DRAFT EIA & EMP FOR
PROPOSED ROUGH STONE AND GRAVEL QUARRY
CATEGORY – B1

(Public Hearing Upgraded after Terms of Reference (ToR) as per the provisions of EIA Notification 2006 & amendments thereof)

ToR Identification No. TO24B0108TN5525413N (F.No.10893), dated 29.06.2024

PROPOSED QUARRY LEASE DETAILS	
SURVEY NOS	613(P) AND 643(P)
VILLAGE	IRUKKANDURAI PART-I
TALUK	RADHAPURAM
DISTRICT	TIRUNELVELI
EXTENT	2.97.57 ha
CLUSTER AREA	7.40.07 ha
PROPOSED PRODUCTION QUANTITY FOR FIVE YEARS	ROUGH STONE : 5,23,006 M^3 GRAVEL : 24,487 M^3
LAND	CONSENT PATTA LAND

(Sector No. 1(a) Sector No.1 as per NABET)
Category of the Project: B1 Cluster Mining, Total Cluster Area – 7.40.07 Ha
Baseline Monitoring Period – March 2024 to May 2024

APPLICANT

THIRU. S. JACOB RAJAMANI
S/O. SOUNDARAPANDIAN, 69A2,
KATHIRESAN KOVIL STREET, V.O.C NAGAR, KOVILPATTI TALUK,
THOOTHUKUDI DISTRICT, PIN CODE– 628 502.

ORGANIZATION

M/s. GLOBAL MINING SOLUTIONS
(NABET ACCREDITED & ISO 9001 CERTIFIED CONSULTANT)
PLOT NO.6, SF NO. 13/2, A2, VS CITY, RC CHETTYPATTY,
KOTTAMETTUPATTY, OMALUR, SALEM, TAMIL NADU – 636 455
NABET ACCREDITATION NO – NABET/EIA/2326/IA 0110

JULY- 2024

AMENDMENT PAGE

SL	Page No.	Section / Clause / Para / Line (as Applicable)	Date of Amendment	Amendment Made	Reasons of amendment	Signature of Person Authorizing Amendment
1						
2						
3						
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7						
8						
9						
10						

ACKNOWLEDGEMENT

M/s. Global Mining Solutions, Salem is very much thankful Thiru. S.Jacob Rajamani, Lessee for the confidence and trust placed on the organization for carrying out Environmental Impact Assessment (EIA) study for the proposed Rough Stone and Gravel quarry over a lease extent of 2.97.57 Ha., & Cluster extent of 7.40.07 Ha., located at Irukkandurai Part-I Village, Radhapuram Taluk, Tirunelveli District, Tamil Nadu State and formulating the Environmental Management Plan (EMP). We also gratefully acknowledge the cooperation and assistance provided by concerned government authorities for collection of secondary information for the preparation of Draft EIA/EMP report. Our sincere thanks to the local people of Irukkandurai Part-I Village and the nearby villages for their whole hearted cooperation and constant involvement during the entire field study without which the study would not have been possible.

For: M/s. Global Mining Solutions

(M. Prabu)

Managing Director

UNDERTAKING

In line with MoEF OM No. J – 11013/41/2006-IA. II (I) dated 5th October 2011, we hereby give our undertaking for owning the content and information in the EIA/EMP report submitted for EC of the proposed Rough Stone and Gravel Quarry over a lease extent of 2.97.57 Ha., & Cluster extent of 7.40.07 Ha, located at Irukkandurai Part-I Village, Radhapuram Taluk, Tirunelveli District, Tamil Nadu State.

For: M/s. Global Mining Solutions

Name: M.Manikandan
EIA Coordinator – Mining

UNDERTAKING

In Line with OM no. J-11013/41/2006-IA.II (1) dated 4th Aug 2009 and its Amendments, we hereby confirm that all Terms of Reference issued by Ministry of Environment, Forest and Climate Change vide. ToR Identification No. TO24B0108TN5525413N (F.No.10893), dated 29.06.2024 of Draft EIA/EMP report for the proposed Rough Stone and Gravel Quarry over a lease extent of 2.97.57. Ha, & Cluster extent of 7.40.07 Ha., located at Irukkandurai Part-I Village, Radhapuram Taluk, Tirunelveli District, Tamil Nadu State for the production of 5,23,006 m^3 of Rough Stone and 24,487 m^3 of Gravel formation from the proposed lease area and the details has been complied in the Draft EIA/EMP report is factually correct.

The EIA/EMP report has been prepared by M/s. Global Mining Solutions (GMS), Salem. GMS is a NABET accredited consultant for preparation of EIA/EMP report of Mining of Minerals (Opencast only) vide certificate No. NABET/EIA/2326/IA 0110, valid till 04.01.2026.

For: M/s. Global Mining Solutions

Name: M. Manikandan
EIA Coordinator – Mining

QUALITY COUNCIL OF INDIA
Creating an Ecosystem for Quality

NABET

National Accreditation Board for Education and Training

NABET

Certificate of Accreditation

Global Mining Solutions

Plot No - 6 SF No 13/2 A2, VS City, RC Chettypatty,
Kottamettupatty, Omalur, Salem, Tamil Nadu-636455

The organization is accredited as ***Category-B*** *under the QCI-NABET Scheme for Accreditation of EIA Consultant Organizations, Version 3: for preparing EIA-EMP reports in the following Sectors –*

S. No	Sector Description	Sector (as per)		Cat.
		NABET	MoEFCC	
1	Mining of minerals-opencast mining only	1	1 (a) (i)	A

Note: Names of approved EIA Coordinators and Functional Area Experts are mentioned in IAAC minutes dated February 10, 2023, posted on the QCI-NABET website.

The Accreditation shall remain in force subject to continued compliance with the terms and conditions mentioned in QCI-NABET's letter of accreditation bearing no. QCI/NABET/ENV/ACO/23/2724 dated March 31, 2023. The accreditation needs to be renewed before the expiry date by Global Mining Solutions, Salem following the due process of assessment.

Sr. Director, NABET
Date: March 31, 2023

Certificate No.
NABET/EIA/2326/IA 0110

Valid up to
January 4, 2026

For the updated List of Accredited EIA Consultant Organizations with approved Sectors please refer to the QCI-NABET website.

ANNEXURE - VII

Declaration by Experts contributing to the proposed Rough Stone and Gravel Quarry over a lease extent of 5,23,006 m^3 of Rough Stone and 24,487 m^3 of Gravel formation., located at Irukkandurai Part-I Village, Radhapuram Taluk, Tirunelveli District, Tamil Nadu State.

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

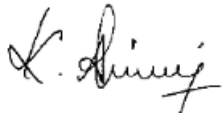
EIA Coordinator Name: M. Manikandan

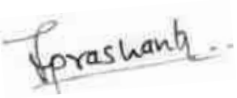
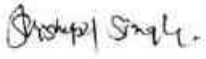
Signature & Date

Period of involvement: March 2024 to May 2024.

Contact information:

M/s Global Mining Solutions
Plot No.6, SF No. 13/2, A2, VS City, RC Chettypatty,
Kottamettupatty, Omalur,
Salem, Tamil Nadu – 636 455

S. No.	Functional areas	Name of the expert/s	Involvement (period and task**)	Signature and Date
1	*AP*	*Dhanalakshmi Ramanathan*	*Assessment of existing air quality, Impact of the project on ambient air and suggested mitigation measures for air pollution.* *Period: March 2024 to May 2024.*	
2	*WP*	*Abirami Kaliaperumal*	*Assessment of existing water quality, impact of the project on surface and ground water quality, suggested mitigation measures for minimizing the impact.* *Period: March 2024 to May 2024.*	
3	*SHW*	*Ramadoss N*	*Assessment of waste generated from the project, suggested waste management practices.* *Period: March 2024 to May 2024.*	
4	*SE*	*Sarasvathy K*	*Baseline SE studies. Data compilation and assessment. Impact of the project on SE status of the area. Formulation of CER plan.* *Period: March 2024 to May 2024.*	
5	*EB*	*Saravanan S*	*Baseline data collection of related to ecology of the area.* *Period: March 2024 to May 2024.*	
6	*HG*	*Ravinthiran N*	*Hydrogeological feature of the area. Ground water depth and impact of project on ground water of the area.* *Period: March 2024 to May 2024.*	
7	*AQ*	*Srilatha Thiruveedhula*	*Air quality modeling utilizing the area source model. Predication of the ground*	

			level concentration of the dust. Suggesting suitable mitigation measures. <u>*Period: March 2024 to May 2024.*</u>	
8	*NV*	*Dhanalakshmi Ramanathan*	*Ambient noise study of the area. Incremental noise generation due to quarry operation and impact of the noise due to the project.* <u>*Period: March 2024 to May 2024.*</u>	
9	*LU*	*Dhanalakshmi Ramanathan*	*Preparation of land use map based on satellite imagery. Land use classification and analysis. Impact prediction of the project on the surrounding land environment.* <u>*Period: March 2024 to May 2024.*</u>	
10	*RH*	*S.V. Prashant*	*Identification of the Risk related to the mining activities. Preparation of emergency disaster management plan. Plan for supply of safety equipment for the worker.* <u>*Period: March 2024 to May 2024.*</u>	
11	*SC*	*Shisupal Sing*	*Soil monitoring, secondary data collection on soil type, soil management practices, utilization of topsoil.* <u>*Period: March 2024 to May 2024.*</u>	
12	*GEO*	*Valliappan Meyyappan*	*Geological map, stability of quarry and dump, management plan for mine stability, after use of mining quarry and geological feature of the area.* <u>*Period: March 2024 to May 2024.*</u>	

EIA CONTENT

FIGURE LIST

TABLE LIST

LIST OF ANNEXURES

COMPLIANCE TO TERMS OF REFERENCE

S.No	ToR Points	Reply	Pg. No
SEAC Conditions-Site Specific			
1.1	The Proposed project site is located 9.80 Km from Kanniyakumari Wildlife Sanctuary, So the PP shall obtain letter from DFO and submit along with EIA Report.	The DFO letter stating that the proximity distance of Kanniyakumari Wildlife Sanctuary to be incorporated at the time of final EIA submission.	-
2	The Proponent shall furnish a slope stability action plan for the proposed quarry operation, during the EIA appraisal	The slope stability action plan furnished in the chapter-7.	172
3	The PP shall carry out a comprehensive study indicating the Travelling route used for quarry operation, Crusher activity as proposed pertaining to the traffic surveys and Axle load surveys and demand forecasting for the next 10 years in the cluster area including the Traffic Volume, Identification of possible improvements in the existing alignment and bypassing congested locations with alternatives, investigation of required sub-grade and sub-soil characteristics and strength for road and embankment design and sub soil investigation, identification of sources of construction material, etc.	Complied. The Details are given in chapter 7.	172
4	The Proponent shall study about the addition of proposed quarrying operation in the existing cluster over the economic growth of the area falling within 10 km from the cluster of mines.	Complied. Cluster of mines details given in chapter-2	55
5	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 with details such as dwelling houses with number of occupants, whether it belongs to the owner (or) not, places of worship, Schools/Colleges 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.	Complied. The Details are given in chapter-3 and also as Annexure.4.	Complied. Enclosed as Annexure 4

3	SEAC Standard Condition		
3.1	Terms of Reference		
1	In the case of existing/operation 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 lining lease area (viii) Condition of Safety zone/benches Revised/Modified Mining Plan showing the benches of not exceeding 6m height and ultimate depth of not exceeding 50m.	The applied lease is not fresh, there is a quarry pit exists in the S.F. No. 643(Part), which was operated by Thiru. Jacob Rajamani during the lease period 21.06.2012 - 20.06.2015 vide District Collector, Tirunelveli Proceedings RC.No. M1/62132/2011 Dated 21.06.2012. The depth of the Existing pit is 5m BGL.	-
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.	Complied.	Complied. Enclosed as Annexure 5
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.	Enumerate on the structures located within the radius of (i) 50 m, (ii) 100 m, (iii) 200 m and (iv) 300 m (v) 500m given chapter-3.	79
4	The PP shall submit a detailed hydrogeological report indicating the impact of proposed quarrying operations on the water bodies like lake, water tanks, etc are located within 1 km of the proposed quarry.	The study is under progress. It will be incorporated in the final EIA & EMP.	-

5	The Project Proponent shall carry out Bio-diversity study through reputed institution and the same shall be included in the EIA report.	Complied. The biodiversity report of the study area to be incorporated at the time of final EIA submission.	130
6	The DFO letter stating that the proximity distance of Reserve Forests, Protected Areas, Sanctuaries. Tiger reserve etc. upto a radius of 25 km from the proposed site.	The DFO letter stating that the proximity distance of RF & PF to be incorporated at the time of final EIA submission.	-
7	In 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, Suratkal 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.	-	**-**
8	However, in case of the fresh/virgin quarries, the project 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 30m below ground level.	It will be complied at the timing of EC appraisal.	-
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, ll/l Class mines manager appointed by the proponent.	Proponent undertaking agreement enclosed	-
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	Agreed. Will be complied.	**-**

	as no fly rock travel beyond 30 m from the blast site		
11	The EIA Coordinators shall obtain and furnish the details of quarry/quarries operated by the proponent in the past, either in the same location or elsewhere in the State with video and photographic evidences.	The details to be incorporated at the time of final EIA Submission.	-
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	Not Applicable. Mines operated from21.06.2012 - 20.06.2015.	-
13	What was the period of the operation and stoppage of the earlier mines with last work permit issued by the AD/DD mines?	Not Applicable. Mines operated from21.06.2012 - 20.06.2015.	-
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.	Not Applicable. Mines operated from21.06.2012 - 20.06.2015.	-
15	All comer 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).	Project coordinates superimposed in satellite imagery and given as Figure No – 2.1 in Chapter – 2. The geology and geomorphology map are provided in Figure No.3.23, 3.24 Chapter 3. The Soil map is provided under Figure No. 3.25, Chapter-3. The 10km Radius Index plan showing buffer zone is given in Figure No.3.1 & Figure 3.2 in Chapter – 3.	49,122 & 124
16	The PP shall carry out Drone video survey covering the cluster, green belt, fencing etc.,	This is an existing quarry. Drone survey cluster, greenbelt, fencing details provided at the time of final EIA Submission.	-

17	The proponent shall furnish photographs of adequate fencing, greenbelt along the periphery including replantation of existing trees & safety distance between the adjacent quarries & water bodies nearby provided as per the approved mining plan	There are no trees within ML area. Fencing and plantations are under process. Greenbelt / Plantation will be carried out in the safety zone to enhance the vegetative growth and aesthetic in the safety zone area. In the post mining stage, an area of 2.02.5 Ha will be under greenbelt and plantation.	-
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.	The geological reserves are estimated to be rough stone 12,80,866 m^3 and Gravel 30,672 m^3. The mineable reserves of rough stone 523006 $m^3$and Gravel 24487 m^3.	68
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 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.	Complied. Please refer Fig. 10.1	180
20	The Project Proponent shall conduct the Hydro-geological study considering the contour map of the water table detailing the number of ground water pumping & open wells, and surface water bodies such as rivers, tanks, canals, ponds etc. within 1 km (radius) along with the collected water level data for both monsoon and non-monsoon seasons from the PWD/TWAD so as to assess the impacts on the wells due to mining activity. Based on actual monitoring data, it may clearly be shown whether working all intersect ground water. Necessary data and documentation in this regard may be provided.	The hydrogeological study from a reputed institute is in progress; however, the final EIA submission report will be incorporated into Chapter 7.	119
21	The proponent shall furnish the baseline data for the environmental and ecological parameters with regard to surface water/ground water quality, air	The baseline data for all environments is collected for the summer season (March to May 2024).	78

	quality, soil quality& flora/fauna including traffic/vehicular movement study.		
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 air pollution, water pollution, & health impacts. Accordingly, the Environment Management plan should be prepared keeping the concerned quarry and the surrounding habitations in the mind.	Detailed cumulative impact study has been carried and the same is incorporated in the Chapter 4. Accordingly, a detailed Environment Management Plan is prepared considering air, water, noise and soil environment and the details are given in Chapter 7.	145 &168
23	Rain water harvesting management with recharging details along with water balance (both monsoon & non-monsoon) be submitted.	Rain water harvesting Plan is given in chapter 4.	135
24	Land use of the study area delineating forest area, agricultural land, grazing land. Wildlife sanctuary, national park, migratory routes of fauna, water bodies, human settlements and other ecological features should be indicated. Land use plan of the mine lease area should be prepared to encompass preoperational, operational and post operational phases and submitted. Impact, if any, of change of land use should be given.	Satellite imagery has been used to study the lease area and the details of land use is given in Chapter 3.	83
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. There is no generation of the OB & waste.	-
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 famishedto the effect that the proposed mining activities could be considered.	No proximity to Critically polluted areas.	-
27	Description of water conservation measures proposed to be adopted in the Project should be given. Details of	The impact of the mining operations due to this quarry on water environment is studied	135

	rainwater harvesting proposed in the Project, if any, should be provided.	and mitigation measures are proposed. Rain water harvesting plan is given Chapter 4.	
28	Impact on local transport infrastructure due to the Project should be indicated	Since the production is very less, only few trucks of 5/10T will be used for transport. The effect of transport on local transport will be negligible.	-
29	A tree survey shall be carried out (Nos. name of species, age, diameter, etc) both within the mining lease applied area & 300m buffer zone and its management during mining activity	There are no tall trees within 300m buffer zone of the project area.	-
30	A detailed mine closure plan for the proposed project shall be included in EIA/EMP report which should be site-specific	Detailed mine closure plan is given in Chapter 7.	173
31	As 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, where ever possible	Accepted. It will be done.	-
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 and local school/college authorities. The plant species with dense/moderate canopy of native origin should be chosen. Species of small/medium/tall trees alternating with shrubs should be planted in a mixed manner.	Green belt is proposed in an area of 0.55.81 ha. Green belt development plan provided.	69
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 green belt area with GPS coordinates all along the boundary of the project site with at least 3 m wide and in between blocks in an organized manner	Accepted. The photographs showing green belt will be provided once it is completed.	-

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.	A disaster management plan is prepared and the details are given in Chapter 7.	173
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	Risk assessment and its management is given in Chapter 7.	160
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.	Occupational Health Impacts of the project and preventive measures are detailed under Chapter 4.	152
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.	No major impact on public health will be there since the villages are located more than 1km from the lease area. Details of CER and CSR are discussed under Chapter No. 8	-
38	The Socio-economic studies should be carried out within a 5km 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.	Socio economic study is conducted both by visits and secondary data collection. Details are given in Chapter 3	114
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.	No litigation is pending	-
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.	Benefits of the project is given in Chapter 8	174
41	If any quarrying operations were carried out in the proposed quarrying site for which now EC is sought, the	The applied lease is not fresh, there is a quarry pit exists in the S.F. No. 643(Part), which was	-

	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.	operated by Thiru. Jacob Rajamani during the lease period 21.06.2012 - 20.06.2015 vide District Collector, Tirunelveli Proceedings RC.No. M1/62132/2011 Dated 21.06.2012. The Regional Office, Tirunelveli or the concerned DEE/TNPCB to be incorporated at the time of final EIA submission.	
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.	-	-
43	Concealing any factual information or submission of false/fabricated data and failure to comply with any of the condition mentioned above may result in withdrawal of this Terms of Conditions besides attracting penal provisions in the Environment (Protection) Act, 1986	Agreed	-
3.1	After detailed discussions, the Authority accepted the recommendation of SEAC and decided to grant of Terms of Reference (ToR) along with with Public Hearing for the quantity of 5,23,006 m3 of Rough Stone & 24,487 m3 of Gravel with an ultimate depth of mining is 47 m BGL as per the approved mining plan, under cluster of undertaking the combined Environmental Impact Assesment Study and Preparation of separate Environment Management Plan subject to the conditions as recommended by SEAC & normal conditions.	Agreed	-
4.0 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	There are three quarries within a 500-metre radius. The proponent will take the initiative to form a cluster management committee once environmental clearance is obtained for this quarry as well as the other proposed quarry.	**-**

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.,	Agreed. Will be complied.	-
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.	Agreed. The list of members of the committee formed will be submitted to AD/mines after obtaining Environmental Clearance.	-
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.	Agreed. Details of the Operation plan for cluster mining operations will be submitted once we get environmental clearance for all quarries proposed in the cluster area.	-
5	The committee shall deliberate on risk management plan 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.	Risk management plan for the individual quarry is given in this report. As far as cluster working condition is concerned, once the committee is formed, risk management as a cluster including inundation of clusters and the evacuation plan will be elaborated and the same will be submitted to the EIA.	-
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.	Environmental policy for the cluster will be framed by the cluster management committee and the policy will be in accordance with EPA Act, 1986 and its amendments, guidelines by MoEF&CC/SEIAA and other regulatory bodies. This policy will be displayed in the quarry.	-
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.	Agreed. It will be complied as mentioned in the Point No.4	-
8	The committee shall furnish the Emergency Management plan within the cluster.	Agreed. It will be complied as mentioned in the Point No.4.	-
9	The committee shall deliberate on the health of the workers/staff involved in the mining as well as the health of the public.	Agreed. It will be complied as mentioned in the Point No.4.	-

10	The committee shall furnish an action plan to achieve sustainable development goals with reference to water, sanitation & safety.	Agreed. It will be complied as mentioned in the Point No.4.	-
11	The committee shall furnish the fire safety and evacuation plan in the case of fire accidents.	Agreed. It will be complied as mentioned in the Point No.4.	-
Impact study of mining			
12	Detailed study shall be carried out in regard to impact of mining around the proposed mine lease area covering the entire mine lease period as per precise area communication order issued from reputed research institutions on the following,		-
a	Soil health & soil biological, physical land chemical features	Complied. The details are given in Chapter 3 of the Draft EIA report.	102
b	Climate change leading to Droughts, Floods etc.	The proposed quarry is a very small-scale Opencast-Mechanized mining method and the anticipated impacts to the climate change, droughts, floods, etc. will be very marginal.	-
c	Pollution leading to release of Greenhouse gases (GHG), rise in Temperature, & Livelihood of the local people	Considering that the quantum of production is less, only 2 excavator, 4 tippers will be engaged. These equipment's will be properly and regularly maintained. Besides, regular vehicular emission tests will be done for the transport vehicles to ensure minimal impact due to carbon emissions. To further mediate the carbon emissions, a good greenbelt and plantation plan has been planned wherein 1500 number of plants will be planted in and around the lease area.	73
d	Possibilities of water contamination and impact on aquatic ecosystem health	The total water requirement is 5.0 KLD. It will be outsourced from the nearby villages. So, no impact in the project area due to water usage. The wastewater generation in the form of runoff water during rainy season will be collected in the bottom quarry through proper drainage pattern and the collected water will be	-

		used for plantation and dust separation during dry season. However, there is no wastewater discharge from this quarry is being anticipated. So, possibilities of water contamination and impact on aquatic ecosystem health is not envisaged.	
e	Agriculture, Forestry & Traditional practices	There are no forest area and traditional practices within the project area. However, there are some agricultural lands around the project site. It may be affected due to the quarry operation as such dust particles sedimentation in the agricultural land. It will be controlled at the source level by proper dust separation as such wet drilling, controlled blasting and water sprinkling on the project roads and project surrounding roads. As per Air Quality Modelling the impact of the air quality limited to 0.5 km radius. So, there is no impact for the Agriculture, Forestry & Traditional practices located within 10km radius.	-
f	Hydrothermal/Geothermal effect due to destruction in the Environment	The proposed quarry operation is Opencast-Mechanized operation with drilling, blasting, excavation, loading and transportation. So, the effect of Hydrothermal/Geothermal is not envisaged.	-
g	Bio-geochemical processes and its foot prints including environmental stress	This is a simple mining operation, so bio-geochemical processes are not envisaged.	-
h	Sediment geochemistry in the surface streams	There is Indian Ocean is located at a distance of 3.43 km in South direction & Hanuman Nadi is located at a distance of 80m in south direction from lease area. Due to mining operation,	-

		there may be minimum impact to the said water bodies due to dust sedimentation. It will be controlled by wet drilling, water sprinkling and plantation.	
Agriculture &Agro-Biodiversity			
13	Impact on surrounding agricultural fields around the proposed mining Area.	Agreed. It is described in the point no. 12 (e) of this ToR Compliance Annexure-B	-
14	Impact on soil flora & vegetation around the project site.	Complied. The details are given in Chapter 3.	103
15	Details of type of vegetations including no. of trees & shrubs within the proposed mining area and. If so, transplantation of such vegetations all along the boundary of the proposed mining area shall committed mentioned in EMP.	Complied. The details are given in Chapter 3.	103
16	The Environmental Impact Assessment should study the biodiversity, the natural ecosystem, the soil micro flora, fauna and soil seed banks and suggest measures to maintain the natural Ecosystem.	Complied. The details are given in Chapter 3.	103
17	Action should specifically suggest for sustainable management of the area and restoration of ecosystem for flow of goods and services.	The detailed action plan has been described in the EMP (Chapter 10) for the sustainable management for the project area and its surroundings.	176
18	The project proponent shall study and furnish the impact of project on plantations in adjoining patta lands, Horticulture, Agriculture and livestock.	Complied. The details are given in Chapter 4.	148
Forests			
19	The project proponent shall detailed study on impact of mining on Reserve Forests free ranging wildlife.	Therkkumalai R.F – 9.80 km (W) Kanniyakumai Wildlife Sanctuary- 9.80 Km (W) and no other reserved forest located in the buffer zone. The fauna commonly found in the core and buffer zone is given in Chapter 3.	186
20	The Environmental Impact Assessment should study impact on forest, vegetation, endemic,	Complied. The details are given in Chapter 3.	103

	vulnerable and endangered indigenous flora and fauna.		
21	The Environmental Impact Assessment should study impact on standing trees and the existing trees should be numbered and action suggested for protection.	Not Applicable. This is a dry barren land.	-
22	The Environmental Impact Assessment should study impact on protected areas, Reserve Forests, National Parks, Corridors and Wildlife pathways, near project site.	Therkkumalai R.F – 9.80 km (W) Kanniyakumai Wildlife Sanctuary- 9.80 Km (W) and no other reserved forest located in the buffer zone. There is no, National Parks, Corridors and Wildlife pathways.	-
Water Environment			
23	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.	The hydrogeological study from a reputed institute is in progress; however, the final EIA submission report will be incorporated into Chapter 3.	119
24	Erosion Control measures.	There is no waste generation (OB) in this quarry has been envisaged. However, there may be erosion due to rainy season and that is limited within quarry area. The control measures are explained in Chapter 8.	133
25	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.	Complied. The details are incorporated in Chapter 3.	103
26	The project proponent shall study impact on fish habitats and the food WEB/ food chain in the water body and Reservoir.	Not applicable.	-

27	The project proponent shall study and furnish the details on potential fragmentation impact on natural environment, by the activities.	Fragmentation impact on environment may be due to drilling and blasting. The anticipated impacts and mitigation measures are discussed in Chapter 4.	76
28	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.	An ecological and biodiversity study has been conducted and the same is incorporated in the Chapter 4 of the Draft EIA/EMP report. However, there is no any features mentioned in this condition within the M.L area. However, the impacts anticipated with respect to the environment of the project area is very negligible and it will be minimized within the project area. The details are described in Chapter 10.	130
29	The Terms of Reference should specifically study impact on soil health, soil erosion, the soil physical, chemical components and microbial components.	Agreed.	-
30	The Environmental Impact Assessment should study on wetlands, water bodies, rivers streams, lakes and farmer sites.	Complied. The details are described in Chapter 3.	105
Energy			
31	The measures taken to control Noise, Air, Water, Dust Control and steps adopted to efficiently utilize the Energy shall be furnished.	Complied. The details are described in Chapter 4.	146
Climate Change			
32	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.	Complied. The details are described in Chapter 4.	146
33	The Environmental Impact Assessment should study impact on climate change, temperature rise, pollution and above soil & below soil carbon stock.	Complied. The details are described in Chapter 4.	146

Mine Closure Plan			
34	Detailed Mine Closure Plan covering the entire mine lease period as per precise area communication order issued.	Complied. Mine Closure Plan has been incorporated in the approved Mining Plan and the same is incorporated in the Chapter 7.	173
EMP			
35	Detailed Environment Management Plan along with adaptation, mitigation & remedial strategies covering the entire mine lease period as per precise area communication order issued.	Complied. The details are described in Chapter 10.	176
36	The Environmental Impact Assessment should hold detailed study on EMP with budget for green belt development and mine closure plan including disaster management plan.	Complied. The details are described in Chapter 10.	179
Risk Assessment			
37	To furnish risk assessment and management plan including anticipated vulnerabilities during operational and post operational phases of Mining.	Complied. The details are described in Chapter 7.	160
Disaster Management Plan			
38	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.	Complied. The details are described in Chapter 7.	173
Others			
39	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.	-	-

40	As per the MoEF& CC office memorandum F.N0.22-65/2017-1A.11I dated: 30.09.2020 and20.10.2020 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. It will be complied in the Final EIA/EMP report.	-
41	The project proponent shall study and furnish the possible pollution due to plastic and microplastic on the environment. The ecological risks and impacts of plastic & microplastics on aquatic environment and fresh water systems due to activities, contemplated during mining may be investigated and reported.	Nil	-
Standard Terms of Reference for (Mining of minerals)			
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.	Complied.	-
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.	Anticipated Environmental Impacts and Mitigation Measures is given in Chapter 8.	128
1.3	Proper KML file with pin drop and coordinate of mine at 500-1000 m interval be provided.	Agreed	-
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	Land Use Pattern of 10 km Radial Buffer Area of Project Site is given page chapter-3.	108

	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		
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 Pattern of 10 km Radial Buffer Area of Project Site is given page chapter-3.	108
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.	Contour map, Physiography and Drainage is given Chapter-3.	120
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 eloboration in form of lengthe, quantity and quality of water to be diverted	Drainage map is given Chapter-3.	120
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	Mineral reserves, geological status of the study area is given chapter-11.	184

	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.		
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.	Method of mining Details is Given Chapter-2.	50
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.	Details given chapter-1	52
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.	Land Use Pattern of 10 km Radial Buffer Area of Project Site is given page chapter-3.	108
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	Land Use Pattern of 10 km Radial Buffer Area of Project Site is given page chapter-3.	108

	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 Area under Surface Area Under Mining Rights(ha) S.N ML/Project Land use Rights(ha) (ha) Area under Both (ha) 1 Agricultural land 2 Forest Land 3 Grazing Land 4 Settlements 5 Others (specify) S.N. Details Area (ha) 1 Buildings 2 Infrastructur 3. Roads 4 Others (specify) Total		
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.	Flora & fauna of 10 km Radial Buffer Area of Project Site is given page chapter-3.	103
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	Details given under description of the environment chapter-3.	104

	accreditation of the consultant to be provided.		
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 given under description of the environment chapter-3.	82
1.16	For proper baseline air quality assessment, Wind rose pattern in the area should be reviewed and accordingly location of AAQMS 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 10 km 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 data to be provided	Details given under description of the environment chapter-3.	87
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	Details given under chapter-4.	172

	should be clearly spell out in EIA/ EMP report		
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.	Socioeconomic Environment Details Given Chapter-3.	114
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.	Biological Environment Details Given Chapter-3.	103
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.	Health Details Given Chapter-3.	118
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	The hydrogeological study from a reputed institute is in progress; however, the final EIA submission report will be incorporated into Chapter 7.	172
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	Abstraction from the mine on the hydrogeology and groundwater regime details is given chapter-3	172

	case there is a declining trend of groundwater availability and/or if the area falls within dark/grey zone.		
1.23	Study on land subsidence including modeling for prediction, mitigation/prevention of subsidence, continuous monitoring measures, and safety issues should be carried out.	Land subsidence is given chapter-3	172
1.24	Detailed water balance should be provided. The breakup 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.	Impact due to Water use in Mines and water balance given chapter-4.	134
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	Air Pollution control equipment (APCEs) to be implemented as part of Environment Management Plan details given chapter-10	197
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	Agreed	-
1.27	PP to evaluate the greenhouse emission gases from the mine operation and corresponding carbon absorption plan.	greenhouse emission gases details given chapter-10	197
1.28	Site specific Impact assessment with its mitigation measures, Risk Assessment and Disaster Preparedness and Management Plan should be provided.	Impact assessment with its mitigation measures, Risk Assessment and Disaster Preparedness and Management Plan given chapter-7.	173
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.	Mining method, technology details given chapter-1.	50

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.	Mineral transportation details given chapter-2.	71
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.	Parking, rest areas and canteen, and effluents/pollution load details given chapter -4	138
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.	PP will provide cost of Rs.2.45 lakhs towards garland drain, installation of Bio-toilet, Sump Maintenance and De-watering under EMP.	138
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.	Final Mine Closure Plan and post mining land use details given in chapter-7	173
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.	Agreed	-

1.35	Cost of EMP (capital and recurring) should be included in the project cost and for progressive and final mine closure plan.	EMP cost details given chapter-10.	182
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.	-
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 details given chapter-11	200
1.38	Corporate Environment Responsibility:	CSR details given chapter-11	200
1.39	a) The Company must have a well laid down Environment Policy approved by the Board of Directors.	Environment policy details given chapter- 10.	180
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.	Environment policy details given chapter- 10.	180
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.	-	-
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.	-	-

1.43	e) Environment Managament Cell and its responsibilities to be clearly spell out in EIA/ EMP report	EMP cell details given Chapter-4	184
1.44	f) In built mechanism of self-monitoring of compliance of environmental regulations should be indicated.	Agreed	-
1.45	Status of any litigations/ court cases filed/pending on the project should be provided	Nil	
1.46	PP shall submit clarification from DFO that mine does not fall under corridors of any National Park and Wildlife Sanctuary with certified map showing distance of nearest sanctuary.	Noted	-
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	-
1.48	Details on the Forest Clearance should be given as per the format given: Total ML Total Project Area Forest (ha) land (ha) Date of FC Extent of Forest Land Balance area for which FC is yet to be obtained Status of appl for diversion of forest land If more than one provides details of each FC	Noted	-
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	Noted	-
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.	Noted	-

1.51	PP shall carry out survey through drone highlighting the ground reality for atleast 10 minutes	Noted	-
1.52	Detailed Chronology of the project starting from the first lease deed alloted/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	Noted	-
1.53	The first page of the EIA/ EMP report must mention the peak capacity production, area, detail of PP, Consultant (NABET acrreditation) and Laboratory (NABL / MoEF & CC certification)	Noted	-
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 chapter,s section	Noted	-

CHAPTER 1

INTRODUCTION

1.1 PURPOSE OF THE REPORT

Environmental Impact Assessment (EIA) as a tool used to identify the environmental, social and economic impacts of a project prior to decision-making. It aims to predict environmental impacts at an early stage in project planning and design, find ways and means to reduce adverse impacts, shape projects to suit the local environment and present the predictions and options to decision-makers.

Thiru. S.Jacob Rajamani, Lessee, has obtained Precise Area communication letter from the Assistant Director (i/c), Department of Geology and Mining, Tirunelveli to quarry out 5,23,006 m^3 of Rough Stone and 24,487 m^3 of Grave Over an extent of 2.97.57 Ha., located at the Survey Nos. 613(P) and 643(P) of Irukkandurai Part-I Village, Radhapuram Taluk, Tirunelveli District, Tamil Nadu State. Hence, this proposed quarry falls under the cluster situation due to the following proposed, existing and abandoned quarries located within 500m radius. The details are given below.

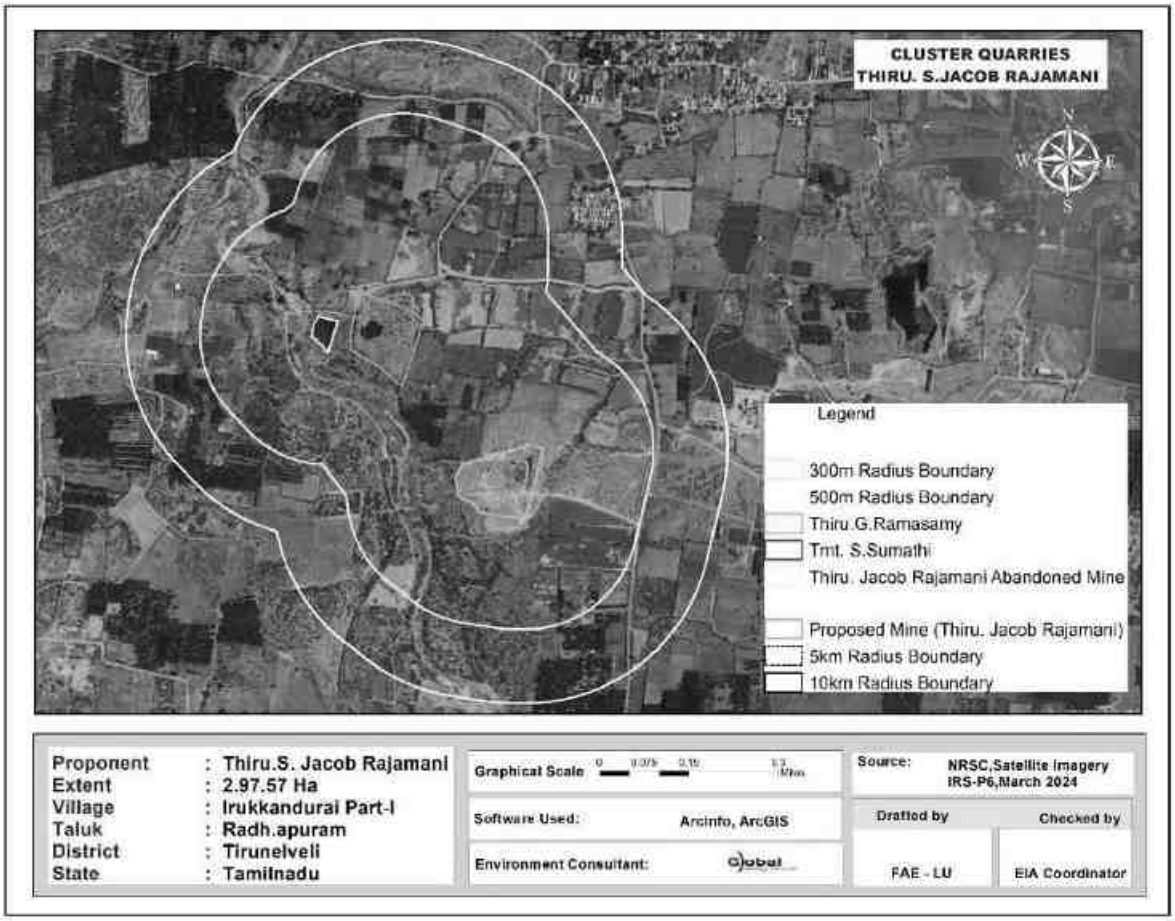
Table 1.1 Details of quarry lies within 500m radius from the applied lease area

Sl. No	Name and address	G.O. No. and Date	Village and Taluk	S.F.No.	Extent (in Ha)	Period of lease
Abandoned Quarries						
1	Thiru.S. Jacob Rajamani S/o.Soundarapandian, 69A2, Kathiresan Kovil Street, V.O.C Nagar, Kovilpatti Taluk, Thoothukudi District. Pin Code– 628 502.	Rc.No.M2/21495 / 2015, Dated 13.03.2024	Irukkandurai Part-I Radhapuram Taluk	647/1	1.56.0	Proceeding No.M1/62132/2011, dated 21.06.2012 for a period 3 years from 21.06.2012 to 20.06.2015

Existing Quarries						
1	Tmt.S.Sumathi, W/o. Sakthi Periya Kumaran 5/132, Velavan Illam, Koodankulam Village, Radhapuram Taluk, Tirunelveli District	Rc.No.M2/21495 / 2015, Dated 13.03.2024	Irukkandurai Part-I Radhapuram Taluk	641(P) & 642/1	1.96.5	Proceeding No.M1/30225/2017, dated 10.11.2022 for a period 5 years from 10.11.2022 to 09.11.2027
2	Thiru.G.Rangasamy, S/o.Ganapathy Nadar, 4/334C, Main Road, Avaraikulam, Radhapuram Taluk, Tirunelveli District	Rc.No.M2/21495 / 2015, Dated 13.03.2024	Irukkandurai Part-I Radhapuram Taluk	626 & 627	2.46.0	Proceeding No.M1/32439/2018, dated 12.10.2022 for a period 5 years from 10.11.2012 to 09.11.2027
Proposed Quarry						
1	Thiru.S. Jacob Rajamani S/o.Soundarapandian, 69A2, Kathiresan Kovil Street, V.O.C Nagar, Kovilpatti Taluk, Thoothukudi District. Pin Code– 628 502.	Rc.No.M2/21495 / 2015, Dated 13.03.2024	Irukkandurai Part-I Radhapuram Taluk	2.97.57		Under Proposed Quarry

As per EIA notification, 2006 and its subsequent amendments the proposed Thiru. S.Jacob Rajamani, Rough Stone & Gravel Quarry, cluster is falls under Schedule 1(a) Mining of Minerals. It is further classified under Category B1 due to the overall extent of cluster area is 7.40.07 Ha which is >5 Ha. Satellite image of Quarries in Cluster is shown in Fig 1.1.

Figure.1.1 Satellite Image showing cluster quarries



The ToR for preparation of EIA/EMP was approved vide ToR Identification No. TO24B0108TN5525413N (File no.10893), dated 29.06.2024. This report has been prepared in line with the approved TOR for production of maximum excavation of 5,23,006 m^3 of Rough Stone and 24,487 m^3 of Gravel for a period of five years.

1.2 IDENTIFICATION OF PROJECT AND PROJECT PROPONENT

The proposed project is for mining of Rough Stone and gravel (under cluster) from the S.F.No. 613(P) and 643(P) over an extent of 2.97.57 Ha., in Irukkandurai Part-I Village, Radhapuram Taluk, Tirunelveli District, Tamil Nadu State. As per EIA notification, 2006 and its subsequent amendments the project comes under Schedule

1 (a) under Category B1 (Lease area >5 to 250 Ha). The proposed project details are given below.

(a) Proposed project details

Sl. No.	Description	Status/Remarks
1.	Sector	Non-coal mining
2.	Category of the project	B1
3.	Proposed mineral	Rough Stone & Gravel quarry
4.	Type of Lease	The applied lease is not fresh, there is a quarry pit exists in the S.F. No. 643 (Part), which was operated by Thiru. Jacob Rajamani during the lease period 21.06.2012 - 20.06.2015.
5.	Extent of the lease	2.97.57 Ha
6.	Proposed depth of mining	47m BGL
7.	Method of mining	Opencast-Mechanized
8.	Proposed lease period	5 Years.
9.	Proposed Environmental Clearance	5 Years.
10.	Proposed production quantity for five years	Rough Stone: 5,23,006 m^3 Gravel: 24,487 m^3

(b) Profile of the project proponent

The proposed lessee Thiru.S. Jacob Rajamani S/o. Soundarapandian is an individual with sound experience in the identification of quarry, operation and marketing in the field of Rough Stone and gravel quarry. The proposed ML is patta land registered in the name of Dharumapuram Adhinam Gnanasambandar Sannadi vide patta no.3, the applicant Thiru. S. Jacob Rajamani has obtained consent from the pattadar, please refer **Annexure no –6**.

(c) Project proponent details

Name of the proponent : Thiru. S. Jacob Rajamani

Status of the Proponent : Individual

Address. S. Jacob Rajamani
S/o. Soundarapandian, 69A2, Kathiresan Kovil Street, V.O.C Nagar, Kovilpatti Taluk, Thoothukudi District, Pin Code– 628 502.

1.3 BRIEF DESCRIPTION OF NATURE OF THE PROJECT

The proposed quarrying operation Opencast-Mechanized method with 5m bench height, 5m bench width and overall bench slope is less than 45°. The quarry operation involves shallow jackhammer drilling, slurry blasting, excavation, loading and transportation.

1.4 SIZE AND LOCATION OF THE PROJECT

(a) Size of the project

Table1.2 Proposed project details

Sl. No.	Feature	Description
1	Type of land	Patta land
2	Extent of lease area	2.97.57 Ha
3	Type of lease	The applied lease is not fresh, there is a quarry pit exists in the S.F. No. 643 (Part), which was operated by Thiru. Jacob Rajamani during the lease period 21.06.2012 - 20.06.2015.
4	Geological Resource	Rough Stone – 30,672 m^3 Gravel - 30,672 m^3
5	Mineable Resource	Rough Stone – 5,23,006 m^3 Gravel – 24,487 m^3
6	Proposed production quantity for five years	Rough Stone - 5,23,006 m^3 Gravel - 24,487 m^3
6	Proposed depth of mining	47m BGL

(b) Location of the project

The proposed project site is located in Irukkandurai Part-I Village, Radhapuram Taluk, Tirunelveli District, Tamil Nadu State and its Latitude 08°10'49.68"N to 08°10'57.99"N and Longitude: 77°38'30.75"E to 77°38'37.19"E with Survey of India Topo Sheet No. 58- H/12.

1.5 IMPORTANCE OF THE PROJECT TO THE COUNTRY AND REGION

There is an increasing demand for rough stone in India and other countries. Since the construction industry is rapidly growing now, there is an increasing demand for rough stone. Thus, this project will contribute not only to the demand of Rough Stone, but also provide employment opportunities to the nearby villages.

1.6 SCOPE OF THE STUDY WITH DETAILS OF REGULATORY SCOPING

Any mining project may cause environmental impacts near the project site during its operation. The type and intensity of impacts on various components of the environment may vary depending on the nature of the project, as well as its geographical location. The net impacts of the project can be quantified through Environment Impact Assessment (EIA) studies on Physical, Biological and Socio-economic environment. The EIA studies give a basis for preparing an Environmental Management Plan (EMP) to conserve the environment of the area.

For the purpose of preparing EIA/EMP the SEIAA, Tamil Nadu has issued a Terms of Reference ToR Identification No. TO24B0108TN5525413N (F.No.10893), dated 29.06.2024 in accordance with the provisions of EIA Notification 2006 and its subsequent amendments. This EIA study includes both Core and Buffer zone i.e., the lease area and 10km radius of the project area respectively. This EIA report prepared based on the data generated from the summer season 2024 (March 2024 to May 2024) and all individual components of environment are described in detail. An in-depth analysis of available information has been made for working out an effective Environmental Management Plan.

