR, Monitor with internet facility	30000	5000
	Appointment of Competent person for ensuring the safety operation	Provision made in operational cost	0	0
CER	As per MoEF &CC OM 22-65/2017-IA.III Dated 25.02.2021	Lumpsum fund allocation	300000	0
TOTAL			**5,65,000**	**3,03,000**

In order to implement the environmental protection measures, an amount of Rs.5.65 lakhs as capital cost and recurring cost as Rs.3.03 lakhs as recurring cost is proposed considering present market price considering present market scenario for the proposed project.

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.

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11. SUMMARY AND CONCLUSION

This EIA & EMP report prepared for the proposed Thiru.N. Dharmalingam Rough Stone and Gravel Quarry project located in S.F. No 27/1, 2, 3, 4, 28/1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 28/11A, Sithalapakkam Village, Vembakkam Taluk and Tiruvannamalai District. The Project falls in the Cluster category consist of 2 Proposed, 1 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 March to May 2025 for various environmental components so as to assess the anticipated impacts of the cluster quarry project 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 project and indirectly around 50 people.

As discussed, it is safe to say that the proposed quarries are not likely to cause any significant impact to the ecology of the area, as adequate preventive measures will be adopted to keep the various pollutants within the permissible limits. Green belt development around the area will also be taken up as an effective pollution mitigate technique, as well as to serve as biological indicators for the pollutants released from the Thiru.N. Dharmalingam Rough Stone and Gravel Quarry (Extent – 3.86.0 ha).

12. DISCLOSURE OF CONSULTANT

Thiru N. Dharmalingam 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, Advaitha 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.Thangaraju.P	In-house	**1**	**A**	HG GEO	A A
2	Dr. M. Ifthikhar Ahmed	In-house	**1** **38**	**A** **B**	SC	A
3	Mr. Devanathan.D	In-house	**-**	**-**	AP EB	B A
4	Mrs. Jisha parameswaran	In-house	-	**-**	SHW	B
5	Mr. Govindasamy.P	In-house	-	**-**	WP	B
6	Mr.Viswanathan.P	In-house	-	**-**	LU	B
7	Mr.Senthilkumar.N	Empanelled			AQ	B
8	Mrs. Sasikala.T	Empanelled	-	**-**	SE	B
9	Mr.Vikram Krishna J.R	Empanelled	-	**-**	NV RH	A A

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

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
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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

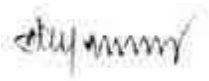
DECLARATION BY EXPERTS CONTRIBUTING TO THE EIA/EMP

This EIA/EMP for Thiru. N.Dharmalingam Rough Stone & Gravel Quarry over an Extent of 3.86.0ha in Sithalapakkam 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. P.Thangaraju**

Designation**:** **EIA Coordinator**

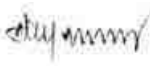
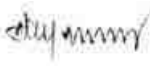
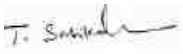
Date & Signature: 

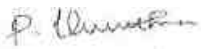
Period of Involvement: **Dec 2023 to till date**

Associated Team Member with EIA Coordinator:

1. **Mr. M Abdul Niyaas.**
2. **Mr.M.Shaik Nawas**

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. D.Devanathan	
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.	Mr.P.Govindasamy	
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. P. Thangaraju	
5	SE	▪ Revision in secondary data as per Census of India, 2011. ▪ Impact Assessment & Preventive Management Plan ▪ Corporate Environment Responsibility.	Mrs.T.Sasikala	

6	EB	▪ Collection of Baseline data of Flora and Fauna. ▪ Identification of species labelled as Rare, Endangered and threatened as per IUCN list. ▪ Impact of the project on flora and fauna. ▪ Suggesting species for greenbelt development.	Mr..D.Devanathan	
7	RH	▪ Identification of hazards and hazardous substances ▪ Risks and consequences analysis ▪ Vulnerability assessment ▪ Preparation of Emergency Preparedness Plan ▪ Management plan for safety.	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.P.Viswanathan	
9	NV	▪ Identify impacts due to noise and vibrations ▪ Suggesting appropriate mitigation measures for EMP.	Mr. J. R. Vikram Krishna	
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.	Mrs.Jisha Parameswaran	

LIST OF TEAM MEMBERS ENGAGED IN THIS PROJECT

Sl.No.	Name	Functional Area Proposed	FAE /Mentor	Involvement	Signature
1	Mr. M Abdul Niyaas.	GEO	Mr. S.Umamahesvaran	▪ Site Visit with FAE ▪ Provide inputs on Geological Aspects ▪ Assist in Resources & Reserve Calculation and preparation of Production Plan & Conceptual Plan	
2	Mr.Shaik Nawas	SC	Dr. M. Ifthikhar Ahmed	▪ 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	

DECLARATION BY THE HEAD OF THE ACCREDITED CONSULTANT ORGANIZATION

I, Dr. M. Ifthikhar Ahmed, Managing Partner, Geo Exploration and Mining Solutions, hereby, confirm that the above-mentioned Functional Area Experts and Team Members prepared the EIA/EMP for Thiru.N.Dharmalingam Rough Stone & Gravel Quarry over an Extent of 3.86.0 ha in SithalapakkamVillage 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**