DRAFT ENVIRONMENTAL IMPACT ASSESSMENT

&

ENVIRONMENT MANAGEMENT PLAN

FOR OBTAINING

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

"B1" CATEGORY – MINOR MINERAL – CLUSTER –

PATTA LAND- EXISTING QUARRY

THIRU. T. NAVEEN KIRAN ROUGH STONE AND GRAVEL QUARRY

Cluster Extent – 17.31.35 Ha

Project Proponent

Thiru. Naveen Kiran

S/o. Thangaraj
No.1/660, Devarayanpalayam, Ichipatti Village
Palldam Taluk,
Tiruppur District – 641 668

PROJECT LOCATION	PROPOSED PRODUCTION
S.F.Nos. 207/2A Ichipatti Village, Palladam Taluk, Tiruppur District **Extent: 2.83.4 Ha**	**Reserves:** 4,38,060m^3 of Rough Stone, First Five Years = 2,90,640 m^3 Second Five Years = 1,47,420 m^3 44,520m^3 of Gravel Peak Production = 66,090m^3 of Rough Stone Proposed Depth = 37m bgl

ToR obtained vide

File No.11252 TOR Identification No. TO24B0108TN5875455N
Dated:22.10.2024

Environmental Consultant
GEO EXPLORATION AND MINING SOLUTIONS
Old No. 260-B, New No. 17,
Advaitha Ashram Road, Alagapuram,
Salem – 636 004, Tamil Nadu, India
Accredited for sector 1 Cat 'A', sector 31 & 38 Cat 'B'
Certificate No : NABET/EIA/2225/RA 0276
Phone: 0427-2431989,
Email: infogeoexploration@gmail.com
Web: www.gemssalem.com

LABORATORY
GLOBAL LAB AND CONSULTANCY SERVICES
S.F.NO:92/3A2, Geetha Nagar, Alagapuram Pudur,
Salem – 636 016, Tamil Nadu, India.
(NABET Accredited vide Certificate No. NABET/EIA/2225/RA 0276, valid up to 06.08.2025)

Baseline Monitoring Period

OCT – DEC 2024

JANUARY 2025

UNDERTAKING

I Thiru. T. Naveen Kiran given undertaking that this EIA & EMP report prepared for our Rough stone and Gravel quarry situated in S.F.No. 207/2A over an extent of 2.83.4 Ha in Ichipatti Village, Palladam Taluk, Tiruppur District based on the ToR issued by the State Level Environmental Impact Assessment Authority (SEIAA), Tamil Nadu vide File No.11252 TOR Identification No. TO24B0108TN5875455N Dated:22.10.2024

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

Signature of the Project Proponent

T. Naveen Kiran

Place: Tiruppur
Dated:

DECLARATION

I Dr. M. Ifthikhar Ahmed – EIA Coordinator declare that the EIA & EMP report prepared for our Rough stone and Gravel quarry situated in S.F.No. 207/2A over an extent of 2.83.4 Ha in Ichipatti Village, Palladam Taluk, Tiruppur District has been prepared by Geo Exploration and Mining Solutions, Salem, Tamil Nadu.

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

Signature of the EIA Coordinator

Dr. M. Ifthikhar Ahmed

Managing Partner

M/s. Geo Exploration and Mining Solutions

Place: Salem
Dated:

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

PROPOSED QUARRIES					
Code	**Name of the Owner**	**Village**	**S.F. Nos**	**Extent in Ha**	**Status**
P1	Thiru.T.Naveen Kiran	Ichipatti	207/2A	2.83.4	File No.11252 TOR Identification No. TO24B0108TN5875455 N Dated:22.10.2024
P2	Thiru.S. A. Ramachandran	Ichipatti	220/1A,223/2F	3.21.5	Public Hearing Completed
			TOTAL EXTENT	**6.04.9**	
EXISTING QUARRIES					
Code	**Name of the Owner**	**Village**	**S.F. Nos**	**Extent in Ha**	**Status**
E-1	C.Rakkiappan	Ichipatti	216/2B2	0.81.0	16.12.2021 to 15.12.2026
E-2	M.Muthurathinam	Ichipatti	215/4,3A	1.81.5	28.02.2022 to 27.02.2027
E-3	M.Lakshmanasamy	Ichipatti	203/2,204/3	1.21.45	10.01.2022 to 09.01.2027
E-4	V.Velmurugan	Ichipatti	213/1A,214/2	1.66.5	05.11.2020 to 04.11.2025
E-5	S.P.Palanisamy	Ichipatti	221/1B,223/2E 2	1.87.5	07.03.2022 to 06.03.2027
E-6	.V.Velmurugan	Ichipatti	203/4(P)	1.21.0	08.03.2022 to 07.03.2027
E-7	M.Thangavel	Ichipatti	208/1,2,3	1.52.0	11.05.2022 to 10.05.2027
E-8	S.Balakumar	Ichipatti	197/1,2,10,11, 201/2	1.15.5	29.01.2024 to 28.01.2029
	TOTAL EXTENT			**11.26.45**	
ABANDONED / EXPIRED QUARRIES					
Code	**Name of the Owner**	**Village**	**S.F. Nos**	**Extent in Ha**	**Status**
Ex-1	C. Thangaraj	Ichipatti	207/1A(P)	1.92.0	13.10.2017-12.10.2022
			TOTAL EXTENT	**1.92.0**	
			TOTAL CLUSTER EXTENT	**17.31.35Ha**	

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

TERMS OF REFERENCE (ToR) COMPLIANCE

File No.**11252** TOR Identification No. **TO24B0108TN5875455N** Dated:**22.10.2024**

SPECIFIC CONDITIONS		
1	A Cluster Management Committee (CMC) shall be constituted including all the mines in the cluster as Committee Members for the effective management of the mining operation in the cluster through systematic & scientific approach with appointment of statutory personnel, appropriate environmental monitoring, good maintenance of haul roads and village/panchayat roads, authorized blasting operation etc. The PP shall submit the following details in the form of an Affidavit during the EIA appraisal: (i) Copy of the agreement forming CMC. (ii) The Organisation chart of the Committee with defining the role of the members (iii) The 'Standard Operating Procedures' (SoP) executing the planned activities.	**Noted & agreed.**
2	The structures within the project site & within the radius of (i) 50 m, (ii) 100 m, (iii) 200 m and (iv) 300 m & upto 1km shall be enumerated with details such as dwelling houses with number of occupants, whether it belongs to the owner (or) not, places of worship, industries, factories, sheds, etc. and spell out the mitigation measures to be proposed for the protection of the above structures, if any during the quarrying operations.	**Noted and agreed** The structure study has been carried out within the radius of 1km. There is no habitation within the radius of 500m from the project site the details of the structures is given in the EIA report, Chapter No.III
3	The proponent shall furnish photographs of adequate fencing, garland drainage built with siltation tank & green belt along the periphery including replantation of existing trees; maintaining the safety distance between the adjacent quarries & water bodies nearby provided as per the approved mining plan.	**Noted and agreed.** Fencing will be carried out before execution of lease deed and greenbelt development will be carried out from the 1st Year of Mining Plan Period, Garland drainage will be carried out and periodical compliance with photographs will be submitted to SEIAA every 6 months.
4	The Proponent shall carry out Bio diversity study as a part of EIA study and the same shall be included in the Report.	**Noted and agreed** The Bio diversity study has been conducted by the Functional Area Expert approved by the NABET. The same has been detailed in the Chapter No. 3.
5	The PP shall prepare the EMP for the entire project life of mine, i.e, 10 years and also furnish the sworn affidavit stating to abide the EMP for the entire life of mine	**Noted and agreed** The EMP has been prepared for the entire life of the mine i.e., upto the lease period (10 Years) and the affidavit will be submitted.
6	The PP shall carry out the comprehensive studies on the cumulative environmental impacts of the existing & proposed quarries which included drilling & blasting, loading & hauling on the surrounding village and structures.	**Noted and agreed**
2.SEAC STANDARD CONDITIONS		
1	In the case of existing/operating mines, a letter obtained from the concerned AD (Mines) shall be submitted and it shall include the following: (i) Original pit dimension (ii) Quantity achieved Vs EC Approved Quantity (iii) Balance Quantity as per Mineable Reserve calculated. (iv) Mined out Depth as on date Vs EC Permitted depth (v) Details of illegal/illicit mining (vi) Violation in the quarry during the past working. (vii) Quantity of material mined out outside the mine lease area	Fresh lease