1.7 PRESENT STUDY

The Project Proponent has assigned M/s. Global Mining Solutions, Salem for conducting Environment Impact Assessment / Environmental Management Plan (EIA/EMP) for this project. The Environmental Impact Assessment and Environmental Management Plan of this cluster quarry addressing all the environmental related impacts and mitigation measures. The EMP report is based on the data generated from March 2024 to May 2024 by M/s. Shrient Analytical & Research Labs Private Limited, Chennai and the data generated by the FAE of the M/s. Global Mining Solutions, Salem. The study evaluates the prevailing baseline environmental conditions. The objectives of the present study are given below.

- To prepare the present baseline scenario through primary field monitoring and secondary data for different environmental descriptors such as air, water, noise, traffic, biodiversity, socio-economic etc.
- To identify the activities of mining that have bearing on the environment
- To Assess the impact of proposed project activity
- To suggest preventive mitigation measures
- To prepare an Environmental Management Plan (EMP) including environmental monitoring.
- To Prepare Disaster Management Plan.

1.8 STATUS OF LITIGATIONS

This is a Rough Stone and Gravel Quarry project. There is no litigation/court case pending against this project.

a. Precise Area Communication:

The Project Proponent has obtained Precise Area Communication from the Assistant Director (i/c), Department of Geology and Mining, Tirunelveli, vide Rc.No.M2/21495/2015 dated 07.08.2023. The letter copy enclosed as **Annexure – 2.**

b. Mining Plan Approval Letter:

The project proponent has prepared mining plan under rule 19(1) 41 & 42 of Tamil Nadu Minor Mineral Concession Rules, 1959 and the same has been approved by the Assistant Director (i/c), Dept. of Geology & Mining, Tirunelveli vide Rc.No.M2/21495/2015, dated 13.03.2024. The approval letter along with approved plan is enclosed as **Annexure – 3.**

c. 500m radius quarry features:

The project proponent has obtained an official letter from the Assistant Director (i/c), Dept. of Geology & Mining, Tirunelveli vide Rc.No. Rc.No.M2/21495/2015, dated 13.03.2024. The letter copy enclosed as **Annexure – 4.**

d. Project Proponent undertaking affidavit:

The project proponent has issued an affidavit under in matter of Common Cause vs Union of India & Ors. The Affidavit copy is enclosed as **Annexure – 12.**

e. Land document of the proposed lease area:

It is patta land registered in the name of Dharumapuram Adhinam Gnanasambandar Sannadi, vide patta no.3 and the applicant has obtained consent from the pattadar are enclosed as **Annexure-6.**

CHAPTER 2

PROJECT DESCRIPTION

2.1 TYPE OF PROJECT

The type of the project is Rough Stone and Gravel Quarry with Opencast-Mechanized mining method to excavate Rough Stone and Gravel within the proposed Mine Lease area with drilling, blasting, loading and transportation. This project is located at S.F. No. 613(P) and 643(P) over an extent of 2.97.57 Ha in Irukkandurai Part-I Village, Radhapuram Taluk, Tirunelveli District, Tamil Nadu State.

As per EIA notification, 2006 and its subsequent amendments the project comes under Schedule 1 (a) under Category B1 (Lease area >5 to 250 Ha), considering cluster situation and the total cluster area is 7.40.07 Ha. The details of mines located in the cluster area is certified by Assistant Director (i/c), Dept. of Geology & Mining, Tirunelveli vide Rc.No.M2/21495/2015, dated 13.03.2024.

Table 2.1 500m Radius Cluster Mines Details

Sl. No	Name and address	G.O. No. and Date	Village and Taluk	S.F.No.	Extent (in Ha)	Period of lease
Abandoned Quarries						
1	Thiru.S. Jacob Rajamani S/o.Soundarapandian, 69A2, Kathiresan Kovil Street, V.O.C Nagar, Kovilpatti Taluk, Thoothukudi District. Pin Code– 628 502.	Rc.No.M2/21495 / 2015, Dated 13.03.2024	Irukkandurai Part-I Radhapuram Taluk	647/1	1.56.0	Proceeding No.M1/62132/ 2011, dated 21.06.2012 for a period 3 years from 21.06.2012 to 20.06.2015
Existing Quarries						
1	Tmt.S.Sumathi, W/o. Sakthi Periya Kumaran 5/132, Velavan Illam, Koodankulam Village, Radhapuram Taluk, Tirunelveli District	Rc.No.M2/21495 / 2015, Dated 13.03.2024	Irukkandurai Part-I Radhapuram Taluk	641(P) & 642/1	1.96.5	Proceeding No.M1/30225/ 2017, dated 10.11.2022 for a period 5 years from

						10.11.2022 to 09.11.2027
2	Thiru.G.Rangasamy, S/o.Ganapathy Nadar, 4/334C, Main Road, Avaraikulam, Radhapuram Taluk, Tirunelveli District	Rc.No.M2/21495 / 2015, Dated 13.03.2024	Irukkandurai Part-I Radhapuram Taluk	626 & 627	2.46.0	Proceeding No.M1/32439/ 2018, dated 12.10.2022 for a period 5 years from 10.11.2012 to 09.11.2027
Proposed Quarry						
1	Thiru.S. Jacob Rajamani S/o.Soundarapandian, 69A2, Kathiresan Kovil Street, V.O.C Nagar, Kovilpatti Taluk, Thoothukudi District. Pin Code– 628 502.	Rc.No.M2/21495 / 2015, Dated 13.03.2024	Irukkandurai Part-I Radhapuram Taluk	2.97.57	Under Proposed Quarry	

The proposed production is 5,23,006 m^3 of Rough Stone and 24,487 m^3 of Gravel by open cast mechanized mining method.

2.2 SALIENT FEATURES OF THE PROJECT

The salient features of the proposed Rough Stone and Gravel quarry of Thiru.S. Jacob Rajamani S/o. Soundarapandian.

Table 2.1.a Salient features of the project

S.No.	Type of Detail	Description
1	Sector	1(a) Non coal mining
2	Fresh/Existing project	New Project
3	Category	B1
4	Nature of mineral	The applied lease is not fresh, there is a quarry pit exists in the S.F. No. 643(Part), which was operated by Thiru. Jacob Rajamani during the lease period 21.06.2012 - 20.06.2015
5	Life of the mine	5 years

6	Production Quantity for five years	Rough Stone - 5,23,006 m^3 Gravel - 24,487 m^3
7	Waste generation and management	Nil
8	Bench height and width	Proposed bench height & width is 5.0m respectively and number of proposed benches is 10 Nos.
9	Ultimate pit depth	47 m BGL
10	End use	The excavated Rough Stone and Gravel is used for construction industries for Government & Public sector projects besides catering domestic housing and infrastructure projects in and around the district.

2.3 LOCATION

This project site is located in Irukkandurai Part-I Village, Radhapuram Taluk, Tirunelveli District, Tamil Nadu State. The Nearest Railway line is Tirunelveli to Nagarcoil line which is about 13.0 km on north west side of the area. The National Highway (NH-44) Salem- Kanniyakumari is about 7.2 m on west side of the area. The State Highway (SH-176) Anjugramam – Manapad about 1.3 Km on South east side of the area. The general location is given in Figure 2.1. The specific location is given in Figure 2.2.

FIGURE 2.1 LOCATION MAP

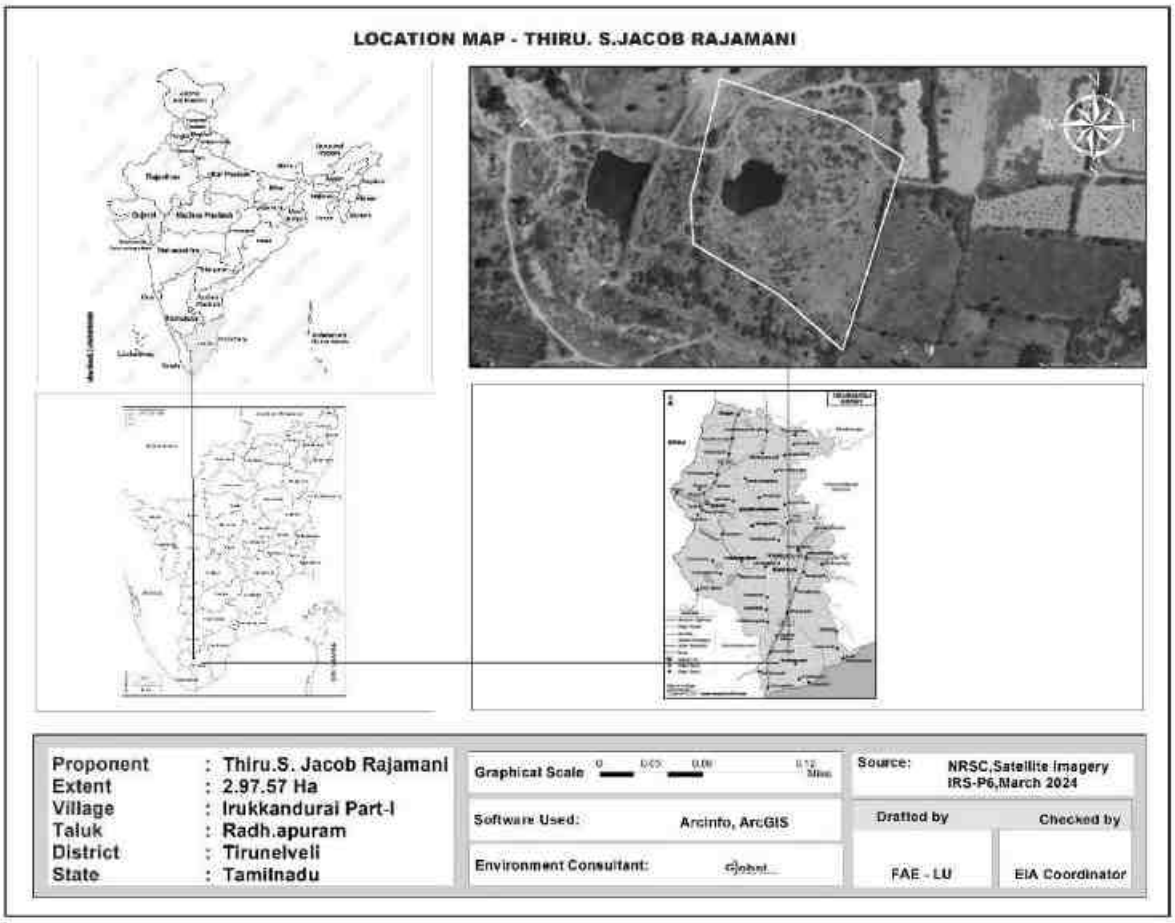


FIGURE 2.2 MAP OF THE PROJECT AREA

As shown in the map above, the project is approachable from Sankanapuram - Irukkandurai Village Road (N), The Nearest Railway line is Tirunelveli to Nagarcoil line which is about 13.0 km on north west side of the area. The National Highway (NH-44) Salem- Kanniyakumari is about 7.2 m on west side of the area. The State Highway (SH-176) Anjugramam – Manapad about 1.3 Km on South east side of the area.

2.4 PROJECT BOUNDARY AND PROJECT SITE LAYOUT:

The lease area has 7 corners and the latitude and longitude values are given below.

Table 2.2 Co-Ordinates of the Project Site			
Corners	Co- ordinates		Distance between the corners
	Latitude	Longitude	
1	08° 10' 53.03'N	77° 38' 30.75"E	1-2 = 47.6m
2	08° 10' 54.57'N	77° 38' 30.95"E	2-3 = 108.0m
3	08° 10' 57.99'N	77° 38' 31.75"E	3-4 = 124.4m
4	08° 10' 56.48'N	77° 38' 35.51"E	4-5 = 61.4m
5	08° 10' 55.39'N	77° 38' 37.19"E	5-6 = 183.6m
6	08° 10' 49.68'N	77° 38' 35.45"E	6-7 = 77.6m
7	08° 10' 51.32'N	77° 38' 33.53"E	7-1 = 100.0m

FIGURE 2.3 GOOGLE IMAGE SHOWING PROJECT SITE

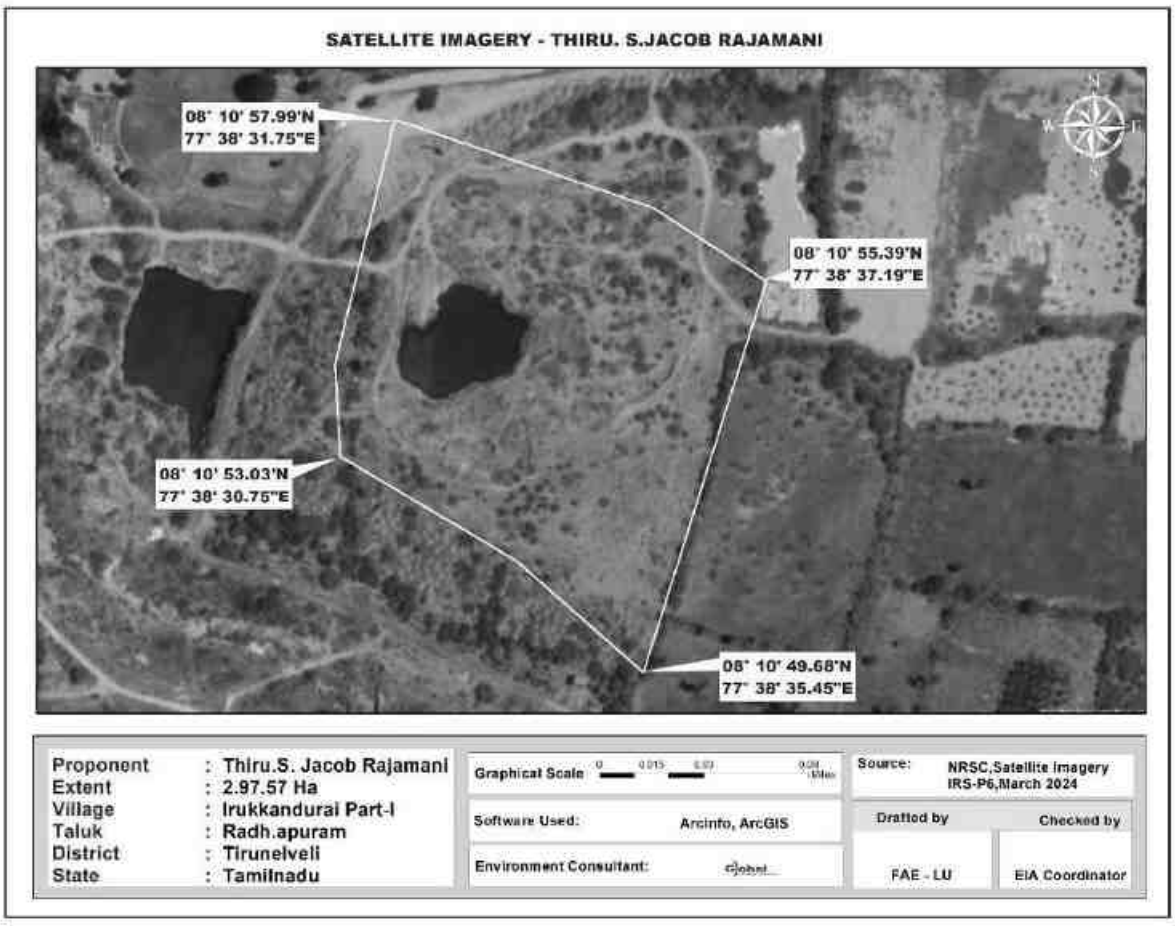


FIGURE 2.4 SURFACE PLAN OF THE PROJECT AREA

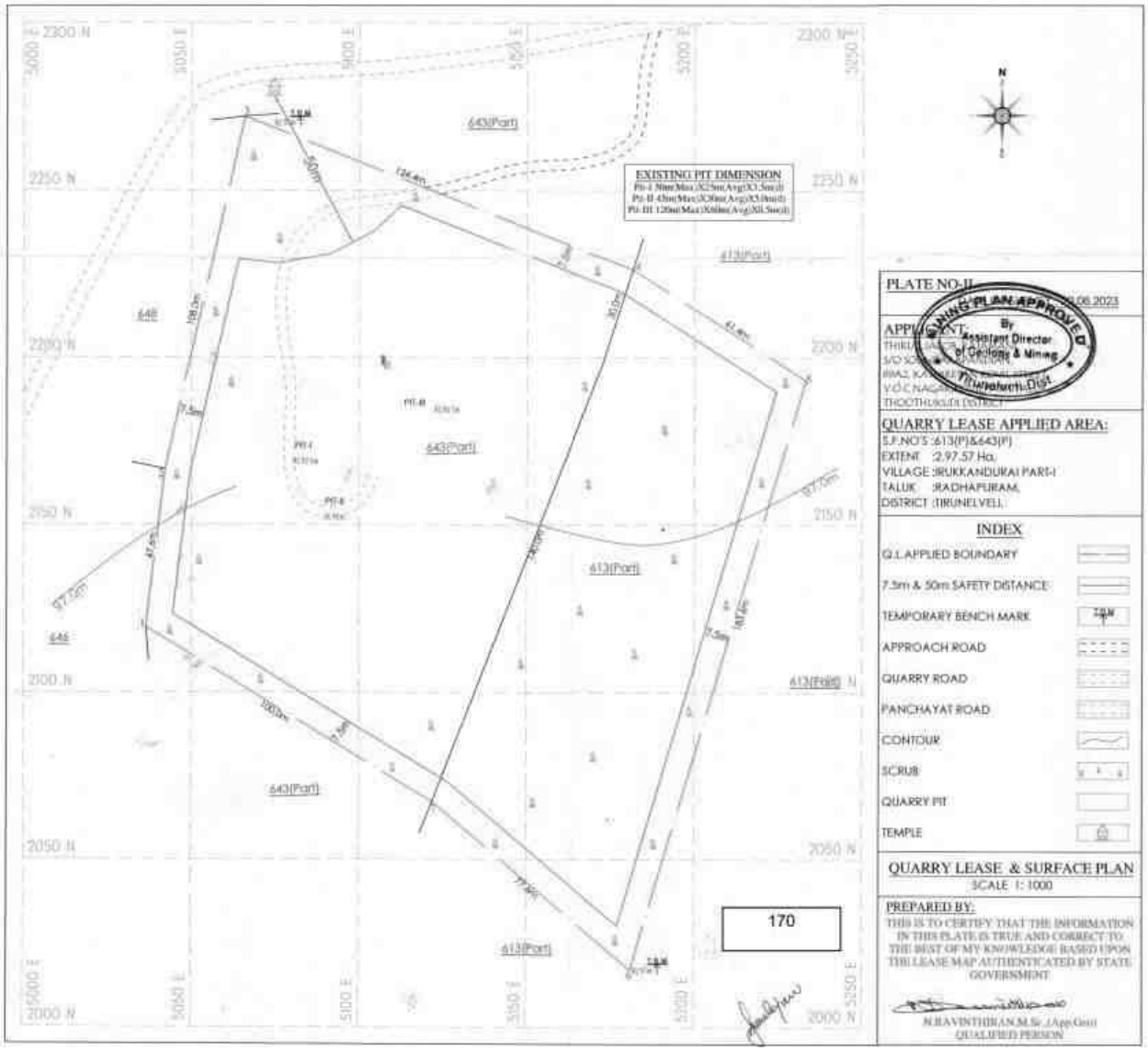


FIGURE 2.5 SITE PHOTOS

Site Connectivity

Sr.No	Salient Features	Description
1	Nearest Roadway	• There is an existing road from the area leads to Sankanapuram - Irukkandurai Village Road on northern side of the area. • The Nearest Railway line is Tirunelveli to Nagarcoil line which is about 13 km on north west side of the area. • National Highway (NH-44) Salem-Kanniyakumari 7.2 km on west side of the area. • The State Highway (SH-176) Anjugramam – Manapad is about 1.3 Km on South eastern side of the area.
2	Nearest Village	Irukkandurai Part-I Village – 800 m - NE
3	Nearest Railway station	Kanyakumari– 14.96 km – SW
4	Nearest Airport	Tuticorin - 72.0 km - NE

2.5 GEOLOGY AND TOPOGRAPHY

a. Topography

The mine lease area of 2.97.57 Ha is covered in the Survey of India Toposheet 58-H/12 and is bounded by Latitude: 08°10'49.68"N to 08°10'57.99"N and Longitude: 77°38'30.75"E to 77°38'37.19"E. No major river is found nearby the lease applied area. Water table is found at a depth of 62 m. Temperature of the area is reported to be 18^0C to a maximum of 42^0C during summer. Rainfall of this area is about 800 mm to 900 mm during the both NE & SW monsoons.

The topo map showing the lease area of the proposed quarry is given in Figure 2.1 and Satellite map showing proposed lease area is given in Figure 2.2.

The elevation of the proposed quarry is 47 m (maximum) from MSL. There is no forest land in the mine lease area. The project site is dry land which is not fit for any cropping.

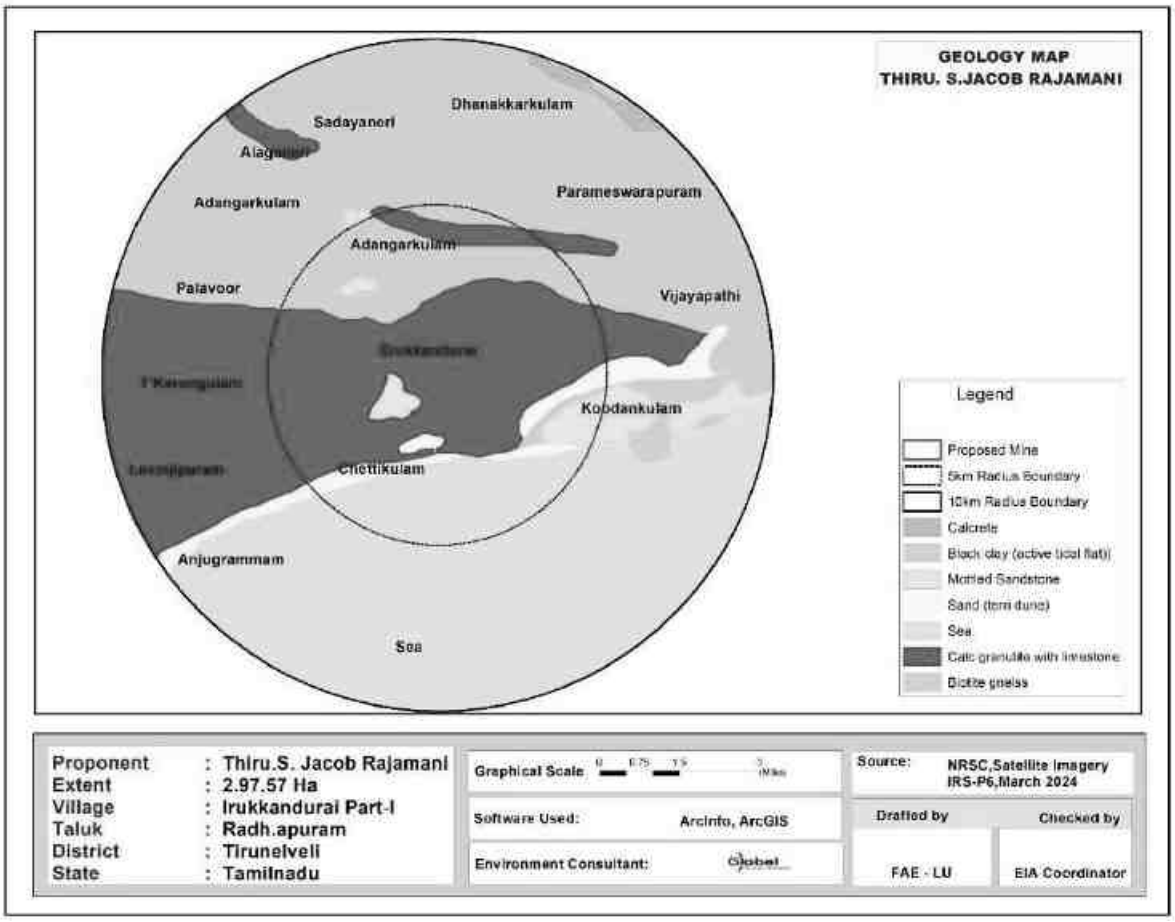
b. Regional Geology

Tirunelveli District is mostly lithologies of the Southern Granulite Terrain (SGT) Supergroup concept, except for the southern coastal parts of the district, which are covered by younger sediments of Quaternary age. The areas of Southern Granulite Terrain (SGT) are occupied by the major 3 lithologies, such as garnet-biotite gneiss, hornblende biotite gneiss of the Migmatitie group, and garnet biotite sillimanite gneiss of the khondalite group. The age of southern granulite terrain ranges from the Neoarchaen to the Mesoproterozoic. The oldest lithology is calc granulite with limestone and occurs in bands in and around Tirunelveli, Ambasamudram and Kalakkadu, while hornblende granulite occurs at west of kalakadu. The linear bands of quartzite occur mostly in the northern parts of the district near Manur,Tirunelveli, Alwarkuruchchi and Palayamkottai.

The garnet biotite gneiss covers a large area between kalakkadu and south of Kilkadiayam. The Charnockite group consists of two lithologies, such as Charnockite and pyroxene granulite. The pyroxene granulite occurs on patches west of Tirukkurugudi, while linear bands of Charnockite ore occur from Kilkadaiyam to Munaradaippu.Also, Charnockite occurs in the southern part of the district area near Karungulam. The Migmatite group consists of 3 lithologies such as biotite gneiss, garnet biotite gneiss, and hornblende biotite gneiss.

The biotite gneiss covers in the western part of the district near the kerala border, while garnet-biotite gneiss covers the central and southern parts of the district, while hornblende-biotite gneiss occurs in the northern part of the district from Kil Kadaiyam to Gangaikondan. Acid instrusive bodies like pegmatite were intruded into calc granulite during the Neoproterozoic period. The Cenozoic period contains limestone, calcrete,and laterite deposites, and these deposits are confirmed mostly in the southern part of the district. Regional Geology map for the 10 Km radius from the proposed project site is given as Figure 2.6.

FIGURE 2.6 REGIONAL EOLOGY MAP - 10 Km RADIUS FROM PROJECT AREA



c. Local Geology

d. Geological Resources

The 10km radius study area geological formations found i.e Calcrete, Black clay (active tidal flat), Mottled Sandstone, Sand (terri dune), Calc Granulite with limestone, Biotite gneiss and Sea shore. This area covers wide range of metamorphic rocks of peninsular gneissic complex. These rocks are extensively weathered and overlain by the recent valley fills and alluvium at places.

The rock type noticed in the area for lease is Charnockite which contains mostly Quartz and Feldspar with some ferromagnesian minerals. The Charnockite is part of

peninsular Gneisses, a high-grade metamorphic rock. The strike of the Charnockite formation is N45^{0}E – S45^{0}W with dipping towards SE80^0.

The general geological succession of the area is given as under.

AGE		ROCK TYPE
Recent	-	Gravellysoil
Unconformity		
Archaean	-	Dolerite dyke Charnockite. Peninsular Gneissic complex and Calc Gneiss

Table 2.3 Geological resources in the lease area

section	Bench	Length in (m)	Width in (m)	Depth in (m)	Volume in m^3	Gravel formation in m^3	Geological Resources of Rough stone in m^3
XY-AB	I	84	22	1.5	2772	2772	-
		30	25	2	1500	1500	-
	II	10	24	3.5	840	-	840
		38	31	2	2356	-	2356
		114	47	5	26790	-	26790
	III	161	102	5	82110	-	82110
	IV	161	102	5	82110	-	82110
	V	161	102	5	82110	-	82110
	VI	161	102	5	82110	-	82110
	VII	161	102	5	82110	-	82110
	VIII	161	102	5	82110	-	82110
	IX	161	102	5	82110	-	82110
	X	161	102	5	82110	-	82110
	Total					**4272**	**686866**
X1Y1-AB	I	176	75	2	26400	26400	-
	II	176	75	5	66000	-	66000
	III	176	75	5	66000	-	66000
	IV	176	75	5	66000	-	66000
	V	176	75	5	66000	-	66000
	VI	176	75	5	66000	-	66000
	VII	176	75	5	66000	-	66000
	VIII	176	75	5	66000	-	66000
	IX	176	75	5	66000	-	66000
	X	176	75	5	66000	-	66000
	Total					**26400**	**594000**
Grand Total						**30672**	**1280866**

Available Geological Resources of Rough stone 12,80,866 m^3 and Gravel 30,672 m^3.

FIGURE - 2.7 GEOLOGY MAP OF PROJECT AREA

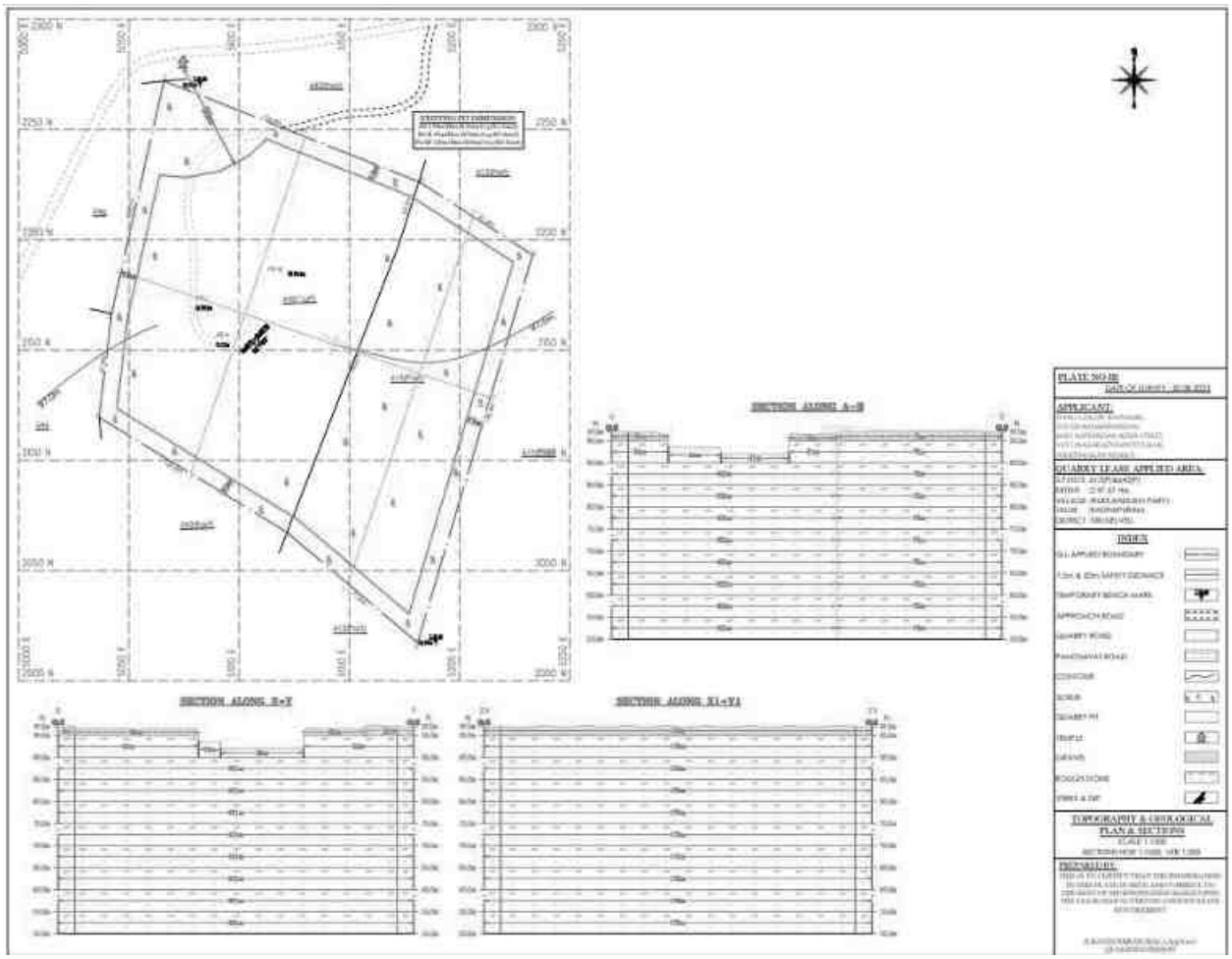


FIGURE - 2.8 GEOLOGY CROSS SECTION

2.6 AVAILABLE MINEABLE RESERVES

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

Table 2.4 Mineable Reserve in the Lease Area

Section	Bench	Length in (m)	Width in (m)	Depth in (m)	Volume in m^3	Gravel in m^3	Mineable Reserves of rough stone in m^3
XY-AB	I	83	22	1.5	2739	2739	-
		13	17	2	442	442	-
	II	10	24	3.5	840	-	840
		38	31	2	2356	-	2356
		90	35	5	15750	-	15750
	III	128	86	5	55040	-	55040
	IV	118	81	5	47790	-	47790
	V	108	76	5	41040	-	41040
	VI	98	71	5	34790	-	34790
	VII	88	66	5	29040	-	29040
	VIII	78	61	5	23790	-	23790
	IX	68	56	5	19040	-	19040
	X	58	51	5	14790	-	14790
	Total					**3181**	**284266**
X1Y1-AB	I	159	67	2	21306	21306	-
	II	153	64	5	48960	-	48960
	III	143	59	5	42185	-	42185
	IV	133	54	5	35910	-	35910
	V	123	49	5	30135	-	30135
	VI	113	44	5	24860	-	24860
	VII	103	39	5	20085	-	20085
	VIII	93	34	5	15810	-	15810
	IX	83	29	5	12035	-	12035
	X	73	24	5	8760	-	8760
	Total					**21306**	**238740**
Grand Total						**24487**	**523006**

2.7 NEED FOR THE PROJECT

The construction industry is growing at a very faster rate so there is an increasing demand for Rough Stone & Gravel. Also, in the international market there is a good demand for Indian cut and raw stones. Thus, this project will contribute to the demand of rough stone and provide employment opportunities to the nearby villages.

2.8 SIZE OR MAGNITUDE OF OPERATION

The proposed production is rough stone 5,23,006 m^3 and 24,487 m^3 Gravel by Opencast Mechanized mining method.

2.9 LAND USE OF THE PROJECT AREA

The proposed Mine Lease area is Consent Patta Land and the Land use pattern of the project site is given below Table 2.5.

Table 2.5 Current Land Use Pattern

S. No.	Land Use	Present Area (Hect)	Area in use during the quarrying period (Hect)
1	Quarrying Pit	0.72.00	2.39.76
2	Infrastructure	Nil	0.01.00
3	Roads	0.01.00	0.01.00
4	Green Belt	Nil	0.55.81
5	Unutilized	2.24.57	Nil
	Total	**2.97.57**	**2.97.57**

2.10 LAND USE AT MINE CLOSURE STAGE

Table 2.6 Land Use at Mine Closure Stage

S. No.	Land Use	Area in use during the quarrying period (Hect)
1	Area left for water body	2.39.76
2	Green Belt	0.55.81
3	Remaining area	0.02.0
Total		**2.97.57**

2.11 METHOD OFMINING

Opencast-Mechanized method with 5.0 m height 5.0m width and overall bench slope 45^0. It is proposed to excavate is 5,23,006 m^3 of Rough Stone and 24,487 m^3 of Gravel. No wastage is envisaged as the entire material available is Rough Stone and Gravel only.

2.12 TIMING

Mining will be done on single shift basis. Timing will be 8 hours from 8 AM to 1 Noon and 2 PM to 5 PM. Lunch time will be provided between 1 Noon and 2 PM. Timing may be variable from season to season depending upon the sunrise and sunset. Weekly one day will be declared as holiday.

2.13 BENCH GEOMETRY

Height (max) and Width (max) of the benches will be maintained as 5m each and overall bench slope 45^0 with the horizontal.

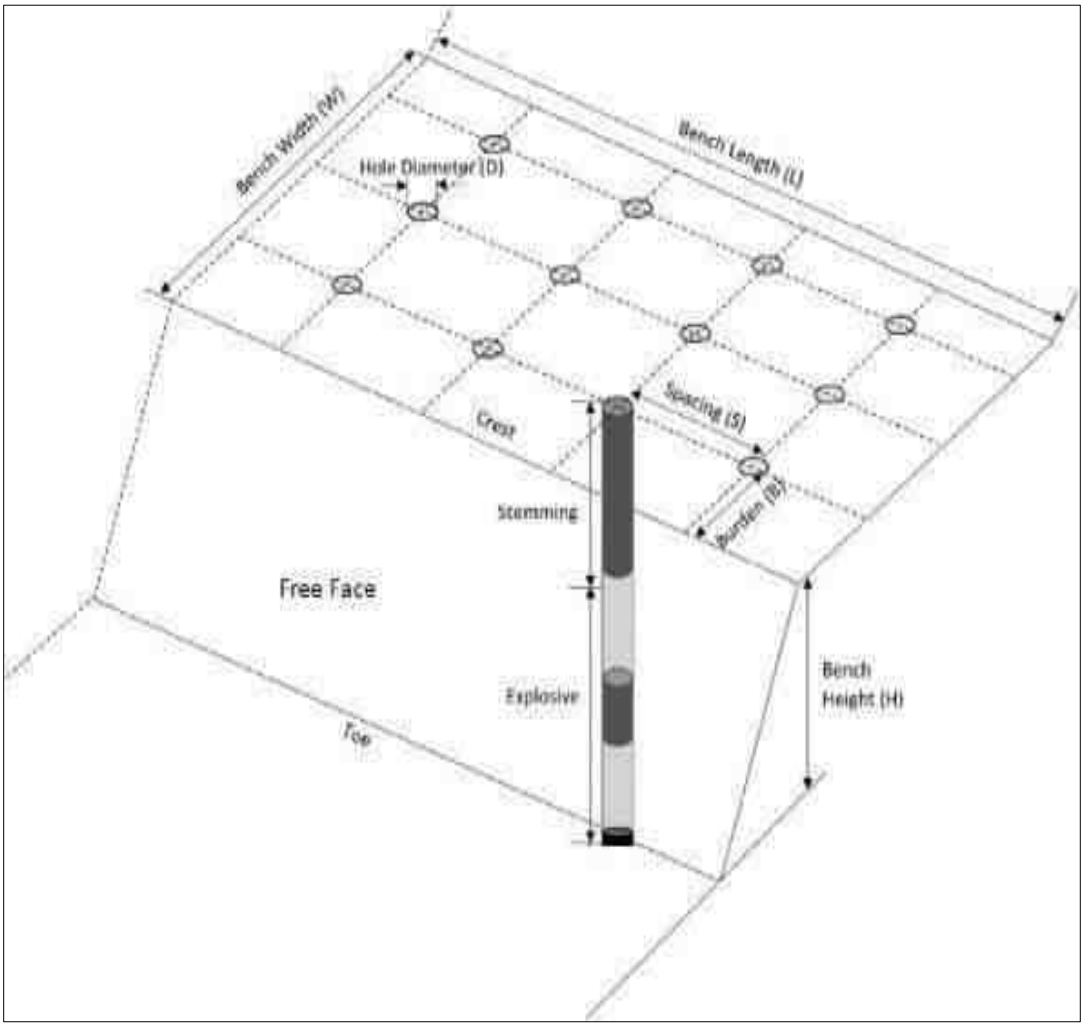
2.14 DEVELOPMENT OF MINING FACES

The proposed mining method is Opencast Mechanized mining. Site preparation as such bush cleaning, approach road, office and sanitary facilities will be done after obtaining all the statutory clearances as such Environmental Clearance, Consent to Operate, Lease Deed, etc., Once site is ready will start the quarrying operation and it is anticipated in the month of March 2025.

2.15 DRILLING & BLASTING

Drilling will be done upto maximum depth of 47m BGL (Drilling diameter will be 32 mm). Jackhammer will be used for drilling with water spray. Powder factor of explosives for breaking such hard rock shall be in the order of 6-7 Tonnes per Kg of explosives and dia 32 mm explosive is proposed to be used for shattering and heaving effect for removal of Rough Stone and Gravel. The proposed blasting pattern is given as **Figure 2.9.**

FIGURE 2.9 BLASTING PATTERN

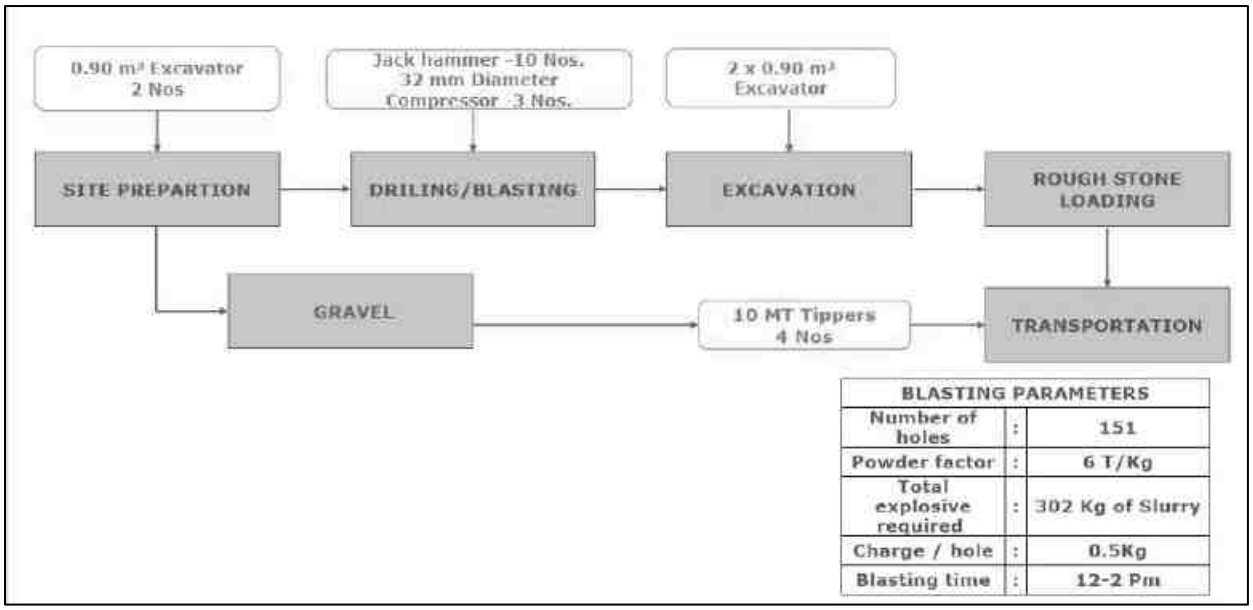


2.16 LOADING& TRANSPORTATION OF ROUGH STONE AND GRAVEL

Hydraulic excavator will be used for lifting and loading of the rough stone and Gravel. This excavator in combination with Tippers (5/10T) capacity of 4 nos will be used.

2.17 PROCESS FLOW CHART FOR MINING OF ROUGH STONE & GRAVEL

FIGURE 2.10 FLOW CHART OF THE QUARRY OPERATION



2.18 LAYOUT

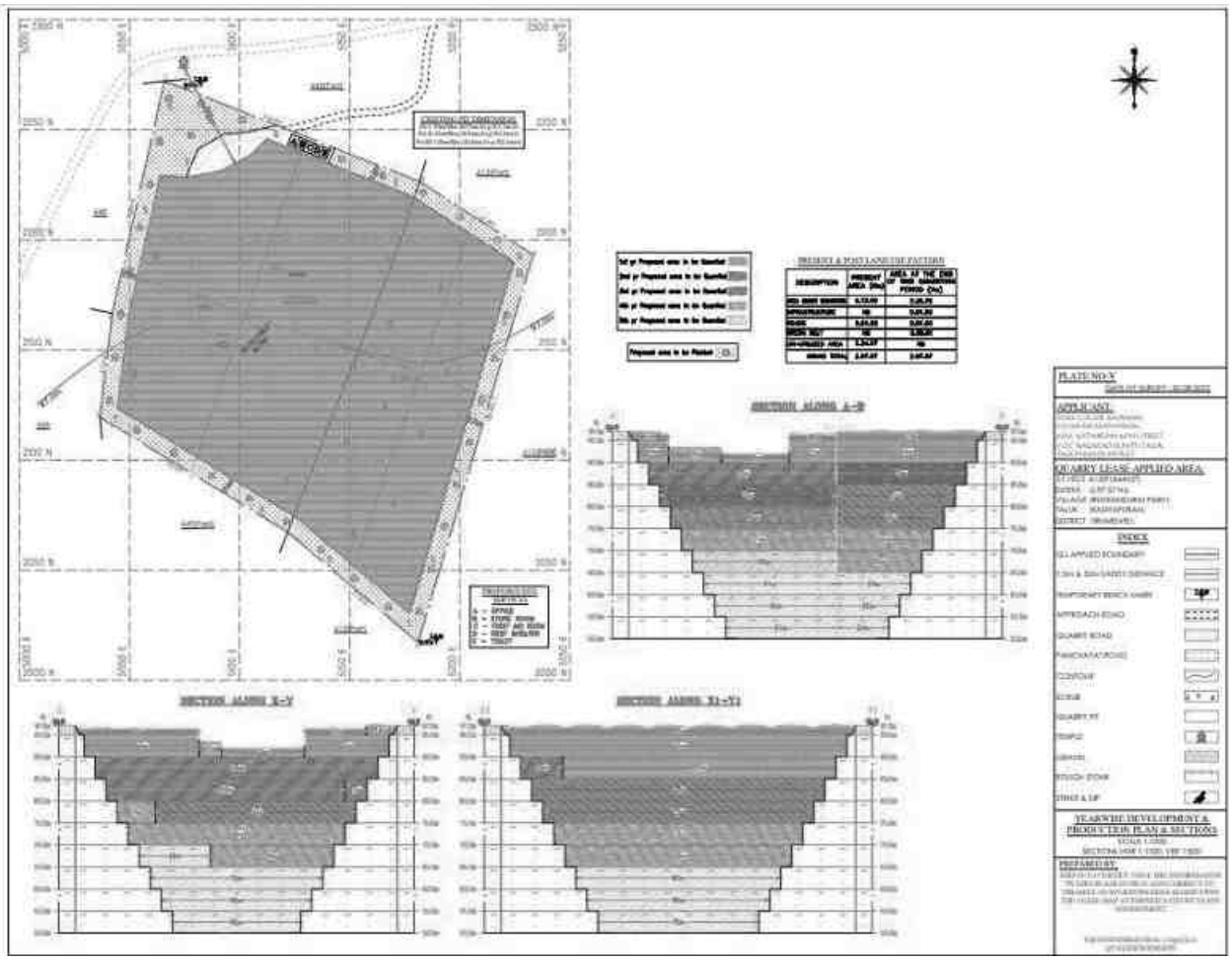
Layout of the proposed quarry working has been shown in development Plan/Sections (Figure 2.11) Coloring has been done distinctly for easy identification of year wise excavation programme.

2.19 MACHINERY DETAILS

Table 2.7 Machineries involved in the project

S.No.	Particulars	capacity	Motive Power	Nos
1.	Jack hammer	32mm dia	Compressed air	10
2.	Compressor	1 psi	Diesel drive	3
3.	Excavator with Bucket and Rock Breaker	0.90 m^3	Diesel drive	2
4.	Tippers	5/10 Ts	Diesel drive	4

FIGURE 2.11 PROJECT LAYOUT PLAN AND SECTIONS



2.20 PROPOSED SCHEDULE FOR IMPLEMENTATION

Year wise Production of Rough stone and Gravel from the area will be upto maximum capacity. The recovery factor is up to 100% hence no waste expected to be generated. All excavated quantity is saleable. The summary of proposed development and production during the mine plan period is given in Table 2.8.

Table 2.8 Summary of production for 5 Years

Year	Section	Bench	Length in (m)	Width in (m)	Depth in (m)	Volume in m^3	Gravel in m^3	Mineable reserve of rough stone in m^3
I	XY-AB	I	83	22	1.5	2739	2739	-
			13	17	2	442	442	-

		II	10	24	3.5	840	-	840
			38	31	2	2356	-	2356
			90	35	5	15750	-	15750
	X1Y1-AB	I	159	67	2	21306	21306	-
		II	153	64	5	48960	-	48960
		III	124	59	5	36580	-	36580
						Total	**24487**	**104486**
II	X1Y1-AB	III	19	59	5	5605	-	5605
	XY-AB	III	128	86	5	55040	-	55040
		IV	108	81	5	43740	-	43740
						Total		**104385**
III	XY-AB	IV	10	81	5	4050	-	4050
		V	91	76	5	34580	-	34580
	X1Y1-AB	IV	133	54	5	35910	-	35910
		V	123	49	5	30135	-	30135
						Total		**104675**
IV	XY-AB	V	17	76	5	6460	-	6460
		VI	98	71	5	34790	-	34790
		VII	56	66	5	18480	-	18480
	X1Y1-AB	VI	113	44	5	24860	-	24860
		VII	103	39	5	20085	-	20085
						Total		**104675**
V	XY-AB	VII	32	66	5	10560	-	10560
		VIII	78	61	5	23790	-	23790
		IX	68	56	5	19040	-	19040
		X	58	51	5	14790	-	14790
	X1Y1-AB	VIII	93	34	5	15810	-	15810
		IX	83	29	5	12035	-	12035
		X	73	24	5	8760	-	8760
						Total		**104785**
						Grand Total	**24487**	**523006**

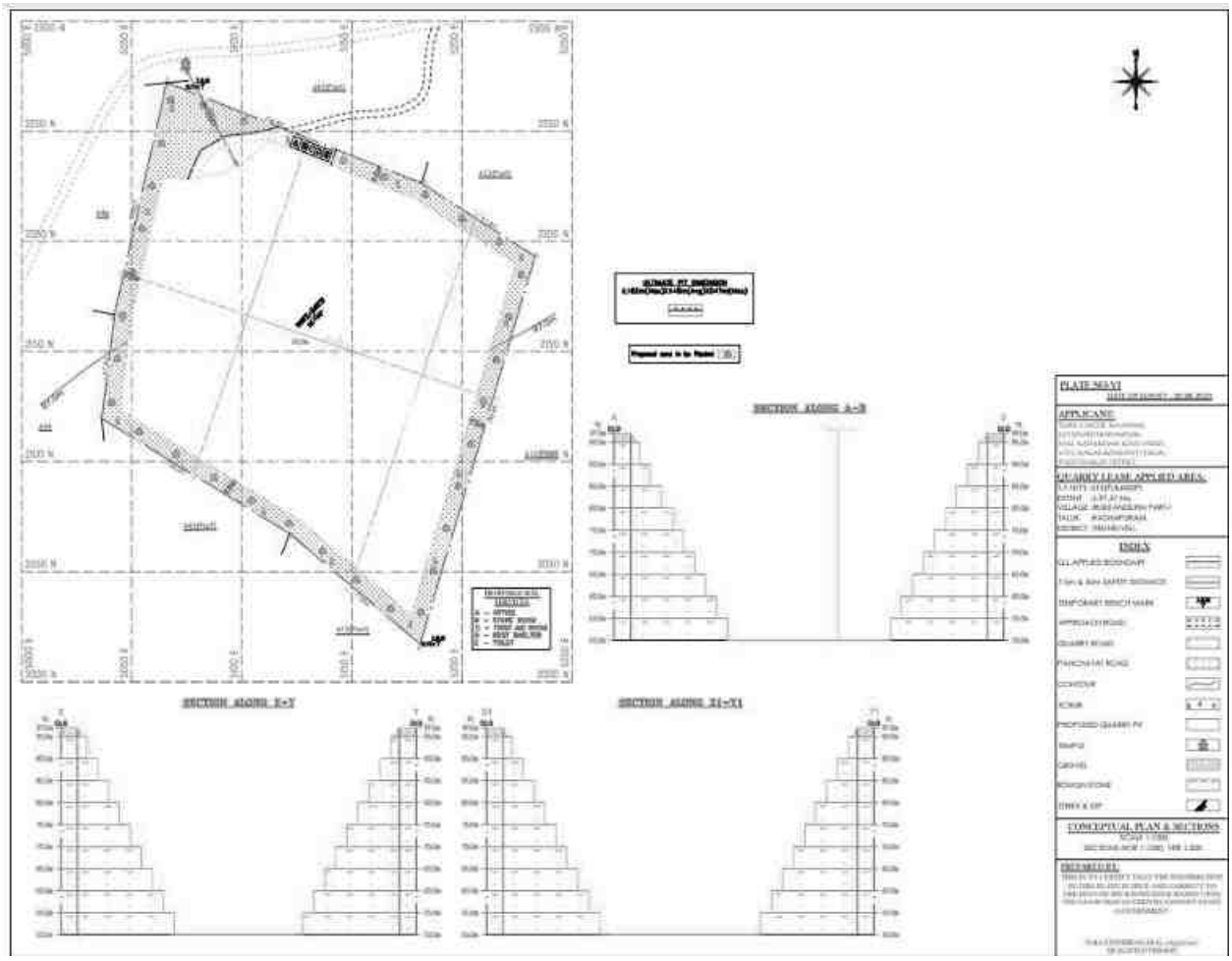
2.21 CONCEPTUAL PERIOD

During conceptual stage the mined-out area will be converted into water reservoir and safety zone as well as upper benches will be used for plantation at the conceptual period. It will also serve the purpose as socio economic and corporate social responsibility of the lessee by way of supplying water for irrigation purpose or at will of the local people. This will help in ground water recharging as well. The conceptual plan and section of mine lease area is given in Figure 2.12. Ultimate extent and size of the quarry at the conceptual stage is given below as Table 2.9 and Land Use pattern is given as Table 2.10. The conceptual plan is given as Figure 2.12.

TABLE 2.9 Ultimate Pit Dimension			
Pit No.	**Length (max) (m)**	**Width (Avg) (m)**	**Depth (max) (m)**
I	162	148	47m BGL

TABLE 2.10 Land Use at Mine Closure Stage		
S. No.	**Land Use**	**Area in use during the quarrying period (Ha)**
1	Area left for water body	2.39.76
2	Green Belt	0.55.81
3	Remaining area	0.02.0
Total		**2.97.57**

FIGURE 2.12 CONCEPTUAL PLAN



Green belt development plan is proposed for the 5-year period.					
S.No.	**Year**	**Species**	**No. of trees**	**Spacing**	**Survival**
1	I	Pungai, Vagai, Vembu, Manjal konrai, Naval, Puvarasu, etc.,	1500	3m x 3m	87%
2	II		-		
3	III		-		
4	IV		-		
5	V		-		
Total			1500		

2.22 TECHNOLOGY AND PROCESS DESCRIPTION

- It is proposed to quarry out rough stone and Gravel with 5m bench height, 5m width with 45° slope using conventional Opencast-Mechanized method.
- The quarry operation involves splitting of rock mass of considerable volume from the parent rock by jackhammer drilling and blasting, hydraulic excavators are used for loading the Rough Stone and Gravel from pithead to the needy customers.
- Occasionally hydraulic excavator is attached with rock breakers for fragmentation to avoid secondary blasting.

2.23 PROJECT REQUIREMENTS

TABLE 2.11 Project Requirements		
S.No.	**Nature of requirement**	**Description**
1	Water requirement	Total water requirement of 5.0 KLD which will be procured from the outside agencies. Out of 1.0 KLD, drinking water requirement, green belt development is 1.6 KLD and for dust suppression is 2.4 KLD.
2	Power requirement	No electricity is needed for mining operations.
3	Manpower requirement	Total Manpower 32 Nos. Permanent employee – 20, Temporary employee – 12

4	Financial requirement	EMP cost will be Rs.301.23 Lakhs have been proposed as EMP costs and recurring costs, respectively, for the period of 5 years.
5	Funds for Socio economic development	INR 8.0 Lakhs is allocated.

2.24 Project Cost

The budget of the project is given below.

TABLE 2.12 Budget of the Project

S.No.	Details	Cost (in INR)
FIXED ASSET COST		
1	Land cost	17,85,420
2	First aid room and accessories	1,00,000
3	Labour Shed	1,00,000
4	Sanitary Facility	1,00,000
TOTAL		**20,85,420**
OPERATIONAL COST		
1	Machineries	70,00,000
2	Fencing cost	2,50,000
TOTAL		**72,50,000**

EMP COST

S.No.	Details	Capital cost	Recurring Cost /Annum
1	Air Environment	11,50,000	9,50,000
2	Noise Environment	50,000	13,14,000
3	Water Environment	2,30,000	2,45,000
4	Implementation of EC, Mining Plan & DGMS Condition	14,67,000	12,58,00
5	Green Belt	3,50,000	45,000
6	Additional Key EMP Expenses	57,57,000	10,000
TOTAL		**90,04,000/-**	**38,22,000**

CHAPTER -3
DESCRIPTION OF THE ENVIRONMENT

3.1. DESCRIPTION OF THE STUDY AREA

The project area is located in Irukkandurai Part-I Village, Radhapuram Taluk, Tirunelveli District, Tamil Nadu State over an extent of 2.97.57 Ha., The project area is considered as Core zone and the area in the surrounding 10km radius is considered as Buffer Zone. The baseline environmental monitoring was conducted by Shrient Analytical & Research Labs Private Limited, Chennai it is an NABL and MOEF recognized laboratory for various components of environment, viz. Air, Noise, Water, Land was carried out during Summer Season i.e. March 2024 to May 2024 in the study area covering 10 km radial distance from the rough stone and Gravel mine. Other environmental data on flora and fauna, land-use pattern, forest etc. were also generated through field surveys and secondary information collected from different State Govt. departments. Sampling methods and analysis. Socio-economic survey was conducted, through interaction with the people, sarpanch and medical officers by floating questionnaires and collection of information are supported by census data for demographic structures, amenities, and infrastructure availability within the study area. Baseline values for various environmental components are discussed in this Chapter.

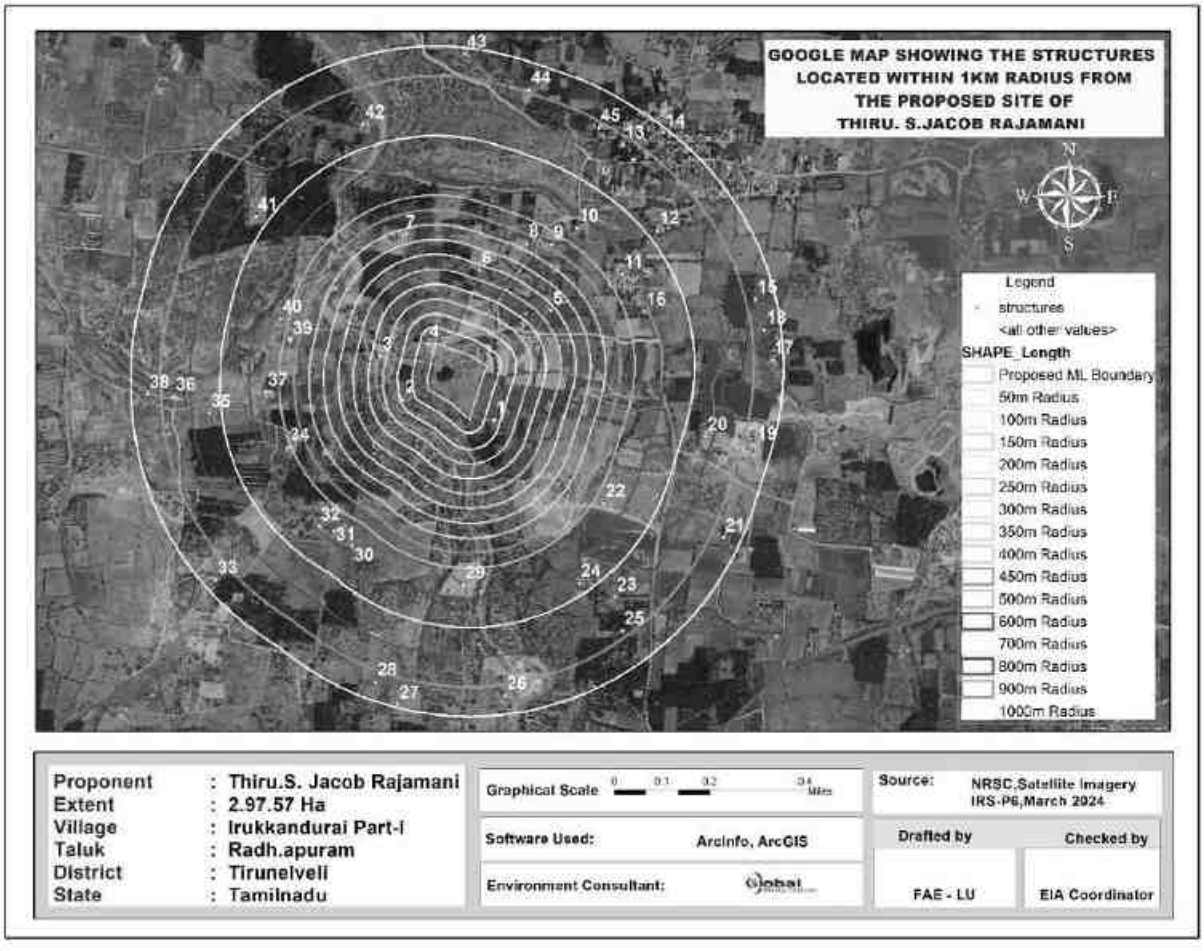
The components included are:

- Meteorological environment
- Air environment
- Water environment
- Noise environment
- Soil environment
- Biological environment
- Land use
- Socio economic environment
- Hydrogeology

3.2. ENUMERATION OF THE STRUCTURES LOCATED WITHIN 1.0 KM RADIUS FROM THE PROPOSED QUARRY SITE

A site survey has been conducted to identify and list structures located within a 1 Km radius from the proposed Quarry and are detailed below. There are permanent structures within a 1 km radius from the project site. The PP has obtained a letter from Village Administrative Office (VAO), Irukkandurai Part-I Village Stating that there are some structures situated within 300 m radius.

FIG 3.1 GOOGLE MAP SHOWING 50M INTERVAL FOR 1KM RADIUS FROM THE LEASE AREA



3.3. DESCRIPTION OF ENVIRONMENT IN THE STUDY AREA

Table 3.1 Description of the lease area

S.No.	Areas	Distance from project site
1	Areas protected under international conventions, national or local legislation for their ecological, landscape, cultural or other related value	Nil within 15km radius
2	Areas which are important or sensitive for ecological reasons	
A	Wetlands, water courses or other water bodies,	**Water bodies** / **Distance** / **Direction** Hanuman Nadi / 80m / S Tank / 230m / S Marankulam / 3.88 km / NW Chettikulam Beach / 4.16 km / S Chithambai Lake / 4.59 km / NW Sembigulam Lake / 6.61 km / NW Indian Ocean / 3.43 km / S
B	Coastal zone, biospheres,	Nil within 10km radius
C	Mountains, forests	Therkkumalai R.F – 9.80 km (W) Kanniyakumai Wildlife Sanctuary- 9.80 Km (W)
3	Areas used by protected, important or sensitive species of flora or fauna for breeding, nesting, foraging, resting, overwintering, migration	Nil within 15km radius
4	Inland, coastal, marine or underground waters	Nil within 15km radius
5	State, National boundaries	Nil within 15km radius
6	Routes or facilities used by the public for access to recreation or other tourist, pilgrim areas	Nil within 15km radius
7	Defense installations	Nil within 15km radius
8	Densely populated or built-up area	Kanniyakumari – 15.78 km (SW)

9	Areas occupied by sensitive man-made land uses (hospitals, schools, places of worship, community facilities)	Kanniyakumari – 15.78 km (SW)
10	Areas containing important, high quality or scarce resources (ground water resources, surface resources, forestry, agriculture, fisheries, tourism, minerals)	Nil
11	Areas already subjected to pollution or environmental damage. (those where existing legal environmental standards are exceeded)	Nil
12	Areas susceptible to natural hazard which could cause the project to present environmental problems (earth quakes, subsidence, landslides, erosion, flooding or extreme or adverse climatic conditions) similar effects	No. The area is not prone to earthquakes, floods, etc.

FIG 3.2 FEATURES OF ENVIRONMENT FOR 10KM RADIUS FROM THE PROPOSED LEASE AREA

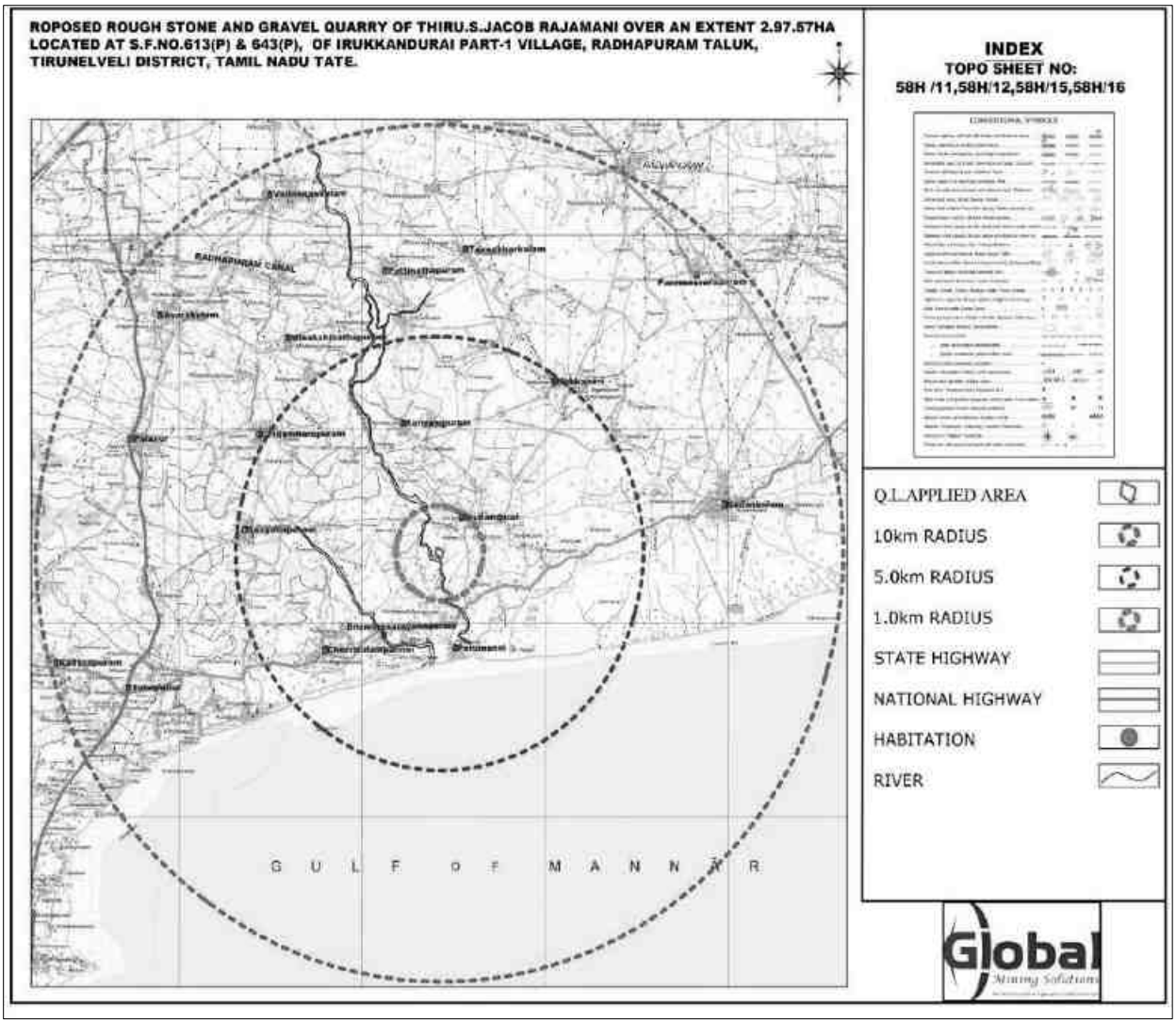
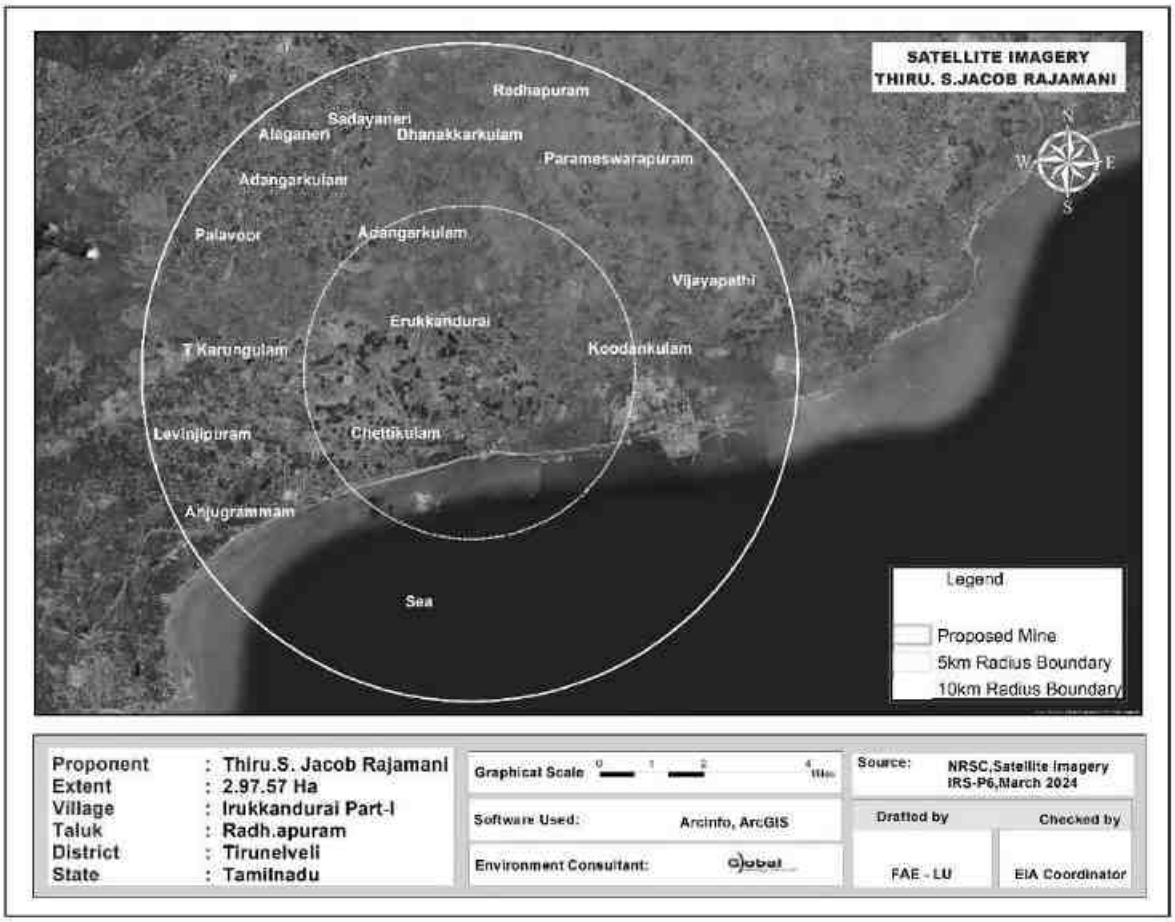


FIGURE - 3.2A SATELLITE MAP OF THE PROJECT AREA (10 KM RADIUS)



3.4. METEOROLOGICAL ENVIRONMENT

3.4.1 Meteorological conditions prevailing in the buffer zone is given below

Climate

The climate of Tirunelveli District is tropical. The period from the weather is pleasant during the period from November to January. The normal temperature varies between 17^0C to a maximum of 41^0C during summer, whereas the hottest climate experiences from March to May with mercury reaching 336.3°C at the highest.

Rainfall

Tirunelveli district generally experiences hot and humid climate conditions. The district receives rain under the influence of both southwest and northeast monsoons. Most of the precipitation occurs in the form of cyclonic storm caused due to depressions in Bay of Bengal chiefly during NE monsoon period. The SW monsoon is highly erratic and summer rains are negligible. Rainfall of this area is about 850 mm to 950 mm during the both NE & SW monsoons. The excess rainfall is 194% (Source: Mausam.imd.gov.in)

Rainfall received from 2017 to 2021 is given below.

Table 3.2 Rainfall data

Actual Rainfall in mm					Normal rainfall in mm
2017	2018	2019	2020	2021	
1231.8	750.3	1022.6	1077	1521.2	980

Relative Humidity

The relative humidity, in general around the year is between 55 and 65% in most parts of the district, except during the north-east monsoon season when it is over 65%. However, the coastal areas will be comparatively more humid.

Seismic information

The study area falls in Zone II, which comes under the least active zone. The seismic map of India is given as Fig 3.2.

FIG 3.3 SEISMIC MAP OF INDIA

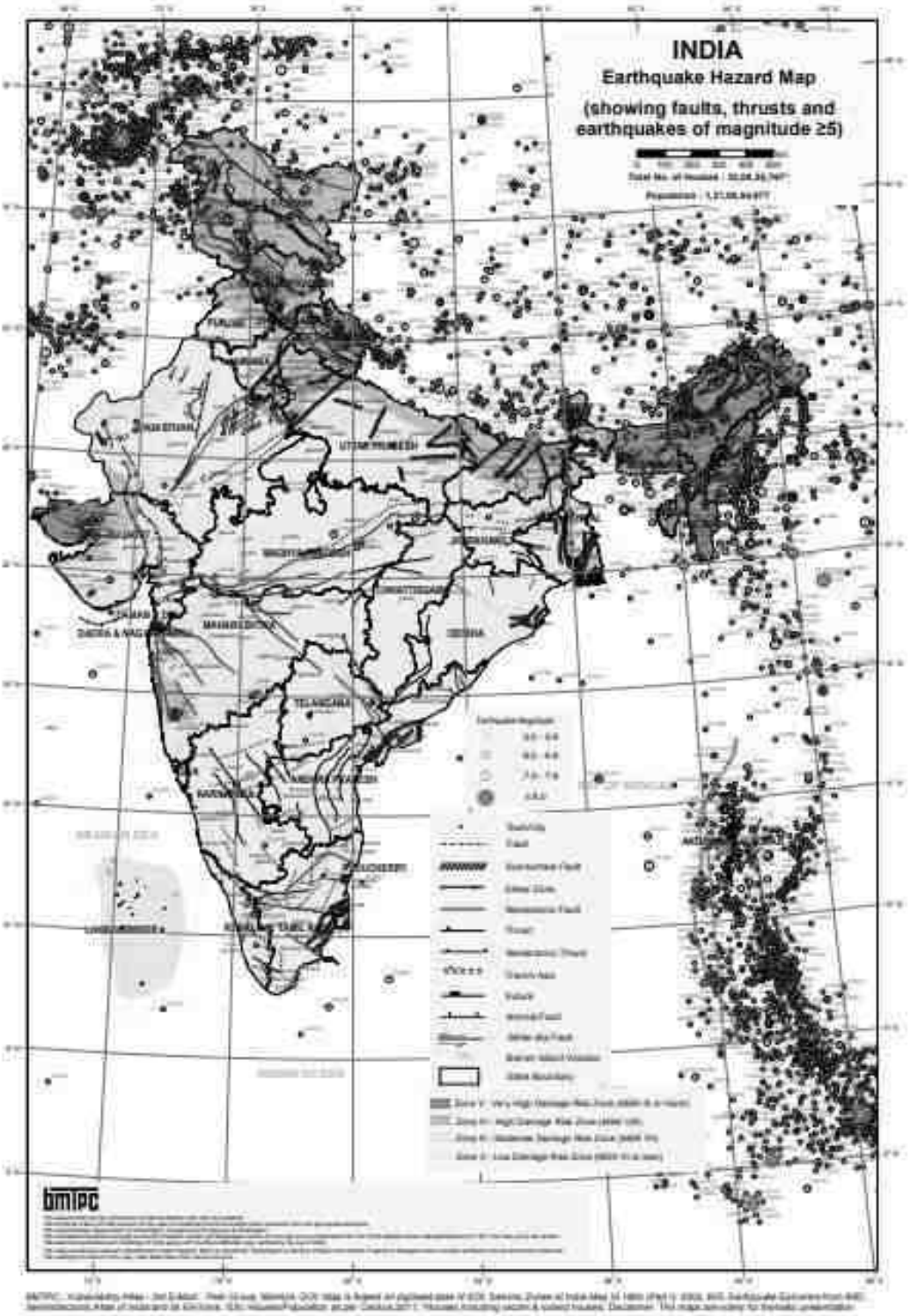
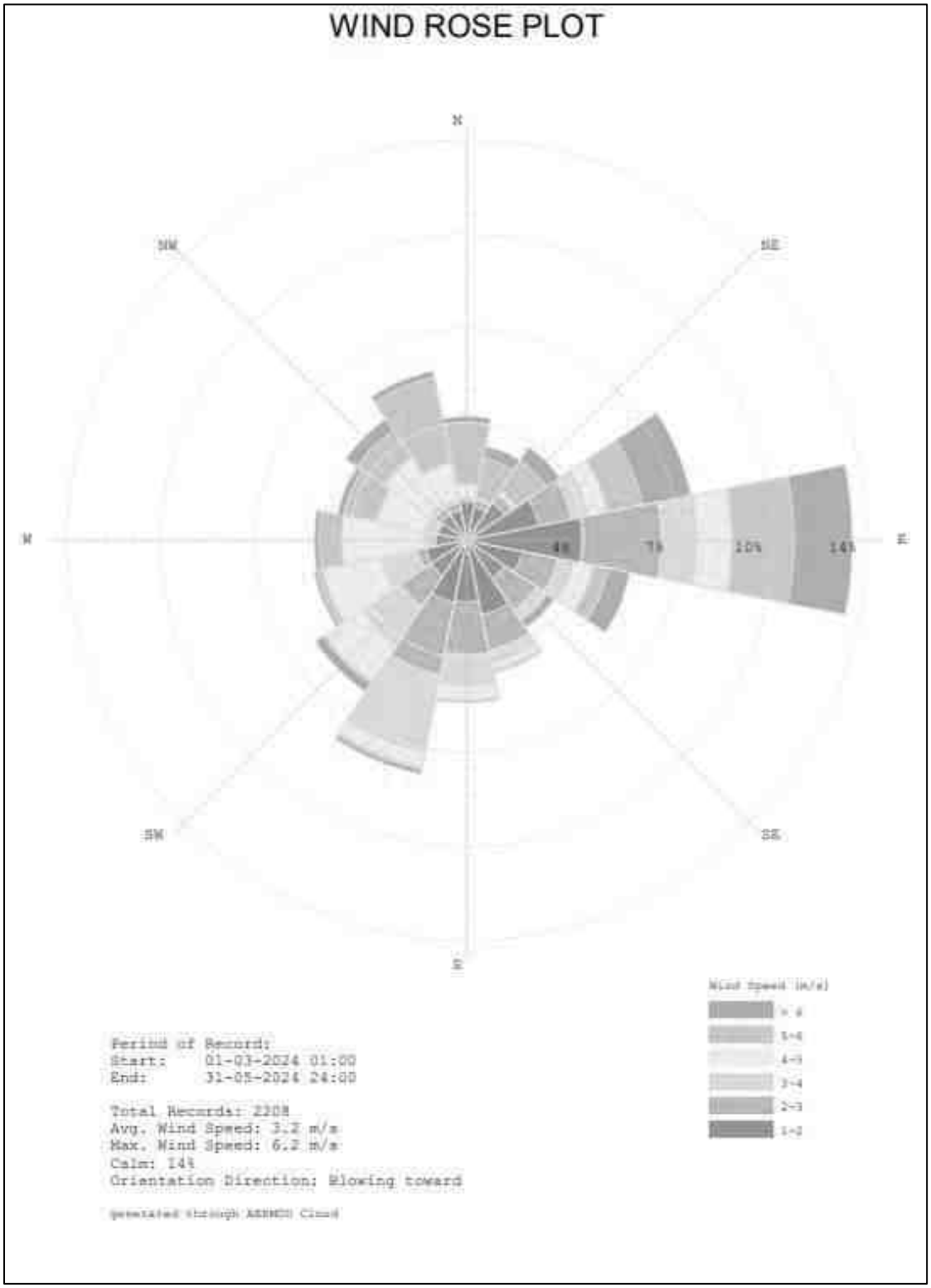


FIG 3.4 WIND ROSE PLOT DURING MARCH TO MAY 2024



Meteorological data of the project area

The meteorological data collected in the study area from March 2024 to May 2024 which includes Temperature, Wind speed, Wind direction and Relative humidity. The predominant wind blows from West. The temperature of the area is reported to be 24.4°C and 27.1°C during summer.

3.5 AMBIENT AIR MONITORING DATA

Ambient air quality monitoring has been carried out in 7 locations. One in the core zone and remaining five locations in the buffer zone areas. Monitoring locations have been chosen such that the measurement represents the overall air condition prevailing in the area. The study area represents mostly rural environment with stone mining quarries & crushers.

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

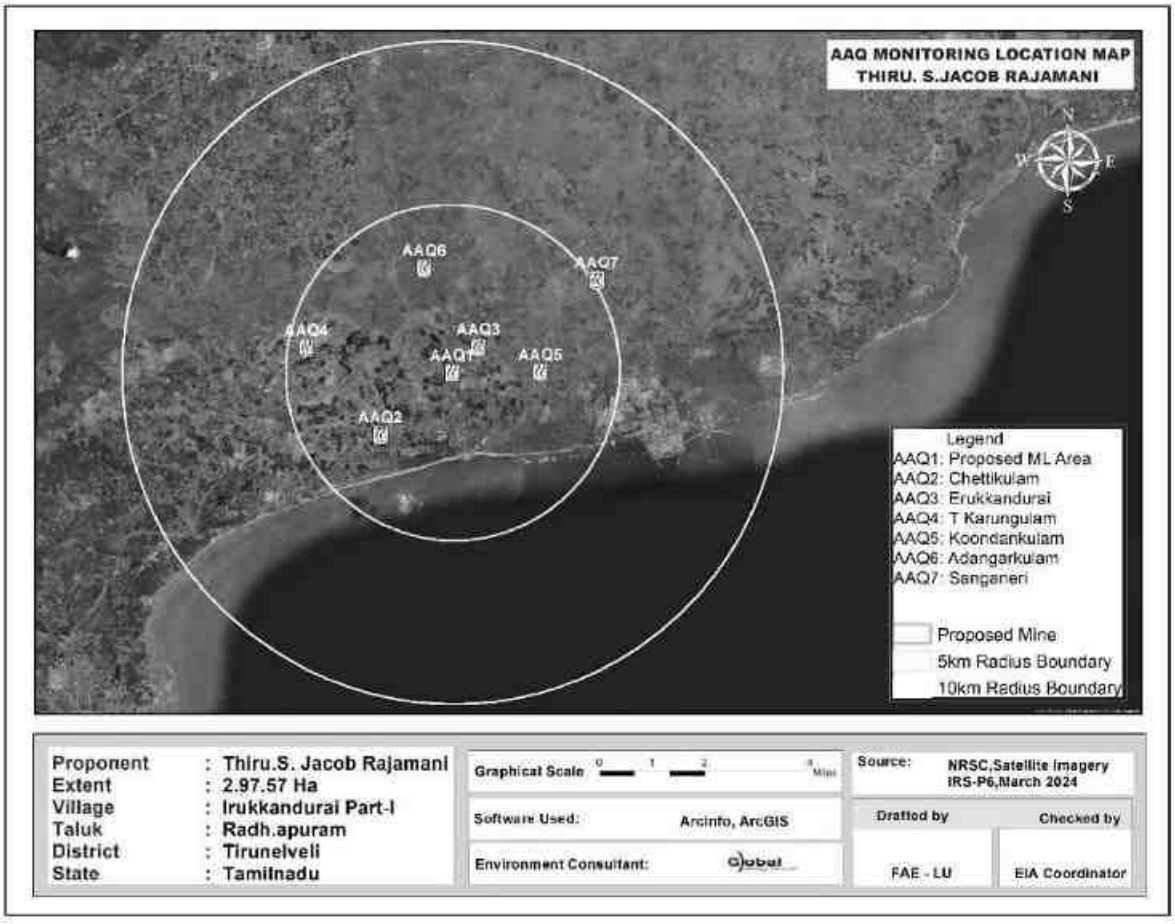
The levels of Respirable Particulate Matter (PM10), Fine Particulates (PM2.5), Sulphur Dioxide (SO2) and Oxides of Nitrogen (NOx) were monitored for establishing the baseline status. PM10 were sampled with the help of Respirable Dust Samplers on filter papers and SO2 & NOx were absorbed in the respective absorption media in the impingers attached to RD samplers and analyzed Spectro-photometrically. PM2.5 was monitored with the help of Fine Particulate Samplers. The monitoring locations for ambient air study are given in Table – 3.3 and Figure 3.5 below.

Table 3.3: Details Of Ambient Air Quality Monitoring Locations

S. No.	Station Code	Locations	Distance & Direction	Coordinates
1	AAQ 1	Project site	Core Zone	8°10'55.51"N 77°38'32.49"E
2	AAQ 2	Chettikulam	2.8 km, SW	8°9'52.62"N 77°37'21.31"E
3	AAQ 3	Erukkandurai	1.0 km, NE	8°11'20.11"N 77°39'0.02"E

Table 3.3: Details Of Ambient Air Quality Monitoring Locations				
S. No.	**Station Code**	**Locations**	**Distance & Direction**	**Coordinates**
4	AAQ 4	T Karungulam	4.4 Km, W	8°11'19.58"N 77°36'8.07"E
5	AAQ 5	Koondankulam	2.6 Km, E	8°10'54.37"N 77°40'1.22"E
6	AAQ6	Adangarkulam	3.18 Km, N	8°12'38.69"N 77°38'5.53"E
7	AAQ7	Sanganeri	5.13 Km NE	8°12'24.88"N 77°40'58.77"E

FIG 3.5 AMBIENT AIR MONITORING LOCATIONS



The concentrations of various air pollutants at the 7 locations are given below. For all the components in the table, the unit are in $\mu g/m^3$.

Table.3.4 Results of Air sampling Analysis in 7 locations

Station ID	Min	Max	Avg.
Particulate matter PM_{10} - ($\mu g/m^3$)			
AAQ-1	47.7	66.6	57.15
AAQ-2	44.4	56.3	50.35
AAQ-3	46.2	61.4	53.80
AAQ-4	56.7	57.9	57.30
AAQ-5	46.3	68.2	57.25
AAQ-6	44.2	55.6	49.90
AAQ-7	43.5	55.9	49.70
CPCB NAAQS 2009 for PM_{10} - 100 $\mu g/m^3$			
Particulate matter $PM_{-2.5}$ ($\mu g/m^3$)			
AAQ-1	23.2	32.3	27.75
AAQ-2	21.8	27.9	24.85
AAQ-3	22.5	30.1	26.32
AAQ-4	21.5	28.1	24.85
AAQ-5	22.4	32.9	27.69
AAQ-6	21.4	26.9	24.16
AAQ-7	21.1	27.2	24.19
CPCB NAAQS 2009 for $PM_{2.5}$ - 60 $\mu g/m^3$			
Sulphur Di-oxide as SO_2 ($\mu g/m^3$)			
AAQ-1	4.9	8.0	6.45
AAQ-2	4.6	7.0	5.80
AAQ-3	4.9	7.7	6.30
AAQ-4	4.5	7.6	6.50
AAQ-5	4.7	8.3	6.50
AAQ-6	4.0	6.9	4.45
AAQ-7	4.3	7.0	5.65
CPCB NAAQS 2009 for SO_2 – 80 $\mu g/m^3$			
Oxide of Nitrogen as NO_2 ($\mu g/m^3$)			
AAQ-1	7.7	10.9	9.30
AAQ-2	7.1	9.2	8.15
AAQ-3	7.2	9.6	8.40
AAQ-4	7.0	9.4	8.20
AAQ-5	7.5	10.4	8.95
AAQ-6	6.2	8.9	7.55
AAQ-7	6.4	9.2	7.8
CPCB NAAQS 2009 for NO_2 – 80 $\mu g/m^3$			

The results are summarized in graph and given as below Fig. 3.6-3.10.