	(viii) Condition of Safety zone/benches (ix) Revised/Modified Mining Plan showing the benches of not exceeding 6 m height and ultimate depth of not exceeding 50m.	
2	Details of habitations around the proposed mining area and latest VAO certificate regarding the location of habitations within 300m radius from the periphery of the site.	**Noted and agreed.** Letter obtained from the VAO regarding surface features within 300m radius
3	The proponent is requested to carry out a survey and enumerate on the structures located within the radius of (i) 50 m, (ii) 100 m, (iii) 200 m and (iv) 300 m (v) 500m shall be enumerated with details such as dwelling houses with number of occupants, whether it belongs to the owner (or) not, places of worship, industries, factories, sheds, etc with indicating the owner of the building, nature of construction, age of the building, number of residents, their profession and income, etc.	**Noted and agreed** The structure study has been carried out within the radius of 1km. There is no habitation within the radius of 500m from the project site the details of the structures is given in the EIA report, Chapter No.III
4	The PP shall submit a detailed hydrological report indicating the impact of proposed quarrying operations on the waterbodies like lake, water tanks, etc are located within 1 km of the proposed quarry.	**Noted and agreed.** The hydro-geological study was conducted to evaluate the possible impact on the ground water table. No significant impacts are anticipated on the water bodies around the project area. Details are discussed under Chapter No. 3
5	The Proponent shall carry out Bio diversity study through reputed Institution and the same shall be included in EIA Report.	**Noted and agreed** The Bio diversity study has been conducted by the Functional Area Expert approved by the NABET. The same has been detailed in the Chapter No. 3.
6	The DFO letter stating that the proximity distance of Reserve Forests, Protected Areas, Sanctuaries, Tiger reserve etc., up to a radius of 25 km from the proposed site.	Request to consider the secondary source data detailing the nearest reserve forest from Tamil Nadu Geographical Information System (TNGIS). The Nearest Reserve Forest Boluvampatti Reserve Forest 31.5km- SW
7	In the case of proposed lease in an existing (or old) quarry where the benches are not formed (or) partially formed as per the approved Mining Plan, the Project Proponent (PP) shall the PP shall carry out the scientific studies to assess the slope stability of the working benches to be constructed and existing quarry wall, by involving any one of the reputed Research and Academic Institutions CSIR-Central Institute of Mining & Fuel Research / Dhanbad, NIRM/Bangalore, Division of Geotechnical Engineering-IIT-Madras, NIT-Dept of Mining Engg, Surathkal, and Anna University Chennai-CEG Campus. The PP shall submit a copy of the aforesaid report indicating the stability status of the quarry wall and possible mitigation measures during the time of appraisal for obtaining the EC.	It is a Fresh lease
8	However, in case of the fresh/virgin quarries, the Proponent shall submit a conceptual 'Slope Stability Plan' for the proposed quarry during the appraisal while obtaining the EC, when the depth of the working is extended beyond 30 m below ground level.	Not applicable It is a fresh quarry; the slope stability plan will be submitted along with the Half yearly compliance report.
9	The PP shall furnish the affidavit stating that the blasting operation in the proposed quarry is carried out by the statutory competent person as per the MMR 1961 such as blaster, mining mate, mine foreman, II/I Class mines manager appointed by the proponent.	**Noted and agreed** The Proponent given affidavit stating that the blasting operation will be carried out by the competent person as per the MMR 1961.
10	The PP shall present a conceptual design for carrying out only controlled blasting operation involving line drilling	Noted and agreed

	and muffle blasting in the proposed quarry such that the blast-induced ground vibrations are controlled as well as no fly rock travel beyond 30 m from the blast site.	The details of design for carrying out controlled blasting operation involving line drilling and muffle blasting to minimize blast-induced ground vibrations and controlled fly rock travel beyond 30 m from the blast site is detailed in Chapter 4.
11	The EIA Coordinators shall obtain and furnish the details of quarry/quarries operated by the proponent in the past, either in the same location or elsewhere in the State with video and photographic evidences	**Noted and agreed.** The project proponent does not own any other quarries apart from the one proposed in this project.
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,	It is a Fresh Lease.
13	What was the period of the operation and stoppage of the earlier mines with last work permit issued by the AD/DD mines?	It is a Fresh Lease.
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.	It is a Fresh Lease.
15	All corner coordinates of the mine lease area, superimposed on a High-Resolution Imagery/Topo sheet, topographic sheet, geomorphology, lithology and geology of the mining lease area should be provided. Such an Imagery of the proposed area should clearly show the land use and other ecological features of the study area (core and buffer zone).	**Noted and agreed** The project site has been superimposed on the high resolution imagery. The Satellite imagery of the project site is enclosed in Chapter II Geomorphology map of the area is enclosed in Chapter II . Lithology and Geology Map of the area is enclosed in Chapter II.
16	The PP shall carry out Drone video survey covering the cluster, green belt, fencing, etc.,	**Noted and agreed** The Drone Video of the project site is taken covering the Greenbelt and Fencing around the Project site.
17	The proponent shall furnish photographs of adequate fencing, green belt along the periphery including replantation of existing trees & safety distance between the adjacent quarries & water bodies nearby provided as per the approved mining plan.	Noted and agreed As per the recommendations during SEAC ToR Presentation of the proposal and commitment of PP a count of 1420 Nos of trees were planted as a part of greenbelt development programme all along the periphery of the lease applied area and approach roads and village roads. As well the pp has provided wire fencing as recommended all along the boundary of the lease applied area.
18	The Project Proponent shall provide the details of mineral reserves and mineable reserves, planned production capacity, proposed working methodology with justifications, the anticipated impacts of the mining operations on the surrounding environment, and the remedial measures for the same.	**Noted and agreed** Details of mineral reserves and mineable reserves, planned production capacity, proposed working methodology justifications are provided in Chapter 2. The anticipated impacts of the mining operations on the surrounding environment and the remedial measures for the same are provided in Chapter 4.
19	The Project Proponent shall provide the Organization chart indicating the appointment of various statutory officials and other competent persons to be appointed as per the provisions of the Mines Act'1952 and the MMR,	**Noted and agreed** The Organization chart indicating the appointment of various statutory officials and other competent persons to be appointed as per

	1961 for carrying out the quarrying operations scientifically and systematically in order to ensure safety and to protect the environment.	the provisions of Mines Act, 1952 and the MMR, 196l for carrying out the quarrying operations scientifically and systematically in order to ensure safety and to protect the environment.
20	The Project Proponent shall conduct the hydro-geological study considering the contour map of the water table detailing the number of groundwater pumping & open wells, and surface water bodies such as rivers, tanks, canals, ponds, etc. within 1 km (radius) along with the collected water level data for both monsoon and non-monsoon seasons from the PWD / TWAD so as to assess the impacts on the wells due to mining activity. Based on actual monitored data, it may clearly be shown whether working will intersect groundwater. Necessary data and documentation in this regard may be provided.	**Noted and agreed** The hydro-geological study was conducted to evaluate the possible impact on the ground water table. No significant impacts are anticipated on the water bodies around the project area. Details are discussed under Chapter No. 3.
21	The proponent shall furnish the baseline data for the environmental and ecological parameters with regard to surface water/ground water quality, air quality, soil quality & flora/fauna including traffic/vehicular movement study	**Noted and agreed** Baseline Data were collected for Post monsoon season October 2024 to Dec 2024. The Details of the Baseline Monitoring is given in the Chapter No. 3.
22	The Proponent shall carry out the Cumulative impact study due to mining operations carried out in the quarry specifically with reference to the specific environment in terms of soil health, biodiversity, air pollution, water pollution, climate change and flood control & health impacts. Accordingly, the Environment Management plan should be prepared keeping the concerned quarry and the surrounding habitations in the mind.	**Noted and agreed** Cumulative impact study has been carried out covering proposed and existing quarries in the cluster and results related to air pollution, water pollution, & health impacts have been given in chapter No. 7, Based on the results, environmental management plan has been prepared and given in Chapter No. 10.
23	Rain water harvesting management with recharging details along with water balance (both monsoon & non-monsoon) be submitted.	**Noted and agreed** The lower part of the mine pit will be utilized as rain water harvesting structure (Temporary) and the water will be used for the water sprinkling on haul roads and Greenbelt development purpose. Rainwater harvesting structure will be constructed near the mine office.
24	Land use of the study area delineating forest area, agricultural land, grazing land, wildlife sanctuary, national park, migratory routes of fauna, water bodies, human settlements and other ecological features should be indicated. Land use plan of the mine lease area should be prepared to encompass preoperational, operational and post operational phases and submitted. Impact, if any, of change of land use should be given.	Noted and Agreed Land use and land cover of the study area is discussed in Chapter No. 3. Land use plan of the project area showing pre-operational, operational and post-operational phases are discussed in Chapter No. 3, Table No 3.3
25	Details of the land for storage of Overburden/Waste Dumps (or) Rejects outside the mine lease, such as extent of land area, distance from mine lease, its land use, R&R issues, if any, should be provided.	Not applicable.
26	Proximity to Areas declared as 'Critically Polluted' (or) the Project areas which attracts the court restrictions for mining operations, should also be indicated and where so required, clearance certifications from the prescribed Authorities, such as the TNPCB (or) Dept. of Geology and Mining should be secured and furnished to the effect that the proposed mining activities could be considered.	Not Applicable. Project area / Study area is not declared in 'Critically Polluted' Area and does not come under 'Aravalli Range.
27	Description of water conservation measures proposed to be adopted in the Project should be	**Noted and agreed** The lower part of the mine pit will be utilized as rain water harvesting structure (Temporary) and

	given. Details of rainwater harvesting proposed in the Project, if any, should be provided.	the water will be used for the water sprinkling on haul roads and Greenbelt development purpose. Rainwater harvesting structure will be constructed near the mine office.
28	Impact on local transport infrastructure due to the Project should be indicated.	**Noted and agreed** Traffic density survey was carried out to analyze the impact of transportation in the study area as per IRC guidelines 1961 and it is inferred that there is no significant impact due to the proposed transportation from the project area. Details have been provided in Chapter No. 2.
29	A tree survey study shall be carried out (nos., name of the species, age, diameter etc.,) both within the mining lease applied area & 300m buffer zone and its management during mining activity.	**Noted and agreed**
30	A detailed mine closure plan for the proposed project shall be included in EIA/EMP report which should be site-specific	**Noted & agreed.** Mine closure plan is detailed in Chapter No. 4.
31	As a part of the study of flora and fauna around the vicinity of the proposed site, the EIA coordinator shall strive to educate the local students on the importance of preserving local flora and fauna by involving them in the study, wherever possible	**Noted and agreed**
32	The purpose of Green belt around the project is to capture the fugitive emissions, carbon sequestration and to attenuate the noise generated, in addition to improving the aesthetics. A wide range of indigenous plant species should be planted as given in the appendix-I in consultation with the DFO, State Agriculture University. The plant species with dense/moderate canopy of native origin should be chosen. Species of small/medium/tall trees alternating with shrubs should be planted in a mixed manner.	**Noted and agreed** As per the recommendations during SEAC ToR Presentation of the proposal and commitment of PP a count of 1420 Nos of trees were planted as a part of greenbelt development program all along the periphery of the lease applied area and approach roads and village roads.
33	Taller/one year old Saplings raised in appropriate size of bags, preferably ecofriendly bagsshould be planted as per the advice of local forest authorities/botanist/Horticulturist with regard to site specific choices. The proponent shall earmark the greenbelt area with GPS coordinates all along the boundary of the project site with at least 3 meters wide and in between blocks in an organized manner	**Noted and agreed** As per the recommendations during SEAC ToR Presentation of the proposal and commitment of PP a count of 1420 Nos of trees were planted as a part of greenbelt development program all along the periphery of the lease applied area and approach roads and village roads.
34	A Disaster management Plan shall be prepared and included in the EIA/EMP Report for the complete life of the proposed quarry (or) till the end of the lease period	Disaster management Plan is detailed in Chapter-7
35	A Risk Assessment and management Plan shall be prepared and included in the EIA/EMP Report for the complete life of the proposed quarry (or) till the end of the lease period	A Risk Assessment and management Plan Chapter- 7
36	Occupational Health impacts of the Project should be anticipated and the proposed preventive measures spelt out in detail. Details of pre-placement medical examination and periodical medical examination schedules should be incorporated in the EMP. The project specific occupational health mitigation measures with required facilities proposed in the mining area may be detailed.	Noted and agreed Occupational Health impacts are discussed in chapter- 10
37	Public health implications of the Project and related activities for the population in the impact zone should be systematically evaluated and the proposed remedial	Noted and agreed No Public Health Implications anticipated due to this project. The anticipated impact and effective