FIG 3.6 AMBIENT AIR QUALITY DATA A1 - MINE LEASE AREA

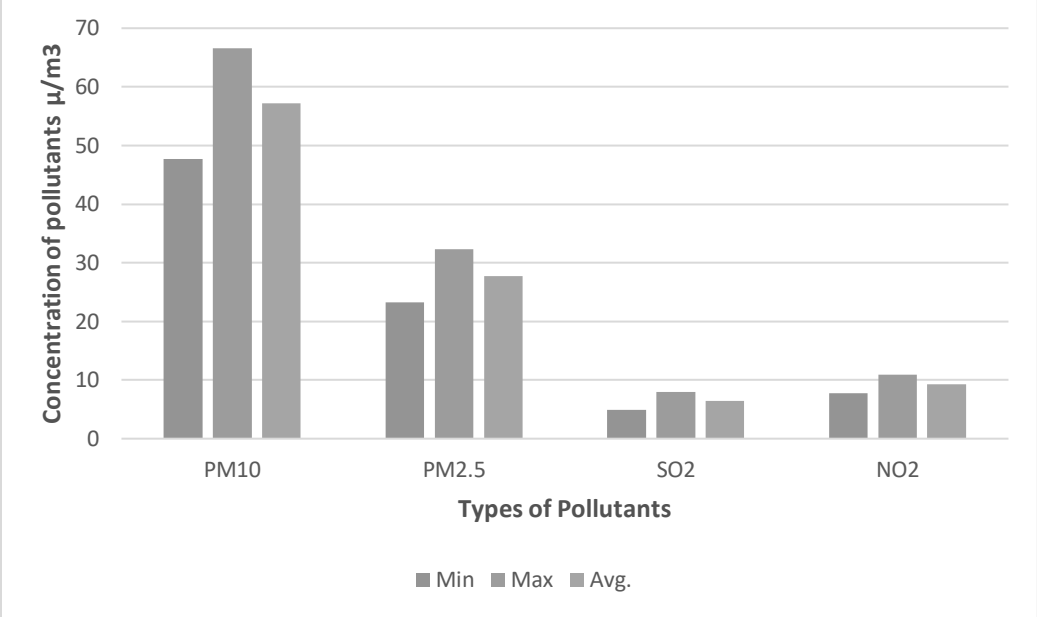


FIG 3.7 AMBIENT AIR QUALITY DATA A2 - CHETTIKULAM VILLAGE

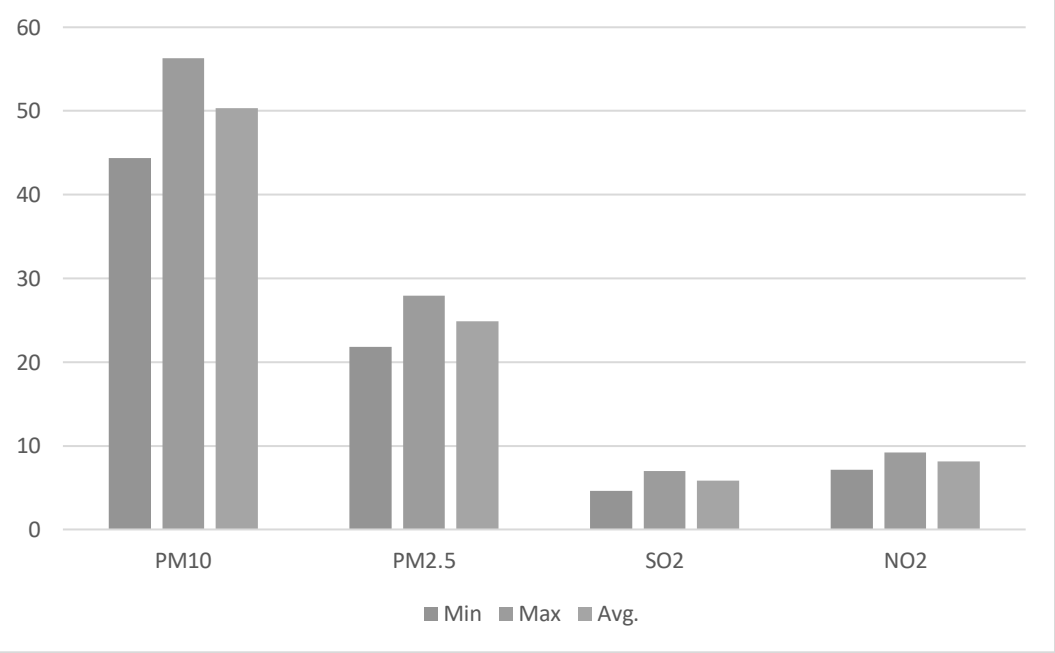


FIG 3.8 AMBIENT AIR QUALITY DATA A3 - ERUKKANDURAI VILLAGE

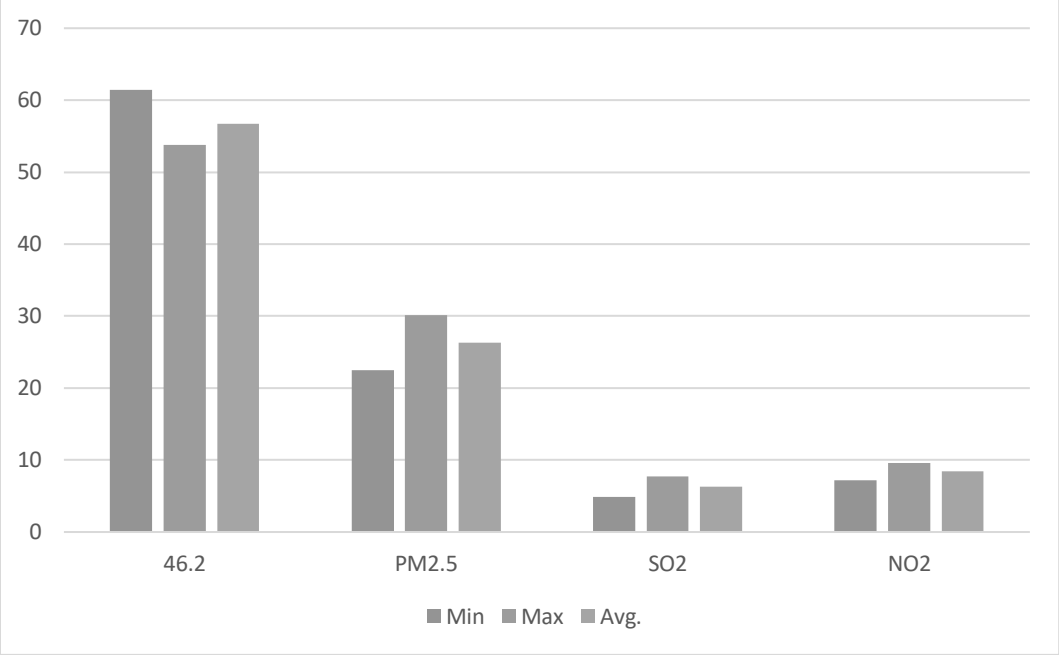


FIG 3.9 AAQ DATA A4 - T KARUNGULAM VILLAGE

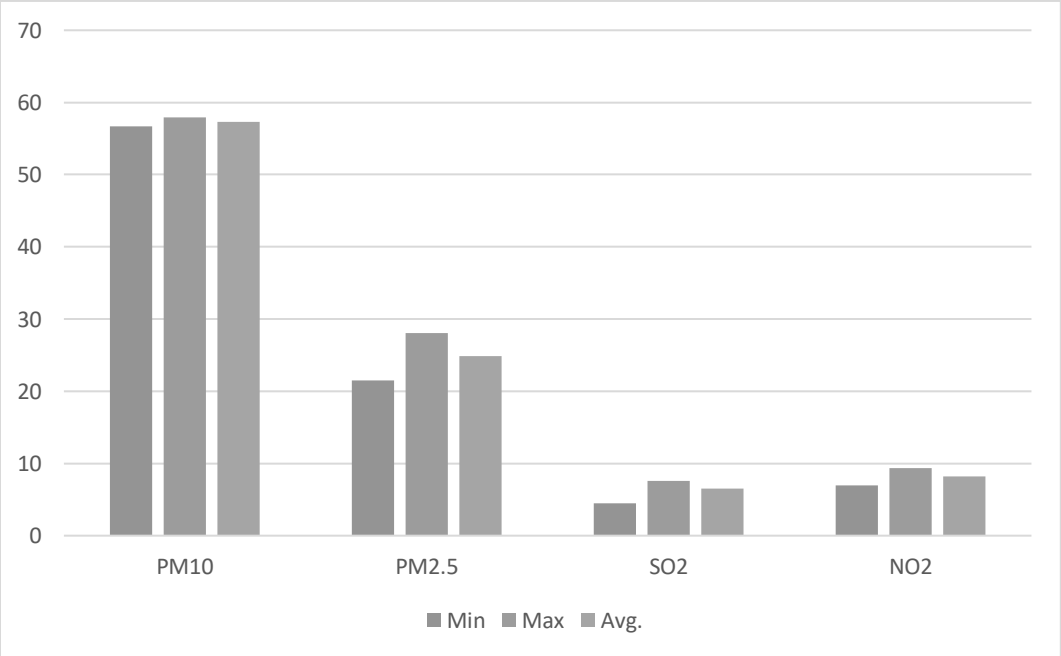


FIG 3.10 AMBIENT AIR QUALITY DATA A5 - KOONDANKULAM VILLAGE

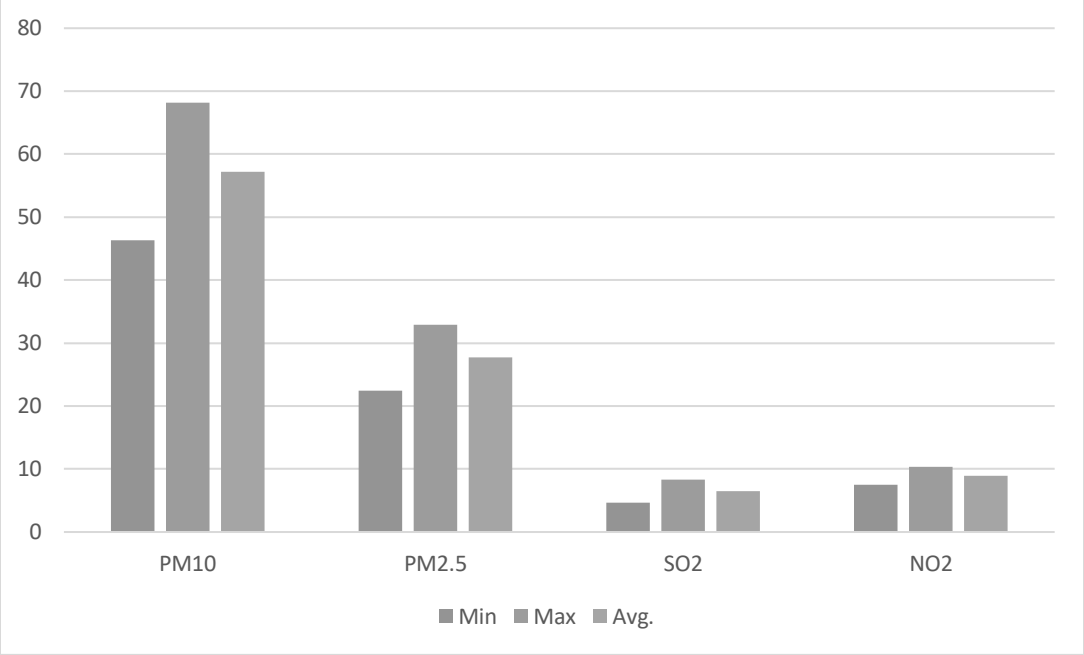


FIG 3.10 AMBIENT AIR QUALITY DATA A6 - ADANGARKULAM VILLAGE

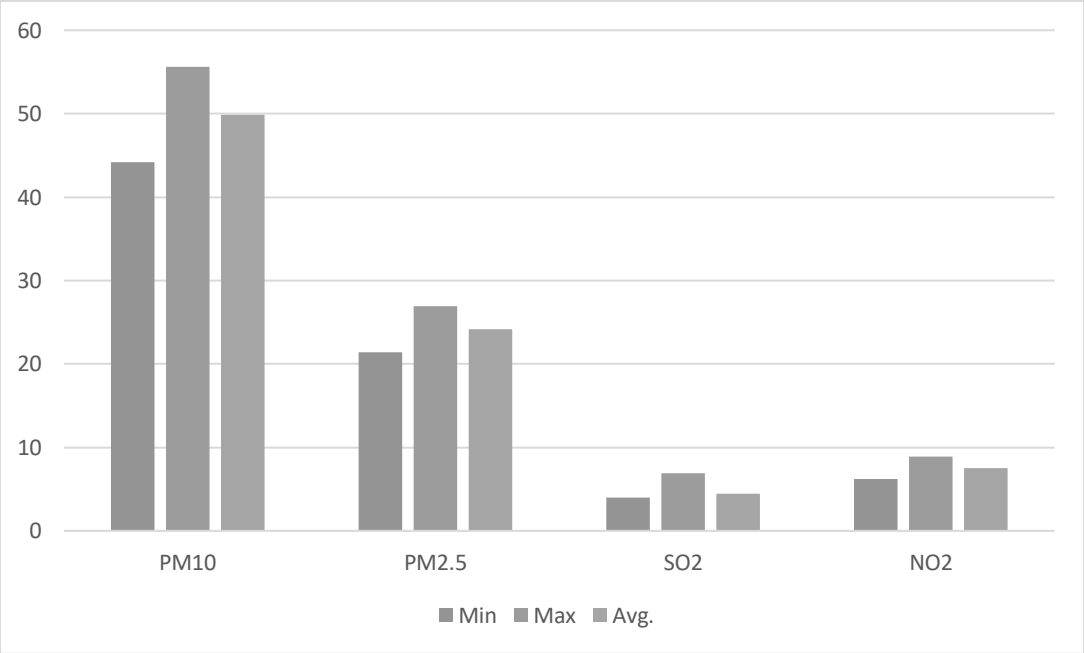
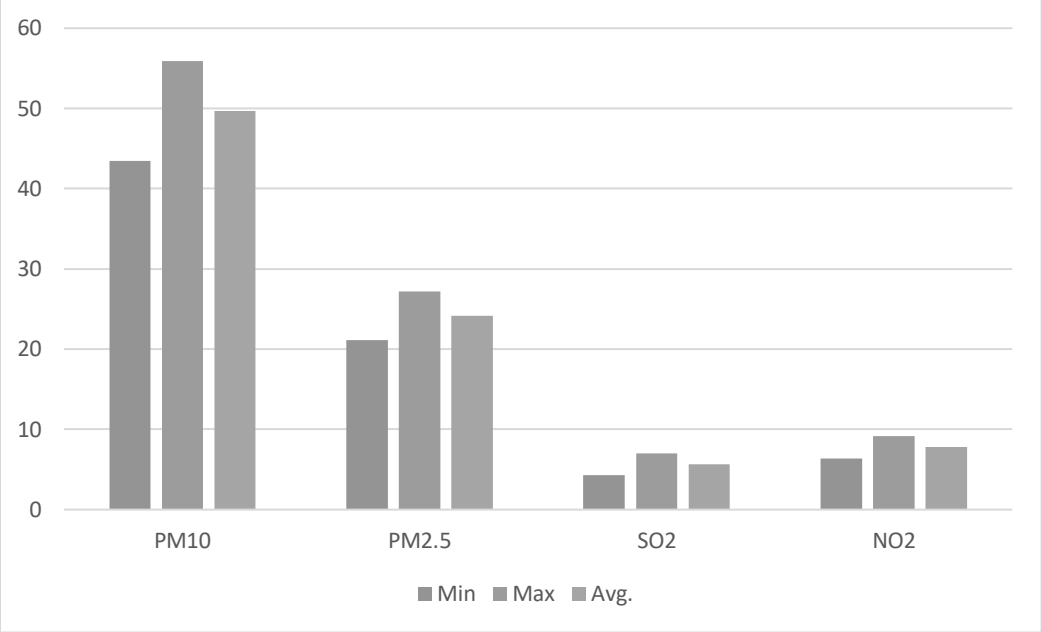


FIG 3.10 AMBIENT AIR QUALITY DATA A7 - : SANGANERI VILLAGE



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

3.6 WATER ENVIRONMENT

Assessment of baseline data on water environment includes:

- Identification of water resources
- Collection of water samples
- Analyzing water samples collected for physico-chemical parameters as per standards.

3.6.1 Surface Water

There is Indian Ocean is located at a distance of 3.43 km in South direction & Hanuman Nadi is located at a distance of 80m in south direction from lease area. The rainfall over the area is moderate, the rainwater storage in open wells, trenches is in practice over the area and the stored water acts as source of freshwater. The prevailing status of surface water quality has been assessed during the study period.

Surface water quality locations and results are provided in Table 3-14 and Figure 3.11.

3.6.2 Ground Water

The rainfall is the main source for the availability of water both in surface and sub-surface. The quantum of rainfall varies every year depending upon the monsoon. However, the extraction of surface and sub-surface water is increasing year by year. It leads to environmental impact on the water sources like depletion of water level, deterioration of water quality. It makes the demand for the quantification of available water and also its quality for various purposes like agriculture, industries, drinking and domestic purposes. Total six (07) ground water monitoring locations were identified for assessment in different villages around the project site based on the usage of sub surface water by the settlements/ villages in the study area. The groundwater results are compared with the acceptable and permissible water quality standards as per IS: 10500 (2012) for drinking water. Groundwater quality monitoring locations and results are given in Table 3.5 and Figure 3.11.

3.6.3 Sampling Locations

Two (2) surface water samples and six (7) ground water samples were collected from the study area and were analyzed for physio-chemical, heavy metals and bacteriological parameters in order to assess the effect of mining and other activities on water bodies. The samples were analyzed as per the procedures specified by CPCB, IS-10500:2012. The water sampling locations are given in Table 3.5 and shown as Figure 3.11.

The monitoring locations were selected based on:

- Location of the major water bodies
- Location of project site,
- Likely areas that can represent baseline conditions

Water bodies nearby

Table 3.5 Water Sampling Locations

S.NO	Location Code	Monitoring Locations	Latitude and longitude
Surface Water			
1	SW1	**Hanuman Nadi** (Up- stream)	8°12'59.89"N 77°37'23.92"E
2	SW2	**Hanuman Nadi** (Downstream)	8°10'24.35"N 77°38'38.09"E
Ground Water			
1	GW1	Project site	8°10'55.51"N 77°38'32.49"E
2	GW2	Chettikulam	8°9'52.62"N 77°37'21.31"E
3	GW3	Erukkandurai	8°11'20.11"N 77°39'0.02"E
4	GW4	T Karungulam	8°11'19.58"N 77°36'8.07"E
5	GW5	Koondankulam	8°10'54.37"N 77°40'1.22"E
6	GW6	Adangarkulam	8°12'38.69"N 77°38'5.53"E
7	GW7	Sanganeri	8°12'24.88"N 77°40'58.77"E

FIG 3.11 GROUND WATER SAMPLING LOCATIONS

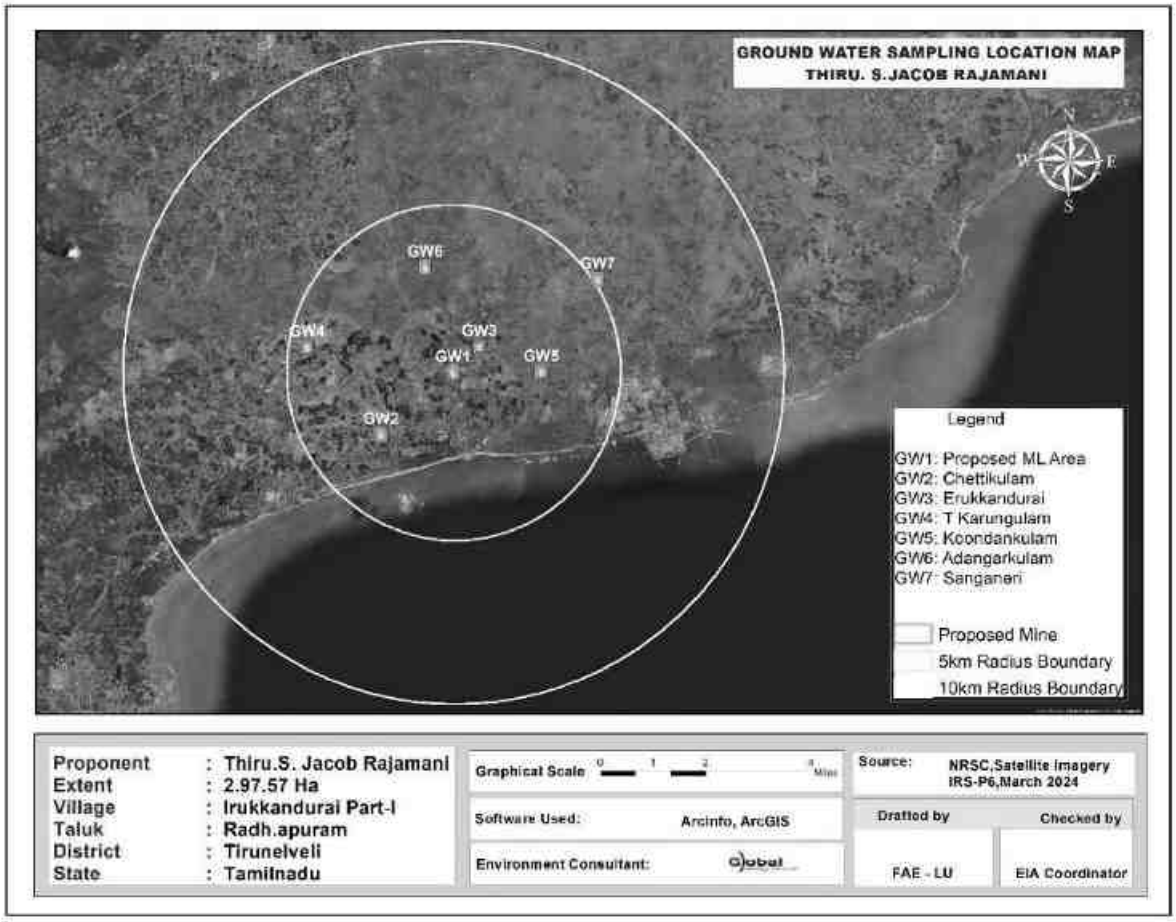


FIG 3.11a SURFACE WATER SAMPLING LOCATIONS

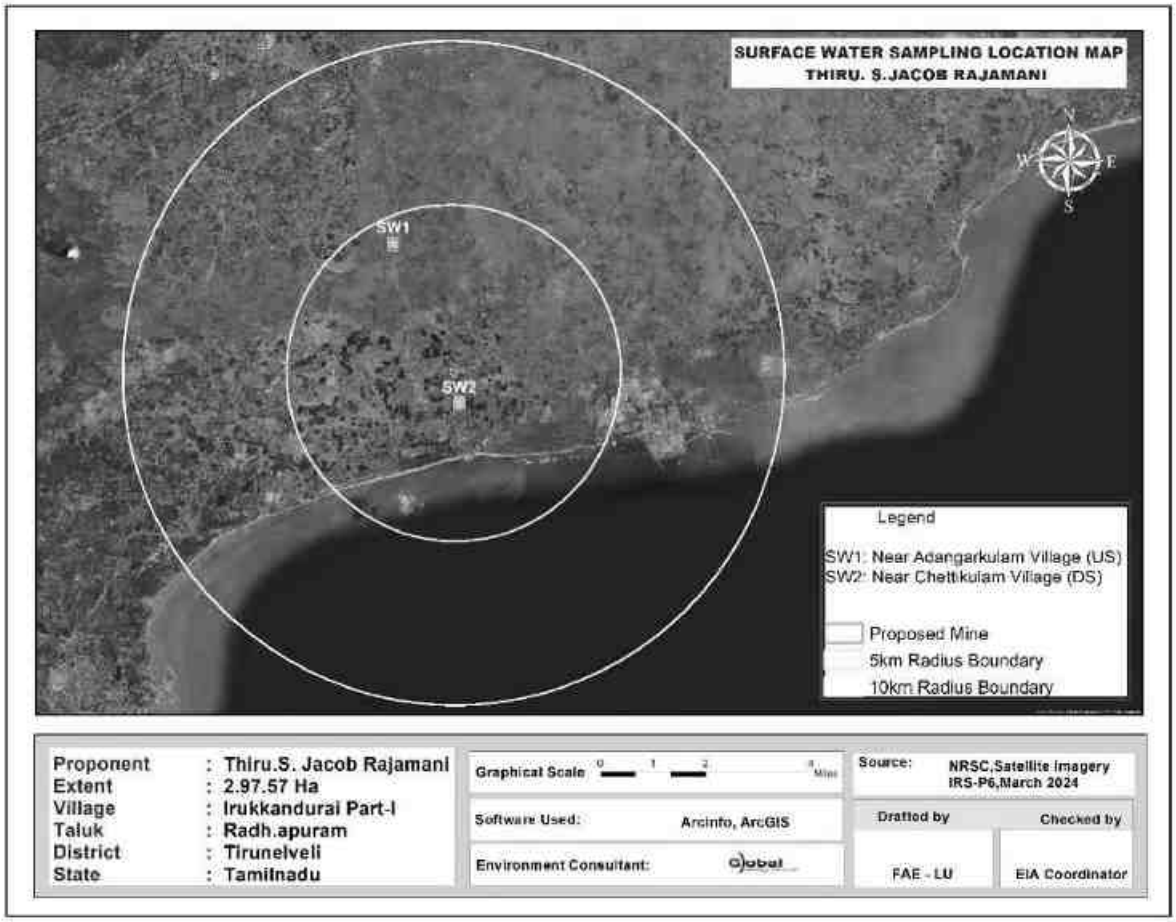


Table 3.6 Surface Water Analysis Results

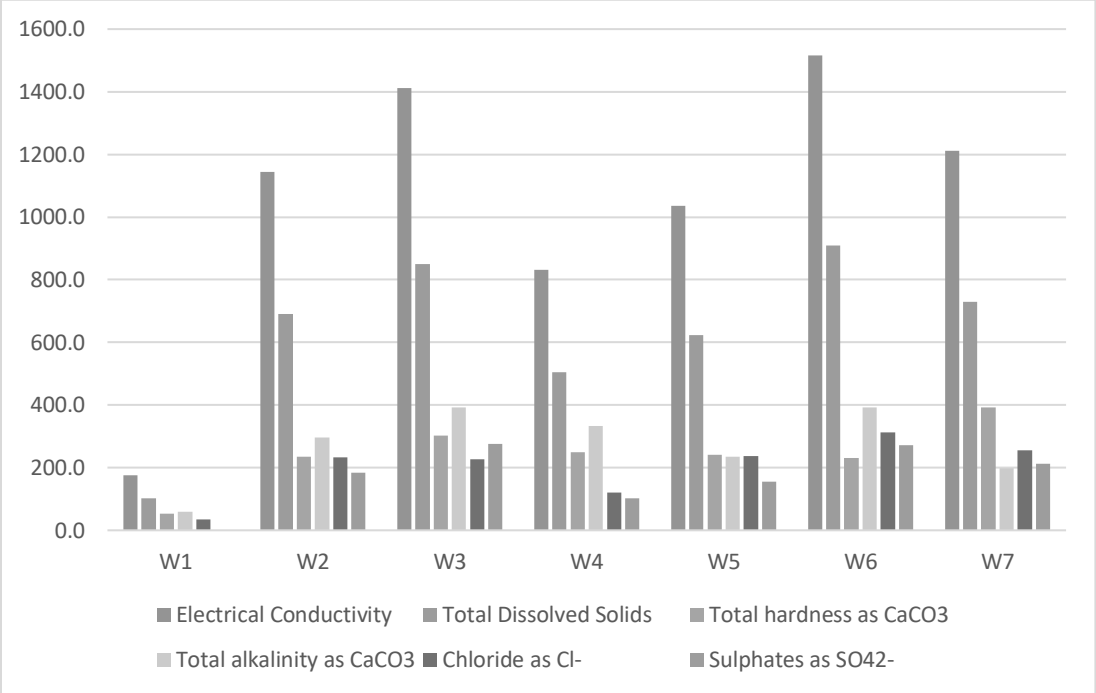
Sr.No	Parameter	Unit	SW1	SW2	Surface water standards (IS 2296 Class-A)
1	Odour	-	Agreeable	Agreeable	-
2	Turbidity	NTU	<1.0	<1	1
3	pH at 25 °C	-	7.53	7.50	6.5-8.5
4	Electrical Conductivity	µs/cm	1012	568.2	-
5	Total Dissolved Solids	mg/l	610	360	500
6	Total hardness as CaCO3	mg/l	261	133.0	-
7	Calcium as Ca	mg/l	42.8	22.60	300
8	Magnesium as Mg	mg/l	37.1	18.40	-
9	Calcium as CaCO3	mg/l	101	56.6	-
10	Magnesium as CaCO3	mg/l	154	76.8	-
11	Total alkalinity as CaCO3	mg/l	263	156.0	-
12	Chloride as Cl-	mg/l	183	142.0	-
13	Free Residual chlorine as Cl-	mg/l	BDL (D.L - 0.2)	BDL (D.L - 0.2)	250
14	Sulphates as SO42-	mg/l	120	65.4	400
15	Iron as Fe	mg/l	0.12	0.06	1.0
16	Nitrate as NO3	mg/l	3.42	2.59	20
17	Fluoride as F	mg/l	0.36	0.34	1.5
18	Manganese as Mn	mg/l	BDL (D.L - 0.05)	BDL (D.L - 0.05)	0.5
19	COD	mg/l	BDL (D.L - 2.0)	24.5	-
20	BOD	mg/l	BDL (D.L - 4.0)	5.1	-
21	TSS	mg/l	BDL (D.L - 2.0)	12	-
22	DO	mg/l	6.1	6.3	-

The samples were analyzed by Shrient Analytical & Research Labs Private Limited; Chennai and the results are summarized below.

Table 3.7 Results of Ground Water sampling Analysis in 7 locations								**Specification/ Limit (As per IS:10500: 2012)**	
	W1	**W2**	**W3**	**W4**	**W5**	**W6**		**Desirable**	**Permissible**
Odour	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
Turbidity	<1	<1	<1	<1	<1	<1	<1	Agreeable	Agreeable
pH at 25 °C	8.37	7.64	7.64	7.34	7.58	7.58	7.37	6.5 - 8.5	No Relax
Electrical Conductivity	176.6	1144	1411	831.4	1036.0	1515.0	1211.0	1	5
Total Dissolved Solids	102	690	850	505	624	910	730	500	2000
Total hardness as CaCO3	52.5	234	303.0	250.0	242.0	230.0	392.0	1	15
Calcium as Ca	9.70	43.6	76.00	48.50	64.60	42.00	85.60	200	600
Magnesium as Mg	6.79	30.1	27.10	31.00	19.40	30.10	42.70	200	600
Calcium as CaCO3	24.2	109	190.0	121.0	162.0	105.0	214.0	75	200
Magnesium as CaCO3	28.3	125	113.0	129.0	80.8	125.0	178.0		
Total alkalinity as CaCO3	59.4	297.0	392.0	333.0	234.0	392.0	198.0		
Chloride as Cl-	35.5	232.0	227.0	121.0	236.0	312.0	256.0	250	1000
Free Residual chlorine as Cl-	BDL (D.L - 0.2)	BDL (D.L - 0.2)	BDL (D.L - 0.2)	BDL (D.L - 0.2)	BDL (D.L - 0.2)	BDL (D.L - 0.2)	BDL (D.L - 0.2)	30	100
Sulphates as SO42-	BDL (D.L-5.0)	183	276	102	156	272	212	45	No Relaxation
Iron as Fe	0.02	0.05	0.09	0.04	0.06	0.07	0.03	200	400
Nitrate as NO3	1.76	2.32	4.56	3.22	3.45	4.52	3.98	1	No Relaxation
Fluoride as F	0.23	0.46	0.57	0.41	0.45	0.51	0.55	0.1	0.3
Manganese as Mn	BDL (D.L - 0.05)	BDL (D.L - 0.05)	BDL (D.L - 0.05)	BDL (D.L - 0.05)	BDL (D.L - 0.05)	BDL (D.L - 0.05)	BDL (D.L - 0.05)	Not Specified	Not Specified

Some of the common parameters including EC, TDS, Total Hardness, Total Alkalinity, Chlorides and Sulphates in the 7 locations were plotted and the graph is provided below.

FIG 3.12 VALUES OF FEW COMMON PARAMETERS IN WATER ANALYSIS



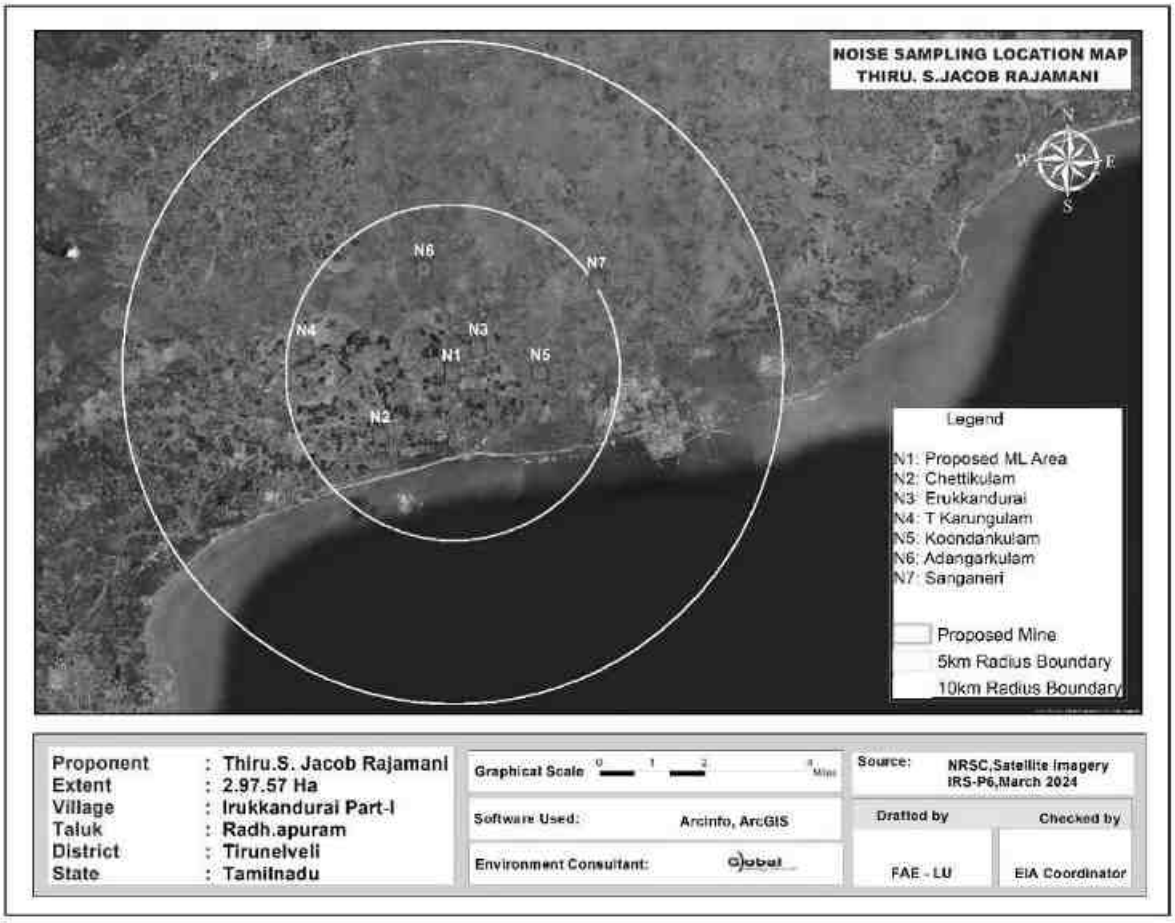
All the values were found to be within the permissible limits.

3.7 NOISE MONITORING

Noise level monitoring was calculated using a noise level meter by NABL Accredited lab and the results are summarized below.

The noise monitoring locations are given in Fig 3.12

FIG 3.13 NOISE MONITORING LOCATIONS



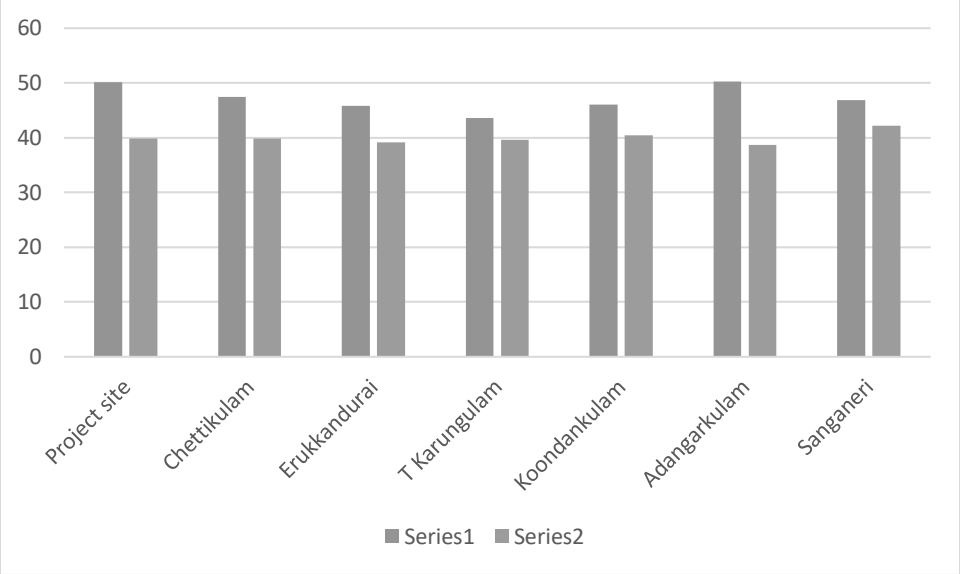
The results are given in Table below.

Table 3.8 Noise monitoring results

S. No	Location	Day equivalent	Night equivalent	Day equivalent limits by CPCB	Night equivalent limits by CPCB
1	Project site	50.2	39.9	75	70
2	Chettikulam	47.4	39.9		
3	Erukkandurai	45.8	39.2		
4	T Karungulam	43.6	39.6		
5	Koondankulam	46.0	40.4		
6	Adangarkulam	50.3	38.7		
7	Sanganeri	46.9	42.2		

The results are plotted as below.

FIG 3.14 DAY AND NIGHT EQUIVALENT VALUES IN 7 LOCATIONS

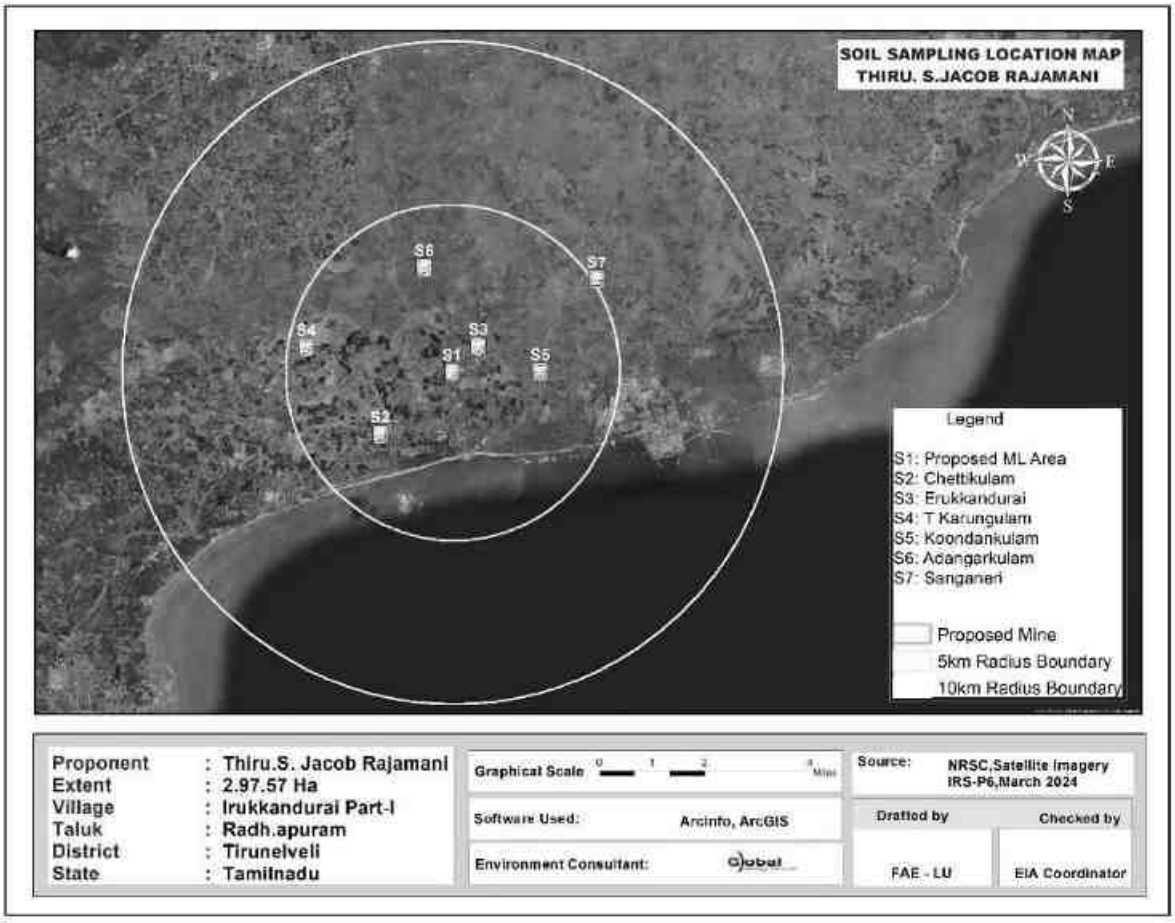


All the values are found to be within CPCB norms.

3.8 SOIL SAMPLING ANALYSIS

Soil samples have been collected from the mine lease area and 6 other locations from Chettikulam, Erukkandurai, T Karungulam, Koondankulam, Sanganeri and Adangarkulam Villages. The locations are shown in figure below.

FIG 3.15 SOIL SAMPLING LOCATIONS



The results are summarized in the table below.

Table 3.9 Results of Soil Sample Analysis

S. N	Parameter	Unit	S1	S2	S3	S4	S5	S6	S7
1	pH at 25 °C	-	6.20	7.25	7.78	7.32	6.50	8.03	7.06
2	Electrical Conductivity	µmho s/cm	81.73	438.40	324.40	295.90	299.80	474.70	235.20
3	Dry matter content	%	95.19	93.65	87.89	90.25	93.30	94.71	95.03
4	Water Content	%	4.81	6.35	12.11	9.75	6.70	5.29	4.97
5	Organic Matter	%	0.59	3.75	1.67	3.06	1.07	0.85	1.22
6	Soil texture	-	CLAY LOAM	CLAY	CLAY	SILT LOAM	LOAM	SILTY CLAY	CLAY
7	Grain Size Distribution	%	30.59	4.01	5.00	16.95	44.23	7.28	4.92

	i. Sand								
8	ii. Silt	%	33.11	33.64	67.05	52.03	14.41	38.99	36.41
9	iii. Clay	%	36.30	62.35	27.96	13.75	14.36	53.73	58.67
10	Phosphorous as P	mg/kg	0.56	0.72	0.91	0.58	0.74	0.55	0.74
11	Sodium as Na	mg/kg	835	943	1039	911	605	1025	768
12	Potassium as K	mg/kg	392	3278	4039	3128	1795	4213	3708
13	Nitrogen and Nitregenous Compounds	mg/kg	210	270	284	397	166	344	344
14	Total Soluble Sulphate	%	BDL(D. L.0.02)	BDL(D. L.0.02)	BDL(D. L.0.02)	BDL(D. L.0.02)	BDL(D. L.0.02)	BDL(D. L.0.02)	BDL(D. L.0.02)
15	Porosity	%	14.50	13.2	13.3	12.1	10.2	15.6	13.9
16	Water Holding Cabacity	Inches /foot	40	42	44	38	36	40	44

3.9 BIOLOGICAL ENVIRONMENT

The biological study of the area has been conducted in order to understand the ecological status of the existing flora and fauna to generate baseline information and evaluate the probable impacts on the biological environment. The details are given below.

3.9.1 Flora in the study area

We have contacted field survey during study period. The flora population in each quadrant is summed up for the total population in the study area. Also, data from the State Forest department is used.

Core Zone

During the field visit, it is observed that there are no national parks / Sanctuaries / forests in the 10km buffer area. The study area is devoid of any major plantations.

Table 3.10 Flora in Core Zone

S.No.	Scientific name	Vernacular/English name	Type of flora
1	Calotropis gigantea	Erukku	Shrubs
2	Cassia auriculata	Aavarai	
3	Achyranthes aspera	Nayuruvi	

Buffer zone

Only common trees, shrubs, bushes, etc. are found. The list is given below.

Table 3.11 Flora in Buffer zone

S.No.	Scientific name	Vernacular/English name	Type of flora
1	Azadirachta indica	Neem	Trees
2	Carica papaya	Papaya	
3	Mangifera indica	Mango	
4	Acacia leucophloea	Velamaram	
5	Acacia nilotica	Karu- velamaram	
6	Moringa oleifera	Murungai	
7	Tamarindus indica	Puli	
8	Tectona grandis	Theku	
9	Manilkara zapota	Sappota	
10	Musa paradisiaca	Valzhlai	
11	Borassus flabelliformis	Panna-maram	
12	Ficus benghalensis	Alamaram	
13	Ficus religiosa	Arasamaram	
14	Phyllanthus emblica	Nelli	
15	Calotropis gigantea	Yerukku	Shrubs
16	Cassia auriculata	Aavarai	
17	Ricinus communis	Aamanakku	
18	Tecoma stans	Arali	
19	Aloe vera	Kathalai	
20	Catharanthus roseus	Nithyakalyani	Herbs
21	Acalypha indica	Kuppaimeni	
22	Coccinia grandis	Kovai	Climbers
23	Cissus quadrangularis	Pirandai	
24	Jasminum angustifolium	malli	
25	Ziziphus oenoplia	Ilandai	
26	Cymbopogon	Kanam	Grasses
27	Cyperus rotundus	Kora grass	
28	Cynodon dactylon	Arugu	

3.9.2 Fauna in the study area

There is no specific Fauna found within ML area. The buffer zone Fauna in the area is studied by direct observation method. Secondary data collected from Forest

department and the same is used in this report. People in the nearby locality were also consulted. The commonly found fauna in the area are given below.

Table 3.12 Fauna in buffer zone

S.No.	Scientific name	Common name	Type of fauna	Schedule to which the species belong
1	Canis familiaris	Common dog	Mammals	IV
2	Felis catus domesticus	Domestic cat		IV
3	Golunda ellioti	Indian bush rat		IV
4	Funambuus palmarum	Squirrel		IV
5	Lepus nigricollis	Indian hare		IV
6	Bos indicus	Domestic cow		IV
7	Common Crow	Corvus splendens	Birds	V
8	House Sparrow	Passer domesticus		IV
9	Common Myna	Acridotheres tristis		IV
10	Streptopelia chinensis	Pigeon		IV
11	Calotes versicolar	Lizard	Amphibia	IV
12	Ptyas mucosa	Snake		IV
13	Rana hexadactyla	Frog		IV

3.10 LAND USE

For Land-use and land cover study, sensing satellite data of NRSC Satellite imagery and GeoEYE has been used as per Figure No. 3.16. A land use map showing 10 Km radial distance. The geographical coordinates of the project are Latitude 08°10'49.68"N to 08°10'57.99"N and Longitude: 77°38'30.75"E to 77°38'37.19"E.

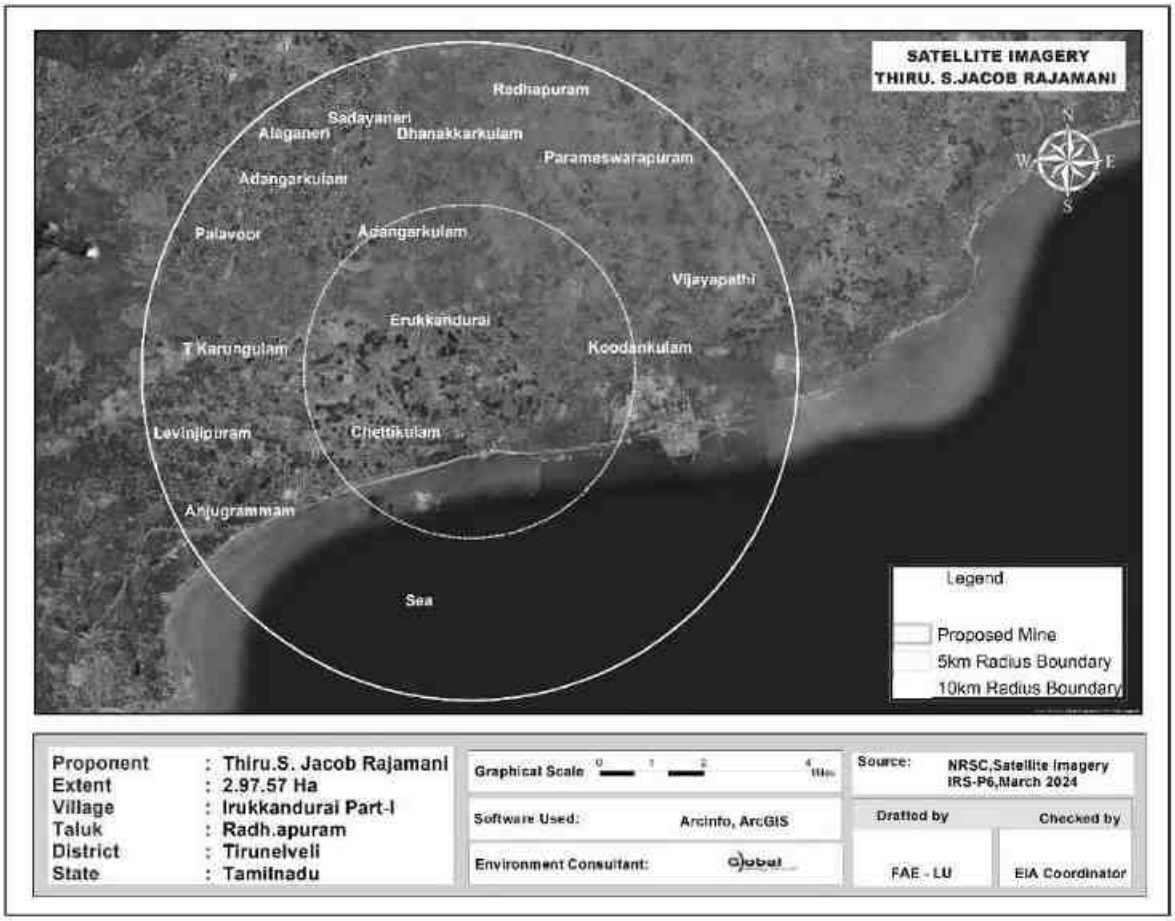


Figure No. 3.16: Remote Sensing Satellite Image

Selection of remote sensing satellite image (RSI) is on the availability of cloud free data and interpretability of predominant landuse and land cover (LULC) category. The examination of satellite data showed that the region is always covered by clouds with lesser percentage during summer due to cluster habitation. But rained crops are cultivated during southwest monsoon and hence a data acquired during first onset of precipitation is preferred so as to delineate crop and fallow land parcels of agricultural category. Delineation of scrub land is also possible since land with scrub could be easily distinguished from crop vegetation and separated. This may be an arduous task during monsoon since the entire area would be witnessed with sudden sprout of lush natural vegetation, mostly *prosopis*, with first onset of precipitation.