	measures should be detailed along with budgetary allocations.	mitigation measures are discussed in the Chapter No. 4
38	The Socio-economic studies should be carried out within a 5 km buffer zone from the mining activity. Measures of socio-economic significance and influence to the local community proposed to be provided by the Project Proponent should be indicated. As far as possible, quantitative dimensions may be given with time frames for implementation.	Noted and agreed Details are listed in Chapter No 3.
39	Details of litigation pending against the project, if any, with direction /order passed by any Court of Law against the Project should be given.	No Litigation is pending against this project
40	Benefits of the Project if the Project is implemented should be spelt out. The benefits of the Project shall clearly indicate environmental, social, economic, employment potential, etc.	**Noted and agreed.** The details of the Project benefits are given in the Chapter No. 8.
41	If any quarrying operations were carried out in the proposed quarrying site for which now the EC is sought, the Project Proponent shall furnish the detailed compliance to EC conditions given in the previous EC with the site photographs which shall duly be certified by MoEF&CC, Regional Office, Chennai (or) the concerned DEE/TNPCB.	Fresh Lease.
42	The PP shall prepare the EMP for the entire life of mine and also furnish the sworn affidavit stating to abide the EMP for the entire life of mine.	Noted and agreed The EMP has been prepared for the entire life of the mine i.e., upto the lease period.
43	Concealing any factual information or submission of false/fabricated data and failure to comply with any of the conditions mentioned above may result in withdrawal of this Terms of Conditions besides attracting penal provisions in the Environment (Protection) Act, 1986.	Noted and agreed

SEIAA STANDARD CONDITIONS		
Cluster Management Committee		
1	Cluster Management Committee shall be framed which must include all the proponents in the cluster as members including the existing as well as proposed quarry.	**Noted and agreed** The Cluster management committee has been formed covering the existing and proposed quarries in the cluster
2	The members must coordinate among themselves for the effective implementation of EMP as committed including Green Belt Development, Water sprinkling, tree plantation, blasting etc.,	**Noted and agreed** The information will be shared to the cluster management committee during the monthly meeting.
3	The List of members of the committee formed shall be submitted to AD/Mines before the execution of mining lease and the same shall be updated every year to the AD/Mines.	**Noted and agreed** The list of members of the committee formed will be submitted to AD/Mines before resuming the mining operation.
4	Detailed Operational Plan must be submitted which must include the blasting frequency with respect to the nearby quarry situated in the cluster, the usage of haul roads by the individual quarry in the form of route map and network.	**Noted and agreed** It is an existing Granite quarry the blasting will be used occasionally for the removal of overburden only the blasting frequency and usage of haul roads are discussed.
5	The committee shall deliberate on risk & emergency management plan, fire safety & evacuation plan and sustainable development goals pertaining to the cluster in a holistic manner especially during natural calamities like intense rain and the mitigation measures considering the inundation of the cluster and evacuation plan.	**Noted and agreed** The risk management plan and disaster management plan has been prepared and enclosed in this EIA report, Chapter No. 7.
6	The Cluster Management Committee shall form Environmental Policy to practice sustainable mining in a scientific and systematic manner in accordance with the law. The role played by the	**Noted and agreed** Environmental policy of the cluster management committee is detailed in the EIA Report Chapter No. 6

	committee in implementing the environmental policy devised shall be given in detail in the EIA Report.	
7	The committee shall furnish action plan regarding the restoration strategy with respect to the individual quarry falling under the cluster in a holistic manner.	**Noted and agreed** The Restoration strategy is discussed in the progressive mine closure plan and enclosed in the Scheme of Mining plan.
8	The committee shall deliberate on the health of the workers/staff involved in the mining as well as the health of the public in the vicinity.	**Noted and agreed** The information on the health of the workers and the local people will be updated periodically along with medical examination.
Agriculture & Agro-Biodiversity		
9	Impact on surrounding agricultural fields around the proposed mining Area.	As the proposed lease area is dominantly surrounded by mining land, barren land, and fallow land, the impact on the surrounding agricultural fields if present is considerably low. The Mining operation will be carried out to reduce the impact further to the level of negligence.
10	Impact on soil flora & vegetation around the project site.	The vegetation details have been provided in chapter III. There is no schedule I species of animals observed within study area as per Wildlife Protection Act, 1972 and no species falls in vulnerable, endangered or threatened category as per IUCN. There is no endangered red list species found in the study area.
11	Details of type of vegetation including no. of trees & shrubs within the proposed mining area and. If so, transplantation of such vegetation all along the boundary of the proposed mining area shall committed mentioned in EMP.	**Noted and agreed** There are no trees within the existing quarry site, and therefore, no proposal for tree felling or removal is anticipated during the quarrying operations.
12	The Environmental Impact Assessment should study the agro-biodiversity, agro-forestry, horticultural plantations, the natural ecosystem, the soil micro flora, fauna and soil seed banks and suggest measures to maintain the natural Ecosystem.	**Noted and agreed** The details of the soil analysis and the impacts are given in the Chapter No 3 & 4.
13	Action should specifically suggest for sustainable management of the area and restoration of ecosystem for flow of goods and services.	**Noted and agreed** The Eco System of the area will be retained during the mining operation by the way of planting trees in the boundary barrier and un utilized areas. After completion of mining operation, the quarried-out pit will be facilitated to collect the rainwater to pit act as temporary reservoir
14	The project proponent shall study and furnish the impact of project on plantations in adjoining patta lands, Horticulture, Agriculture and livestock	**Noted and agreed** The project area is situated centre part of the quarry lands. The proposed Rough Stone quarrying operation will employ the wet drilling method, which is expected to have negligible impacts on nearby agricultural lands.
Forests		
15	The project proponent shall detailed study on impact of mining on Reserve forests and free ranging wildlife	**Noted and agreed.** There is no Reserve Forest within 1km radius from the project area. The mining operation will not cause any significant impact to the Reserve Forest and Wild life Sanctuaries
16	The Environmental Impact Assessment should study impact on forest, vegetation, endemic, vulnerable and endangered indigenous flora and fauna.	There is no forest/wildlife within 10km radius, chapter 3 details of Ecology and Biodiversity, and 4 endemic vulnerable and endangered indigenous flora and fauna.

17	The Environmental Impact Assessment should study impact on standing trees and the existing trees should be numbered and action suggested for protection	Details are discussed in the Chapter No.3
18	The Environmental Impact Assessment should study impact on protected areas, Reserve Forests, National Parks, Corridors and Wildlife pathways, near project site	Anticipated Environment Impact and Mitigation measures are detailed in Chapter No.4
Water Environment		
19	Hydro-geological study considering the contour map of the water table detailing the number of ground water pumping & open wells, and surface water bodies such as rivers, tanks, canals, ponds etc. within 1 km (radius) so as to assess the impacts on the nearby waterbodies due to mining activity. Based on actual monitored data, it may clearly be shown whether working will intersect groundwater. Necessary data and documentation in this regard may be provided, covering the entire mine lease period	There are 11 open wells and 9 bore wells within the radius of 1km from the project area, Hydrogeological study has been conducted by the resistivity method
20	Erosion Control measures	Details discussed in the chapter No.4
21	Detailed study shall be carried out in regard to impact of mining around the proposed mine lease area on the nearby Villages, Water-bodies/ Rivers, & any ecological fragile areas.	Details in Chapter 3
22	The project proponent shall study impact on fish habitats and the food WEB/ food chain in the water body and Reservoir	Food webs describe who eats whom in an ecological community. Made of interconnected food chains, food webs help us understand how changes to ecosystems — say, removing a top predator or adding nutrients — affect many different species, both directly and indirectly. Whereas in this proposed project is for quarrying of Rough Stone and Gravel and is on a hard batholith formation where no diversion of any water bodies is proposed of there is no intersection of ground water table anticipated.
23	The project proponent shall study and furnish the details on potential fragmentation impact on natural environment, by the activities.	Details are given in the Chapter No 4.
24	The project proponent shall study and furnish the impact on aquatic plants and animals in water bodies and possible scars on the landscape, damages to nearby caves, heritage site, and archaeological sites possible land form changes visual and aesthetic impacts.	Details in Chapter 4 impact of bio diversity.
25	The Terms of Reference should specifically study impact on soil health, soil erosion, the soil physical, chemical components and microbial components	Details of impact on soil environment is detailed in Chapter No.4
26	The Environmental Impact Assessment should study on wetlands, water bodies, rivers streams, lakes and farmer sites	Boluvampatti R.F. 31.5-SW There is, National Parks, Eco sensitive areas, Wild life sanctuaries within the radius of 10km. An ecological survey of the study area was conducted particularly with reference to the listing of species and assessment of the existing baseline ecological (terrestrial) condition in the study area. Ecological Environment is discussed under Chapter 3
27	The EIA shall include the impact of mining activity on the following: a) Hydrothermal/Geothermal effect due to destruction in the Environment.	There are 10 open wells and 11 bore wells within the radius of 1km from the project area, Hydrogeological study has been conducted by the resistivity method