Methodology Adopted for the Land Use Study

Present study involves micro level analysis of landuse pattern showing 10 km radius and changes in landuse pattern using satellite data. This necessitates a careful analysis of satellite data adopting a well-defined methodology.

To cater the requirement, a preliminary assessment of terrain using digital analysis helping to infer relationship between terrain and landuse has been carried out. Such an approach provides lucid understanding of landuse units and enhances the knowledge on the landuse pattern assisting in impact assessment.

The knowledge base thus generated is used to delineate various landuse units while carrying out interpretation of the satellite image. The derived landuse information is transformed into a GIS based spatial database using geo-referencing techniques. Besides, a limited but well focused field investigation also carried out and coordinates of significant landuse units using handheld GPS (Global Positioning System) are gathered to be used as control points for geo-referencing. Interpreted landuse units are verified in the field to carryout necessary corrections wherever is required before preparing final landuse map.

Using the image elements such as color, tone, texture, size, shape and associated elements various landuse units are delineated following the categorization and nomenclature adopted for the national level landuse classification system as recommended by National Remote Sensing Centre (NRSC), Department of Space, Government of India. Some of the landuse units that are identified in the study area are listed in **Table No. 3.13** given below.

Field Verification:

Field verification involved collection, verification and record of the different surface features that create specific spectral signatures / image expressions on FCC. In the study area, doubtful areas identified in course of interpretation of imagery is systematically listed and transferred on to the corresponding SOI topographical maps for ground verification. In addition to these, traverse routes were planned with reference to SOI topographical maps to verify interpreted LU/LC classes in such a

manner that all the different classes are covered by at least 6 sampling areas, evenly distributed in the area. Ground truth details involving LU/LC classes and other ancillary information about crop growth stage, exposed soils, landform, nature and type of land degradation are recorded and the different land use classes are taken the Land use map.

Table No.3.13: Major Land use Units of the Study Area

Sr. No.	1st level classification	2nd level classification
1	Built-Up Or Habitation	Residential
		Commercial / Industrial
2	Agriculture	Crop / Fallow Land
		Plantation
3	Water Bodies	Reservoir / Lake / Pond
		River
4	Vegetation Cover	Scrub
		Open Vegetation
		Close Vegetation
		Mangroves
5	Waste Land	Open Without Scrub
		Open With Scrub
6	Others	Mudflow
		Salt Pan
		Brick Manufacturing

Land Use Pattern of 10 km Radial Buffer Area of Project Site

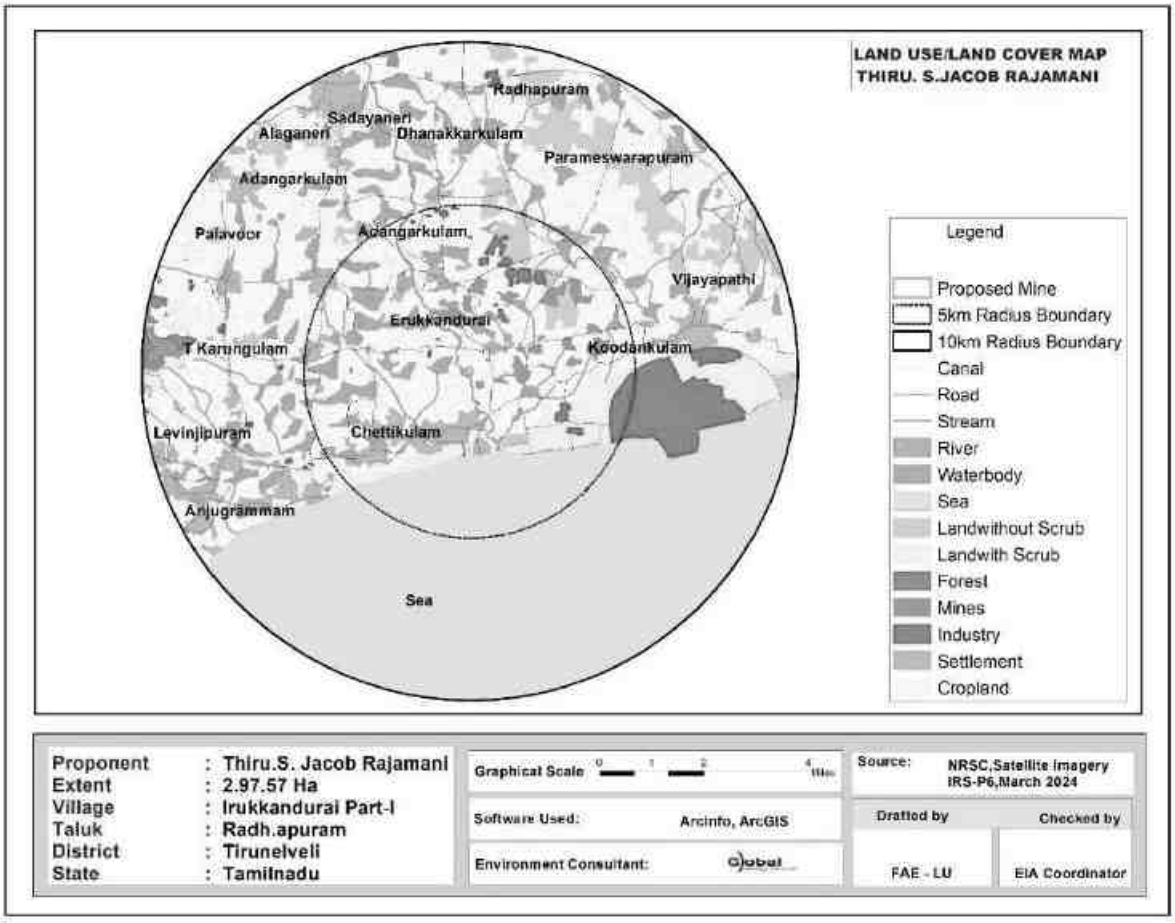
The existing land use pattern and land cover distribution of the whole acquired block, have been studied from the satellite imagery and subsequent ground checking during the field surveys.

It mainly comprises of agricultural land with bi-annual crops of Kharif (Kharif: Jowar, Bajra, Cotton, etc. Season: July to October) and Rabi (Rabi: Wheat, Rai etc. Season: December to March). The presence of the agricultural land is followed by few dense settlements Irukkandurai Part-1 village natural or man-made pond etc. The shortage of rainfall, availability of ground water at deeper level and other climatic condition do

not support good agricultural productivity inspite of having enough land. There is no demarcated forest land within the study area, however, some scattered forest is found throughout the 10 km radius, especially along the periphery of the villages.

The general landuse pattern of the core and buffer may be broadly classified into four major types – Buildup or habitation, Agriculture, Water Bodies, Waste land and Other categories. Under buildup or habitation category covered villages, town and infrastructure. Under agriculture category considered crop land/fallow land and plantation. Under the water body categories Reservoir/ lake, pond, River and stream. Under wasteland category considered land with scrub and land without scrub is interpreted. Lastly other category's covered Mines area and forest are interpreted under this category. These categories are delineated from the selected satellite image using image elements such as color, tone, texture, size, shape and associated elements. The delineated land use units are transformed into a spatial database in GIS environment. Estimated for area and representation of each category in the study area. The total area of LULC in the study area is calculated as 321 sq. km and spatial distribution of various LULC categories within buffer area are discussed below. The 5km and 10km radius lands map is shown above. The details are given below.

FIG 3.17 LAND USE/LAND COVER MAP OF THE STUDY AREA



Land Use / Land Cover Classification classified into first level classification and second level classification and major land use/land cover classes were demarcated in the study area following Level II classification. A thematic map of 1:50,000 scale was generated incorporating these classified categories considering the area of the project.

Built-up / Settlements

Settlements in the study area are generally small to medium size in stature and area scattered. Radhspuram is the relatively larger settlements observed at the north part of the study area.

Interpretation of settlement from the satellite image is based upon the image elements such as color, tone, texture and association. It is delineated by their typical red color. Association with linear features such as roads reaffirmed the presence of delineation of settlements. The spatial extent of settlement is estimated as 20.92 sq. km representing 6.52 % of the study area and Industrial + Commercial area covers 10.17 sq. km with 3.17 %.

Agricultural Land

Under the broad category of agriculture crop land, fallow land and plantation is delineated. Cultivation is mostly dependent upon river water for irrigational activities are good. River, Ponds and tanks in each village act as rainwater storage units and do support domestic requirement and even cultivation to some extent. Because of these conditions, minimal water requiring crops such as corn, sunflower, oil seeds, grams, millets and coriander are cultivated. Cultivation is the most predominant crop cultivated and even if it failed their stalks are used as fodder for cattle.

Crop and Fallow land are interpreted using their image elements such as light to green, smooth to medium tone, they are the second most predominant landuse category delineated in the buffer area. As explained earlier, cultivation mostly depends upon river, canal and rainfall and majority of the land parcels are tilled and ready for cultivation with even a scanty Canal. Hence, cropland is the predominant category estimated at 135.56 Sq.km representing 42.23 % of the buffer area.

Wasteland

The last category of the landuse units in the study area is "Wasteland" which denotes land parcels that could not be utilized for cultivation even after conservation measures – such as land with scrub, land without scrub area.

Next to agricultural area, natural vegetation such as land with scrub forms the predominant LULC category of the buffer area. Land with scrub is sparse and delineated as patches scattered in all the parts of the buffer area. The spatial pattern of scrub suggests it is closely associated with water courses. This category occupies

land with scrub an area of 11.33 sq.km representing 3.53 % of the total core and buffer area.

Land without scrub, on the other hand is interpreted using brown to white color, medium tone and medium texture and is generally restricted around land covered with scrub and fallow land. They occur as small patches and very minimal area covering 16.76 sq.km representing 5.22 % of the buffer area.

Water bodies

Many Streams small and big water bodies are seen in the study area distributed all over the study area. They support the domestic water requirements and for cattle. At some places, they may also use for irrigation purpose and are very limited. Few dry stream courses are also seen in the study area. In the satellite image, water bodies are interpreted by their light blue to greyish blue color, smooth tone and smooth texture.

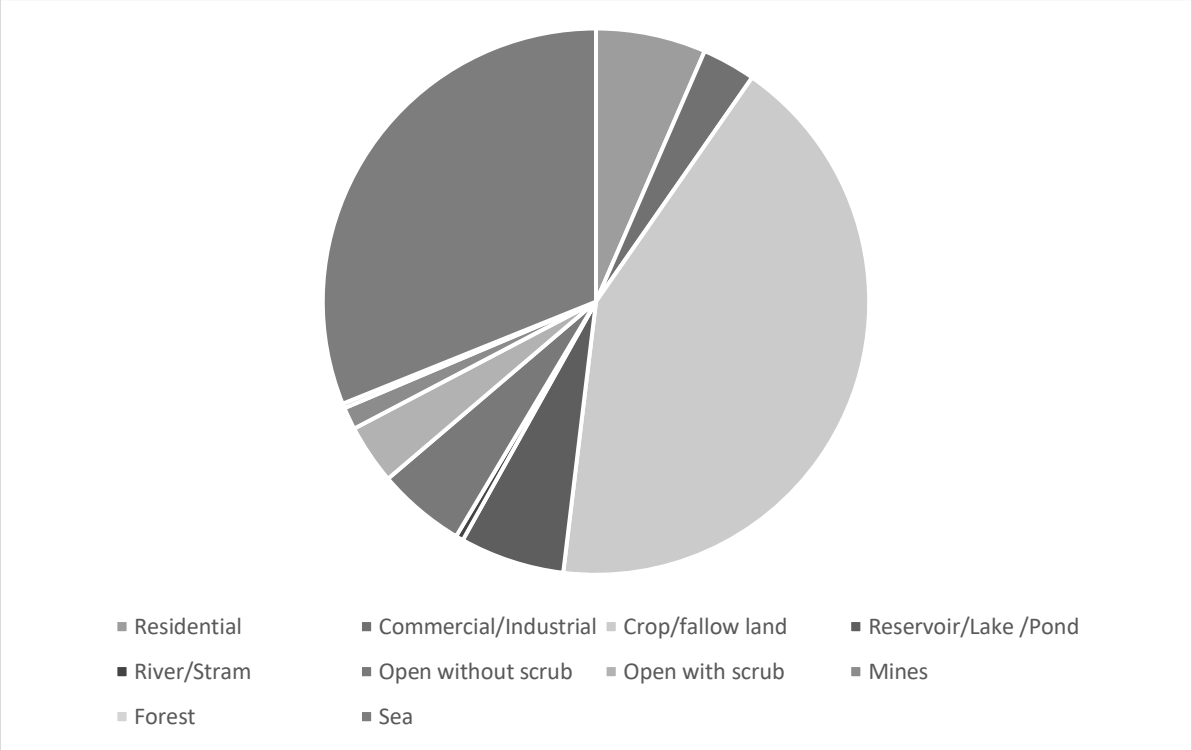
Most of the water bodies retain water for a shorter period after precipitation due to the soil constraint and hence go dry soon. Spatial extent of rivers, stream and water bodies is estimated at 19.88 sq.km and 6.19 %.

Mining area

Mining, forest and sea shore area seen in the study area distributed all over the study area. Major domestic income from mining business. Spatial extent of mining is estimated at 4.24 sq.km and 1.32 %, Forest cover at 0.89 sq.km and 0.28% & Sea shore area around 99.82 sq.km and 31.10%.

Table No. 3.14: Major Land Use Units of the Study Area in Percentage

S. No	1st Level Classification	Area in (sq.km)	Percentage (%)	2nd Level Classification	Area in (sq.km)	Percentage (%)
1	Built-up or habitation	31.09	9.69	Residential	20.92	6.52
				Commercial/Industrial	10.17	3.17
2	Agriculture	135.56	42.23	Crop/fallow land	135.56	42.23
3	Water bodies	21.31	6.64	Reservoir/Lake /Pond	19.88	6.19
				River/Stram	1.43	0.45
4	Waste Land	28.09	8.85	Open without scrub	16.76	5.22
				Open with scrub	11.33	3.53
5	Mines	4.24	1.32	Mines	4.24	1.32
6	Forest	0.89	0.28	Forest	0.89	0.28
7	Sea	99.82	31.10	Sea	99.82	31.10
Total		**321**	**100**		**321**	**100**



3.11 SOCIOECONOMIC ENVIRONMENT

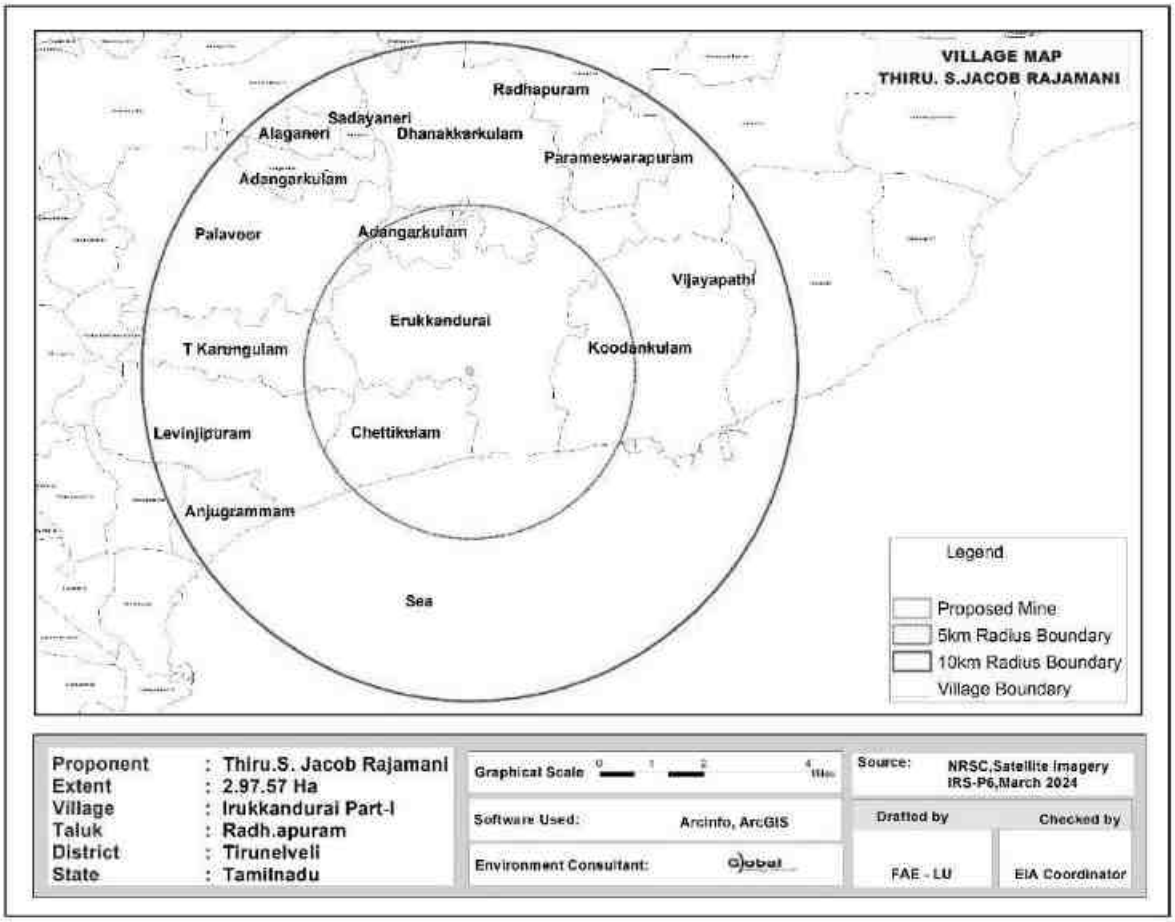
The socio-economic environment of the study area is studied by conducting primary sites through site visits and conducting sample surveys. The secondary data obtained from Census 2011 is also used. The following data area collected from secondary data:

- Demographic pattern.
- Health pattern
- Occupational structure.

3.11.1 DETAILS OF VILLAGES

The profile of the villages located in the study area is given in Fig 3.18 below.

FIG 3.18 VILLAGE MAP OF THE STUDY AREA



DETAILS OF VILLAGES

The project is located in Radhapuram Taluk, Tirunelveli District. The total population is 122930 which comprise of 60795 males and 62135 females. There are 15 rural villages and one urban area in the study area. List of villages are given below.

Table 3.15 Village details in study area

S.No.	Village/Town Name	Radius	Taluk Name	District Name
1	Adangarkulam	1-5km	Radhapuram	Tirunelveli
2	Erukkandurai			
3	Koondankulam			
4	T Karungulam			
5	Chettikulam			
6	Radhapuram	6-10km		
7	Udayathoor			
8	Parameswarapuram			
9	Alaganeri			
10	Palavoor			
11	Vijayapathi			
12	Vaddakkankulam CT			
13	Levinjipuram			
14	Azhagappapuram		Agastheeswaram	
15	Anjugrammam Tp			

Table 3.16 Population profile of the study area

Particulars	No of Population	Percentage (%)
A. Population break-up by Gender		
Male Population	60795	49
Female Population	62135	51
Total	122930	100
B. Population break-up by Caste		
Scheduled Caste	9325	7.59
Scheduled Tribes	9687	7.88
Others	103918	84.53
Total	122930	100
C. Literacy Level		
Male Literate Population	49997	40.67
Female Literate Population	47471	38.62
Male Illiterate	10798	8.78

Female Illiterate	14664	11.93
Total	122930	100
D. Occupational structure		
Main workers	41788	-
Marginal workers	7966	-
Total Workers	49754	40
Total non-workers	73176	60
Total		100

The above table shows that the male and female population ratios are almost equal. Among the total population 7.88 % belong to Scheduled Tribes, 7.59 % are Scheduled Caste and the balance 84.53 % people belong to other castes. Among the total population 79.29% of the people are literate. Among the total population,8.78 % are literate males and 11.93 % are literate females. This shows that the male literates are higher than the female literates. The results are plotted in figures below.

FIG 3.19 GENDER-WISE POPULATION DISTRIBUTION

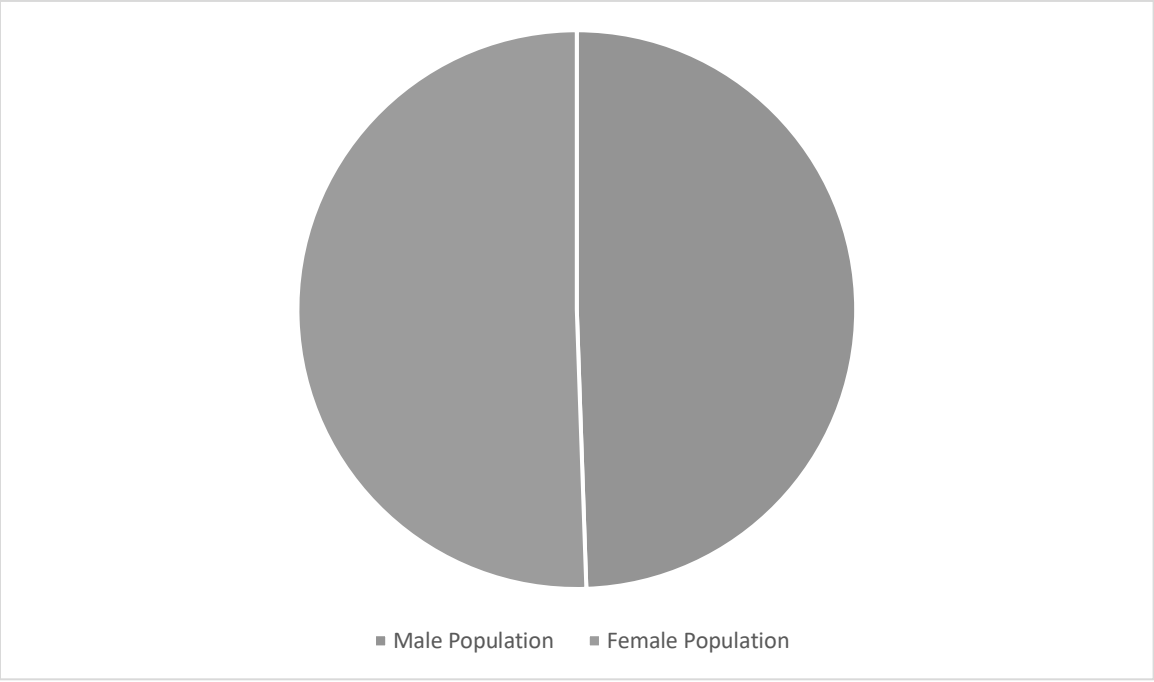


FIG 3.20 GENDER WISE LITERACY DISTRIBUTION

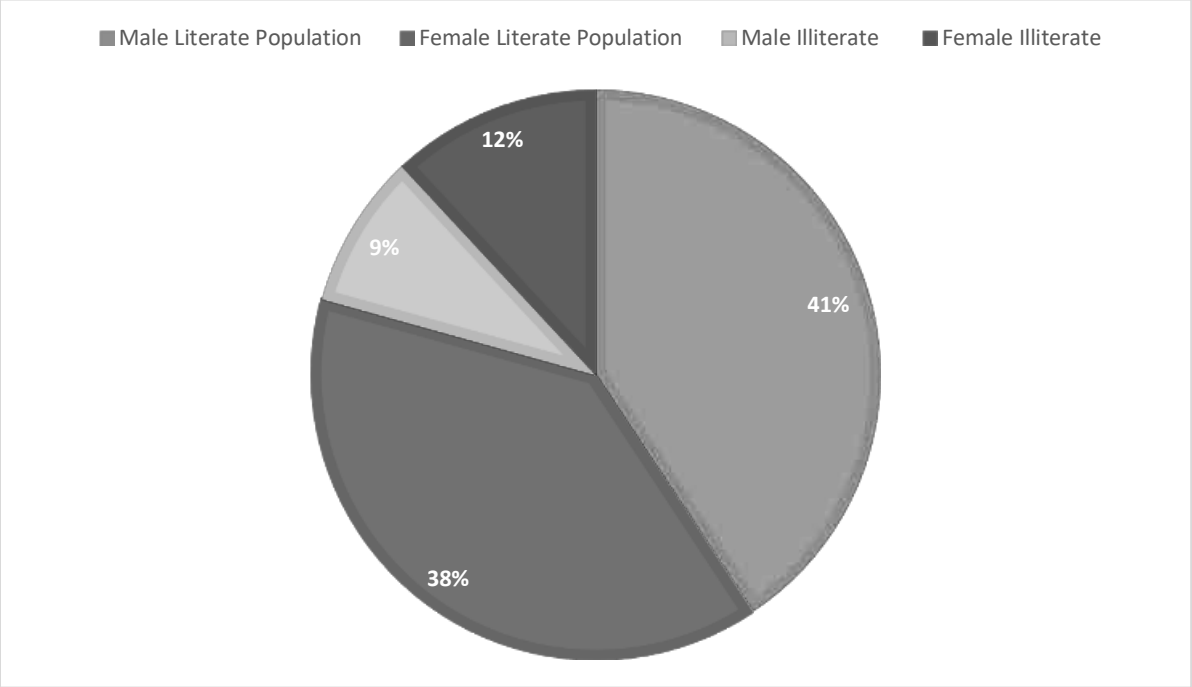
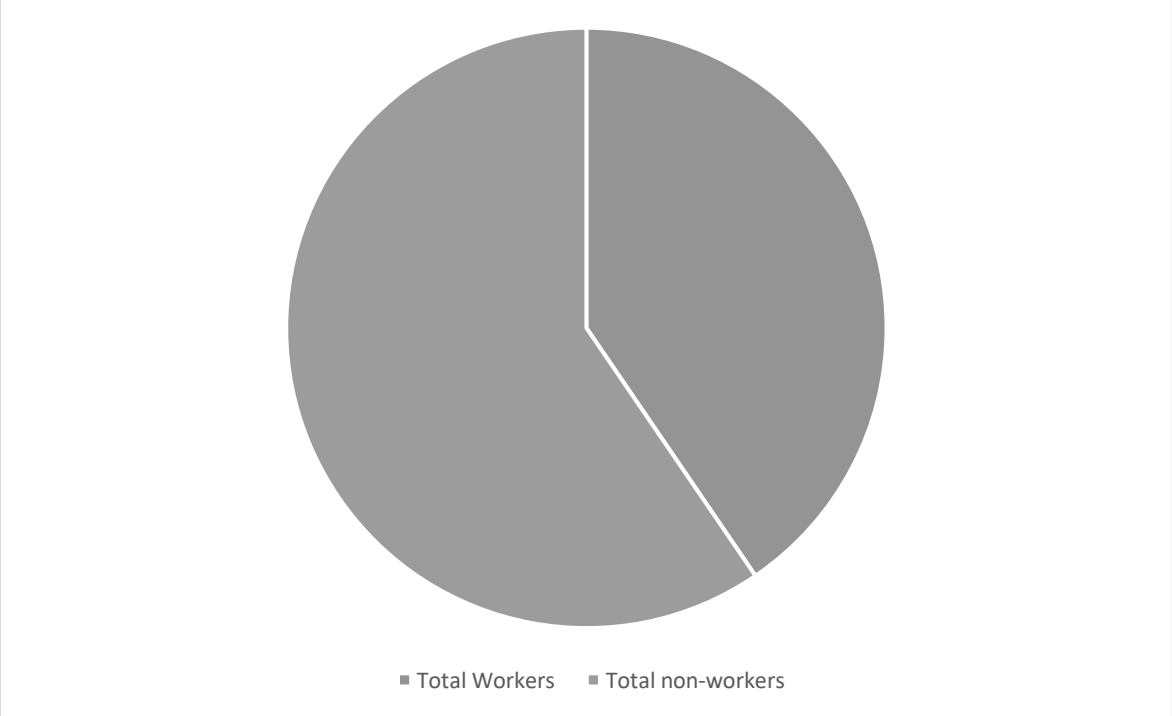


FIG 3.21 OCCUPATIONAL STRUCTURE WITHIN BUFFER ZONE



Infrastructure facilities in the study area

Education

Table 3.17 Educational infrastructure -10 km radius from the proposed site		
S. No.	**Particulars**	**Available in village (Nos)**
1	Govt. Primary School	Radhapuram - 32
2	Govt. Middle School	18
3	Govt. Secondary School	13
4	Govt. Senior Secondary School	16
5	Govt. Arts and Science Degree College	29
6	Govt. Engineering College	0
7	Govt. Medicine College	0
8	Govt. Management Institute	0
9	Govt. Polytechnic	0
10	Govt. Vocational Training School/ITI	0

In the study area, there are totally 32 Primary Schools functioning in these 20 urban areas. Among them 10 villages have 5 primary school, 3 villages have 2 primary schools & 2 villages have more than 4 primary school.

Healthcare

In the study area, the following facilities are available.

Table 3.18 Medical Infrastructure -10 km radius from the proposed site		
S.No.	**Particulars**	**Available in village (Nos)**
1	Community Health Centre	9
2	Primary Health Centre	5
3	Primary Health Sub Centre	19
4	Maternity And Child Welfare Centre	12
5	TB Clinic	5
6	Hospital Allopathic	0

Other Infrastructure

The other infrastructure facilities available are given below.

Table 3.19 Other Infrastructure -10 km radius from the proposed site		
S.No.	**Particulars**	**Available in village**
1	Tap Water-Treated	20
2	Covered Well	12
3	Hand Pump	11
4	Tube Wells/Borehole	13
5	Post office	7
6	Public bus services	20
7	Commercial Bank	6
8	Cooperative bank	16

Sample Survey

The expert visited 6 villages in the study area namely Chettikulam, Erukkandurai, T Karungulam, Koondankulam, Adangarkulam and Sanganeri villages. Discussions were held with the people from nearby locality to study the social and economic conditions prevailing in the area. The expert also visited nearby hospitals, primary health centres and Irukkandurai Part -I. The following observations were made.

Primary schools are available in many villages. For hospital facilities, people in the locality have to go to hospital in Irukkandurai Part -I which is about 800m NE from the lease area. Major schools with higher secondary and senior secondary schools are located in Irukkandurai Part -I. The major Irukkandurai Part -I Union located in the area is Irukkandurai Part -I. Facilities like petrol pump stations, ATM facility is available in Irukkandurai Part -I.

3.12 HYDROGEOLOGY OF THE STUDY AREA

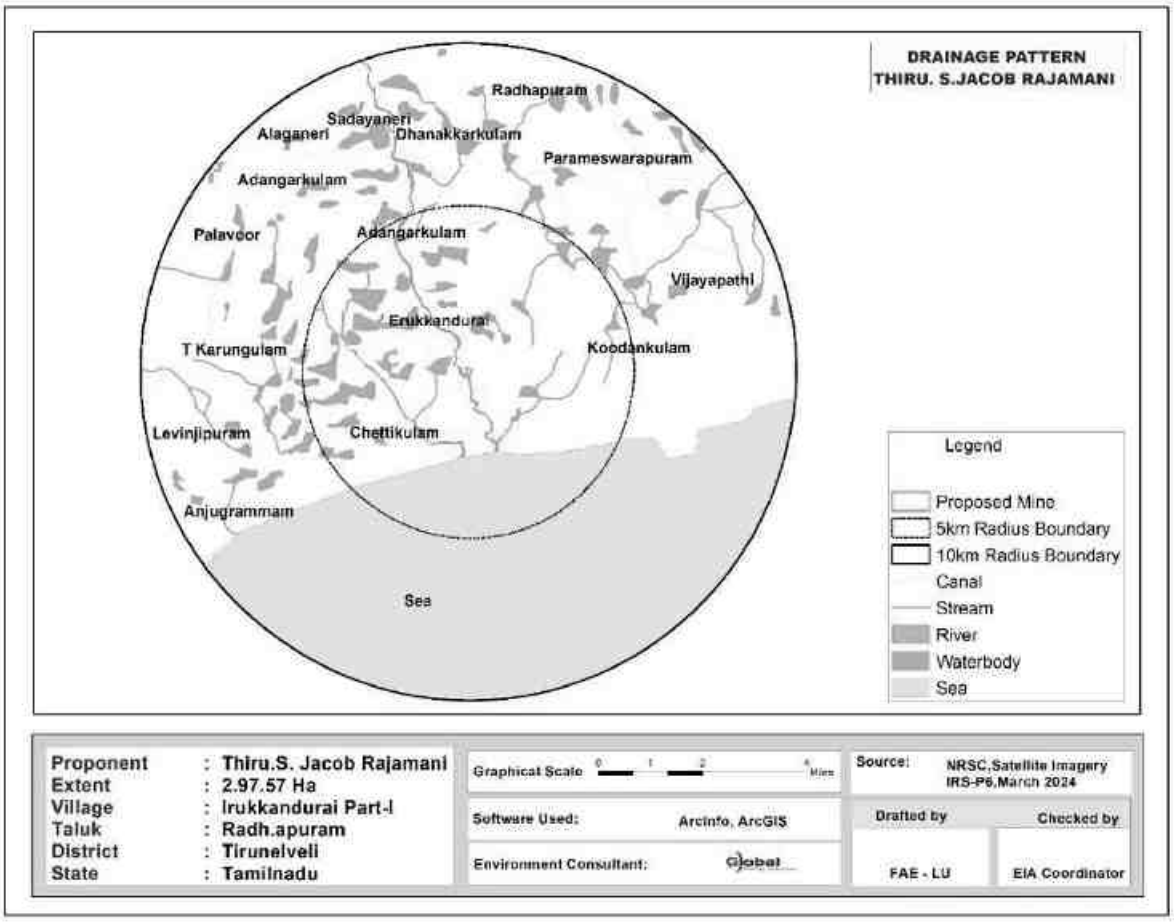
Since there is Indian Ocean is located at a distance of 3.43 km in South direction & Hanuman Nadi is located at a distance of 80m in south direction from lease area. the hydrological and hydrogeological pattern of the study area is studied in detail using satellite imagery.

3.12.1 HYDROGEOLOGICAL STUDY

To assess the hydrogeological condition of the surrounding proposed mine lease area. The study area is located in Irukkandurai Part-I Village, Radhapuram Taluk, Tirunelveli

District, Tamil Nadu State. is considered to understand the nature of the general hydrogeological conditions of the surrounding proposed mine lease area.

FIGURE 3. 22 10 KILOMETER RADIUS OF THE DRAINAGE MAP



3.12.2 PHYSIOGRAPHY AND DRAINAGE

Physiography: The area applied for quarry lease is exhibits plain topography covered by rough stone and Gravel formation. The massive Charnockite formation is clearly visible right from the surface and gentle towards Southwestern side of the area, the altitude of the area is above 38m (maximum) from MSL.

Drainage: The drainage pattern study reveals that from the proposed mine lease area with around 1 Km radius and 10 Km study observed in Figure 3.23. There is Indian

Ocean is located at a distance of 3.43 km in South direction & Hanuman Nadi is located at a distance of 80m in south direction from lease area.

3.12.3 GEOLOGY, GEOMORPHOLOGY AND SOIL

Geology:

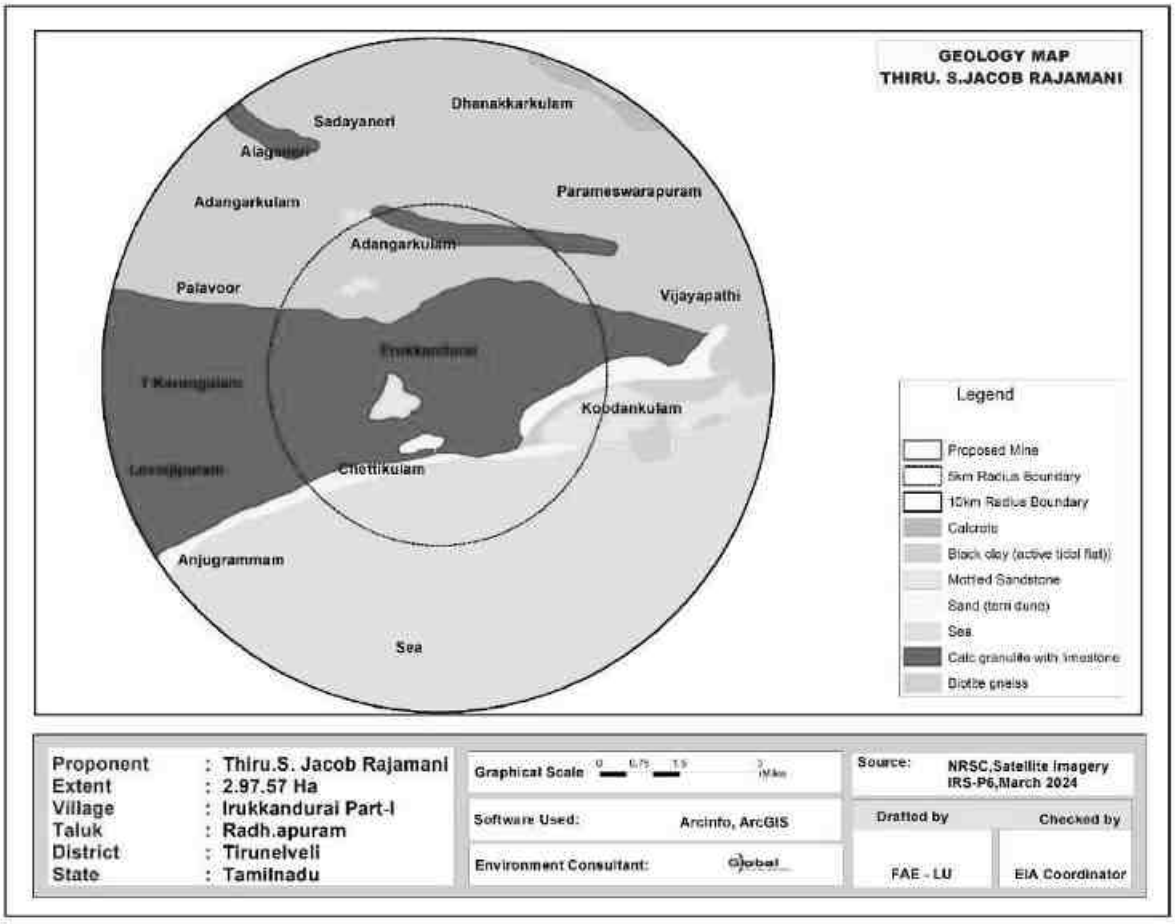
Tirunelveli District is mostly lithologies of the Southern Granulite Terrain (SGT) Supergroup concept, except for the southern coastal parts of the district, which are covered by younger sediments of Quaternary age. The areas of Southern Granulite Terrain (SGT) are occupied by the major 3 lithologies, such as garnet-biotite gneiss, hornblende biotite gneiss of the Migmatitie group, and garnet biotite sillimanite gneiss of the khondalite group. The age of southern granulite terrain ranges from the Neoarchaen to the Mesoproterozoic. The oldest lithology is calc granulite with limestone and occurs in bands in and around Tirunelveli, Ambasamudram and Kalakkadu, while hornblende granulite occurs at west of kalakadu. The linear bands of quartzite occur mostly in the northern parts of the district near Manur, Tirunelveli, Alwarkuruchchi and Palayamkottai.

The garnet biotite gneiss covers a large area between kalakkadu and south of Kilkadiayam. The Charnockite group consists of two lithologies, such as Charnockite and pyroxene granulite. The pyroxene granulite occurs on patches west of Tirukkurugudi, while linear bands of Charnockite ore occur from Kilkadaiyam to Munaradaippu. Also, Charnockite occurs in the southern part of the district area near Karungulam. The Migmatite group consists of 3 lithologies such as biotite gneiss, garnet biotite gneiss, and hornblende biotite gneiss.

The biotite gneiss covers in the western part of the district near the Kerala border, while garnet-biotite gneiss covers the central and southern parts of the district, while hornblende-biotite gneiss occurs in the northern part of the district from Kil Kadaiyam to Gangaikondan. Acid intrusive bodies like pegmatite were intruded into calc granulite during the Neoproterozoic period. The Cenozoic period contains limestone, calcrete (1.65 sq.km area), Black clay (5.59 sq.km area), Mottled Sandstone (8.28 sq.km area), sand stone (8.31 sq km), Calc granulite with limestone (86.26 sq.km

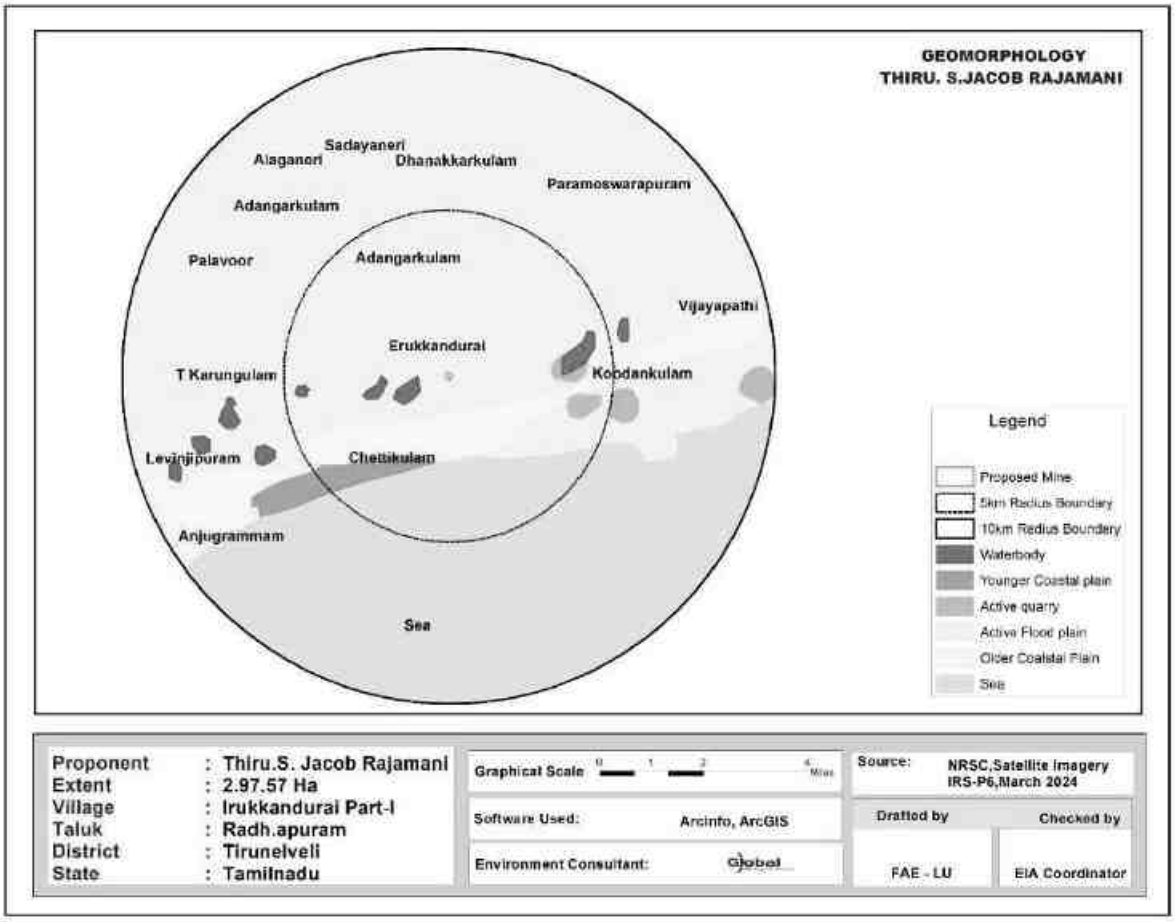
area), Biotite gneiss (123.07 sq.km area) and sea (99.83 sq.km) and these deposits are confirmed mostly in the southern part of the district.

FIGURE 3. 23 10 KILOMETER RADIUS OF THE GEOLOGY MAP



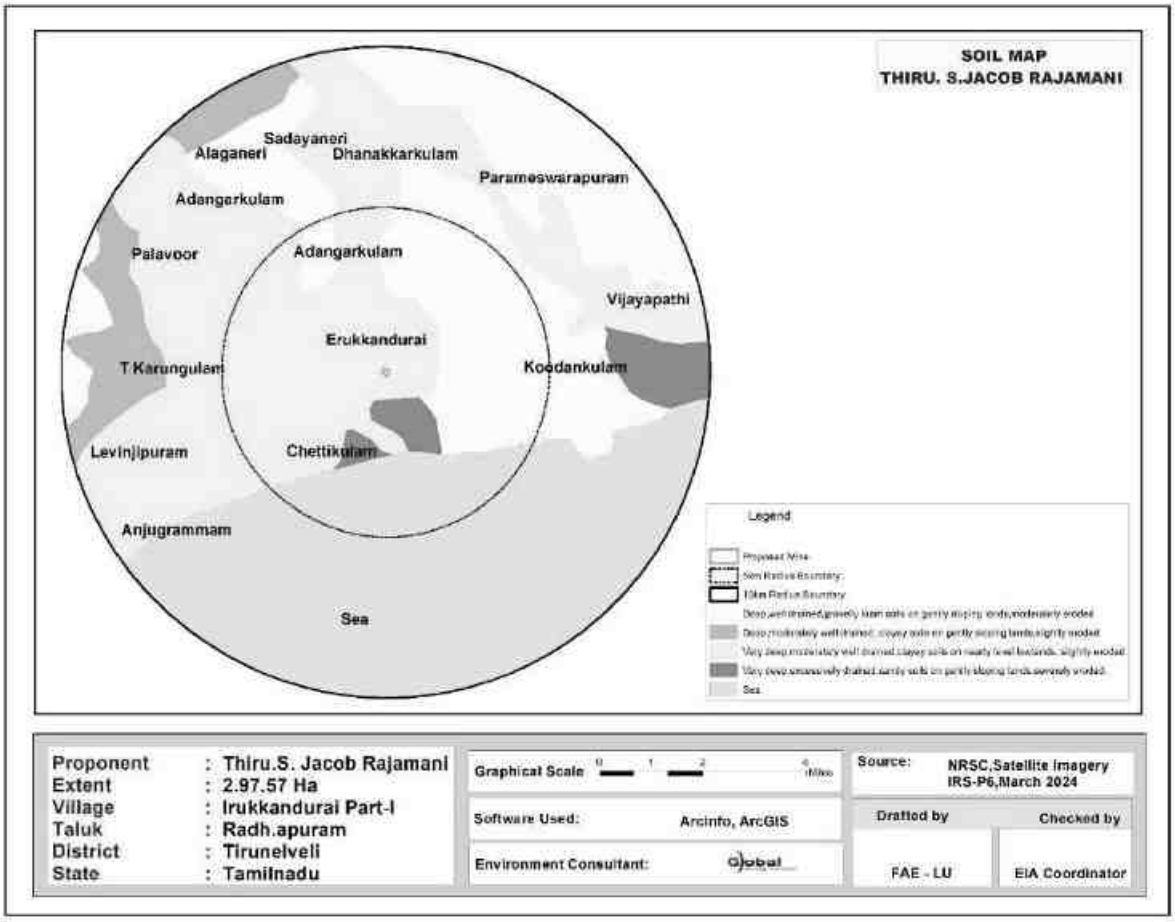
Geomorphology: The core and 10 km buffered zone geomorphological features (Figure 3.24) show that the study area covered a younger coastal plain (4.02 sq.km area) on the southern side of the study area, an active quarry area (3.33 sq.km) in the eastern part of the buffer zone, 50% of the of the area covered by the active flood plain (195.76 sq.km area), and 35% of the of the area covered by the sea (99.83 sq.km). The older coastal plain (25.19 sq.km) as well as aeolian-stabilized dunes are seen in the southern coastal parts of the study area. The numerous lineaments are mostly tending in the NE-SW direction, while a few are tending in the NW-SE direction.