	b) Bio-geochemical processes and its foot prints including environmental stress. c) Sediment geochemistry in the surface streams.	
Energy		
28	The measures taken to control Noise, Air, Water, Dust Control and steps adopted to efficiently utilise the Energy shall be furnished.	Detailed discussed in chapter 4
Climate Change		
29	The Environmental Impact Assessment shall study in detail the carbon emission and also suggest the measures to mitigate carbon emission including development of carbon sinks and temperature reduction including control of other emission and climate mitigation activities	Noted and agreed. Details discussed in chapter 4.
30	The Environmental Impact Assessment should study impact on climate change, temperature rise, pollution and above soil & below soil carbon stock, soil health and physical, chemical & biological soil features	Detailed discussed in chapter 3.
31	Impact of mining on pollution leading to GHGs emissions and the impact of the same on the local livelihood.	A greenhouse gas (GHG) is a gas that absorbs and emits radiant energy within the thermal infrared range, causing the greenhouse effect. The primary greenhouse gases in Earth's atmosphere are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and ozone (O_3) Carbon dioxide (CO_2): Carbon dioxide enters the atmosphere through burning fossil fuels (coal, natural gas, and oil), solid waste, trees and other biological materials. Carbon dioxide is removed from the atmosphere (or "sequestered") when it is absorbed by plants as part of the biological carbon cycle. Methane (CH_4): Methane is emitted during the production and transport of coal, natural gas, and oil. Methane emissions also result from livestock and other agricultural practices, land use and by the decay of organic waste in municipal solid waste landfills. Nitrous oxide (N_2O): Nitrous oxide is emitted during agricultural, land use, and industrial activities; combustion of fossil fuels and solid waste; as well as during treatment of wastewater
Mine Closure Plan		
32	Detailed Mine Closure Plan covering the entire mine lease period as per precise area communication order issued.	Progressive Mine closure plan has been prepared considering the entire lease period in the mining plan and the same has been approved.
EMP		
33	Detailed Environment Management Plan along with adaptation, mitigation & remedial strategies covering the entire mine lease period as per precise area communication order issued and the scope for achieving SDGs	Detailed discussed in chapter 10.
34	The Environmental Impact Assessment should hold detailed study on EMP with budget for	Detailed discussed in chapter 10.

	Green belt development and mine closure plan including disaster management plan.	
Risk Assessment		
35	To furnish risk assessment and management plan including anticipated vulnerabilities during operational and post operational phases of Mining.	A Risk Assessment and management Plan Chapter- 7
Disaster Management Plan		
36	To furnish disaster management plan and disaster mitigation measures in regard to all aspects to avoid/reduce vulnerability to hazards & to cope with disaster/untoward accidents in & around the proposed mine lease area due to the proposed method of mining activity & its related activities covering the entire mine lease period as per precise area communication order issued.	Disaster management Plan details in Chapter-7
Others		
37	The project proponent shall furnish VAO certificate with reference to 300m radius regard to approved habitations, schools, Archaeological sites, Structures, railway lines, roads, water bodies such as streams, odai, vaari, canal, channel, river, lake pond, tank etc.	Letter obtained from the VAO regarding surface features within 300m radius
38	As per the MoEF& CC office memorandum F.No.22-65/2017-IA.III dated: 30.09.2020 and 20.10.2020 the proponent shall address the concerns raised during the public consultation and all the activities proposed shall be part of the Environment Management Plan.	The issues raised during public hearing is addressed in chapter No.7
39	The project proponent shall study and furnish the possible pollution due to plastic and microplastic on the environment. The ecological risks and impacts of plastic & microplastics on aquatic environment and fresh water systems due to activities, contemplated during mining may be investigated and reported	Plastic waste management in the project area detailed in Chapter No.7.

Standard Terms of Reference for (Mining of minerals)		
S.No	**Terms of Reference**	**Reply**
1.1	An EIA-EMP Report shall be prepared for peak capacity (…..MTPA) operation in an ML/project area of.....ha based on the generic structure specified in Appendix III of the EIA Notification, 2006.	Peak Production – 66090m^3 Depth – 37m bgl Mine Lease area - 2.83.4 Ha
1.2	An EIA-EMP Report would be prepared for peak capacity operation to cover the impacts and environment management plan for the project specific activities on the environment of the region, and the environmental quality encompassing air, water, land, biotic community, etc. through collection of data and information, generation of data on impacts including prediction modeling for.... MTPA of mineral production based on approved project/Mining Plan for.... MTPA. Baseline data collection can be for any season (three months) except monsoon.	Peak capacity of 66090m^3 operation to cover the impacts and environment management plan in chapter-IV and Chapter 10 covered in project specific activities. Baseline Data were collected for Post Monsoon Season Oct– Dec2024 as per CPCB Notification and MoEF & CC Guidelines. Details in Chapter No. III
1.3	Proper KML file with pin drop and coordinate of mine at 500-1000 m interval be provided.	Noted, Google earth image showing lease area with Coordinates of pillars in chapter-II.

1.4	A Study area map of the core zone (project area) and 10 km area of the buffer zone (1: 50,000 scale) clearly delineating the major topographical features such as the land use, surface drainage pattern including rivers/streams/nullahs/canals, locations of human habitations, major constructions including railways, roads, pipelines, major industries, mines, and other polluting sources. In case of ecologically sensitive areas such as Biosphere Reserves/National Parks/WL Sanctuaries/ Elephant Reserves, forests (Reserved/Protected), migratory corridors of fauna, and areas where endangered fauna and plants of medicinal and economic importance found in the 15 km study area should be given. The above details to be furnished in tabular form also.	Land use and land cover of the 10km Radius of study area is discussed in Chapter No. III. Geology map of the project area covering 10km radius Figure No. 2.8. page No.22 Geomorphology of the area is given in Chapter No 2 Figure No 2.9, page no.23 There are No National Parks, Biosphere Reserves, Wildlife Corridors, and Tiger/Elephant Reserves within 10 km Radius from the periphery of the project area.
1.5	Map showing the core zone delineating the agricultural land (irrigated and un-irrigated, uncultivable land as defined in the revenue records, forest areas (as per records), along with other physical features such as water bodies, etc should be furnished.	Land use and land cover of the study area is discussed in Chapter No. III with Physical features such as waterbodies, odai, canal etc.,
1.6	A contour map showing the area drainage of the core zone and 25 km of the study area (where the water courses of the core zone ultimately join the major rivers/streams outside the lease/project area) should also be clearly indicated in the separate map.	DEM data using Drainage pattern around 10km radius showing streams and lakes etc., discussed in Chapter No. 3.
1.7	Catchment area with its drainage map of 25 km area within and outside the mine shall be provided with names, details of rivers/ riverlet system and its respective order. The map should clearly indicate drainage pattern of the catchment area with basin of major rivers. Diversion of drains/ river need elaboration in form of length, quantity and quality of water to be diverted.	Drainage pattern around 10km radius showing streams and lakes etc., is discussed in Chapter No. 3.
1.8	(Details of mineral reserves, geological status of the study area and the seams to be worked, ultimate working depth and progressive stage-wise working scheme until the end of mine life should be provided on the basis of the approved rated capacity and calendar plans of production from the approved Mining Plan. Geological maps and sections should be included. The Progressive mine development and Conceptual Final Mine Closure Plan should also be shown in figures. Details of mine plan and mine closure plan approval of Competent Authority should be furnished for green field and expansion projects.	Details in chapter-2 showing the land features. And also enclosed Approved 3rd Scheme of mining plan in annexure.

<table>
<tr><td>1.9</td><td>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.</td><td>It is an opencast quarrying operation proposed to operate in Mechanized method.
The height and width of the bench will be maintained as 5m with 90^0 bench angles.
Quarrying activities will be carried out under the supervision of Competent Persons like Mines Manager, Mines Foreman and Mining Mate.
Necessary permissions will be obtained from DGMS after obtaining Environmental Clearance.</td></tr>
<tr><td>1.10</td><td>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.</td><td>Impact Studies and Mitigation Measures of Water Environment including Surface Water and Ground Water are discussed in Chapter 4.</td></tr>
<tr><td>1.11</td><td>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.</td><td>Not Applicable.
The details of waste dump management are given in the Chapter No. 4</td></tr>
<tr><td>1.12</td><td>Original land use (agricultural land/forestland/grazing land/wasteland/water bodies) of the area should be provided as per the tables given below. Impacts of project, if any on the land use, in particular, agricultural land/forestland/grazing land/water bodies falling within the lease/project and acquired for mining operations should be analyzed. Extent of area under surface rights and under mining rights should be specified. Area under Surface Rights
<table>
<tr><th>Sno</th><th>ML. project Land use</th><th>Area under Surface Rights(ha</th><th>Area Under Mining Rights(ha)</th><th>Area under Both (ha)</th></tr>
<tr><td>1</td><td>Agriculture Land</td><td></td><td></td><td></td></tr>
<tr><td>2</td><td>Forest Land</td><td></td><td></td><td></td></tr>
<tr><td>3</td><td>Grazing Land</td><td></td><td></td><td></td></tr>
<tr><td>4</td><td>Settlements</td><td></td><td></td><td></td></tr>
<tr><td>5</td><td>Others (Specify)</td><td></td><td></td><td></td></tr>
</table>
<table>
<tr><th>S.No</th><th>Details</th><th>Area (Ha)</th></tr>
<tr><td>1</td><td>Buildings</td><td></td></tr>
<tr><td>2</td><td>Infrastructure</td><td></td></tr>
<tr><td>3</td><td>Roads</td><td></td></tr>
<tr><td>4</td><td>Others (Specify)</td><td></td></tr>
<tr><td></td><td>Total</td><td></td></tr>
</table></td><td>Land use and land cover of the study area is discussed in Chapter No. 3.
Land use plan of the project area showing pre-operational, operational and post-operational phases are discussed in Chapter No. 2, Table No 2.5.
<table>
<tr><th>Description</th><th>Present area (Ha)</th><th>Area required during first five years (Ha)</th><th>Area at the end of the lease period (Ha)</th></tr>
<tr><td>Area Under Quarrying</td><td>Nil</td><td>2.29.78</td><td>2.29.78</td></tr>
<tr><td>Infrastructure</td><td>Nil</td><td>0.01.00</td><td>0.01.00</td></tr>
<tr><td>Roads</td><td>Nil</td><td>0.02.00</td><td>0.02.00</td></tr>
<tr><td>Green Belt</td><td>Nil</td><td>0.31.65</td><td>0.50.62</td></tr>
<tr><td>Unutilized Area</td><td>2.83.40</td><td>0.18.97</td><td>Nil</td></tr>
<tr><td>Grand Total</td><td>2.83.40</td><td>2.83.40</td><td>2.83.40</td></tr>
</table></td></tr>
</table>