FIGURE 3. 24 10 KM RADIUS OF THE STUDY AREA GEOMORPHOLOGY MAP



Soil: The soil types in the study area are very deep, moderately well drained, calcareous clay soil develops over lowlands (Figure 3.25.). Study area mostly Deep, well drained, gravelly loam soils on gently sloping lands, moderately eroded with area of 86.87 sq.km (Figure 3.25) (north, east, west and central part of the study area), Deep, moderately well drained, clayey soils on gently sloping lands, slightly eroded with area of 16.08 sq.km, Very deep, moderately well drained, clayey soils on nearly level lowlands, slightly eroded with area of 108.07 sq.km, Very deep, excessively drained, sandy soils on gently sloping lands, severely eroded with an area of 9.58 sq.km and Sea (99.82 sq.km).

FIGURE 3.25 10 KM RADIUS OF THE STUDY AREA SOIL TYPE MAP



3.12.4 BELOW GROUND LEVEL (BGL)

Figure 3.26 & 3.27 shows the Non-Monsoon and Monsoon water level map of the study area.

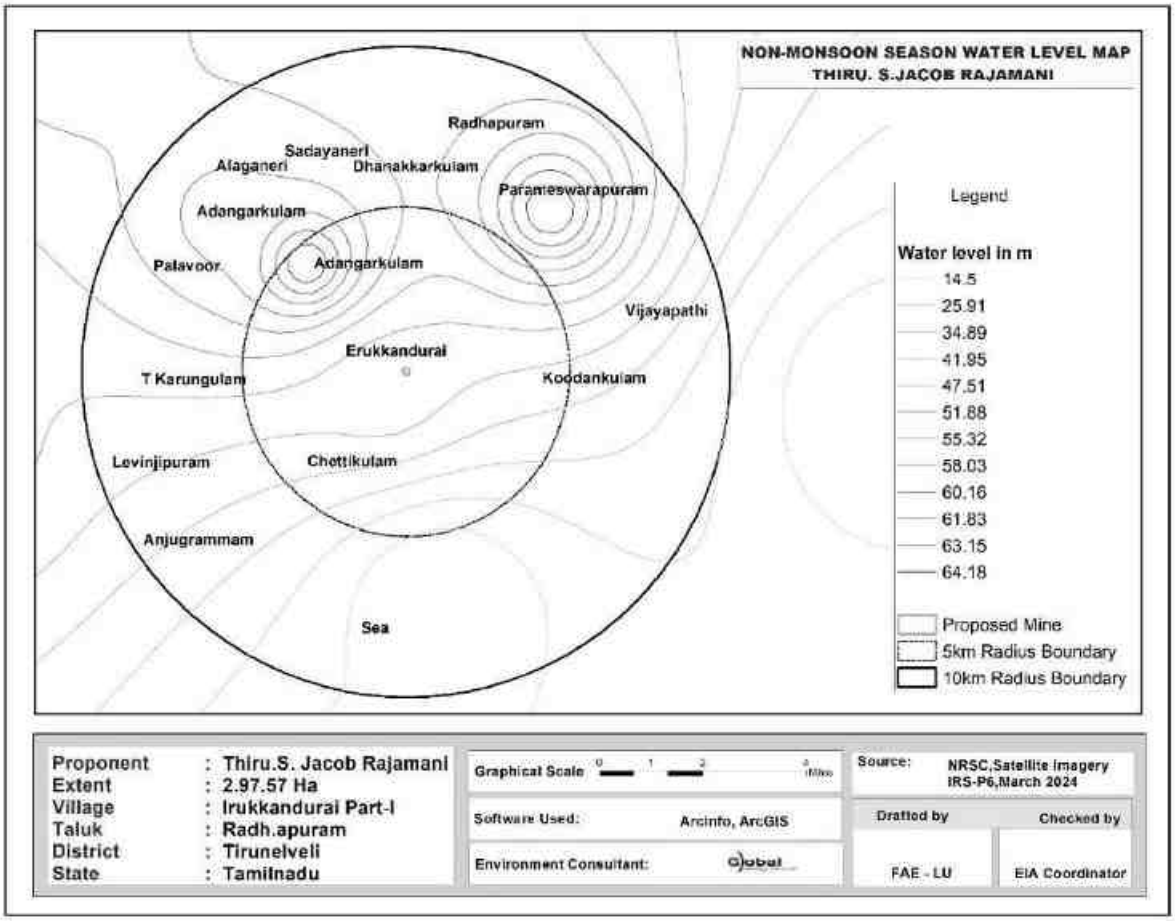


FIGURE 3.26 NON-MONSOON WATER LEVEL MAP OF THE STUDY AREA

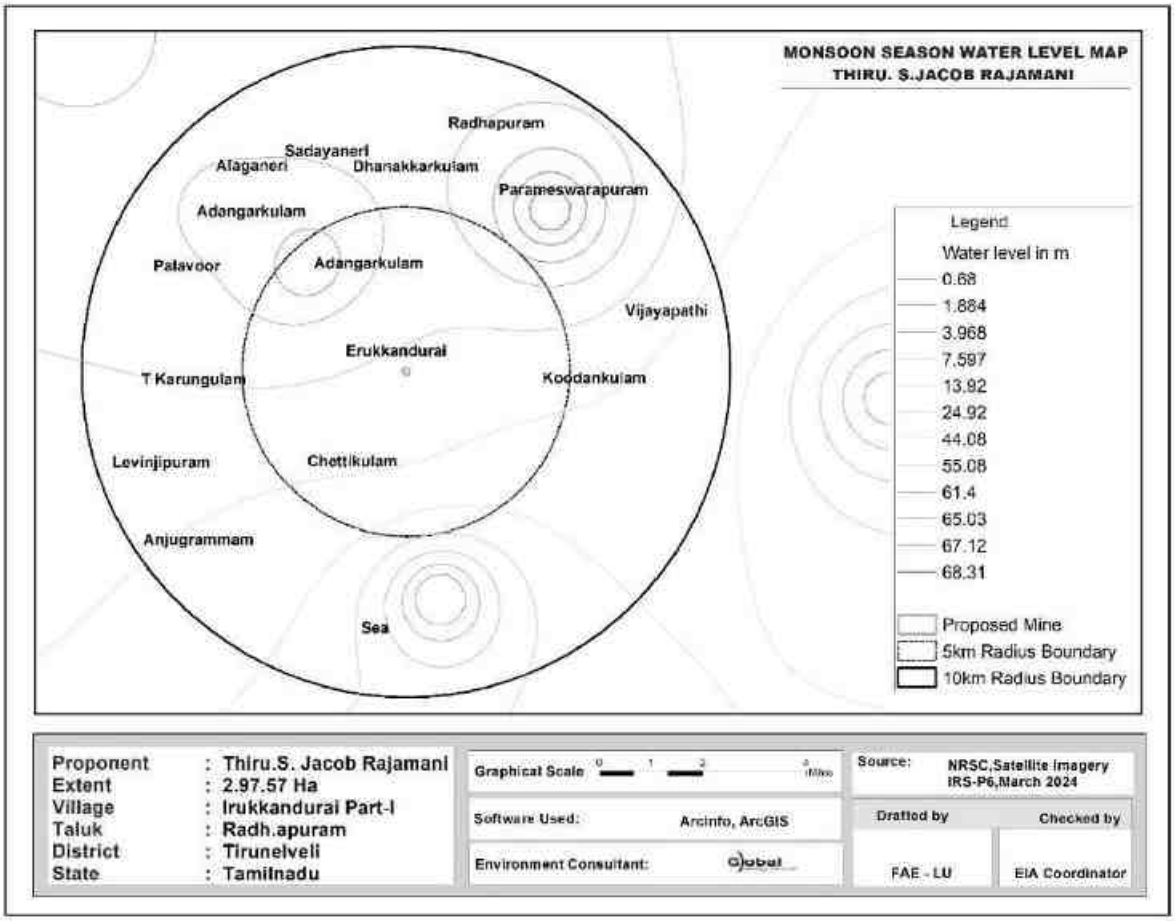


FIGURE 3.27 MONSOON WATER LEVEL MAP OF THE STUDY AREA

3.12.5 FIELD INVESTIGATION

There is Indian Ocean is located at a distance of 3.43 km in South direction & Hanuman Nadi is located at a distance of 80m in south direction from lease area. The water is temporarily found only during the rainy season.

In this representation in the two seasons, the water level substantially gets fall-down in the non-monsoon season, because of the rainfall impact and it extended up to the Monsoon season. Some of the wells water level is shallow depth in both seasons. These dug wells are located nearby water bodies. So, clearly shows that surface water is impact in these wells.

The shallow depth of groundwater level in the monsoon season. It is interesting to note that the water level is increased because of heavy rainfall during the southwest and northeast monsoon. The groundwater table level is substantially increased in the monsoon season.

In the study area, the shallow aquifer is developed through dug wells and deeper aquifer through tube wells. The study has revealed that potential fractures are encountered at deeper levels. The water in the wells is available mainly monsoon and it reduces during non-monsoon demanding the groundwater. Bore wells are deep and it reflects that the yield is only better at deeper water levels.

Rain water collected in the tanks in the region acts as a good source of water during monsoon season. In order to increase the recharge, tanks, and percolation ponds may be provided with the recharge wells/recharge shafts penetrating this impervious layer to make it more effective in recharging the aquifer.

CHAPTER 4

ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

4.1. INTRODUCTION

This chapter deals with the various anticipated environmental impacts and mitigation measures of the proposed mining activity. The proposed method of mining is Opencast Mechanized and the quarry operation involves Shallow Jack Hammer Drilling, Blasting, Excavation, Formation of benches, Loading and Transportation of minerals. The above activities may affect the surrounding environment like removal of rock mass, Loss of flora and fauna of the area, surface water discharge, change in air and water quality, etc., If adequate measures are not taken for the proposed operations, it will cause the environmental degradation of the area and it will lead to affect to the ecosystem of the surrounding environment.

In order to maintain the existing environmental scenario of the proposed mine lease area it is mandatorily required to assess the present ecology and environment of the proposed mine lease area and buffer area of the project before starting mining operations. The various environmental impacts which are identified by the proposed quarrying activities have been discussed below and its subsequent paragraphs.

- Land Environment
- Soil Environment
- Water Environment
- Air Environment
- Noise Environment
- Biological Environment
- Socio Economic Environment

4.2. LAND ENVIRONMENT

This is a proposed Rough Stone Quarry & Gravel Quarry of Thiru.S. Jacob Rajamani S/o.Soundarapandian, at S.F. No. 613(P) and 643(P) over an extent of 2.97.57 Ha., in Irukkandurai Part-I Village, Radhapuram Taluk, Tirunelveli District, Tamil Nadu State. The method of mining is Opencast mechanized with a bench width and height of 5m. It is proposed to excavate to 5,23,006 m^3 of Rough Stone and 24,487 m^3 gravel formation upto a depth of 47 m (BGL) for the period of five years. There is no stream/odai within the mine lease area.

The main anticipated impact on the Land Environment due to quarrying operation is change in Landscape, change in Land – use Pattern.

The entire mine lease area is Patta land. The project area of 2.97.57 ha boundary/fencing to be completed . It is proposed to be altered by effective quarrying operation such as excavation (2.39.76 Ha), Infrastructure (0.01.0), Road (0.01.0 Ha) and green belt will be developed in the safety zone of 0.55.81 Ha. The ultimate depth of quarrying is proposed with maximum depth of 47 m BGL and will not intersect the ground water table.

4.3 ANTICIPATED IMPACTS AND MITIGATION MEASURES

<table>
<tr><th>Aspect</th><th>Impact</th><th>Mitigation measures</th></tr>
<tr><td>Topography</td><td>The area is exhibits plain region covered by rough stone and Gravel formation. Quarrying activity will lead to change in geological setting of the area i.e., Due to the quarrying activity in the mine lease area will leads to affect the aesthetic view on the environment. Further, due to the movement of heavy vehicles in and around the mine lease area will leads to affect the surrounding agricultural lands, ecology and biodiversity, human habitations due to the emissions from vehicles like SO_2, NO_x, PM_{10}, $PM_{2.5}$, etc., The existing land use pattern is given as under.
<table>
<tr><th>Land Use</th><th>Present Area (Hect)</th><th>Area in use during the quarrying period (Hect)</th></tr>
<tr><td>Quarrying Pit</td><td>0.72.00</td><td>2.39.76</td></tr>
<tr><td>Infrastructure</td><td>Nil</td><td>0.01.00</td></tr>
<tr><td>Roads</td><td>0.01.00</td><td>0.01.00</td></tr>
<tr><td>Green Belt</td><td>Nil</td><td>0.55.81</td></tr>
<tr><td>Unutilized</td><td>2.24.57</td><td>Nil</td></tr>
<tr><td>Total</td><td>2.97.57</td><td>2.97.57</td></tr>
</table></td><td>The major impact due to this project on land environment is the change in land use. Mining activity will be carried out upto a depth of 47 m Below ground level. At the end of mining period, the quarried pit will act as a water reservoir to store the rain water.
Land Use at the end of mine will be as follows.
<table>
<tr><th>Land Use</th><th>Area in use during the quarrying period (Hect)</th></tr>
<tr><td>Area left for water body</td><td>2.39.76</td></tr>
<tr><td>Green Belt</td><td>0.55.81</td></tr>
<tr><td>Remaining area</td><td>0.02.0</td></tr>
<tr><td>Total</td><td>2.97.57</td></tr>
</table>
At the mine closure stage 2.39.76 Ha of lease area will be left as harvesting pond. 0.55.81 Ha will be developed with green belt.

Greenbelt shall be developed around the mine lease area and the details has been given below.
<table>
<tr><th>Year</th><th>Species</th><th>No. of trees</th><th>Spacing</th><th>Survival</th></tr>
<tr><td>I</td><td rowspan="2">Azadirachta indiaca</td><td>1500</td><td rowspan="2">3m x 3m</td><td rowspan="2">80%</td></tr>
<tr><td>II</td><td>-</td></tr>
</table></td></tr>
</table>

<table>
<tr>
<td></td>
<td>The ultimate pit dimension of the mine lease area is given below.

<table>
<tr><th colspan="4">Ultimate Pit dimension at the end of Mining plan Period</th></tr>
<tr><th>Pit No.</th><th>Length (max) (m)</th><th>Width (Avg) (m)</th><th>Depth (max) (m)</th></tr>
<tr><td>I</td><td>162</td><td>148</td><td>47 m Below ground level</td></tr>
</table>

If mining is not done systematically it will lead to the dumping failure in the mining area.</td>
<td>
<table>
<tr><td>III</td><td rowspan="3"></td><td>-</td><td rowspan="3"></td><td rowspan="3"></td></tr>
<tr><td>IV</td><td>-</td></tr>
<tr><td>V</td><td>-</td></tr>
<tr><td colspan="2">Total</td><td>1500</td><td></td><td></td></tr>
</table>

Due to the thick vegetation around the mine lease area and sprinkling of water around the haul roads the dust emissions arises from the vehicles will be controlled.
At the end of mining period, fencing will be provided around the mine lease area to arrest the entry of public/cattle to the mining area.
The rough stone and Gravel are proposed to quarry 5m bench height and 5m width with 45^0 slope and with conventional Opencast-Mechanized method. As per the approved mining plan a safety distance of 7.5m & 50m safety barrier to be provided for Amman temple. There is no overburden anticipated during the entire Rough Stone and Gravel quarrying operation. The excavated rough stone and Gravel will be directly loaded into tipper to the needy crusher/other buyers.</td>
</tr>
<tr>
<td>Drainage</td>
<td>Mine drainage is surface water or groundwater that drains from an active or abandoned mine. One of the adverse impacts of mine drainage is it will contaminate the ground water.</td>
<td>As per the approved mining plan the ultimate pit limit is 47m (BGL). The ground water table is reported as 62m. In the proposed mining plan only 47 m below ground level has been envisaged as workable depth for safe & economic quarrying for the entire lease period. Hence the quarrying operation may not affect the ground water.</td>
</tr>
<tr>
<td>Soil Quality and Agriculture</td>
<td>In monsoon seasons due to the excavation of minerals soil erosion and sediment deposition will occur in the nearby water bodies.</td>
<td>It is proposed to quarry upto a depth of 47m below ground level and the nearby water table is 62 m. So, the mining activity will not affect the ground water. To prevent the soil erosion during monsoon season, garland drain will be constructed with silt traps.</td>
</tr>
</table>

Visual impact on surrounding environment	Quarrying activities and rock extraction generally cause several environmental effects on the surrounding areas. The alteration of landscape due to activities like excavation, drilling or blasting, in particular, often generates a visual impact on the receptors set in the surroundings. Among these effects, the shape, extent, or chromatic contrast of the mining surface with the original land form may represent a huge loss of appeal for the growth of new urban settlements.	The reclamation of the post mined quarry surface is aimed at restoring the ecological balance taking into account geological parameters but also local flora and climate. Further the ultimate depth of mining is 47m. In the post mining stage, the quarried-out pit will be used for rainwater harvesting.

4.4 SOLID WASTE GENERATION AND MANAGEMENT

The plastic waste generation is very negligible and it will be collected from the source level in specific dustbin and disposed through the municipal bins.

- Identification of solid waste generations
- Providing dustbins to collect with different color coding
- Creating awareness among the employees
- Developing common storage yards
- Disposal to the nearby municipal yards
- Record keeping
- Review once in quarter

4.5 WATER ENVIRONMENT

4.5.1 Impact on Surface Water Resources

There is no seasonal or perennial Odai within the M.L area. The drainage pattern of the region is plane to sub-dendritic. Surface run-off water of the M.L. area is drained through proposed drainage and collected in the bottom of the quarry and collected water will be used for same quarry operation as such for plantation & dust suppression.

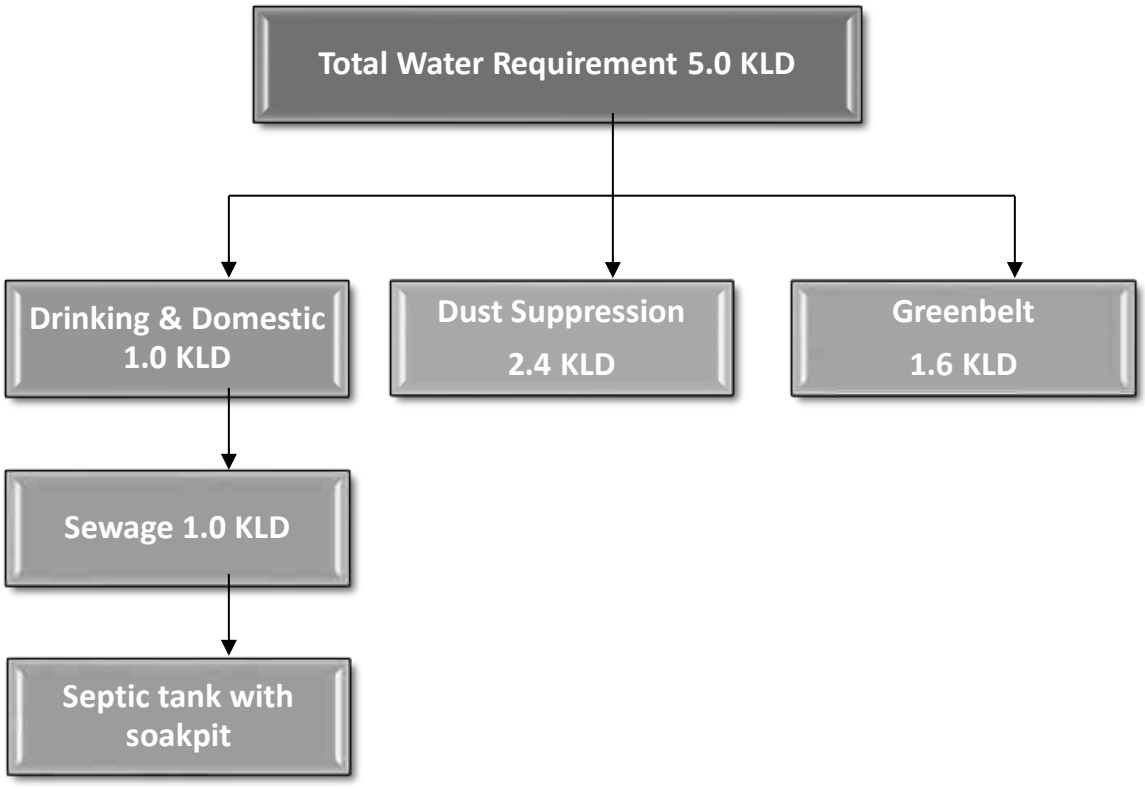
There is Indian Ocean is located at a distance of 3.43 km in South direction & Hanuman Nadi is located at a distance of 80m in south direction from lease area. The water table in the area is around 62m BGL.

Since these water bodies are located outside the lease area and there is no discharge of effluent or any untreated water from the mines will be made into these water bodies, there is no major impact. The project proponent will restrict the mining operation only within the lease and no other work will be carried out outside the mining lease.

4.5.2 Impact due to Water use in Mines

In the proposed mines water will be mainly used for domestic purpose, dust suppression & plantation. Total water requirement for the project is 5.0 KLD which will be sourced from outside agencies. Negligible sewage of 1.0 KLD will be generated, for which a septic tank with soak pit will be set up. The water balance diagram is given below.

FIG 4.1 WATER BALANCE DIAGRAM



4.5.3 Impact on Ground Water

The mining activity is not likely to intersect ground water as The water table in the area is around 62m BGL. The mining will go up to the maximum depth of 47m BGL. So, there will be no chance of intersecting the ground water table by the mining activity. So, the impact of mining on the ground water is not envisaged.

4.5.4 Mitigation measures

- Entire lease area will be provided with proper garland drains.
- Check wears will be provided to prevent solids from wash off.
- Construction of garland drains around freshly excavated so that flow of water with loose material is prevented.
- The mine water will be passed through the natural slopes and valleys and gets accumulated in the settling tank (Bottom pit)

4.5.5 Ground water environment in buffer zone

The scenario of ground water in Tirunelveli District, Radha Puram Taluk is given below.

Table 4.1 Ground Water Level Status in Tirunelveli District

S. No.	Assessment Unit (Firka)	Net Annual Ground water availability	Existing gross ground water consumption for irrigation	Existing gross ground water consumption for domestic and industrial water supply	Existing gross ground water consumption for all uses	Stage of ground water development	Category
1	Tirunelveli	1,452.10	1,306.20	42.09	1,348.29	93%	CRITICAL

Source:nwm.gov.in

It is planned to carryout appropriate rainwater harvesting schemes and artificial recharge schemes in the area.

4.6 VEGETATION

4.6.1 VEGETATION IN THE CORE ZONE

The mine lease area is devoid of major plantation. Shrubs and bushes are majorly found within the lease area. The proponent has planned to develop green belt in an area of 0.55.81 Ha. Trees like Pungai, Vagai, Vembu, Manjal konrai, Naval, Puvarasu, etc., will be planted around the mine lease area. A total of 1500 trees are planned to be planted. Spacing will be 3m x 3m.

4.6.2 FAUNA

There are no sanctuaries/national parks in the buffer zone of 10km study area. The commonly found fauna in the buffer zone are given in Chapter III. During mining activity, the impacts and mitigation measures for Fauna are given in below table.

Table 4.2 Impacts and mitigation measures for Fauna

S.No.	Impact	Mitigation measure
1	Fauna is affected due to noise and vibration.	Sirens will be blown before blasting in the mines. To reduce noise levels, plantation will be done. Blasting will be carried out only in the allotted time.
2	Dust generation due to mining activities	To reduce dust generation, mist sprayers will be used. During transportation, the material will be covered with tarpaulin. Water sprinkling will be done to reduce generation of pollutants.
3	Change in land use of the lease area	After the mine closure stage, the mine pit will be left as rain water collecting tank, which can attract bird population in the nearby areas.
4	Accidental falling of animals	To prevent entry of animals, the mine lease surrounding area will be properly fenced with barbed wire.

4.7 AIR ENVIRONMENT

4.7.1 IMPACT DUE TO MINING OPERATION

Impact prediction is a very important phenomenon in evaluating the environmentally potential adverse impacts for any proposed mine project. The impact prediction is always carried out under worst possible conditions so as to mitigate or to eliminate the environmental hazards. These predictions thus calculated are superimposed over the baseline data to calculate the net impact on the environment after the proposed mine Project comes into production.

4.7.2 IMPACT ON AIR ENVIRONMENT

The impacts on air environment from a mining activity depend on various factors like production capacity, machinery involved, operations and maintenance of various equipment's and vehicle. Apart from these, there will be other activities associated viz transportation of mineral and waste, stocking facilities and dump management within the mine lease area that may contribute to pollution.

4.7.3 Air Emissions

The impacts on air environment from a mining activity depend on various factors like production capacity, machinery involved, operations and maintenance of various equipments and vehicle. Apart from these, there will be other activities associated viz transportation of mineral and waste, stocking facilities and dump management within the mine lease area that may contribute to pollution.

4.7.4 Quantitative Estimation of Impacts on Air Environment

An attempt has been made to predict the incremental rise of various ground level concentrations above the baseline status in respect of air pollution due to proposed is 5,23,006 m^3 of Rough Stone and 24,487 m^3 gravel by the open-cast mechanised mining method.

The pollutants released into the atmosphere will disperse in the down wind direction and finally reach the ground at farther distance from the source. The concentration of ground level concentrations mainly depends upon the strength of the emission source and micrometeorology of the study area.

In order to estimate the ground level concentrations due to the emission from the proposed project, EPA approved Industrial Source Complex ISC AERMOD View Model has been employed.

The mathematical model used for predictions on air quality impact in the present study is ISC-AERMOD View-6.8.6. It is the next generation air dispersion model, which incorporates planetary boundary layer concepts.

The AERMOD is actually a modeling system with three separate components:

AERMOD (AERMIC Dispersion Model), AERMAP (AERMOD Terrain Preprocessor) and AERMET (AERMOD Meteorological Preprocessor).

Special features of AERMOD include its ability to treat the vertical in homogeneity of the planetary boundary layer special treatment of surface releases, irregularly shaped area sources, a plume model for the convective boundary layer, limitation of vertical mixing in the stable boundary layer, and fixing the reflecting surface at the stack base.

The AERMET is the meteorological preprocessor for the AERMOD. Input data can come from hourly cloud cover observations, surface meteorological observations and twice-a-day upper air soundings. Output includes surface meteorological observations and parameters and vertical profiles of several atmospheric parameters.

The AERMAP is a terrain preprocessor designed to simplify and standardize the input of terrain data for the AERMOD. Input data include receptor terrain elevation data. Output includes, for each receptor, location and height scale, which are elevations used for the computation of airflow around hills.

Salient features of the AERMOD model are given hereunder:

- Excavation operations are considered as area sources.
- Transportation of material on haulage roads has been considered as line source

The predicted ground level concentrations for study period computed using AERMOD model are plotted as isopleths.

4.7.5 Sources of Dust Emission

The proposed mining is carried out by mechanized opencast method. The air borne particulate matter generated by ore handling operations, transportation and screening of ore is the main air pollutant. The emissions of sulphur dioxide (SO_2), Oxides of Nitrogen (NOx) contributed by diesel operated excavation/loading equipment and vehicles plying on haul roads are marginal. Prediction of impacts on

air environment has been carried out taking into consideration proposed production and net increase in emissions. Based on the various operations involved in the production of minerals, the various emission sources has been identified as given below.

a. Area sources.
b. Line sources.

Extraction of mineral from mine, are considered as area sources. Transportation of material from mining benches to various end points are considered as line sources. The impact of above sources on air environment is discussed below:

The other sources of air pollution are the dust generated during the movement of tippers on the haul road. Water tankers with spraying arrangement will be used for regular water sprinkling on the haul roads to ensure effective dust suppression. The tippers are well maintained so that exhaust smoke does not contribute abnormal values of noxious gases and un-burnt hydrocarbons.

4.7.6 Emission Details

All the emissions discussed above are quantified for proposed maximum production of is 5,23,006 m^3 of Rough Stone and 24,487 m^3 gravel by the open-cast mechanised mining method. The existing air quality levels are covered in the baseline scenario. Excavation, loading and transportation through tippers are the major sources, which are of significance. Therefore, the emissions considered for modeling are from drilling blasting, excavation & transportation rough stone and Gravel.

The emissions are computed based on AP-42 emission factors. Operational hours, activity rate, wind speed and moisture content have been considered for estimation of emissions from point and area sources. For line source, apart from operational hours, activity rate, moisture, silt content and vehicle weight have been considered.

Predictions are carried out for the worst-case scenario of simultaneous operation of excavators (area sources) and tippers for transportation from mine pit to loading pit (line sources) over a distance of 500 m.

The number of working days has been taken at 300 days per year with 8 hours of operation/day, hence the concentrations predicted are considered to be the worst case. With control measures, the emissions have been taken at 30% of uncontrolled emissions for handling and 10% of uncontrolled emissions for transportation.

4.7.7 Meteorological Data

The meteorological data recorded continuously during the month of March 2024 – May 2024 on hourly basis on wind speed, wind direction and temperature has been processed to extract the 24- hourly mean meteorological data as per the guidelines of IMD and MoEF for application of AERMOD model. Stability classes computed for the mean hours is based on guidelines issued by CPCB on modeling. Mixing heights representative of the region have been taken from the available published literature.

4.7.8 Summary of Predicted Ground Level Concentrations

Ground level concentrations due to the mining activities have been estimated to know the incremental raise and extent of impact in the study area.

The maximum ground level concentration is estimated to be about 0.74 µg/m^3 of PM 2.5 & 1.73 µg/m^3 of PM10 within the mine area and surrounding cluster area 0.99 µg/m^3 of PM 2.5 & 2.23 µg/m^3 of PM10, where mining operations are being carried out. The impact of mining operations would be negligible beyond 0.5 km.

Figure – 4.1 represents the spatial distribution of the predicted ground level concentrations of PM_{10} due to emissions from mine.

4.7.9 Emission sources & Quantification

Various point and non-point sources of emissions from Proposed Rough Stone and Gravel Quarry of Thiru.S. Jacob Rajamani S/o. Soundarapandian (Total Material handling (Rough Stone & Gravel) is quantified and presented below:

Area Emissions – Total Material handling of Thiru.S. Jacob Rajamani S/o.Soundarapandian (Rough Stone & Gravel).

Quantity, m^3	**Rough Stone:** 104601.2 m^3 **Gravel:** 4897.4 m^3
Operational Hours Per Year	2400
Activity Rate, t/hr.	390.2414
Emission of dust, g/t.	0.17
Emission of dust, g /hr.	53.12971
Area of influence, m^2	625
Uncontrolled emission rate g/s/m^2	0.000079757
Controlled emission rate, PM10 g/s/m^2	0.0000797578
Controlled emission rate, PM2.5 g/s/m^2	0.00000531718

Area Emissions – Total Material handling (Cluster Rough Stone & Gravel)

Quantity, m^3	**Existing Quarries:** • Thiru.G. Ramasamy (2.46.0 Ha) - Rough Stone (11940.8 m^3) & Gravel quarry (390 m3). • Tmt. Aswani (1.96.5 Ha) – Rough Stone: & Gravel quarry (57050 m^3) & Gravel quarry (24196 m^3).
Operational Hours Per Year	2400
Activity Rate, t/hr.	390.2151
Emission of dust, g/t.	0.20
Emission of dust, g /hr.	56.23475
Area of influence, m^2	625
Uncontrolled emission rate g/s/m^2	0.00068160
Controlled emission rate, PM10 g/s/m^2	0.000681608
Controlled emission rate, PM2.5 g/s/m^2	0.000045440

Line Source – Transport of Rough Stone & Gravel from Pit to Boundary

Quantity, m^3	**Rough Stone:** 104601.2 m^3 **Gravel:** 4897.4 m^3
Operational Hours Per Year	2400
Capacity of each Dumper (T)	10
Total No. of Tippers/ year	10949
Lead length/trip, Km	13
Total VKT/Year	53418
Emission Kg/VKT	0.23
Total emission Kg/Year	168469
Uncontrolled emission rate g/s/m	478546
Controlled emission rate, PM10 g/s/m	0.478564
Controlled emission rate, PM2.5 g/s/m	0.132929

Line Source – Transport of Rough Stone & Gravel (Cluster)

Quantity, m^3	**Existing Quarries:** • Thiru.G. Ramasamy (2.46.0 Ha) - Rough Stone (11940.8 m^3) & Gravel quarry (390 m3). • Tmt. Aswani (1.96.5 Ha) – Rough Stone: & Gravel quarry (57050 m^3) & Gravel quarry (24196 m^3).
Operational Hours Per Year	2400
Capacity of each Dumper (T)	10
Total No. of Tippers/ year	1,40,200
Lead length/trip, Km	0.8
Total VKT/Year	9357
Emission Kg/VKT	0.23
Total emission Kg/Year	181426
Uncontrolled emission rate g/s/m	408965
Controlled emission rate, PM10 g/s/m	0.4089652
Controlled emission rate, PM2.5 g/s/m	0.113601

Note: *Emission factor computed based on wind speed of 2 m/s, and moisture content of 10 %. + Emission factor computed based on silt content of 10 % and moisture content of 10 %

FIG 4.2 Isopleth of GLC Prediction for $PM_{2.5}$

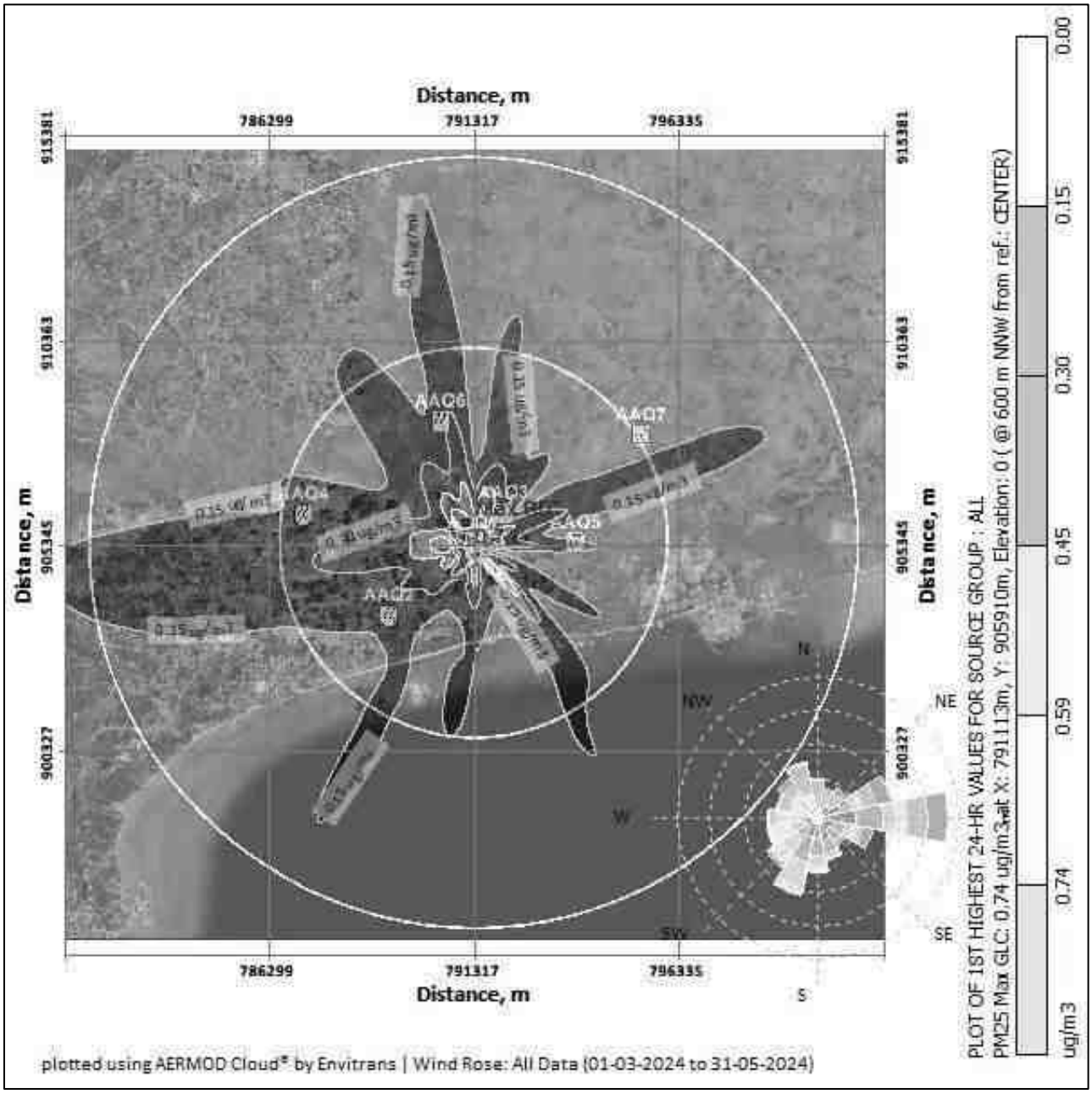


FIG 4.3 Isopleth of GLC Prediction for PM_{10}

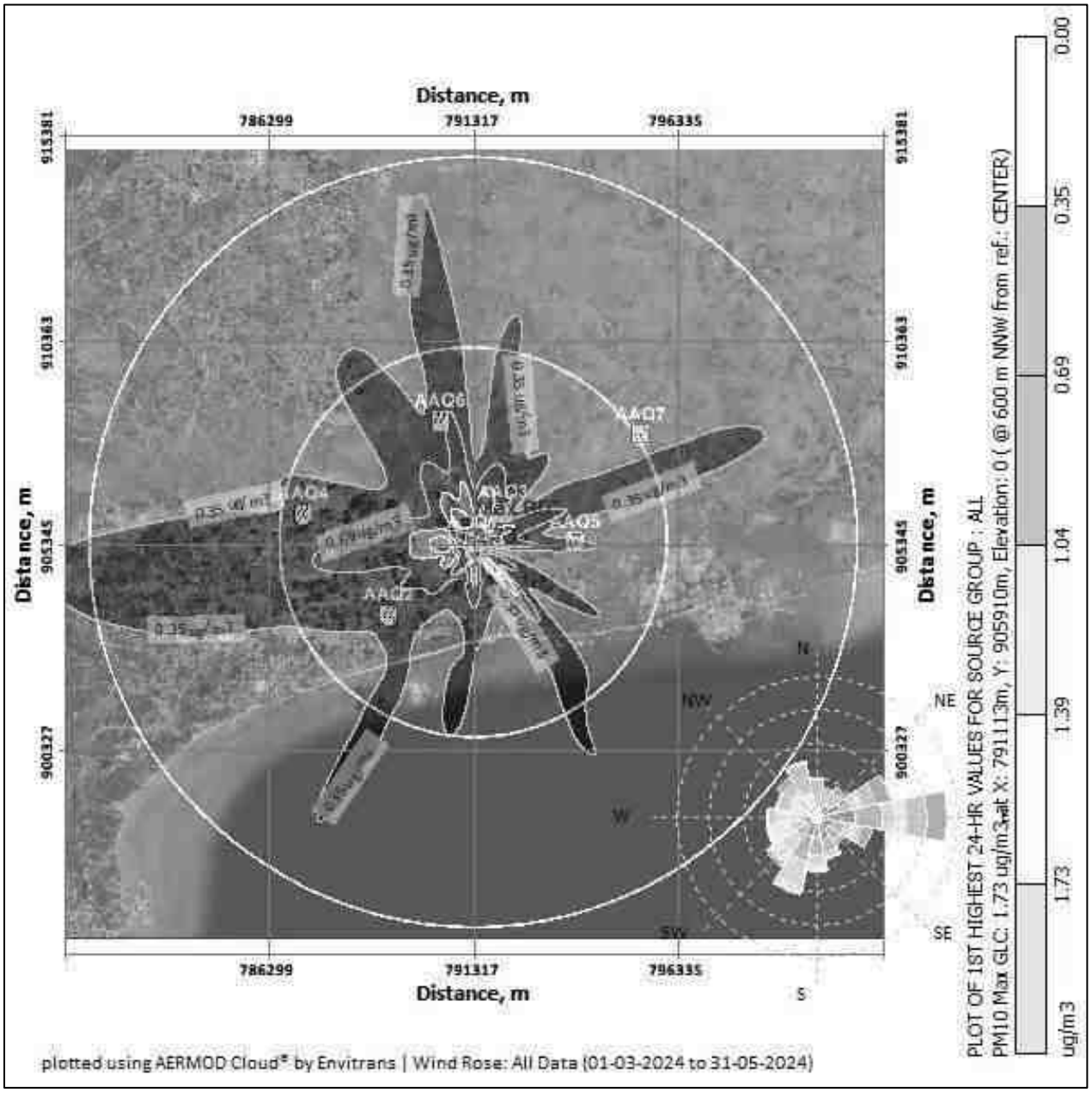


FIG 4.4 Isopleth of GLC Prediction –Cumulative for $PM_{2.5}$

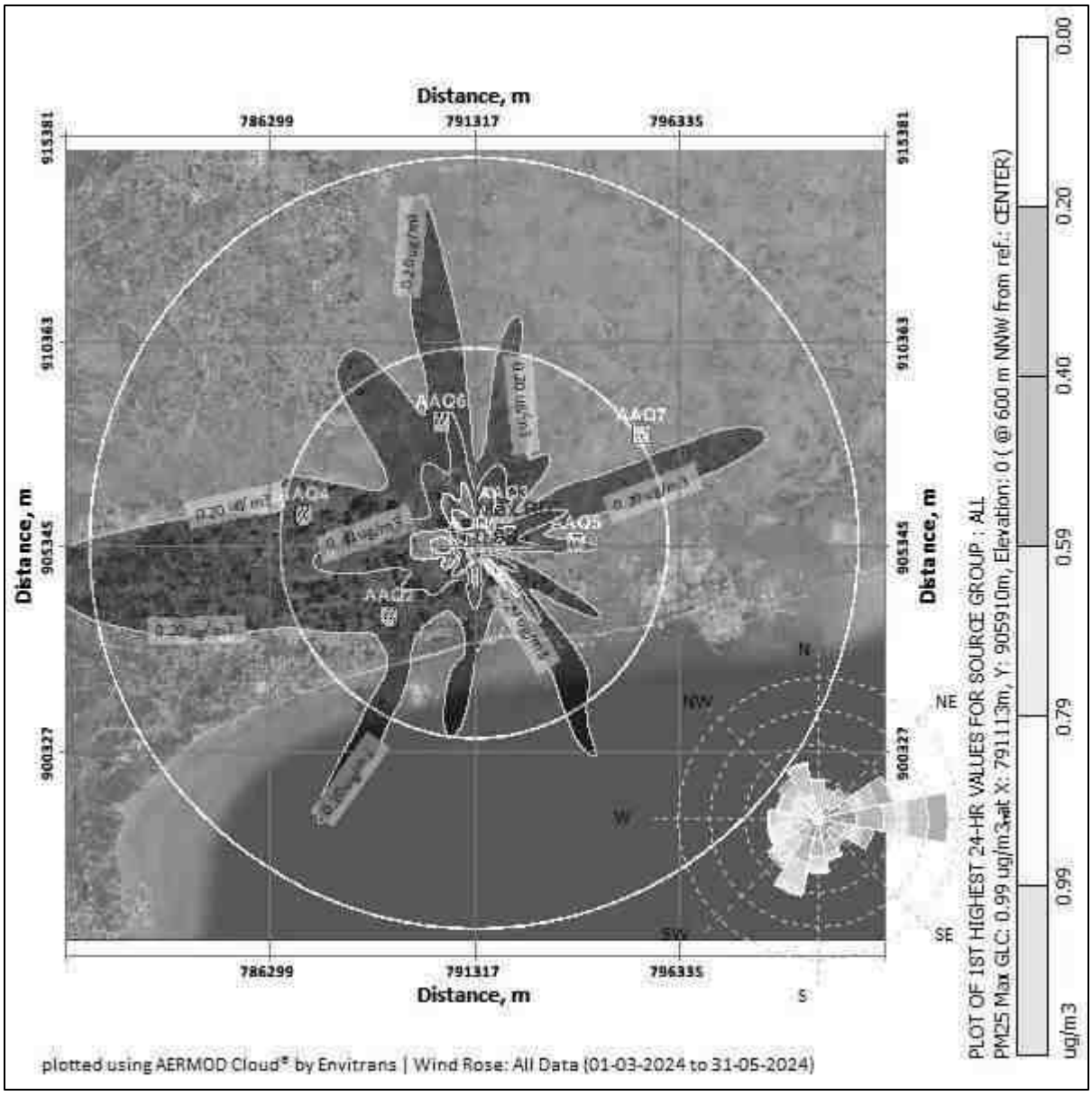
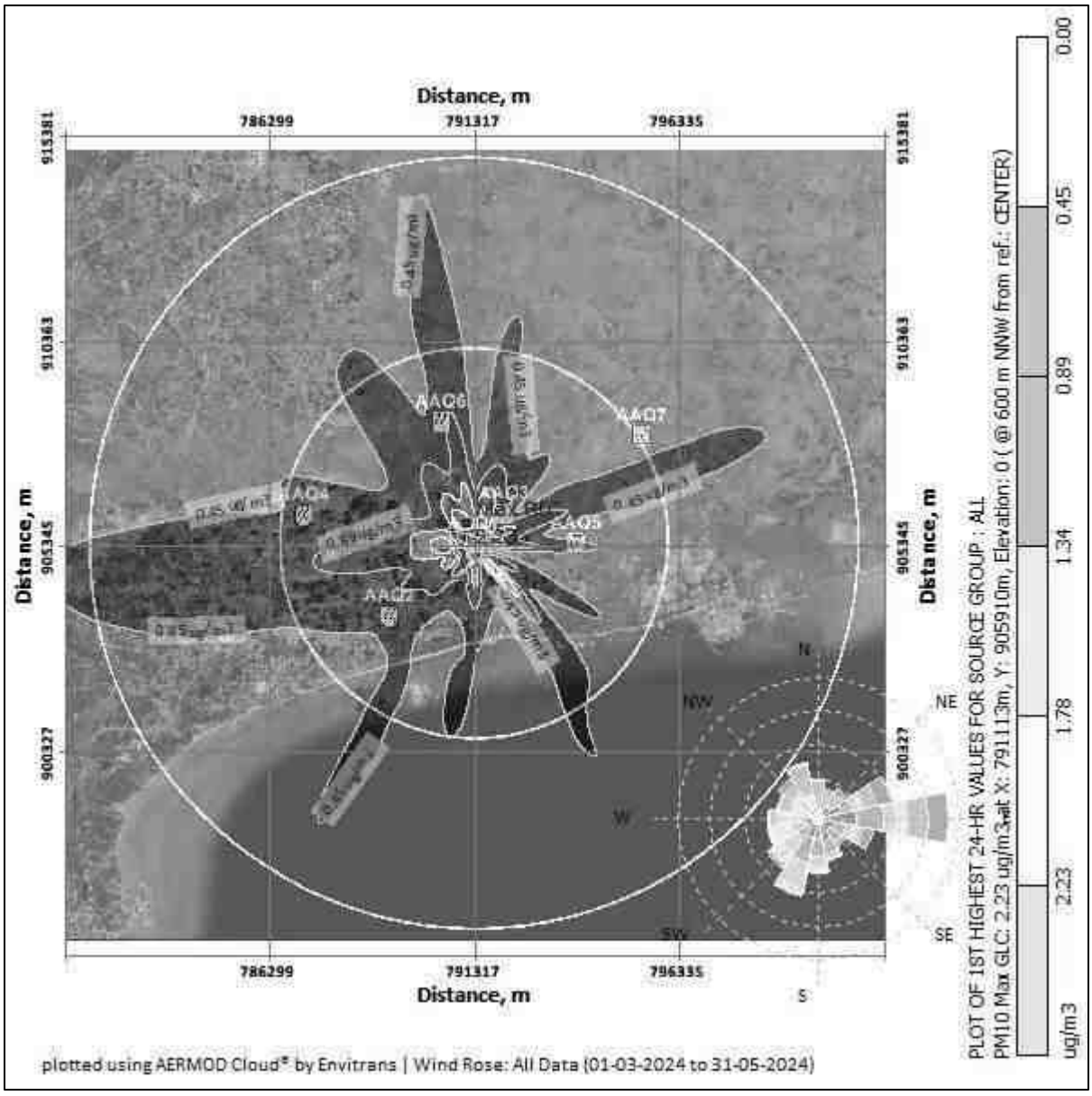


FIG 4.5 Isopleth of GLC Prediction –Cumulative for PM_{10}



PREDICTED AMBIENT AIR QUALITY:

The post project Concentrations of PM10, PM2.5, (GLC) (base line + incremental) after adopting necessary control measures is given in Table No - 4.3.