1.13	Study on the existing flora and fauna in the study area (10km) should be carried out by an institution of relevant discipline. The list of flora and fauna duly authenticated separately for the core and study area and a statement clearly specifying whether the study area forms a part of the migratory corridor of any endangered fauna should be given. If the study area has endangered flora and fauna, or if the area is occasionally visited or used as a habitat by Schedule-I species, or if the project falls within 15 km of an ecologically sensitive area, or used as a migratory corridor then a Comprehensive Conservation Plan along with the appropriate budgetary provision should be prepared and submitted with EIA-EMP Report; and comments/observation from the CWLW of the State Govt. should also be obtained and furnished.	Detailed biological study of the study area [core zone and buffer zone (10 km radius of the periphery of the mine lease)] was carried out and discussed under Chapter No. 3. There is no schedule I species of animals observed within study area as per Wildlife Protection Act 1972 as well as no species is in vulnerable, endangered or threatened category as per IUCN. There is no endangered red list species found in the study area.
1.14	One-season (other than monsoon) primary baseline data on environmental quality - air (PM10, PM2.5, SOx, NOx and heavy metals such as Hg, Pb, Cr, As, etc), noise, water (surface and groundwater), soil - along with one-season met data coinciding with the same season for AAQ collection period should be provided. The detail of NABL/ MoEF&CC certification of the respective laborartory and NABET accreditation of the consultant to be provided.	Baseline Data were collected for Post Monsoon Season Oct– Dec 2024 as per CPCB Notification and MoEF & CC Guidelines. Details in Chapter No. 3.
1.15	Map (1: 50, 000 scale) of the study area (core and buffer zone) showing the location of various sampling stations superimposed with location of habitats, other industries/mines, polluting sources, should be provided. The number and location of the sampling stations in both core and buffer zones should be selected on the basis of size of lease/project area, the proposed impacts in the downwind (air) / downstream (surface water)/groundwater regime (based on flow). One station should be in the upwind/upstream/non-impact/non-polluting area as a control station. The monitoring should be as per CPCB guidelines and parameters for water testing for both ground water and surface water as per ISI standards and CPCB classification wherever applicable. Observed values should be provided along with the specified standards.	Details in chapter-3 showing the various sampling stations As per CPCB guidelines.
1.16	For proper baseline air quality assessment, Wind rose pattern in the area should be reviewed and accordingly location of AAMSQ shall be planned by the collection of air quality data by adequate monitoring stations in the downwind areas. Monitoring location for collecting baseline data should cover overall the 10km buffer zone i.e., dispersed in 10 km buffer area. In case of expansion, the displayed data of CAAQMS	Air Quality Modelling and wind rose pattern for prediction of incremental GLC's of pollutant was carried out using AERMOD view 13 Model. Details in Chapter No. 4.
1.17	A detailed traffic study along with presence of habitation in 100 mts distance from both side of road, the impact on the air quality with its proper measures and plan of action with timeline for widening of road. The project will increase the no. of vehicle along the road which will indirectly contribute to carbon emission so what will be the compensatory action plan should be clearly spell out in EIA/ EMP report.	Traffic density survey was carried out to analyses the impact of Transportation in the study area as per IRC guidelines 1961 and it is inferred that there is no significant impact due to the proposed transportation from the project area. Details in Chapter-II.

1.18	The socio-economic study to conducted with actual survey report and a comparative assessment to be provided from the census data should be provided in EIA/ EMP report also occupational status & economic status of the study area and what economically project will contribute should be clearly mention. The study should also include the status of infrastructural facilities and amenities present in the study area and a comparative assessment with census data to be provided and to link it with the initialization and quantification of need-based survey for CSR activities to be followed.	Detailed in chapter-3 socio-economic study with occupational status & economic status of the study area. The study should also include the status of infrastructural facilities and amenities present in the study area CSR are discussed under Chapter 8.
1.19	The Ecology and biodiversity study should also indicate the likely impact of change in forest area for surface infrastructural development or mining activity in relation to the climate change of that area and what will be the compensatory measure to be adopted by PP to minimize the impact of forest diversion.	Detailed Ecology and biodiversity study in chapter-3
1.20	Baseline data on the health of the population in the impact zone and measures for occupational health and safety of the personnel and manpower for the mine should be submitted.	Detailed in chapter-4 population in the impact zone and measures for occupational health and safety and proposed occupational health in chapter-X
1.21	Impact of proposed project/activity on hydrological regime of the area shall be assessed and report be submitted. Hydrological studies as per GEC 2015 guidelines to be prepared and submitted.	Noted and agreed
1.22	Impact of mining and water abstraction from the mine on the hydrogeology and groundwater regime within the core zone and 10 km buffer zone including long-term monitoring measures should be provided. Details of rainwater harvesting and measures for recharge of groundwater should be reflected in case there is a declining trend of groundwater availability and/or if the area falls within dark/grey zone.	The ground water table is at 68-64m below ground level. In this project, ultimate depth is 37m Bgl It is inferred the quarrying activities in the Cumulative EIA project (Quarry) will not intersect the Ground water table.
1.23	Study on land subsidence including modeling for prediction, mitigation/prevention of subsidence, continuous monitoring measures, and safety issues should be carried out.	Detailed in Chapter-IV Anticipated and mitigation measures of in the study area.
1.24	Detailed water balance should be provided. The breaku p of water requirement as per different activities in the mining operations, including use of water for sand stowing should be given separately. Source of water for use in mine, sanction of the Competent Authority in the State Govt. and impacts vis-à-vis the competing users should be provided.	Total Water Requirement: 2.4 KLD Discussed under Chapter 2, Table No 2.15, The required water will be met from rainwater accumulated in mine pit (when available) and from the approved water vendors.
1.25	PP shall submit design details of all Air Pollution control equipment (APCEs) to be implemented as part of Environment Management Plan vis-à-vis reduction in concentration of emission for each APCEs	Methodology And Instrument Used for Air Quality Analysis in chapter-3and Air Pollution control equipment (APCEs) in chapter-10 sub 10.2 Environmental policy.
1.26	PP shall propose to use LNG/CNG based mining machineries and trucks for mining operation and transportation of mineral. The measures adopted to conserve energy or use of renewable sources shall be explored.	Details in Machinery and equipment details in Chapter-2 Table No 2.16

1.27	PP to evaluate the green house emission gases from the mine operation/ washery plant and corresponding carbon absorption plan.	Noted and agreed
1.28	Site specific Impact assessment with its mitigation measures, Risk Assessment and Disaster Preparedness and Management Plan should be provided.	A Risk Assessment and Disaster Preparedness and management Plan Chapter- 7
1.29	Impact of choice of mining method, technology, selected use of machinery and impact on air quality, mineral transportation, handling & storage/stockyard, etc, Impact of blasting, noise and vibrations should be provided.	Detailed in Machinery and technology used Chapter-3 Table 3.17 – Methodology and Instrument Used for Air Quality Analysis Detailed study in chapter-4 Impact of choice of mining method and impact on air quality and blasting and noise and vibrations.
1.30	Impacts of mineral transportation within the mining area and outside the lease/project along with flow-chart indicating the specific areas generating fugitive emissions should be provided. Impacts of transportation, handling, transfer of mineral and waste on air quality, generation of effluents from workshop etc, management plan for maintenance of HEMM and other machinery/equipment should be given. Details of various facilities such as rest areas and canteen for workers and effluents/pollution load emanating from these activities should also be provided.	Traffic density survey was carried out to analyse the impact of Transportation in the study area as per IRC guidelines 1961 and it is inferred that there is no much significant impact due to the proposed transportation from the project area. Details in Chapter 2. Infrastructure & other facilities will be provided to the Mine Workers after the grant of quarry lease and the same has been discussed in the Chapter No.2.
1.31	Details of various facilities to be provided to the workers in terms of parking, rest areas and canteen, and effluents/pollution load resulting from these activities should also be given.	Infrastructure & other facilities will be provided to the Mine Workers after the grant of quarry lease and the same has been discussed in the Chapter No.2
1.32	The number and efficiency of mobile/static water jet, Fog cannon sprinkling system along the main mineral transportation road inside the mine, approach roads to the mine/stockyard/siding, and also the frequency of their use in impacting air quality should be provided.	Detailed in chapter-2 for mineral transportation route with approach roads etc., and impacting air quality detailed given chapter-4
1.33	Conceptual Final Mine Closure Plan and post mining land use and restoration of land/habitat to the pre- mining status should be provided. A Plan for the ecological restoration of the mined-out area and post mining land use should be prepared with detailed cost provisions. Impact and management of wastes and issues of re-handling (wherever applicable) and backfilling and progressive mine closure and reclamation should be furnished.	Discussed under Chapter 2. Mine Closure Plan is a part of Approved Mining Plan enclosed as Annexure Volume – 1.
1.34	Adequate greenbelt nearby areas, mineral stock yard and transportation area of mineral shall be provided with details of species selected and survival rate Greenbelt development should be undertaken particularly around the transport route.	Greenbelt Development Plan is discussed under Chapter 4
1.35	Cost of EMP (capital and recurring) should be included in the project cost and for progressive and final mine closure plan.	The total cost and the details are given in the Chapter No. 10
1.36	Details of R&R. Detailed project specific R&R Plan with data on the existing socio- economic status of the population (including tribals, SC/ST, BPL families) found in the study area and broad plan for resettlement of the displaced population, site for the resettlement colony, alternate livelihood concerns/employment for the displaced people, civic and housing amenities being offered, etc. and costs along with the schedule of the implementation of the R&R Plan should be given.	Not Applicable. There are no approved habitations within a radius of 300 meters. Therefore, R&R Plan / Compensation details for the Project Affected People (PAP) is not anticipated and Not Applicable for this project.

1.37	CSR Plan along with details of villages and specific budgetary provisions (capital and recurring) for specific activities over the life of the project should be given.	CSR are discussed under Chapter 8. And specific budgetary provisions (capital and recurring) for specific activities over the life of the project in chapter-10
1.38	Corporate Environment Responsibility:	CER are discussed under Chapter 8.
1.39	a) The Company must have a well laid down Environment Policy approved by the Board of Directors.	Detailed in chapter-10 The Environment Policy
1.40	b) The Environment Policy must prescribe for standard operating process/procedures to bring into focus any infringements/deviation/violation of the environmental or forest norms/conditions.	
1.41	c) The hierarchical system or Administrative Order of the company to deal with environmental issues and for ensuring compliance with the environmental clearance conditions must be furnished.	The Environment Monitoring Cell discussed under Chapter 6
1.42	d) To have proper checks and balances, the company should have a well laid down system of reporting of non-compliances/violations of environmental norms to the Board of Directors of the company and/or shareholders or stakeholders at large	The Environment Monitoring Cell discussed under Chapter 6
1.43	e) Environment Management Cell and its responsibilities to be clearly spell out in EIA/ EMP report	The Environment Monitoring Cell discussed under Chapter 6
1.44	f) In built mechanism of self-monitoring of compliance of environmental regulations should be indicated.	The Environment Monitoring Cell discussed under Chapter 6
1.45	Status of any litigations/ court cases filed/pending on the project should be provided.	No litigation is pending in any court against this project
1.46	PP shall submit clarification from DFO that mine does not falls under corridors of any National Park and Wildlife Sanctuary with certified map showing distance of nearest sanctuary.	Nanjarayan Bird Sanctuary – 20.8km –NE It will Submit final EIA/EMP report
1.47	Copy of clearances/approvals such as Forestry clearances, Mining Plan Approval, mine closer plan approval. NOC from Flood and Irrigation Dept. (if req.), etc. wherever applicable	Noted and agreed
1.48	Details on the Forest Clearance should be given as per the format given: Total Mine lease area (ha): Total Forest Land (Ha) : Date of FC : Extent of Forest Land : Balance area for which FC is yet to be obtained: Status of application for diversion of forest Land: If more than one provides details of each FC	Boluvampatti R.F. 31.5km- SW Total Mine Lease area 2.83.4ha Details on the Forest Clearance will Submit final EIA/EMP report.
1.49	In case of expansion of the proposal, the status of the work done as per mining plan and approved mine closure plan shall be detailed in EIA/ EMP report.	**Noted and agreed**.
1.50	Details on Public Hearing should cover the information relating to notices issued in the newspaper, proceedings/minutes of Public Hearing, the points raised by the general public and commitments made by the proponent and the time bound action proposed with budgets in suitable time frame. These details should be presented in a tabular form. If the Public Hearing is in the regional language, an authenticated English Translation of the same. should be provided.	The outcome of public hearing will be updated in the final EIA/AMP report.

1.51	PP shall carry out survey through drone highlighting the ground reality for at least 10 minutes.	Noted and agreed
1.52	Detailed Chronology of the project starting from the first lease deed allotted/Block allotment/ Land acquired to its No. of renewals, CTO /CTE with details of no. renewals, previous EC(s) granted details and its compliance details, NOC details from various Govt bodies like Forest NOC(s), CGWA permissions, Power permissions, etc as per the requisites respectively to be furnished in tabular form.	It is a fresh lease.
1.53	The first page of the EIA/ EMP report must mention the peak capacity production, area, detail of PP, Consultant (NABET accreditation) and Laboratory (NABL / MoEF & CC certification)	**Noted and agreed.** As per detailed in front page of Draft EIA/EMP, NABET, NABL certification detailed given in the report.
1.54	The compliances of Tor must be properly cited with respective chapter section and page no in tabular form and also mention sequence of the respective ToR complied within the EIA-EMP report in all the chapters section.	**Noted and agreed.** As per Tor compliance each chapter wise page and table, figure no given in the EIA/EMP report.

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1.INTRODUCTION

1.0 PREAMBLE

Project History: -

The project proponent Thiru.T. Naveen Kiran applied for Rough stone and Gravel quarry over an extent of 2.83.4Ha in S S.F.Nos.207/2A of Ichipatti Village, Palladam Taluk, Tiruppur District

- Proponent applied for Rough stone and Gravel quarry lease on 06.06.2024
- Precise area communication letter was issued by the Assistant Director vide Rc.No.330/Mines/2024, Dated: 28.08.2024.
- The Mining plan has been prepared by the Qualified person and got approval vide Letter Rc.No. 330/Mines/2024 Dated: 03.09.2024.
- The Mining plan has been approved for the quantity of **4,38,060** $m^3$of Rough stone & 44,520m^3 of Gravel up to the depth of 37m bgl for the period of Ten years.

As per the EIA Notification, 2006 and subsequent amendments and OM The proposal falls in the B1 Category (Cluster quarries – 2 proposals and 8 Existing quarries forming Cluster Category {Total Extent of the Cluster is 17.31.35Ha}- Cluster area calculated as per MoEF & CC Notification S.O. 2269(E) Dated 1st July 2016).

- Proponent applied for Terms of Reference vide Proposal No. SIA/TN/MIN/496110/2024 dated 10.09.2024 and the ToR Was Granted vide **File. No.11252 TOR Identification No.TO24B0108TN5875455N Dated:22.10.2024**
- Based on the ToR Baseline Monitoring study has been carried out for one season i.e., **Oct- Dec 2024** and this EIA and EMP report is prepared for considering cumulative impacts arising out of these projects, the Cumulative Environmental Impact Assessment study is undertaken, which is followed by preparation of a detailed Environmental Management Plan (EMP) to minimize those adverse impacts.

Environmental Impact Assessment (EIA) is the management tool to ensure the sustainable development and it is a process, used to identify the environmental, social and economic impacts of a project prior to decision-making. It is a decision-making tool, which guides the decision makers in taking appropriate decisions for any project. EIA systematically examines both beneficial and adverse consequences of the project and ensures that these impacts are taken into account during the project designing. It also reduces conflicts by promoting community participation, information, decision makers, and helps in developing the base for environmentally sound project.

1.1 PURPOSE OF THE REPORT

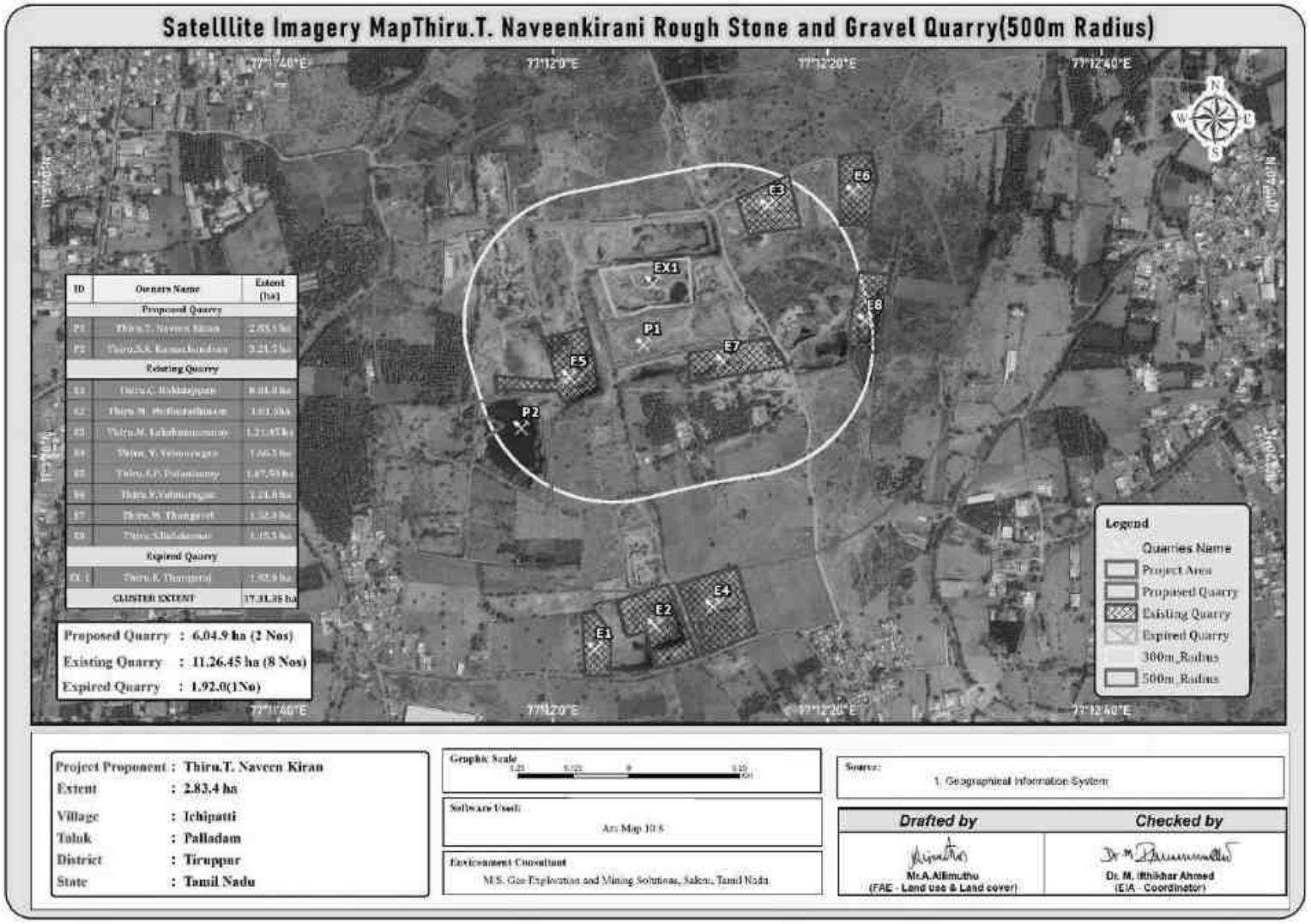
The Ministry of Environment and Forests, Govt. of India, through its EIA notification S.O. 1533(E) of 14th September 2006 and its subsequent amendments as per Gazette Notification S.O. 1889 of 20thApril 2022, Mining Projects are classified under two categories i.e. A (> 250 Ha) and B (≤ 250 Ha), and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