Table 4.3 Concentrations of PM2.5 after Project Implementation					
SL. No	**Location**	**Background Concentration**	**Predicted incremental Concentration**	**Post Project Concentration**	**Statutory Limits in µg/m³**
1	Project site	27.75	0.74	28.49	60
2	Chettikulam	24.85	0.59	25.44	
3	Erukkandurai	26.32	0.45	26.77	
4	T Karungulam	24.85	0.30	25.15	
5	Koondankulam	27.69	0.26	27.95	
6	Adangarkulam	24.16	0.20	24.36	
7	Sanganeri	24.19	0.15	24.34	

Table 4.3a Cluster Concentrations of PM2.5 after Project Implementation					
SL. No	**Location**	**Background Concentration**	**Predicted incremental Concentration**	**Post Project Concentration**	**Statutory Limits in µg/m³**
1	Project site	27.75	0.99	28.74	60
2	Chettikulam	24.85	0.79	25.64	
3	Erukkandurai	26.32	0.59	26.91	
4	T Karungulam	24.85	0.40	25.25	
5	Koondankulam	27.69	0.30	27.99	
6	Adangarkulam	24.16	0.20	24.36	
7	Sanganeri	24.19	0.15	24.34	

Table 4.3b Concentrations of PM10 after Project Implementation					
SL. No	**Location**	**Background Concentration**	**Predicted incremental Concentration**	**Post Project Concentration**	**Statutory Limits in µg/m³**
1	Project site	57.15	1.73	58.88	100
2	Chettikulam	50.35	1.39	51.74	
3	Erukkandurai	53.80	1.04	54.84	
4	T Karungulam	57.30	0.69	57.99	
5	Koondankulam	57.25	0.50	57.75	

6	Adangarkulam	49.90	0.35	50.25	
7	Sanganeri	49.70	0.15	49.85	

Table 4.3c Cluster Concentrations of PM10 after Project Implementation

SL. No	Location	Background Concentration	Predicted incremental Concentration	Post Project Concentration	Statutory Limits in µg/m^3
1	Project site	57.15	2.23	59.38	100
2	Chettikulam	50.35	1.78	52.13	
3	Erukkandurai	53.80	1.34	55.14	
4	T Karungulam	57.30	1.00	58.30	
5	Koondankulam	57.25	0.89	58.14	
6	Adangarkulam	49.90	0.45	50.35	
7	Sanganeri	49.70	0.22	49.92	

The above report seems that, even in the worst-case scenario, the resultant added concentrations with baseline figures show that the values of ambient air quality for PM_{10} are in the range of 49.85 µg/m^3 to 58.88 µg/m^3 and for $PM_{2.5}$ are in the range of 24.34 µg/m^3 to 28.49 µg/m^3 and PM_{10} are surrounding area range of 49.92 µg/m^3 to 59.38 µg/m^3 and for $PM_{2.5}$ are in the range of 25.25 µg/m^3 to 28.74 µg/m^3 which are within the statutory limits in each case. The mitigation measures undertaken in the mine for control of air pollution are given below.

- Wet drilling will be practiced in drilling operation.
- Water sprinkling will be done in haul roads & loading etc.
- The mines workers are provided with the dust masks.
- Three-layer plantation in the safety zone.

DG sets shall be periodically maintained as per manufacturer's specifications.

4.8 NOISE ENVIRONMENT

The main noise generating source during mining operation and related activities are drilling, excavation, loading and transportation. Intermittent noise is generated due to operation of diesel generator.

4.8.1 Likely Noise Levels in Lease Area due to mining activity

S.No.	Source Name	Noise Level in dB (A)
1	Diesel generator	90
2	Excavator Operation	86
3	Trucks movement	82
4	Drilling	96
5	Blasting	102

It is expected that the generated noise will be limited within the mine lease area and there will be no profound effect of noise on the buffer zone. The noise level will be maintained below the threshold limit by vigorous maintenance of the machineries. Wet drilling with dust extractor is being used to reduce the noise level during the mining operation.

Noise levels were measured in the lease area and in the nearby villages Erukkandurai, Village, Chettikulam Village, T Karungulam Village, Koondankulam Village, Sanganeri village and Adangarkulam village the values are given below.

Table 4.4 Noise Levels in Monitoring Locations

S. No.	Location	Distance and direction from Mine lease area	Day Equivalent (in dBA)	Night Equivalent (dBA)
1	Project site	Core Zone	50.2	39.9
2	Chettikulam	2.8 km, SW	47.4	39.9
3	Erukkandurai	1.0 km, NE	45.8	39.2
4	T Karungulam	4.4 Km, W	43.6	39.6

5	Koondankulam	2.6 Km, E	46.0	40.4
6	Adangarkulam	3.18 Km, N	50.3	38.7
7	Sanganeri	5.13 Km NE	46.9	42.2

The noise levels are within the MoEF & CC limits of 75 dB(A) in the working area and in the buffer areas, the values are below the limit of 70 dB(A). Since, the residential area norm has been considered for all seven locations mentioned above, during mining operation mine lease area will be considered as industrial area/quarry area for which DGMS norms 85 dB(A)/CPCB guidelines 75 dB(A)

4.8.2 Impact of Noise due to mining

- Noise generation in mining is due to operation like drilling, blasting and transportation of minerals within and outside the lease area.
- As per DGMS (Directorate General of Mines Safety) limits, the acceptable noise level is 85 dB(A) for an exposure period of 8 hours.
- Exposure to loud noise can also cause high blood pressure, heart disease, sleep disturbances, and stress. Noise pollution also impacts the health and well-being of wildlife.
- Noise exceeding prescribed limits may cause impairment like abnormal loudness perception, tinnitus which causes a persistent high-pitched ringing in the ears, paracusis or distorted hearing.

4.8.3 Mitigation measures for Noise level control

- As the distance between the source and receptor increases, the noise level decreases. Hence, there will be a natural attenuation.
- The proponent has planned to develop green belt in the periphery of the lease area which diminishes sound volume by dampening them.
- All the equipment/machinery/tippers involved will be properly maintained to control noise generation.
- Conducting regular health checkups for employees involved.

- Employees will be made to work on shifts to reduce their exposure time.
- Providing earplugs to all employees.
- Providing green walls/nets wherever possible.

By adopting these measures, the noise levels will be maintained well within MoEF & CC limits since the baseline value is low.

4.9 IMPACTS DUE TO VIBRATION

There will be negligible vibration of ground due to the following activities.

- Due to Blasting
- Due to Drilling
- Due to movement of machinery

Impacts

- Though vibration will be only felt by the people working inside the lease area it is usually undesired.
- Vibration may also cause flyrocks.
- It may frighten the birds and small insects in the lease area. However, it will be felt only for a short period.

Mitigation measures

- The DG set will be kept within the acoustic enclosure made by the stone blocks.
- Drills will be equipped with sharp bits and wet drilling will be adopted.
- A well planned green belt is proposed for the mining to reduce noise level.
- Proper warning system before blasting will be adopted and clearance of the area before blasting will be ensured.
- Regular maintenance of the machineries and vehicles to reduce the noise level.
- Use of ear muffs by the workers with occupational exposure to noise.
- Carrying out blasting on limited scale, only from 12:00 PM to 2:00 PM
- Control of fly rock and vibration by maintaining peak particle velocity within the standard as prescribed by the DGMS and MOEF & CC.
- Shallow depth jackhammer drilling and blasting is proposed to be carried out with minimum use of explosive.

- Supervising blasting by competent and statutory Foreman/ Mines Manager.

4.10 SOCIO ECONOMIC IMPACT

The lease area is Consented Patt land. The proponent has planned to spend INR 8,00,000 for CER activities.

4.11 OCCUPATIONAL HEALTH

4.11.1 Impacts on humans due to various mining activities

The occupational risk due to proposed mining may be due to drilling, blasting, excavation and transportation. A total of 32 workers will be engaged in the mining activity. Mining activity may cause various health problems to the mines workers as follows:

- Dust generated during excavation, drilling, stone cutting, sizing and transportation may cause health problems like Silicosis, Asthma, Tuberculosis and other respiratory lungs disorders.
- Heavy weight lifting by the workers may cause injuries to arms, legs and back.
- Noise generated during the mining activity may cause Noise Induced Hearing Loss (NIHL).

Table 4.5 Impacts on humans due to various mining activities

S.No.	Type of activity	Impact
1	Dust generation due to drilling and blasting	Continuous exposure to dust causes Pneumonia, Tuberculosis, Rhematic arthritis and Segmental Vibration
2	Noise generation due to drilling and blasting	Short term impact will be lack of sleep, high blood pressure and heart ailments. Long term exposure may lead to partial or permanent deafness
3	Unexpected accidents	Risks include fly rocks, cracks or fissures due to improper mining methods

4.11.2 Mitigation measures

- The mines worker will be provided with dust mask to minimize the inhalation of the dust.
- Water sprinkling twice in a day is in practice on the haul roads, near excavation and roads to reduce the fugitive dust emission.
- Wet drilling and drilling with dust extractor will be practiced.
- Ear muffs will be supplied to the workers working in the noise prone area
- The mining site will be supplied with first aid facilities and the entire mines worker will have access to that.
- The mines workers will be well trained about the safety practices in the mining activities.
- As per Mines Rules, 1955, medical examination of employees at the initial stage and periodically, shall be done by a team of qualified medical officers provided by the project proponent.
- Regular medical checkup camps shall also be arranged for detection of occupational diseases and minor disease in the nearby rural population.
- Free checkup and medicine for treatment for their acute and chronic illness shall be provided by the lessee. Conducting periodical Medical Examination as per DGMS.
- Making all first aid kits available in mines office
- Keeping fire extinguisher in place
- Educating the employees about how to handle unexpected happenings
- Posting information containing emergency contact numbers in mines office
- By adopting all these measures, the safety of the employees working in the quarry will be ensured.

4.12 WASTE MANAGEMENT

4.12.1 Solid Waste

Since the entire mined out material will be utilized there will not be any solid waste generation from this project. However, the Solid waste (MSW) generated from administrative activities will be properly collected and disposed to Govt. Authorized yards / Re-cylers / Disposers.

4.12.2 Liquid Waste

There is no process effluent generation from this mine. Hence no liquid waste is generated. Domestic wastewater i.e 1.0 KLD will be discharged in soak pit via septic tank.

4.12.3 Hazardous Waste Management

In this project the following management practices will be followed:

In the quarrying operation, the source of hazardous waste is from machinery maintenance activities that are waste oil/ Waste lubricants / Used filters / Used Hydraulic horses. The said hazardous waste are very negligible quantity, it will be properly collected in the source level, stored in impervious storage yards and disposed of as per the Hazardous waste (Trans-boundary Movement) Management Rules, 2016.

4.12.4 Plastic Waste

Single use plastics/ use and throwaway plastics will be banned in the site as directed by the Tamil Nadu Government vide GO(Ms)No.84 regarding ban on use of plastic products. The employees will be encouraged to use compostable material or reusable material.

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CHAPTER 5

ANALYSIS OF ALTERNATIVES

5.1 ALTERNATE TECHNOLOGY

The mining technology is mechanized Opencast in single-shift operation without any change in technology. The operation will be carried out as per DGMS norms. No alternate technology will be used. Details of the technology used are given in Chapter II.

5.2 ALTERNATE SITE

The proposed project is a mining project and will be operated within the lease grant area. So, no alternate sites have been assessed. Since the resource (Rough Stone & Gravel) is site-specific, the chosen location is the only site to carry out Rough Stone and Gravel quarry.

CHAPTER 6

ENVIRONMENTAL MONITORING PROGRAMME

6.1 ENVIRONMENTAL MONITORING

Monitoring is done to measure the efficiency of control measures implemented. Regular monitoring of various environmental parameters like air, water, noise and soil environments is needed to assess the status of environment during the project operation.

A schedule is framed with timeline to monitor various parameters during the operation of the project. The schedule is framed based on MoEF& CC and Tamil Nadu State Pollution Control Board. In case the SEIAA/TNPCB/MoEF&CC or other statutory bodies demand monitoring of any additional parameter/factor, the same will also be done.

The proposed quarry is a small quarry. Hence the Mines-in-charge will be responsible for environmental related activities. After obtaining EC, the conditions mentioned in EC will be strictly followed. The Mines-in-charge will be responsible for implementing the conditions. EC compliance report will also be submitted periodically.

6.2 OBJECTIVES OF ENVIRONMENTAL MONITORING

The objectives of Environmental Monitoring are as follows.

- Monitoring and analysis of air and water samples
- Implementing the control and protective measures.
- Coordinating the environment related activities within the project as well as with outside agencies. Collecting statistics of health of workers and population of the surrounding villages. Green belt development etc.
- Monitoring the progress of implementation of Environmental Management Programme.
- Monitoring the noise generation in and around the project areas.

- Monitoring of wastewater treatment and disposal of solid waste.
- The laboratory will be suitably equipped for sampling/testing for various environmental pollutants.

6.3 ENVIRONMENTAL MONITORING SCHEDULE

To evaluate the effectiveness of Environmental Management Programme, regular monitoring of the important environmental parameters will be taken up. The frequency of monitoring different parameters is given in table 6.1.

Table 6.1 Environmental Monitoring Schedule

Sl.No.	Description of Parameters	Parameters	Frequency
1	Air	Air Quality for SPM, PM-10, PM-2.5, SO_2 and NO_x	24 hour average samples Once in a 3 month
2	Water	General, Physical, and chemical parameters	Once per season
3	Noise	L_{eq}, L_{max}, L_{min}, L_{eq} Day & L_{eq} Night dB(A)	8-hour average samples Once in a 3 month
4	Soil	Physical and Chemical characteristics	Once per season

6.4 LOCATION

Monitoring of the above-mentioned environmental parameters would be done at appropriate and sensitive areas. The exact location of monitoring is given as Figure – 3.4, 3.10, 3.12 & 3.14.

6.5 MEASUREMENT METHODOLOGY

(a) Ambient Air Quality

Ambient air quality will be monitored for SO_2, NO_x, PM_{10} and $PM_{2.5}$. The instruments like high volume air samplers and Respirable dust samplers would be used for this purpose. These parameters will be monitored as mentioned in the monitoring schedule previously.

(b) Water Quality

Water quality analysis will be done quarterly and the monitored parameters include pH, Temperature, TDS, etc. as specified by SPCB from time to time.

(c) Noise Monitoring

Noise level will be monitored in working environment mainly noise producing sources over the boundary and around the mining area**.**

(d) Green Belt and Afforested Areas

Continuous vigilance and monitoring of green belt will be done for performance and survival rate of the saplings. Watch and ward personnel will properly guard the plantation. Provision will be made for fertilizers application and watering on schedule.

(e) Socio-Economics

Socio-economic of the core and buffer zone details elaborated in Chapter-3.

6.6 TECHNICAL ASPECTS OF MONITORING THE EFFECTIVENESS OF MITIGATION MEASURES

The above monitoring schedule will be followed periodically. After collection of the data, the mines-in-charge will analyze the data obtained. The data thus obtained will be incorporated in the EC Compliance report submitted to the Regional office, MoEF&CC. The measurement methodologies will be as per CPCB/BIS/MoEF&CC/DGMS norms.

6.7 EMERGENCY PROCEDURES

In case of any emergency due to environmental conditions, the mines in-charge will immediately report to the top-level management and the emergency response protocol will be implemented as per MoEF&CC/ SPCB / DGMS norms.

6.8 REPORTS TO BE GENERATED

The Project Proponent will maintain records of each test and its interpretation so as to formulate an adequate Environmental Management Plan. The set of records planned to be maintained by Project Proponent are given in below table 6.2.

Table 6.2 Important Records to be maintained by PP	
S.No.	**Particulars**
1	Monitoring results for Air, Water & Soil.
2	Records of slope failure, land erosion & drainage.
3	Plantation Records
4	Environmental and related standards/ norms
5	Records pertaining to statutory consents, approvals.
6	Periodic Medical examination (PME) records.
7	Complain register (Environmental pollution)
8	Records on water and electricity consumption
9	Periodic progress records.
10	Environmental Expenses Records

6.9 DETAILED BUDGET AND PROCUREMENT SCHEDULES

The budget planned for environmental monitoring is given below.

Table 6.3 - Environmental Management Plan Budget

Sl .No	Budget planned for	Capital Cost Amount (INR)	Recurring Cost/Annum Amount (INR) - 5 Years
1	Air Environment	11,50,000	9,50,000
2	Noise Environment	50,000	13,14,000
3	Water Environment	2,30,000	2,45,000
4	Implementation of EC, Mining Plan & DGMS Condition	14,67,000	12,58,00
5	Green Belt	3,50,000	45,000
6	Additional Key EMP Expenses	57,57,000	10,000
Total		**90,04,000**	**38,22,000**

CHAPTER 7

ADDITIONAL STUDIES

The additional studies covered for this EIA / EMP report are,

- Public consultation
- Risk Assessment
- Social Impact Assessment, R&R Action Plans
- Cumulative Environmental Impact Assessment Study
- A detailed Hydrogeological Study
- Slope Stability plan

7.1 PUBLIC CONSULTATION

After the preparation of the draft EIA/EMP report, it must be submitted to the State Pollution Control Board. A public consultation will be conducted on behalf of the Pollution Control Board through the District Collector and the officials from the PCB. A prior notice must be issued about the event, along with the time and date, in two leading newspapers. The opinions, suggestions, demands, and objections of people, NGO environmentalists, etc. are sought, and the proceedings are recorded. The replies of the proponent and corresponding officials will be recorded in the final EIA/EMP report.

7.2 RISK ASSESSMENT & MANAGEMENT

(a) Objectives

Risk assessment is a method in method in which possible threats/hazards which may arise during mining operations are identified so that adequate machinery/equipment are made available in precaution. The objectives of environmental risk assessment are governed by the following, which excludes natural calamities:

- To identify the potential hazardous areas so that necessary design safety measures can be adopted to minimize the probability of accidental events.
- To identify the potential areas of environmental disaster which can be prevented by proper design of the installations and its controlled operation.
- To manage the emergency situation or a disastrous event, if any, from the mining operation.

The major hazards related to the mining activities are as follows

- Open cast bench slope failure
- Accident due to fall of quarry sides
- Accident due to machineries
- Accident due to explosives
- Accident due to large block cutting, separation and loading

Some of the common hazards are identified and the corresponding precautionary measures are drafted.

Table 7.1 Hazards and Precautionary measures

S.No.	Hazard	Precautionary measures
1	Fire	Fire suppressants will be made available at mines office and explosive storage room.
2	Explosion	Controlled blasting will be done. DGMS norms will be strictly followed during blasting. Blasting will be done only by trained professionals.
3	Combustion of chemicals or hazardous substances	Combustible Substances are stored with all precautionary measures. Fire suppressant is made available at storage site
4	Landslide	Width, height and slope will be maintained as suggested by DGMS

5	Accidents during handlings	All vehicles will be properly maintained. Overloading will not be done. Only trained/certified people will be employed.
6	Accidental fall of people or animals	The lease area will be fenced properly. Only people working in the mines will be permitted to enter.

7.3 REHABILITATION AND RESETTLEMENT (R & R) PLAN

No land is acquired from people dwelling in the area. The lease area is an uninhabited land. No R & R plan is proposed.

7.4 CUMULATIVE ENVIRONMENTAL IMPACT ASSESSMENT STUDY

The details of other quarries located within the 500m radius of this project are provided below:

Table 7.2 500m Radius Cluster Mines Details

Sl. No	Name and address	G.O. No. and Date	Village and Taluk	S.F.No.	Extent (in Ha)	Period of lease
Abandoned Quarries						
1	Thiru.S. Jacob Rajamani S/o.Soundarapandian, 69A2, Kathiresan Kovil Street, V.O.C Nagar, Kovilpatti Taluk, Thoothukudi District. Pin Code– 628 502.	Rc.No.M2/21495 / 2015, Dated 13.03.2024	Irukkandurai Part-I Radhapuram Taluk	647/1	1.56.0	Proceeding No.M1/62132/2011, dated 21.06.2012 for a period 3 years from 21.06.2012 to 20.06.2015
Existing Quarries						
1	Tmt.S.Sumathi, W/o. Sakthi Periya Kumaran 5/132, Velavan Illam, Koodankulam Village, Radhapuram Taluk, Tirunelveli District	Rc.No.M2/21495 / 2015, Dated 13.03.2024	Irukkandurai Part-I Radhapuram Taluk	641(P) & 642/1	1.96.5	Proceeding No.M1/30225/2017, dated 10.11.2022 for a period 5 years from 10.11.2022 to 09.11.2027

2	Thiru.G.Rangasamy, S/o.Ganapathy Nadar, 4/334C, Main Road, Avaraikulam, Radhapuram Taluk, Tirunelveli District	Rc.No.M2/21495 / 2015, Dated 13.03.2024	Irukkandurai Part-I Radhapuram Taluk	626 & 627	2.46.0	Proceeding No.M1/32439/2018, dated 12.10.2022 for a period 5 years from 10.11.2012 to 09.11.2027
Proposed Quarry						
1	Thiru.S. Jacob Rajamani S/o.Soundarapandian, 69A2, Kathiresan Kovil Street, V.O.C Nagar, Kovilpatti Taluk, Thoothukudi District. Pin Code– 628 502.	Rc.No.M2/21495 / 2015, Dated 13.03.2024	Irukkandurai Part-I Radhapuram Taluk	2.97.57	Under Proposed Quarry	

A cumulative impact of these two proposed quarries has been studied and the details are given in Chapter IV.

7.5 AIR QUALITY IMPACT PREDICTION FOR THE CLUSTER

The AERMOD atmospheric dispersion modeling (AERMOD Cloud remote version) is used for assessment of incremental Ground level concentration (GLC) for the cluster area. Area source model taken into consideration taking into consideration of wet drilling and loading of the cluster mines. Further line source model was taken into consideration for transportation through haul road. Baseline meteorological studies were conducted for the period of March to May 2024. The following sources are considered.

Emission sources & Quantification of the cluster area.

Various point and non-point sources of emissions from Proposed Rough Stone and Gravel Quarry of Thiru.S. Jacob Rajamani S/o. Soundarapandian (Total Material handling (Rough Stone & Gravel) is quantified and presented below:

Area Emissions – Total Material handling of Thiru.S. Jacob Rajamani S/o. Soundarapandian (Rough Stone & Gravel).

Quantity, m^3	**Rough Stone:** 104601.2 m^3 **Gravel:** 4897.4 m^3
Operational Hours Per Year	2400
Activity Rate, t/hr.	390.2414
Emission of dust, g/t.	0.17
Emission of dust, g /hr.	53.12971
Area of influence, m^2	625
Uncontrolled emission rate g/s/m^2	0.000079757
Controlled emission rate, PM10 g/s/m^2	0.0000797578
Controlled emission rate, PM2.5 g/s/m^2	0.00000531718

Area Emissions – Total Material handling (Cluster Rough Stone & Gravel)

Quantity, m^3	**Existing Quarries:** • Thiru.G. Ramasamy (2.46.0 Ha) - Rough Stone (11940.8 m^3) & Gravel quarry (390 m3). • Tmt. Aswani (1.96.5 Ha) – Rough Stone: & Gravel quarry (57050 m^3) & Gravel quarry (24196 m^3).
Operational Hours Per Year	2400
Activity Rate, t/hr.	390.2151
Emission of dust, g/t.	0.20
Emission of dust, g /hr.	56.23475
Area of influence, m^2	625
Uncontrolled emission rate g/s/m^2	0.00068160
Controlled emission rate, PM10 g/s/m^2	0.000681608
Controlled emission rate, PM2.5 g/s/m^2	0.000045440

Line Source – Transport of Rough Stone & Gravel from Pit to Boundary

Quantity, m^3	**Rough Stone:** 104601.2 m^3 **Gravel:** 4897.4 m^3
Operational Hours Per Year	2400
Capacity of each Dumper (T)	10
Total No. of Tippers/ year	10949
Lead length/trip, Km	13

Total VKT/Year	53418
Emission Kg/VKT	0.23
Total emission Kg/Year	168469
Uncontrolled emission rate g/s/m	478546
Controlled emission rate, PM10 g/s/m	0.478564
Controlled emission rate, PM2.5 g/s/m	0.132929

Line Source – Transport of Rough Stone & Gravel (Cluster)

Quantity, m^3	**Existing Quarries:** • Thiru.G. Ramasamy (2.46.0 Ha) - Rough Stone (11940.8 m^3) & Gravel quarry (390 m3). • Tmt. Aswani (1.96.5 Ha) – Rough Stone: & Gravel quarry (57050 m^3) & Gravel quarry (24196 m^3).
Operational Hours Per Year	2400
Capacity of each Dumper (T)	10
Total No. of Tippers/ year	1,40,200
Lead length/trip, Km	0.8
Total VKT/Year	9357
Emission Kg/VKT	0.23
Total emission Kg/Year	181426
Uncontrolled emission rate g/s/m	408965
Controlled emission rate, PM10 g/s/m	0.4089652
Controlled emission rate, PM2.5 g/s/m	0.113601

Note: *Emission factor computed based on wind speed of 2 m/s, and moisture content of 10 %. + Emission factor computed based on silt content of 10 % and moisture content of 10 %

FIG 7.1 Isopleth of GLC Prediction for $PM_{2.5}$

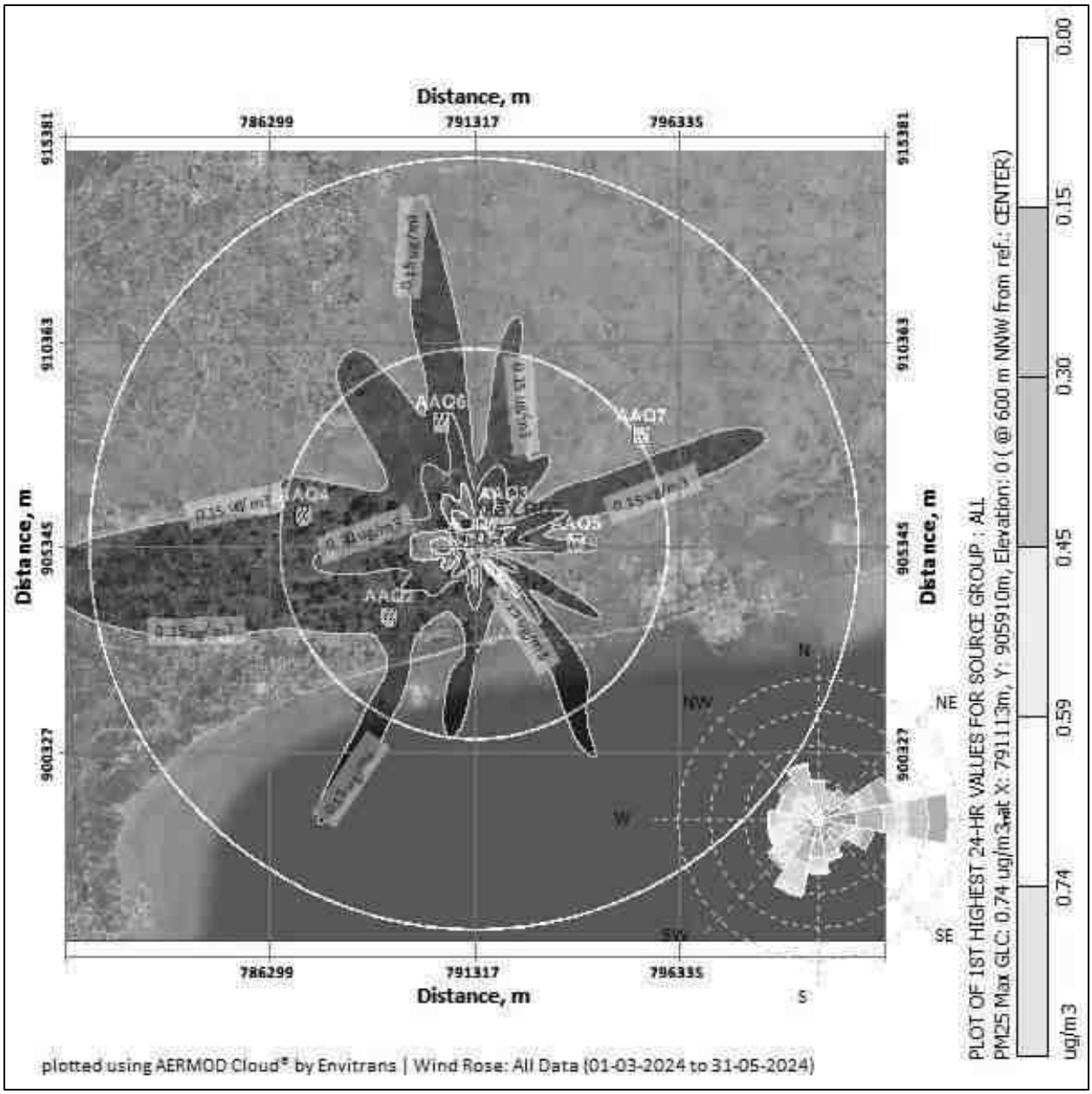


FIG 7.2 Isopleth of GLC Prediction for PM_{10}

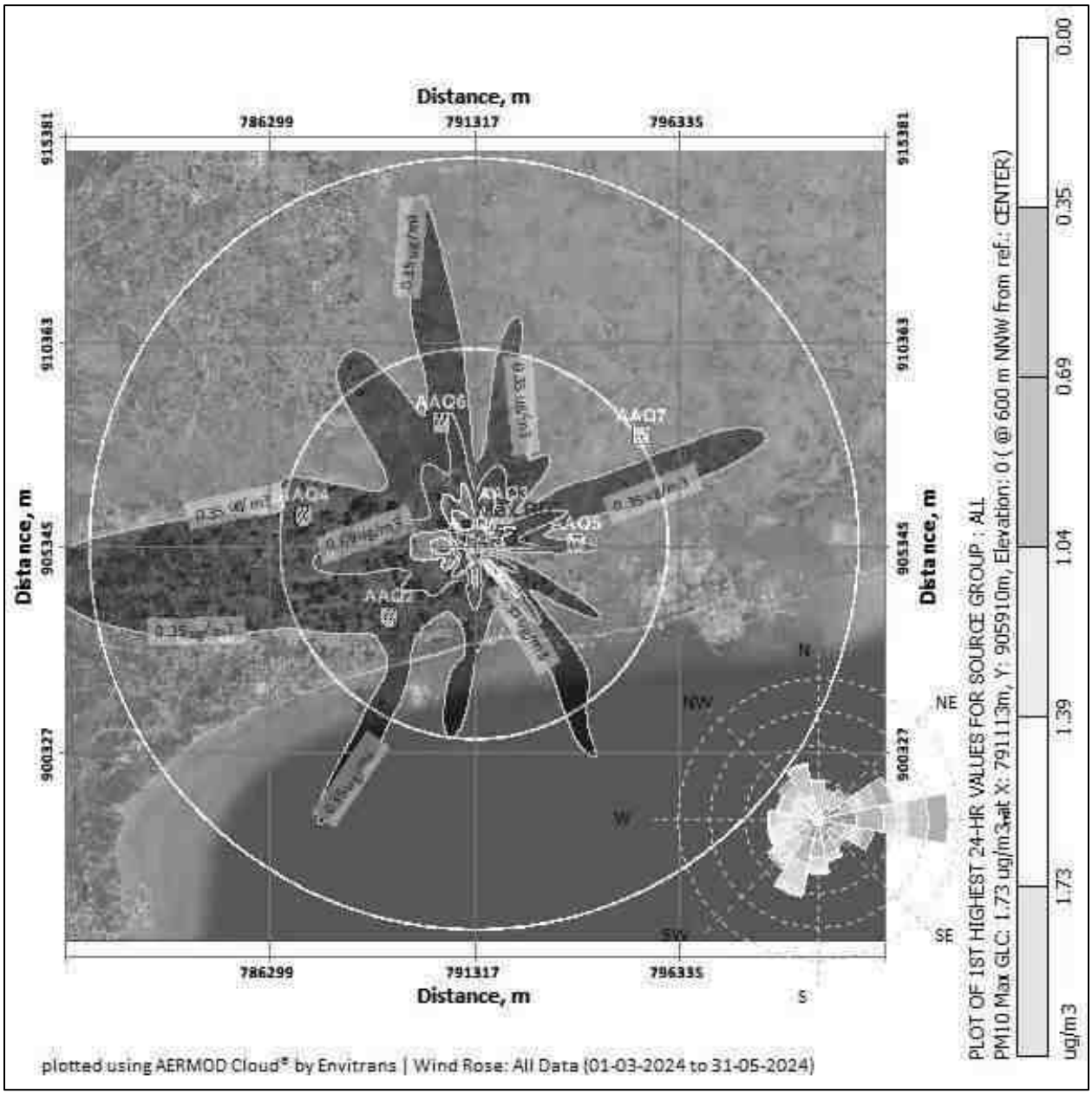


FIG 7.3 Isopleth of GLC Prediction –Cumulative for $PM_{2.5}$

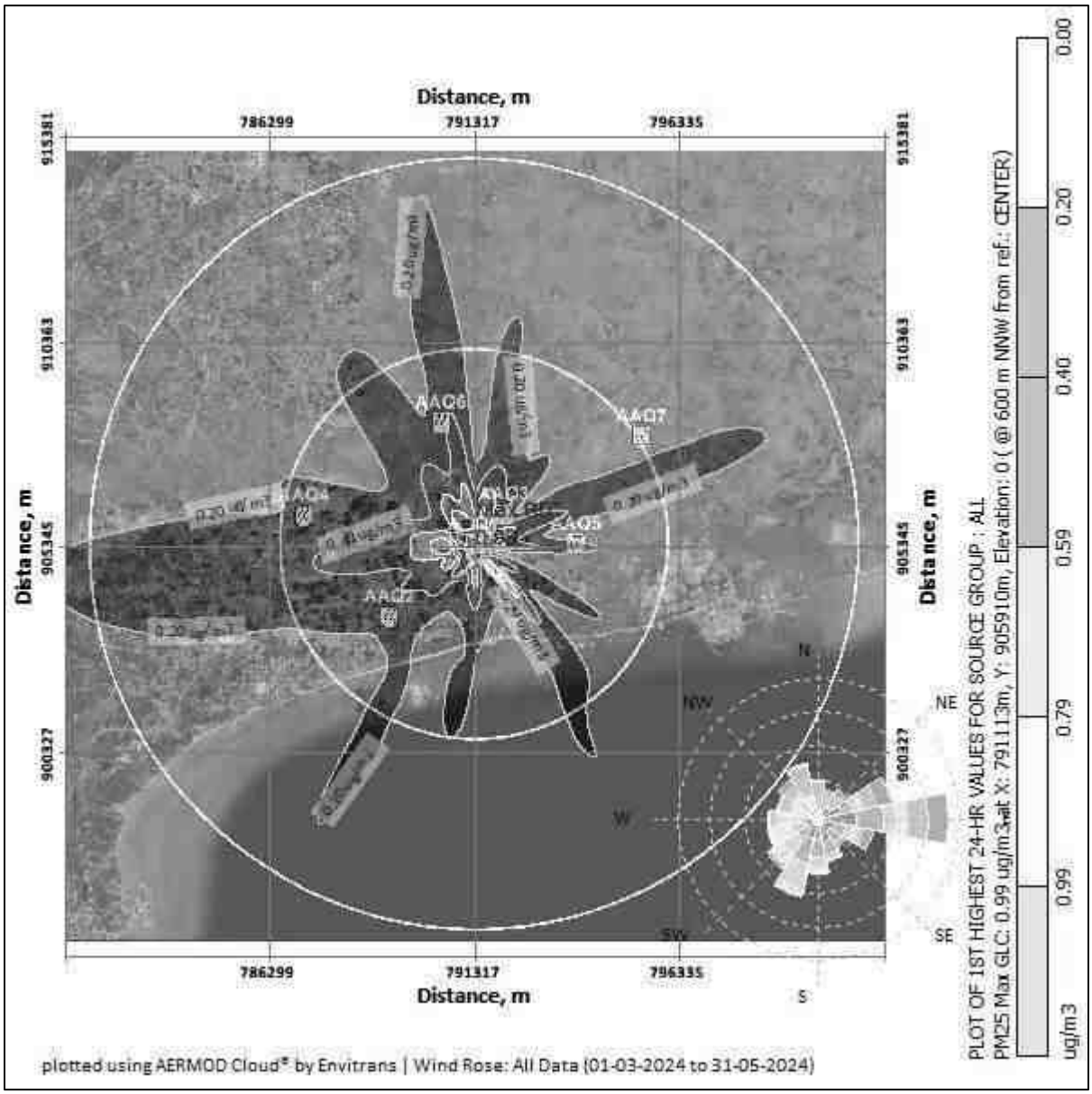
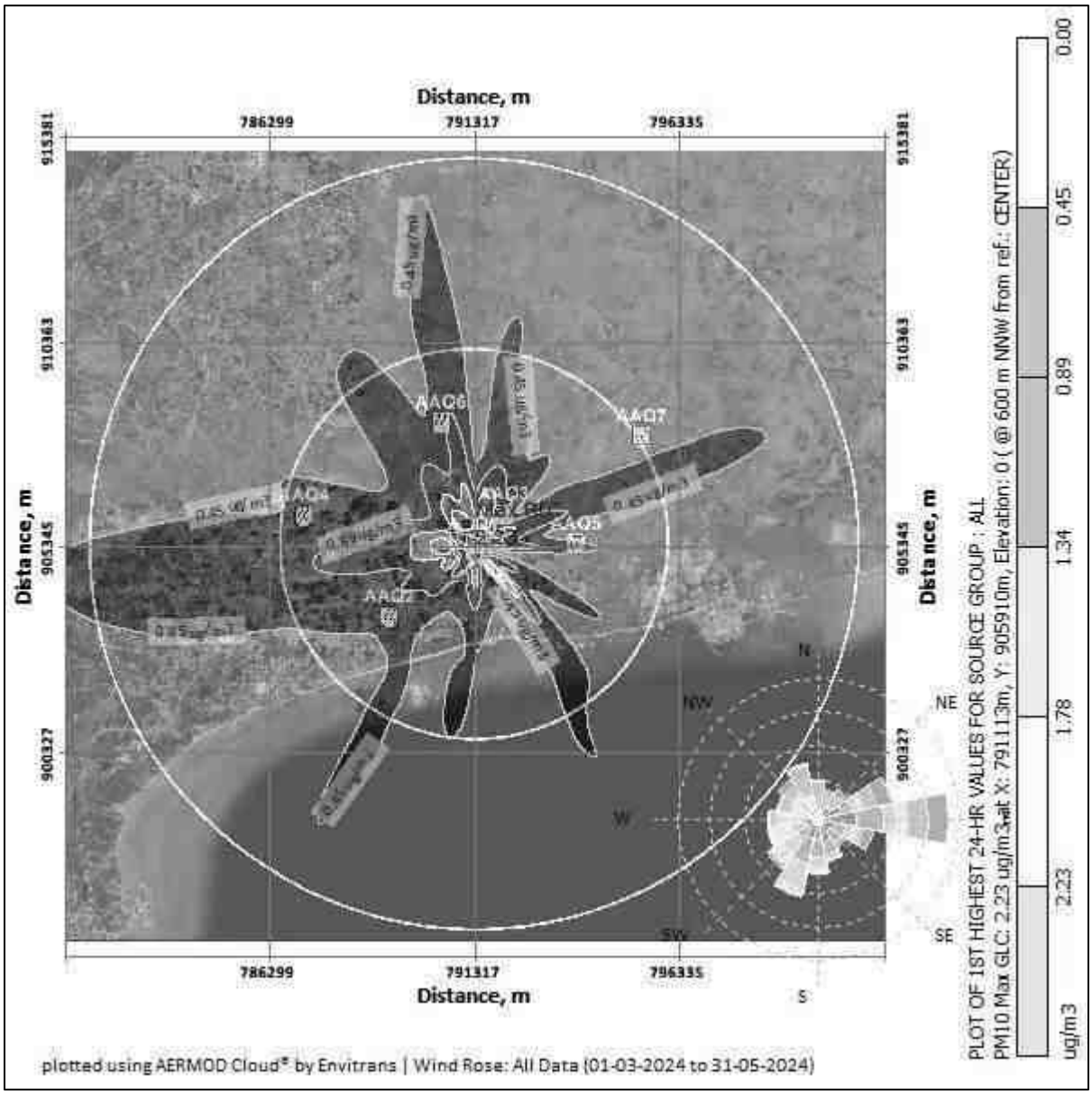


FIG 7.4 Isopleth of GLC Prediction –Cumulative for PM_{10}



PREDICTED AMBIENT AIR QUALITY:

The post project Concentrations of PM10, PM2.5, (GLC) (base line + incremental) after adopting necessary control measures is given in Table No - 4.3.

Table 7.3 Concentrations of PM2.5 after Project Implementation

SL. No	Location	Background Concentration	Predicted incremental Concentration	Post Project Concentration	Statutory Limits in µg/m³
1	Project site	27.75	0.74	28.49	60
2	Chettikulam	24.85	0.59	25.44	
3	Erukkandurai	26.32	0.45	26.77	
4	T Karungulam	24.85	0.30	25.15	
5	Koondankulam	27.69	0.26	27.95	
6	Adangarkulam	24.16	0.20	24.36	
7	Sanganeri	24.19	0.15	24.34	

Table 7.4 Cluster Concentrations of PM2.5 after Project Implementation

SL. No	Location	Background Concentration	Predicted incremental Concentration	Post Project Concentration	Statutory Limits in µg/m³
1	Project site	27.75	0.99	28.74	60
2	Chettikulam	24.85	0.79	25.64	
3	Erukkandurai	26.32	0.59	26.91	
4	T Karungulam	24.85	0.40	25.25	
5	Koondankulam	27.69	0.30	27.99	
6	Adangarkulam	24.16	0.20	24.36	
7	Sanganeri	24.19	0.15	24.34	

Table 7.5 Concentrations of PM10 after Project Implementation

SL. No	Location	Background Concentration	Predicted incremental Concentration	Post Project Concentration	Statutory Limits in µg/m³
1	Project site	57.15	1.73	58.88	100
2	Chettikulam	50.35	1.39	51.74	
3	Erukkandurai	53.80	1.04	54.84	
4	T Karungulam	57.30	0.69	57.99	
5	Koondankulam	57.25	0.50	57.75	

6	Adangarkulam	49.90	0.35	50.25	
7	Sanganeri	49.70	0.15	49.85	

Table 47.5a Cluster Concentrations of PM10 after Project Implementation

SL. No	Location	Background Concentration	Predicted incremental Concentration	Post Project Concentration	Statutory Limits in µg/m³
1	Project site	57.15	2.23	59.38	100
2	Chettikulam	50.35	1.78	52.13	
3	Erukkandurai	53.80	1.34	55.14	
4	T Karungulam	57.30	1.00	58.30	
5	Koondankulam	57.25	0.89	58.14	
6	Adangarkulam	49.90	0.45	50.35	
7	Sanganeri	49.70	0.22	49.92	

The above report seems that, even in the worst-case scenario, the resultant added concentrations with baseline figures show that the values of ambient air quality for PM_{10} are in the range of 49.85 µg/m^3 to 58.88 µg/m^3 and for $PM_{2.5}$ are in the range of 24.34 µg/m^3 to 28.49 µg/m^3 and PM_{10} are surrounding area range of 49.92 µg/m^3 to 59.38 µg/m^3 and for $PM_{2.5}$ are in the range of 25.25 µg/m^3 to 28.74 µg/m^3 which are within the statutory limits in each case. The mitigation measures undertaken in the mine for control of air pollution are given below.