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

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

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

FIGURE 1.1 SATELLITE IMAGERY CLUSTER QUARRIES



1.2 IDENTIFICATION OF PROJECT AND PROJECT PROPONENT

1.2.1 Identification of Project Proponent

TABLE 1.1: DETAILS OF PROJECT PROPONENT

Name of the Project Proponent	Thiru.T.Naveen Kiran
Address	S/o. Thangaraj No.1/660, Devarayanpalayam, Ichipatti Village Palldam Taluk, Tiruppur District – 641 668
Mobile	+91 7373407363
Email	naveenkiran128@gmail.com
Status	Individual

1.2.2 Identification of Project

TABLE 1.2: SALIENT FEATURES OF THE PROPOSED PROJECT

Name of the Project	Thiru. T.Naveen Kiran Rough stone and Gravel quarry	
S.F. No.	**207/2A**	
Extent	2.83.4 ha	
Village Taluk and District	Ichipatti Village, Palladam Taluk, Tiruppur District.	
Land Type	Proponent own patta land	
Land Ownership	It is a Patta lands. Registered in the name of the applicant (Thiru.T.Naveen Kiran), vide Patta Nos. 3110	
Toposheet No	58 - E/04	
Latitude between	**11° 03' 26.39"N to 11° 03' 31.48"N**	
Longitude between	**77° 12' 03.41"E to 77° 12' 13.44"E**	
Elevation of the area	375m(Max) AMSL	
Lease period	10 Years	
Mining Plan period	5 years	
Proposed Depth of Mining	37m Bgl	
	Rough Stone in m^3	Gravel m^3
Geological Resources	9,91,900	56,680
Mineable Reserves	4,38,060	44,520
Year wise Production First Five Years	2,90,640	44,520
Year wise Production Second Five Years	1,47,420	-
Peak Production	66,090	15,960
Ultimate Pit Dimension	265m(L) x 84m(W) x 37m(D) Bgl	
Water Level in the region	64-68 m bgl	
Method of Mining	Opencast Mechanized Mining Method involving small drilling and Controlled blasting using Slurry Explosives	
Topography	The lease applied area is situated in flat terrain. The area has gentle sloping towards North-eastern side. The altitude of the area is 375m (max) above Mean Sea level. The area is covered by gravel having an average thickness of 2m and followed by Massive Charnockite Which is clearly inferred from the adjacent existing quarry pit	
Machinery proposed	Jack Hammer	8 Nos
	Compressor	2 Nos
	Excavator with Bucket and Rock Breaker	2 No
	Tippers	3 Nos

Blasting Method	Controlled Blasting Method by shot hole drilling and small dia of 25mm slurry explosive are proposed to be used for shattering and heaving effect for removal and winning of Rough Stone. No deep hole drilling is proposed.	
Proposed Manpower Deployment	35 Nos	
Project Cost	Rs.1,83,23,000/-	
EMP Cost	Rs. 7,60,000/-	
Total Project cost	Rs. 1,90,83,000/-	
CER Cost	Rs. 5,00,000/-	
Nearby Water Bodies	Vaikkal	210m_N
	Odai	480m- NW
	Samalpuram Lake	1.5km – North
	Noyyal River	2km – North West
	Sendevipalayam Dam	3.7km – North West
Greenbelt Development Plan	Proposed to plant 1420Nos of trees considering 500 Nos of trees/ Ha criteria The plantation will be developed around the project site and nearby village roads	
Proposed Water Requirement	2.4 KLD	
Nearest Habitation	640m – South West	
Nearest Reserve Forest	Boluvampatti R.F – 31.5 km – South West	
Nearest Wild Life Sanctuary	Nanjarayan bird Sanctuary – 21km – NE Sathiyamangalam Tiger Reserve- 46km NW	

Source: Approved Mining & Land Documents.

1.3 BRIEF DESCRIPTION OF THE PROJECT

1.3.1 Nature and Size of the Project

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

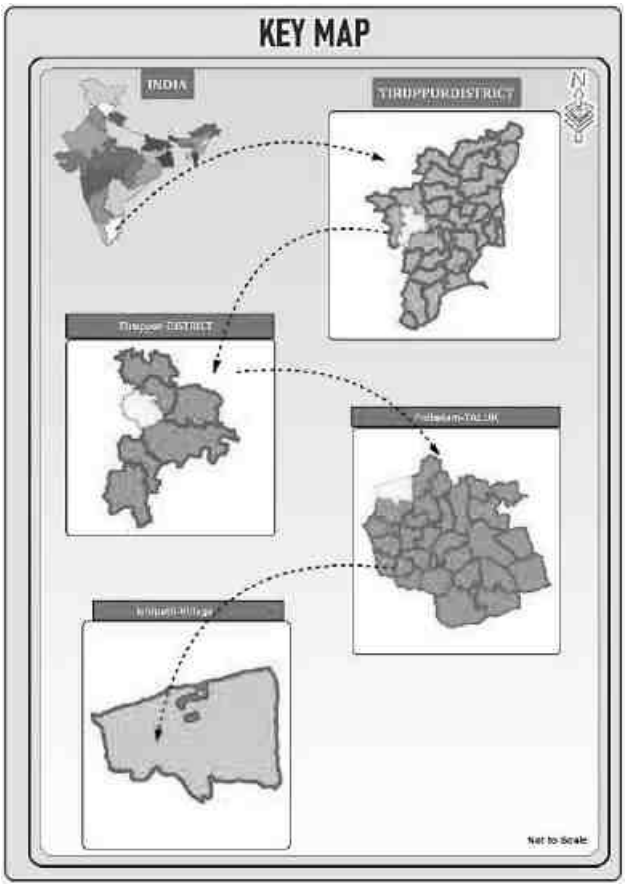
The peak production of Rough stone is 66,090m^3 and 15,960m^3 of Gravel maximum in a year for rough stone is 146m^3 per day/ 12 Tippers per day considering 12m^3 per load. The depth of the mining is 37bgl.

1.3.2 Location of the Project

- The project site is located in Ichipatti Village, Palladam Taluk, Tiruppur District.
- The lease applied area is located about 16.0 km Southwest side of Tiruppur, 11.0 km Northwest side of Palladam town and 700m Northwestern side of Ichipatti Village.

	13km		10km		700m	
Tiruppur	→	Palladam	→	Ichipatti	→	Lease applied area
	Southwest		Northwest		Northwest	