- Wet drilling will be practiced in drilling operation.
- Water sprinkling will be done in haul roads & loading etc.
- The mines workers are provided with the dust masks.
- Three-layer plantation in the safety zone.

DG sets shall be periodically maintained as per manufacturer's specifications.

Cumulative Impact on Traffic

The mined-out minerals will be transported by means of trucks to the consumers like crusher units for producing stone aggregates of different sizes or construction of

roads, bridges, buildings and other buyers etc. The cumulative impact on traffic due to transportation of minerals from these three leases are provided below:

Table 7. 6 – Impact on Traffic

Description	Rough Stone and Gravel Production Per day in tons	No. of Lorry Load per day
P1	364	36
Total		**36**

The proposed projects will bring 36 trips per day. The existing road can absorb this additional traffic due to this project. Various measures like proper maintenance of road, covering of the loaded truck with tarpaulin, water sprinkling will be carried out to ensure no adverse impact on the logistical front.

7.6 HYDROGEOLOGICAL STUDY

There is Indian Ocean is located at a distance of 3.43 km in South direction & Hanuman Nadi is located at a distance of 80m in south direction from lease area. Due to the presence of these water bodies nearby, a detailed hydrogeological study has been done. As suggested in the Precise Area Communication letter, safety distances of 7.5m to adjacent Patta land.

7.7 SLOPE STABILITY STUDY

The proposed quarry is a very small quarry and the production is also less. Opencast-Mechanized mining with a bench height of 5m and bench width of 5m and 45° Slope is proposed. The depth of mining is proposed as 47 m (BGL), which is the ultimate pit limit. Also, there is no overburden since the entire mined out material will be utilized.

As far as technical factors are concerned, the following precautionary measures will be adopted:

- Strict adherence to DGMS norms
- Frequent inspection by Mines-in-charge/Mines Manager
- Bench height, width, slope will be as per DGMS norms

7.8 DISASTER MANAGEMENT PLAN

Proper preventive mechanism exists already in the mines.

- Precautionary measures are well explained to all staff by the mines in-charge.
- PPE necessary for all staff are available in the quarry. No person is allowed to enter inside without PPE. Avoiding quarrying during unfavorable environmental conditions.
- Carrying out safe blasting by following DGMS norms
- Safety equipment like fire extinguisher, first aid kit, etc are present in the mine.
- Proper maintenance of machinery used for mining
- In case of any emergency, the contact numbers of mines in-charge, mines manager, Management contact are available in the mines office.

7.9 MINE CLOSURE PLAN

The quarrying operation is proposed up to a depth of 47m (BGL) only, which will be achieved in 5 years. The ultimate pit dimension will be length 162 m X Width 148 m X depth 47m. After completion of quarrying operation, the mined-out pit will be left as rain water harvesting pond. The quarry will be properly fenced with barbed wire.

CHAPTER 8

PROJECT BENEFITS

The project area is located on Patta land, thereby causing no impact on the loss of agriculture or forest land. The project will create employment opportunities in the area. There will be no adverse effect of mining on the socioeconomic status of the people; rather, mining activities will improve their standard of living. The mining activity creates employment opportunities for the local people, and this definitely raises their economic status. Apart from the overall beneficial impact of the project on the local people of the region, it is felt necessary to augment facilities in the fields of education, health, and social awareness, including concern for the environment and ecosystem.

The mining activity at proposed Rough Stone and Gravel of Thiru.S. Jacob Rajamani S/o.Soundarapandian will create direct employment opportunity for 32 local people. As per MOEF & CC Notification CER cost is arrived for an amount of 8 Lakhs.

CHAPTER 9

ENVIRONMENTAL COST BENEFIT ANALYSIS

Environmental Cost Benefit Analysis is recommended during the scoping stage, if needed. In the ToR granted by SEIAA, Tamil Nadu it is not recommended. Hence not applicable.

CHAPTER 10

ENVIRONMENTAL MANAGEMENT PLAN

10.1 OBJECTIVES

The Environmental Management Plan is developed to ensure that a project is implemented in an environmentally sustainable manner, where all contractors and subcontractors, including consultants, understand the potential environmental risks arising from the project and take appropriate actions to minimize those risks. EMP also ensures that the project implementation is carried out in accordance with the planned design and by taking appropriate mitigation measures to reduce adverse environmental impacts during the project's life cycle. The impacts due to this mining project are detailed in Chapter 4 and Mitigation measures at the source level and an overall Management Plan at the site level are elaborated on in this chapter.

10.2 BASIC OF EMP

The Environmental Management Plan for the proposed project activities is formulated taking into considerations the following key environmental issues.

- Project activities
- Studies on Environmental Impact Assessment
- Air & water pollution control
- Working zone environment improvement
- Occupational hazards & safety
- Environmental monitoring facilities
- Environmental management costs

EMP covers all phases of the project considering the impacts with mitigation measures and monitoring programme. The plan outlines the measures that will be undertaken to ensure compliance with environmental legislations and to minimize adverse impact. Details of EMP measures for implementation in the mine are given below.

Table 10.1 Environmental Management Plan

Environmental Parameter	Mitigation Measures
Air	Wet drilling to suppress the dust emission from drill machine
	Regular water sprinkling on haulage road through fixed water sprinkler.
	2.4 KLD of water will be used for dust suppression.
	Avoiding blasting during high wind period, night times and temperature inversion periods.
	Regular grading of haul road to clear accumulation of loose material.
	It will be ensured that vehicles are properly maintained to comply with exhaust emission requirements
	Maintenance as per operator manual of the equipment and machinery in the mines to minimizing air pollution
	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.
	Afforestation for control of dust.
Surface water	There is Indian Ocean is located at a distance of 3.43 km in South direction & Hanuman Nadi is located at a distance of 80m in south direction from lease area. Adequate safety distance is left. No dumping of material or discharge will be done in or near the river or water body.
	Surface runoff management structures like garland drain of required length which is connected to a settling pond will be constructed around the quarry to collect the rain water. Monthly or after rainfall, inspection will do to ensure performance of water management structures and systems. There is no discharge of any effluent into nearby water bodies.

Ground Water	The quarrying operation is proposed upto a depth of 47 m below ground level, water table in the area is around 62m BGL, hence the project will not intersect the Ground water table during entire quarry period.
Water Consumption and Wastewater generation	Water required for this project will be sourced from vendors.
	Domestic wastewater generation of 1.0 KLD will be treated in septic tank with soak pit.
	Conduct ground water and surface water monitoring for parameters specified by CPCB
Noise	The workers employed are provided with protection equipment, earmuffs and ear- plugs for the protection from high noise level generated at the mine site wherever required.
	Noise levels are controlled by using optimum explosive charge, proper delay detonators and proper stemming to prevent blow out of holes.
	Development of thick greenbelt all along the safety Zone (7.5 m & 50 m) of the project area to attenuate the noise and the same will be maintained.
	Preventive maintenance of mining machinery and replacement of worn-out accessories to control noise generation.
	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.
Ground Vibration and Fly Rock Control	Controlled blasting using delay detonators will be carried out to maintain the PPV value well within the prescribed standards of DGMS.
	Drilling and blasting will be carried under the supervision of qualified persons.
	Will be Ensured that blast holes are adequately stemmed for the depth of the hole and stemmed with suitable angular material.
	To be Undertake noise or vibration monitoring.
Land Environment	At conceptual stage, the mining pits will be converted into Rain Water Harvesting pit. Remaining area will be converted into greenbelt area.

	No external dumping i.e., outside the project area. The entire material will be sold.
	Garland drains with catch pits / settlement traps to be provided all around the project area to prevent run off affecting the surrounding lands.
	The periphery of Project area will be planted with thick plantation to arrest the fugitive dust, which will also act as acoustic barrier.
	Frequent Soil and ground water testing as per Environmental Monitoring Plan.
Top Soil / Overburden	There is no overburden anticipated during the quarrying operation.
Biological Environment	During mining, thick plantation will be carried out on the mentioned safety zone areas.
	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.
	Regular review on Green belt development programme.
	Year wise greenbelt development plan mentioned in Chapter III will be monitored.

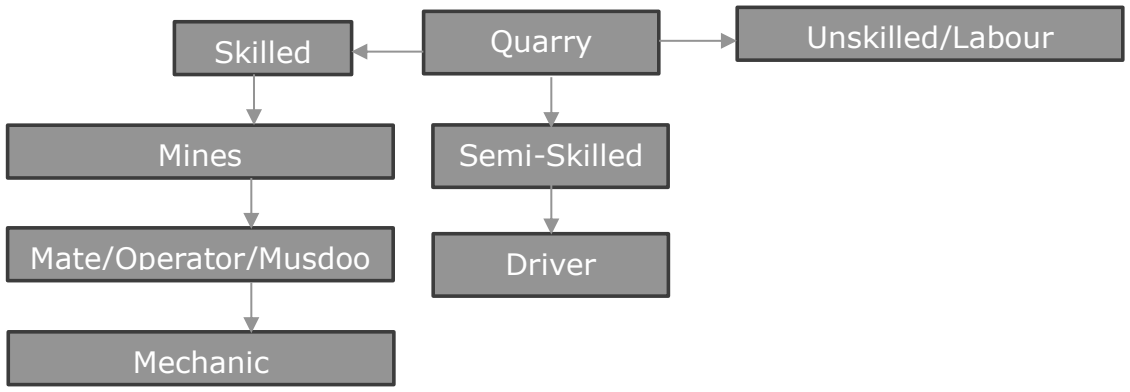
10.3 ADMINISTRATION AND TECHNICAL SETUP

Since this is a very small quarry, the mines in-charge will take care of all environment related aspects. He will ensure effective implementation of environment management plan and to ensure compliance of environmental statutory guidelines through Mine Management Level. The action plan for monitoring consists of monitoring of following environmental components.

- 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.

Fig. 10.1 Organization Chart



1	Skilled	Mines Manager	1 No
		Foreman/Mate	3 Nos
		Operator	10 Nos
		Mechanic	1 No
2	Semi-Skilled	Diver	4 Nos
3	Un-skilled	Labours	13 Nos
		Total	**32 Nos**

10.4 ENVIRONMENTAL POLICY

- The Project Proponent has stipulated a well-defined Environmental policy by which the lessee is committed to conducting business with a strong

environmental conscience towards the community, customers, and employees. The Environment policy is given as below.

- The Environment policy of "Rough Stone & Gravel Quarry of Thiru.S. Jacob Rajamani S/o.Soundarapandian is that the rules and commitment are driven towards conservation of the environment.
- The lessee is committed to efficient use of natural resources based on the reduce, recycle and reuse method.
- The project is committed to the identification of possible impacts and will take the necessary management steps to mitigate the impacts.
- Environment performance will be regularly monitored and reported for continual improvement of our environment and health performance.

10.5 OCCUPATIONAL SAFETY & HEALTH MANAGEMENT

Occupational safety and health are very closely related to productivity and a good employer-employee relationship. The main factors affecting occupational health in quarries are fugitive dust and noise. Safety of employees during quarrying operations and maintenance of mining equipment will be taken care of as per the Mines Act 1952 and Rule 29 of the Mines Rules 1955. To avoid any adverse effect on the health of workers due to dust, noise, and vibration, sufficient measures have been provided. The health status of workers in the mine will be regularly monitored under an occupational surveillance programme. Under this programme, all employees are subjected to a detailed medical examination at the time of employment. Before the induction of employees, a pre-medical checkup is done. In addition, a periodical medical checkup will be done annually for all employees.

10.6 COST OF ENVIRONMENTAL CONTROL MEASURES

The effective implementation of EMP is not only reduce pollution load and comply the regulatory requirement but also increase productivity and improve marketability of product. The capital and recurring cost of EMP for the cluster of mines has been given in below table.

Table 10.2 - Environmental Management Plan Budget

Sl .No	Budget planned for	Capital Cost Amount (INR)	Recurring Cost/Annum Amount (INR) -5 Year
1	Air Environment	11,50,000	9,50,000
2	Noise Environment	50,000	13,14,000
3	Water Environment	2,30,000	2,45,000
4	Implementation of EC, Mining Plan & DGMS Condition	14,67,000	12,58,00
5	Green Belt	3,50,000	45,000
6	Additional Key EMP Expenses	57,57,000	10,000
Total		**90,04,000**	**38,22,000**

10.7 CONCLUSION

Various aspects of mining activities were considered, and related impacts were evaluated. Considering all the possible ways to mitigate the Environmental concerns, an Environmental Management Plan was prepared, and INR 301.23 lakhs has been allocated for the same. The EMP is dynamic, flexible, and subjected to periodic review. For projects where major environmental impacts are associated, EMP will be under regular review. Thus, the proper steps will be taken to accomplish all the goals mentioned in the EMP, and the project will have a positive impact on the study area.

CHAPTER 11
SUMMARY& CONCLUSION

11.1 INTRODUCTION

Thiru.S. Jacob Rajamani S/o. Soundarapandian has obtained Precise Area Communication Letter from Assistant Director, Department of Geology and Mining, Viluppuram to quarry out 5,23,006 m^3 of Rough Stone and 24,487 m^3 gravel from an extent of 2.97.57 Ha located in S.F. Nos. 613(P) and 643(P) in Irukkandurai Part-I Village, Radhapuram Taluk, Tirunelveli District, Tamil Nadu State

As per EIA notification, 2006 and its subsequent amendments the proposed "Rough Stone and Gravel Quarry" of Thiru.S. Jacob Rajamani S/o. Soundarapandian mines cluster falls under Schedule 1(a) of EIA Notification and its subsequent amendments the project comes under Category B1. The ToR for preparation of EIA/EMP report of the project was approved vide ToR Identification No. TO24B0108TN5525413N (F.No.10893), dated 29.06.2024. This report has been prepared in line with the approved TOR for production of maximum excavation of 5,23,006 m^3 of Rough Stone and 24,487 m^3 gravel.

S.No.	Description	Status/Remarks
1.	Sector	Non-coal mining
2.	Category of the project	B1
3.	Proposed mineral	Rough Stone & Gravel quarry
4.	Type of Lease	The applied lease is not fresh, there is a quarry pit exists in the S.F. Nos. 643(Part), which was operated by Thiru. Jacob Rajamani during the lease period 21.06.2012 - 20.06.2015.
5.	Extent of the lease	2.97.57 Ha
6.	Proposed depth of Mining	47m BGL
7.	Method of mining	Opencast-Mechanized
8.	Proposed lease period	5 Years
9.	Proposed Environmental Clearance	5 Years
10.	Proposed production quantity for five years	Rough Stone: 5,23,006 m^3 & Gravel: 24,487 m^3

The Lessee Thiru.S. Jacob Rajamani S/o. Soundarapandian is an individual with sound experience in the identification, quarrying and marketing of Rough Stone and Gravel. The proposed land is a Patta land attached as **Annexure 6.**

11.2 LOCATION

This project site is located in Irukkandurai Part-I Village, Radhapuram Taluk, Tirunelveli District, Tamil Nadu State with Latitude 08°10'49.68"N to 08°10'57.99"N and Longitude: 77°38'30.75"E to 77°38'37.19"E. with Survey of India Topo Sheet No. 58- H/12. To conduct the study, the proposed mine lease area (core zone) and an impact zone of 10 km radius (called buffer zone) around the proposed mine site were considered. The EIA report is based on three months baseline data (i.e. March 2024 to May 2024)

11.3 GEOLOGY

The rock type noticed in the area for lease is Charnockite which contains mostly Quartz and Feldspar with some ferromagnesian minerals. The Charnockite is part of peninsular Gneisses, a high-grade metamorphic rock. The strike of the Charnockite formation is with vertical dipping.

11.4 PROJECT DESCRIPTION

This is a proposed Rough Stone and Gravel quarry by Opencast-Mechanized mining method with drilling and blasting. The quarrying is restricted up to a depth of 47 m below ground level. The geological reserves are estimated to be 12,80,866 m^3 of Rough Stone and 30,672 m^3 Gravel. The mineable reserve calculated by deducting 7 m & 50m safety distance and bench loss. The mineable reserves are 5,23,006 m^3 of Rough Stone and 24,487 m^3 of Gravel which will be recovered at the rate of 100% recovery upto a depth of 47m Below ground level for the period of five years.

- It is proposed to quarry out rough stone and Gravel with 5m bench height, 5m width with 454° slope using conventional Open cast Mechanized method. The quarry operation involves shallow jack hammer drilling, slurry blasting, excavation, Loading and transportation of Rough Stone and Gravel.

- There is no overburden anticipated during entire rough stone and Gravel quarrying operation.

S.No.	Type of Detail	Description
1	Sector	1(a) Non coal mining
2	Fresh/Existing project	New Project
3	Category	B1
4	Nature of mineral	The applied lease is not fresh, there is a quarry pit exists in the S.F. Nos. 643(Part), which was operated by Thiru. Jacob Rajamani during the lease period 21.06.2012 - 20.06.2015.
5	Production	5 years
6	Life	Rough Stone - 5,23,006 m^3 Gravel - 24,487 m^3
7	Waste generation and management	Nil
8	Bench height and width	Proposed bench height & width is 5.0m respectively and number of proposed benches is 10 Nos.
9	Ultimate pit depth	47 m BGL
10	End use	The excavated Rough Stone and Gravel is used for construction industries for Government & Public sector projects besides catering domestic housing and infrastructure projects in and around the district.

11.5 PROJECT REQUIREMENTS

The requirements of the project are given below.

S.No.	Nature of requirement	Description
1	Water requirement	Total water requirement of 5.0 KLD which will be procured from the outside agencies. 1.0 KLD drinking water requirement, green belt development is 1.6 KLD and dust suppression is 2.4 KLD.
2	Power requirement	No electricity is needed for mining operations, for office demands, it will be met from the state grid.

3	Manpower requirement	Permanent employees – 15, temporary employees – 17
4	Financial requirement	The total project cost as per PFR will be INR 402.58 lakhs including Operational cost, Fixed Asset cost and EMP cost
5	Funds for Socio economic development	INR 8 Lakhs is allocated. In addition, any demand raised by people during public hearing will also be met.

11.6 DESCRIPTION OF LEASE AREA

The features in the study area are given below.

Table 3.1 Description of the lease area

S.No.	Areas	Distance from project site
1	Areas protected under international conventions, national or local legislation for their ecological, landscape, cultural or other related value	Nil within 15km radius
2	Areas which are important or sensitive for ecological reasons	
A	Wetlands, water courses or other water bodies,	**Water bodies** / **Distance** / **Direction** Hanuman Nadi – 80m – S Tank – 230m – S Marankulam – 3.88 km – NW Chettikulam Beach – 4.16 km – S Chithambai Lake – 4.59 km – NW Sembigulam Lake – 6.61 km – NW Indian Ocean – 3.43 km – S
B	Coastal zone, biospheres,	Nil within 10km radius
C	Mountains, forests	Therkkumalai R.F – 9.80 km (W) Kanniyakumai Wildlife Sanctuary- 9.80 Km (W)

3	Areas used by protected, important or sensitive species of flora or fauna for breeding, nesting, foraging, resting, overwintering, migration	Nil within 15km radius
4	Inland, coastal, marine or underground waters	Nil within 15km radius
5	State, National boundaries	Nil within 15km radius
6	Routes or facilities used by the public for access to recreation or other tourist, pilgrim areas	Nil within 15km radius
7	Defense installations	Nil within 15km radius
8	Densely populated or built-up area	Kanniyakumari – 15.78 km (SW)
9	Areas occupied by sensitive man-made land uses (hospitals, schools, places of worship, community facilities)	Kanniyakumari – 15.78 km (SW)
10	Areas containing important, high quality or scarce resources (ground water resources, surface resources, forestry, agriculture, fisheries, tourism, minerals)	Nil
11	Areas already subjected to pollution or environmental damage. (those where existing legal environmental standards are exceeded)	Nil
12	Areas susceptible to natural hazard which could cause the project to present environmental problems (earth quakes, subsidence, landslides, erosion, flooding or extreme or adverse climatic conditions) similar effects	No. The area is not prone to earthquakes, floods, etc.

The baseline data collection for meteorology, air, water, noise and soil environments have been carried out during March to May 2024.

Air, water, noise and soil samples are collected and analyzed through NABL accredited lab.

11.7 AIR ENVIRONMENT

The air monitoring have been carried out in 7 locations and the results are given below.

11.2 Details Of Ambient Air Quality Monitoring Locations				
S. No.	**Station Code**	**Locations**	**Distance & Direction**	**Coordinates**
1	AAQ 1	Project site	Core Zone	8°10'55.51"N 77°38'32.49"E
2	AAQ 2	Chettikulam	2.8 km, SW	8°9'52.62"N 77°37'21.31"E
3	AAQ 3	Erukkandurai	1.0 km, NE	8°11'20.11"N 77°39'0.02"E
4	AAQ 4	T Karungulam	4.4 Km, W	8°11'19.58"N 77°36'8.07"E
5	AAQ 5	Koondankulam	2.6 Km, E	8°10'54.37"N 77°40'1.22"E
6	AAQ6	Adangarkulam	3.18 Km, N	8°12'38.69"N 77°38'5.53"E
	AAQ7	Sanganeri	5.13 Km NE	8°12'24.88"N 77°40'58.77"E

Station ID	Min	Max	Avg.
Particulate matter PM_{10} - ($\mu g/m^3$)			
AAQ-1	47.7	66.6	57.15
AAQ-2	44.4	56.3	50.35
AAQ-3	46.2	61.4	53.80
AAQ-4	56.7	57.9	57.30
AAQ-5	46.3	68.2	57.25
AAQ-6	44.2	55.6	49.90
AAQ-7	43.5	55.9	49.70
CPCB NAAQS 2009 for PM_{10} - 100 $\mu g/m^3$			
Particulate matter $PM_{2.5}$ ($\mu g/m^3$)			
AAQ-1	23.2	32.3	27.75
AAQ-2	21.8	27.9	24.85
AAQ-3	22.5	30.1	26.32
AAQ-4	21.5	28.1	24.85
AAQ-5	22.4	32.9	27.69
AAQ-6	21.4	26.9	24.16
AAQ-7	21.1	27.2	24.19
CPCB NAAQS 2009 for $PM_{2.5}$ - 60 $\mu g/m^3$			
Sulphur Di-oxide as SO_2 ($\mu g/m^3$)			

Station ID	Min	Max	Avg.
AAQ-1	4.9	8.0	6.45
AAQ-2	4.6	7.0	5.80
AAQ-3	4.9	7.7	6.30
AAQ-4	4.5	7.6	6.50
AAQ-5	4.7	8.3	6.50
AAQ-6	4.0	6.9	4.45
AAQ-7	4.3	7.0	5.65
CPCB NAAQS 2009 for SO_2 – 80 µg/m^3			
Oxide of Nitrogen as NO_2 (µg/m^3)			
AAQ-1	7.7	10.9	9.30
AAQ-2	7.1	9.2	8.15
AAQ-3	7.2	9.6	8.40
AAQ-4	7.0	9.4	8.20
AAQ-5	7.5	10.4	8.95
AAQ-6	6.2	8.9	7.55
AAQ-7	6.4	9.2	7.8
CPCB NAAQS 2009 for NO_2 – 80 µg/m^3			

All the values of pollutant concentrations were found to be within the NAAQs Standards.

11.8 WATER ENVIRONMENT

Table 3.7 Results of Ground Water sampling Analysis in 7 locations								**Specification / Limit (As per IS:10500: 2012)**	
	W1	**W2**	**W3**	**W4**	**W5**	**W6**		**Desirable**	**Permissible**
Odour	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
Turbidity	<1	<1	<1	<1	<1	<1	<1	Agreeable	Agreeable
pH at 25 °C	8.37	7.64	7.64	7.34	7.58	7.58	7.37	6.5 - 8.5	No Relax
Electrical Conductivity	176.6	1144	1411	831.4	1036.0	1515.0	1211.0	1	5
Total Dissolved Solids	102	690	850	505	624	910	730	500	2000
Total hardness as CaCO3	52.5	234	303.0	250.0	242.0	230.0	392.0	1	15
Calcium as Ca	9.70	43.6	76.00	48.50	64.60	42.00	85.60	200	600
Magnesium as Mg	6.79	30.1	27.10	31.00	19.40	30.10	42.70	200	600
Calcium as CaCO3	24.2	109	190.0	121.0	162.0	105.0	214.0	75	200

Magnesium as CaCO3	28.3	125	113.0	129.0	80.8	125.0	178.0		
Total alkalinity as CaCO3	59.4	297.0	392.0	333.0	234.0	392.0	198.0		
Chloride as Cl-	35.5	232.0	227.0	121.0	236.0	312.0	256.0	250	1000
Free Residual chlorine as Cl-	BDL (D.L - 0.2)	BDL (D.L - 0.2)	BDL (D.L - 0.2)	BDL (D.L - 0.2)	BDL (D.L - 0.2)	BDL (D.L - 0.2)	BDL (D.L - 0.2)	30	100
Sulphates as SO42-	BDL (D.L-5.0)	183	276	102	156	272	212	45	No Relaxation
Iron as Fe	0.02	0.05	0.09	0.04	0.06	0.07	0.03	200	400
Nitrate as NO3	1.76	2.32	4.56	3.22	3.45	4.52	3.98	1	No Relaxation
Fluoride as F	0.23	0.46	0.57	0.41	0.45	0.51	0.55	0.1	0.3
Manganese as Mn	BDL (D.L - 0.05)	BDL (D.L - 0.05)	BDL (D.L - 0.05)	BDL (D.L - 0.05)	BDL (D.L - 0.05)	BDL (D.L - 0.05)	BDL (D.L - 0.05)	Not Specified	Not Specified

All the values were found to be within permissible limits

11.9 NOISE ENVIRONMENT

Noise levels were measured in 6 locations and the results are given below.

Table.11.4 Noise monitoring results

S. No	Location	Day equivalent	Night equivalent	Day equivalent limits by CPCB	Night equivalent limits by CPCB
1	Project site	50.2	39.9	75	70
2	Chettikulam	47.4	39.9		
3	Erukkandurai	45.8	39.2		
4	T Karungulam	43.6	39.6		
5	Koondankulam	46.0	40.4		
6	Adangarkulam	50.3	38.7		
7	Sanganeri	46.9	42.2		

11.10 SOIL ENVIRONMENT

Soil samples are collected from 7 locations and the results are given below.

Table 11.5 Results of Soil Sample Analysis									
S. N	Parameter	Unit	S1	S2	S3	S4	S5	S6	S7

1	pH at 25 °C	-	6.20	7.25	7.78	7.32	6.50	8.03	7.06
2	Electrical Conductivity	µmho s/cm	81.73	438.40	324.40	295.90	299.80	474.70	235.20
3	Dry matter content	%	95.19	93.65	87.89	90.25	93.30	94.71	95.03
4	Water Content	%	4.81	6.35	12.11	9.75	6.70	5.29	4.97
5	Organic Matter	%	0.59	3.75	1.67	3.06	1.07	0.85	1.22
6	Soil texture	-	CLAY LOAM	CLAY	CLAY	SILT LOAM	LOAM	SILTY CLAY	CLAY
7	Grain Size Distribution	%	30.59	4.01	5.00	16.95	44.23	7.28	4.92
	i. Sand		2.70 33.11	2.86 33.64	5.10 67.05	4.26 52.03	5.74 14.41	4.67 38.99	
8	ii. Silt	%							36.41
9	iii. Clay	%	36.30	62.35	27.96	13.75	14.36	53.73	58.67
10	Phosphorous as P	mg/kg	0.56	0.72	0.91	0.58	0.74	0.55	0.74
11	Sodium as Na	mg/kg	835	943	1039	911	605	1025	768
12	Potassium as K	mg/kg	392	3278	4039	3128	1795	4213	3708
13	Nitrogen and Nitregenous Compounds	mg/kg	210	270	284	397	166	344	344
14	Total Soluble Sulphate	%	BDL(D. L.0.02)	BDL(D. L.0.02)	BDL(D. L.0.02)	BDL(D. L.0.02)	BDL(D. L.0.02)	BDL(D. L.0.02)	BDL(D. L.0.02)
15	Porosity	%	14.50	13.2	13.3	12.1	10.2	15.6	13.9
16	Water Holding Cabacity	Inches /foot	40	42	44	38	36	40	44

11.11 BIOLOGICAL ENVIRONMENT

FLORA

For measuring the extent of flora present in the study area, the area is divided in to 4 quadrants. The flora population in each quadrant is summed up for the total population in the study area. Field survey is done. Erukku, Aavarai and Nayuruvi are found in lease area. In the buffer zone, common trees like Neem, papaya, mango, teak, etc and shrubs like Avarai, Aloe vera, etc, climbers like Kovai,jasmine etc are found.

FAUNA

In the study area, commonly found animals like dogs, cats, bush rat, cows, birds like crow, Myna, Sparrow, etc were found.

11.12 LAND USE

The land use land cover data is found using the LANDSAT – 9 satellite imagery. The number of bands used are 11. The land use pattern is given below:

Table No. 11.6: Major Land Use Units of the Study Area in Percentage

S. No	1st Level Classification	Area in (sq.km)	Percentage (%)	2nd Level Classification	Area in (sq.km)	Percentage (%)
1	Built-up or habitation	31.09	9.69	Residential	20.92	6.52
				Commercial/Industrial	10.17	3.17
2	Agriculture	135.56	42.23	Crop/fallow land	135.56	42.23
3	Water bodies	21.31	6.64	Reservoir/Lake /Pond	19.88	6.19
				River/Stram	1.43	0.45
4	Waste Land	28.09	8.85	Open without scrub	16.76	5.22
				Open with scrub	11.33	3.53
5	Mines	4.24	1.32	Mines	4.24	1.32
6	Forest	0.89	0.28	Forest	0.89	0.28
7	Sea	99.82	31.10	Sea	99.82	31.10
Total		**321**	**100**		**321**	**100**

11.13 SOCIO ECONOMIC ENVIRONMENT

The socio-economic environment of the study area is studied by conducting primary sites through site visits and conducting sample surveys. The secondary data obtained from Census 2011 is also used.

The following data area collected from secondary data.

- Demographic pattern.
- Health pattern
- Occupational structure.
- Amenities available.

The expert visited 6 villages in the study area namely Chettikulam, Erukkandurai, T Karungulam, Koondankulam, Adangarkulam and Sanganeri villages. Discussions were held with the people from nearby locality to study the social and economic conditions prevailing in the area. The expert also visited nearby hospitals, primary health centres and Irukkandurai Part -I. The following observations were made.

Primary schools are available in many villages. For hospital facilities, people in the locality have to go to hospital in Irukkandurai Part -I which is about 800m NE from the lease area. Major schools with higher secondary and senior secondary schools are located in Irukkandurai Part -I. The major Irukkandurai Part -I Union located in the area is Irukkandurai Part -I. Facilities like petrol pump stations, ATM facility is available in Irukkandurai Part -I.

11.14 HYDROGEOLOGY OF THE LEASE AREA

There is Indian Ocean is located at a distance of 3.43 km in South direction & Hanuman Nadi is located at a distance of 80m in south direction from lease area, the hydrological and hydrogeological pattern of the study area is studied in detail using satellite imagery.

Indian Ocean is located at a distance of 3.43 km in South direction & Hanuman Nadi is located at a distance of 80m in south direction from lease area. But there is no running water currently in the river. Only during monsoons, water gets stagnated at a few places.

There are many tanks located in the study area, which are mostly dry throughout the year. These tanks get water only during monsoons. The factors may be monsoon

failure, insufficient rainfall, poor rain water management and water consuming patterns.

11.15 GROUND WATER STUDY

For Ground water study, satellite imagery is used. Water levels from monitoring levels are collected through imaging. The pre-monsoon and post-monsoon data are collected and the results are analyzed.

During field visit, it is observed that water is available in wells only after monsoon. The yield is obtained at deep levels only.

As far as the mining lease area is considered, the area is rocky and no major seepage is envisaged. The production quantity is very less and the depth proposed is 47m BGL. Hence, there will not be any major impact due to mining on water levels or ground water levels in the area.

ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Environmental impacts on the following environments are identified.

- Land environment
- Water environment
- Vegetation
- Fauna
- Air environment
- Noise environment
- Socio-economic impacts

11.16 LAND ENVIRONMENT: IMPACT AND MITIGATION MEASURES

The major impact due to this project on land environment is the change in land use. Since this quarry is a small one and the production is less, mining activity will be carried out upto 47 m BGL. Other than quarrying of minerals, no other change will be done since there is no dumping. To prevent soil erosion during monsoon season,

garland drain will be constructed with silt traps. At the mine closure stage 2.39.76Ha of lease area will be left as rain water harvesting pond 0.55.81 Ha will be developed with green belt. For this, plants like Pungai, Vagai, Vembu, Manjal konrai, Naval, Puvarasu, etc are selected. A total of 1500 trees are planned to be planted. Spacing will be 3m x 3m.

11.17 WATER ENVIRONMENT: IMPACT AND MITIGATION MEASURES

There is no water body present inside the lease area. The entire water requirement for the project is 5.0 KLD which will be sourced from outside agencies. Negligible sewage will be generated, for which a septic tank with soak pit will be set up.

During monsoon season, the excess rain water, if any, will be led through garland drain of 0.6m width and 0.3 m depth to the collection pond with silt traps.

Since the mining operation will be limited upto depth of 47 m (BGL), there will not be any seepage. However, the rain water percolation and collection of water from seepage shall be less than 300 lpm and it shall be pumped out periodically by a stand by diesel powered Centrifugal pump motivated with 7.5H.P.Motor. The quality of water is expected to be potable. Hence, water stored in the quarry pit will be pumped into the adjacent agricultural fields. Further the water can also be used for plantation purposes

The major water bodies found in the buffer zone are.

- Hanuman Nadi - 80m - S
- Tank - 230m - S
- Marankulam - 3.88 km (NW),
- Chettikulam Beach - 4.16 km (S)
- Chithambai Lake - 4.59 km (NW),
- Sembigulam Lake - 6.61 km (NW),
- Indian Ocean- 3.43 km (S)

Since these water bodies are located outside the lease area and there is no discharge of effluent or any untreated water from the mines will be made in to these water bodies, there is no major impact. For the canal, adequate safety distance is left. The proponent will restrict the mining operation only within the lease and no other work will be carried out near the canal or any area outside the lease.

It is planned to carryout appropriate rainwater harvesting schemes and artificial recharge schemes in the area.

- Rain water falling in the quarry will be collected efficiently through garland drains.
- Water thus collected will be passed through collection tank with silt traps. This water can be used by the proponent for water sprinkling and for green belt purposes.
- Excess water after desiltation will be provided to downstream users, if any

11.18 BIOLOGICAL ENVIRONMENT: IMPACT AND MITIGATION MEASURES

Impacts

- Fauna is affected due to noise and vibration.
- Dust generation due to mining activities
- Change in land use of the lease area
- Accidental falling of animals

Mitigation measures

- Sirens will be blown before blasting in the mines. To reduce noise levels, plantation will be done. Blasting will be carried out only in the allotted time.
- To reduce dust generation, mist sprayers will be used. During transportation, the material will be covered with tarpaulin. Water sprinkling will be done to reduce generation of pollutants
- After the mine closure stage, the mine pit will be left as rain water collecting tank, which can attract bird population in the nearby areas.

- To prevent entry of animals, the mining area will be properly fenced.

11.19 AIR ENVIRONMENT: IMPACT AND MITIGATION MEASURES

The major air pollutants due to mining operations are fugitive emissions like PM_{10}, $PM_{2.5}$. Other than these pollutants, gaseous emissions of sulfur dioxide (SO_2) and oxides of nitrogen (NO_x) due to excavation/loading equipment and vehicles plying on haul roads are the cause of air pollution in the project area.

The major impacts are Dust emission due to drilling, blasting and transportation. The major mitigation measures include Using Wet drilling methods, Allowing drilling only with PPE, Carrying out blasting only during specified times, Avoiding blasting during unfavorable weather conditions, Using explosives of good quality, Using mist sprayers Regular wetting of transport, Covering the materials carried in tippers with tarpaulin, Proper maintenance of vehicles used for transportation, Conducting regular emission tests for vehicles used for transport Development of greenbelt is proposed in the safety zone of 7.5m & 50m barriers in the lease area.

The anticipated data is calculated using AERMOD software and the projected values are found to be within limits.

11.20 NOISE ENVIRONMENT: IMPACT AND MITIGATION MEASURES

Impacts

- Noise generation in mining is due to operation like drilling, blasting and transportation of minerals within and outside the lease area.
- As per DGMS (Directorate General of Mines Safety) and OSHA (Occupational Safety and Health Administration) limits, the acceptable noise level is 85 dB(A) for an exposure period of 8 hours.
- Exposure to loud noise can also cause high blood pressure, heart disease, sleep disturbances, and stress. Noise pollution also impacts the health and well-being of wildlife.

- Noise exceeding prescribed limits may cause impairment like abnormal loudness perception, tinnitus, which causes a persistent high-pitched ringing in the ears, paracusis or distorted hearing

Mitigation measures

- As the distance between the source and receptor increases, the noise level also decreases. Hence, there will be a natural attenuation
- The proposed has planned to develop green belt in the periphery of the lease area, which diminishes sound volume by dampening them.
- All the equipment/machinery/trucks involved will be properly maintained to control noise generation
- Conducting regular health checkups for employees involved
- Employees will be made to work on shifts to reduce their exposure time
- Providing earplugs to all employees

By adopting these measures, the noise levels will be maintained well within MoEF & CC limits since the baseline value is low.

11.21 VIBRATION: IMPACT AND MITIGATION MEASURES

Impacts

- Though vibration will be only felt by the people working inside the lease area, it is usually undesired.
- Vibration may also cause flyrocks
- It may frighten the birds and small insects in the lease area. However, it will be felt only for a short period

Mitigation measures

- Carrying out blasting on limited scale, only from 12:00 PM to 2:00 PM
- Control of fly rock and vibration by maintaining peak particle velocity with in standard as prescribed by the DGMS and MOEF & CC.
- Shallow depths jackhammer drilling and blasting is proposed to be carried out with minimum use of explosive
- Supervising blasting by competent and statutory foreman/ mines manager

11.22 SOCIO ECONOMIC ENVIRONMENT

Impact and Mitigation measures

No land is acquired from anyone. No rehabilitation is needed. Hence, there is no negative impact. The proponent has planned to spend INR 8,00,000 for CER activities. This amount will be subjected to change after public hearing.

11.23 OCCUPATIONAL HEALTH

Impacts

Dust generation due to drilling and blasting, Noise generation due to drilling and blasting, unexpected accidents. Continuous exposure to dust causes Pneumonia, Tuberculosis, Rhematic arthritis and Segmental Vibration, Short term impact will be lack of sleep, high blood pressure and heart ailments. Long term exposure may lead to partial or permanent deafness, Risks include fly rocks, cracks or fissures due to improper mining methods

Mitigation measures

- Using dust suppression measures like water spraying on roads to reduce rise of air pollutants
- Providing green belt for air pollutant and noise attenuation
- Ensuring slope stability
- Employing only trained professionals for blasting
- Conducting Pre-Medical Examination for employees before inducting
- Conducting periodical Medical Examination once in 6 months.
- Making all first aid kits available in mines office
- Keeping fire extinguisher in place

- Educating the employees about how to handle unexpected happenings
- Posting information containing emergency contact numbers in mines office
- By adopting all these measures, the safety of the employees working in the quarry will be ensured.

11.24 ENVIRONMENTAL MONITORING PROGRAMME

Monitoring is done to measure the efficiency of control measures implemented. Regular monitoring of various environmental parameters like air, water, noise and soil environments is needed to assess the status of environment during the project operation. A schedule is framed with timeline to monitor various parameters during the operation of the project. To evaluate the effectiveness of environmental management programme, regular monitoring of the important environmental parameters will be taken up. Air monitoring will be carried out once in 3 months, water sample will be collected once in a season, noise will be monitored once in 3 months, soil samples will be analyzed once per season. For EMP, a budget of INR 301.23 Lakhs is allocated.

11.25 PROJECT BENEFITS

Financial benefits

- This project will contribute financially through payment of taxes like royalty, GST, etc
- The project will also contribute via CSR.
- The demands of people during public hearing will also be considered by the project proponent

Social benefits

- This project provides employment to 32 people directly. Local people will be hired for unskilled labour.

- Through CSR, nearby schools, hospitals will be benefitted.
- For CSR, INR 8,00,000 is allocated.
- Based on the demand of the people during public hearing, further funds will be allocated, if necessary.
- 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 301.23 lakhs for the five years has been allocated as EMP cost. 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. 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.

CHAPTER 12

DISCLOSURE OF CONSULTANTS

Global Mining Solutions is a NABET Accredited EIA consultant as per NABET certificate NABET/EIA/2326/IA 0110. The registered office of Global Mining Solutions is at Plot No.6, S.F.No.13/2 A2, VS City, RC Chettypatty, Kottamettupatty, Omalur, Salem, Tamilnadu-636455.

Declaration by Experts contributing to the proposed Rough Stone & Gravel Quarry over an extent of 2.97.57 Ha in Irukkandurai Part-I Village, Radhapuram Taluk, Tirunelveli District, Tamil Nadu State.

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

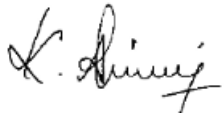
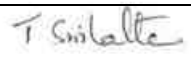
EIA Coordinator Name: M. Manikandan

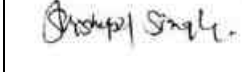
Signature & Date

Period of involvement: March 2024 to May 2024.

Contact information:

M/s Global Mining Solutions
Plot No.6, SF No. 13/2, A2, VS City, RC Chettypatty,
Kottamettupatty, Omalur,
Salem, Tamil Nadu – 636 455

S. No.	Functional areas	Name of the expert/s	Involvement (period and task**)	Signature and Date
1	*AP*	*Dhanalakshmi Ramanathan*	*Assessment of existing air quality, Impact of the project on ambient air and suggested mitigation measures for air pollution.* *Period: March 2024 to May 2024.*	
2	*WP*	*Abirami Kaliaperumal*	*Assessment of existing water quality, impact of the project on surface and ground water quality, suggested mitigation measures for minimizing the impact.* *Period: March 2024 to May 2024.*	
3	*SHW*	*Ramadoss N*	*Assessment of waste generated from the project, suggested waste management practices.* *Period: March 2024 to May 2024.*	
4	*SE*	*Sarasvathy K*	*Baseline SE studies. Data compilation and assessment. Impact of the project on SE status of the area. Formulation of CER plan.* *Period: March 2024 to May 2024.*	
5	*EB*	*Saravanan S*	*Baseline data collection of related to ecology of the area.* *Period: March 2024 to May 2024.*	
6	*HG*	*Ravinthiran N*	*Hydrogeological feature of the area. Ground water depth and impact of project on ground water of the area.* *Period: March 2024 to May 2024.*	
7	*AQ*	*Srilatha Thiruveedhula*	*Air quality modeling utilizing the area source model.*	

			Predication of the ground level concentration of the dust. Suggesting suitable mitigation measures. <u>*Period: March 2024 to May 2024..*</u>	
8	*NV*	*Dhanalakshmi Ramanathan*	*Ambient noise study of the area. Incremental noise generation due to quarry operation and impact of the noise due to the project.* <u>*Period: March 2024 to May 2024.*</u>	
9	*LU*	*Dhanalakshmi Ramanathan*	*Preparation of land use map based on satellite imagery. Land use classification and analysis. Impact prediction of the project on the surrounding land environment.* <u>*Period: March 2024 to May 2024.*</u>	
10	*RH*	*S.V. Prashant*	*Identification of the Risk related to the mining activities. Preparation of emergency disaster management plan. Plan for supply of safety equipment for the worker.* <u>*Period: March 2024 to May 2024.*</u>	
11	*SC*	*Shisupal Sing*	*Soil monitoring, secondary data collection on soil type, soil management practices, utilization of topsoil.* <u>*Period: March 2024 to May 2024.*</u>	
12	*GEO*	*Valliappan Meyyappan*	*Geological map, stability of quarry and dump, management plan for mine stability, after use of mining quarry and geological feature of the area.*	

			Period: March 2024 to May 2024.	

TM-FAE:

S.No	Name of TM (FAE)	Functional Area	Approved FAE (to work under)	Period of involvement	Type of work	Signature
1	S. Kamaraj	GEO	Mr.Valliappan	*Period: March 2024 to May 2024.*	Associated with FAE in preparing Geological map, stability of quarry and dump, management plan for mine stability, after use of mining quarry and geological feature of the area	
2	M.Prabu	LU	T.Srilatha	*Period: March 2024 to May 2024.*	Associated with FAE in preparing Land use map based on satellite imagery, Land use classification and analysis, Impact prediction on surrounding land environment	
		HG	Ashok Kumar		Associated with FAE in studying hydrogeological pattern of study area, Studying ground water and the impact of the project	

					on ground water	
3	M. Manikandan	EB	S.Saravanan	<u>Period: March 2024 to May 2024.</u>	Associated with the expert in baseline data collection related to ecology of the study area	
		SC	Shishupal Singh		Associated with the expert in Soil monitoring, secondary data collection on soil type, soil management practices, utilization of top soil	
4	Suresh	WP	*Abirami Kaliaperumal*		*Air quality modeling utilizing the area source model. Predication of the ground level concentration of the dust. Suggesting suitable mitigation measures.* <u>Period: Oct 2023 to Dec 2023.</u>	M. Suresh
		AP	*Dhanalakshmi Ramanathan*	<u>Period: March 2024 to May 2024.</u>	*Ambient noise study of the area. Incremental noise generation due to quarry operation and impact of the noise due to the project.*	

					Period: Oct 2023 to Dec 2023.	
5	S.Kamaraj	SC	Shishupal Singh	*Period: March 2024 to May 2024.*	Associated with the expert in Soil monitoring, secondary data collection on soil type, soil management practices, utilization of top soil	
		RH	S.V.Prashant		Associated with the expert in Identification of the Risk related to the mining activities. Preparation of emergency disaster management plan. Plan for supply of safety equipment for the workers	