FIGURE 1.2 LOCATION MAP OF THE PROJECT SITE



Source: Survey of India Toposheet 58-E/04,

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

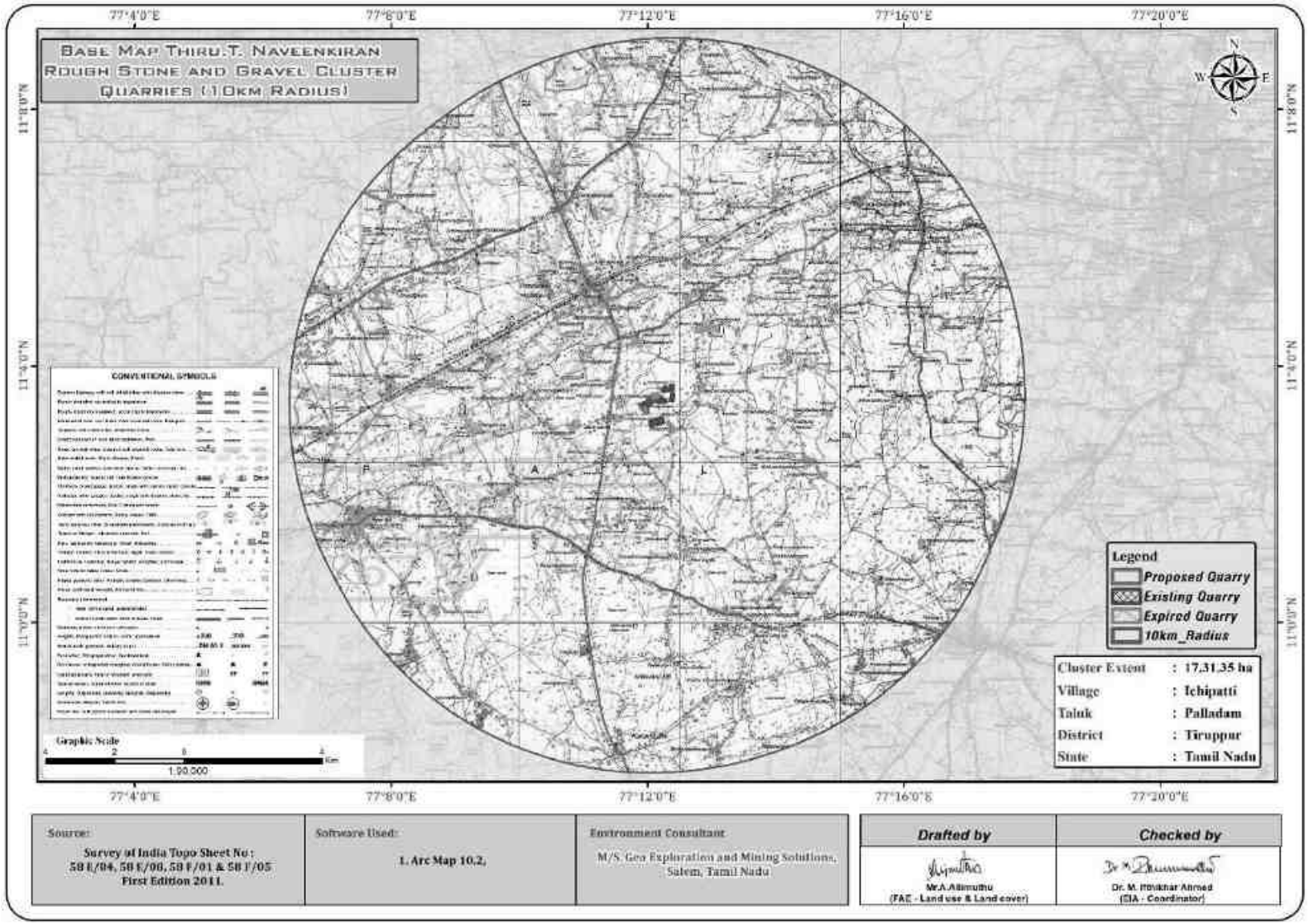
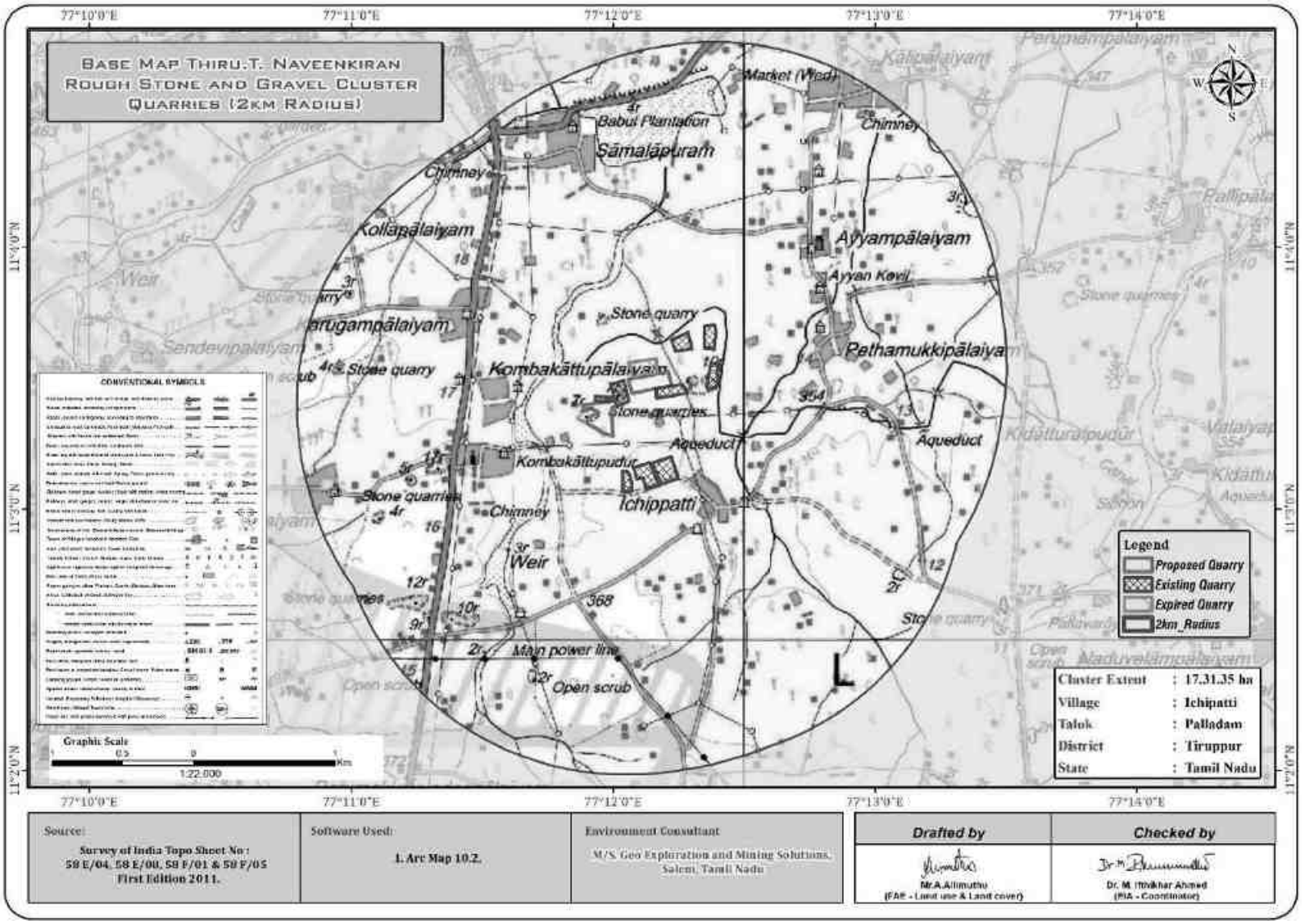


FIGURE 1.4: TOPOSHEET MAP OF THE STUDY AREA 2KM RADIUS



1.4 ENVIRONMENTAL CLEARANCE

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

- Screening,
- Scoping
- Public consultation &
- Appraisal

SCREENING:

- Proponent applied for Rough stone and Gravel quarry lease on 06.06.2024
- Precise area communication letter was issued by the Assistant Director vide Rc.No.330/Mines/2024, Dated: 28.08.2024.
- The Mining plan has been prepared by the Qualified person and got approval vide Letter Rc.No. 330/Mines/2024 Dated: 03.09.2024.
- The proposed project falls under "B1" Category as per Order Dated: 04.09.2018 & 13.09.2018 passed by Hon'ble National Green tribunal, New Delhi in O.A. No. 173 of 2018 & O.A. No, 186 of 2016 and MoEF & CC Office Memorandum F. No. L-11011/175/2018-IA-II (M) Dated: 12.12.2018
- Proponent applied for ToR for Environmental Clearance vide online Proposal No. SIA/TN/MIN/496110/2024 dated 10.09.2024

SCOPING:

- The proposal was placed in 502nd SEAC meeting held on 03.10.2024 and the committee recommended for issue of ToR.
- The proposal was considered in 765th Authority meeting held on 18.10.2024, issued ToR vide **File No.11252. TOR Identification No TO24B0108TN5875455N, dated: 22.10.2024**

PUBLIC CONSULTATION

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

APPRAISAL –

Appraisal is the detailed scrutiny by the State Expert Appraisal Committee (SEAC) of the application and other documents like the final EIA & EMP Report, outcome of the Public Consultations including Public Hearing Proceedings, submitted by the proponent to the regulatory authority concerned for grant of environmental clearance.

1.5 TERMS OF REFERENCE (ToR)

The ToR was issued by the SEIAA vide **File No.11252. TOR Identification No TO24B0108TN5875455N, dated: 22.10.2024.** The Details of the ToR Compliance is given in the Page No. i to xvii

1.6 POST ENVIRONMENT CLEARANCE MONITORING

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

1.7 GENERIC STRUCTURE OF EIA DOCUMENT

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

1.8 THE SCOPE OF THE STUDY

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

TABLE 1.3: ENVIRONMENT ATTRIBUTES

Sl.No.	Attributes	Parameters	Source and Frequency
1	Ambient Air Quality	PM_{10}, $PM_{2.5}$, SO_2, NO_2	Continuous 24-hourly samples twice a week for three months at 7 locations (1 Core & 6 Buffer)
2	Meteorology	Wind speed and direction, temperature, relative humidity and rainfall	Near project site continuous for three months with hourly recording and from secondary sources of IMD station
3	Water quality	Physical, Chemical and Bacteriological parameters	Grab samples were collected at 6 locations – 2 Surface water and 4 Ground water samples; once during study period.
4	Ecology	Existing terrestrial and aquatic flora and fauna within 10 km radius circle.	Limited primary survey and secondary data was collected from the Forest department.
5	Noise levels	Noise levels in dB(A)	7 locations – data monitored once for 24 hours during EIA study
6	Soil Characteristics	Physical and Chemical Parameters	Once at 6 locations during study period
7	Land use	Existing land use for different categories	Based on Survey of India topographical sheet and satellite imagery and primary survey.
8	Socio-Economic Aspects	Socio-economic and demographic characteristics, worker characteristics	Based on primary survey and secondary sources data like census of India 2011.

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

Source: Field Monitoring Data

1.8.1 Regulatory Compliance & Applicable Laws/Regulations for all Proposed Quarries

- Application for Quarrying Lease as per Tamil Nadu Minor Mineral Concession Rules, 1959.
- Obtained Precise Area Communication Letter as per Tamil Nadu Minor Mineral Concession Rules, 1959 for Preparation of Mining Plan and obtaining Environmental Clearance.
- The Mining Plan has been approved under Rule 41 & 42 as amended of Tamil Nadu Minor Mineral Concession Rules, 1959.
- ToR vide **File No.11252. TOR Identification No TO24B0108TN5875455N, dated: 22.10.2024**
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2. PROJECT DESCRIPTION

2.0 GENERAL

The Proposed Rough Stone Quarry require Environmental Clearance. There are 2 proposed and 8 existing quarries forming a cluster; calculated as per MoEF & CC Notification S.O. 2269(E) Dated 1st July 2016 and the total extent of cluster is 17.31.35 ha

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

2.1 DESCRIPTION OF THE PROJECT

The proposed project is site specific and there is no additional area required for this project. There is no effluent generation/discharge from this project. Method of mining is opencast mechanized method involving splitting of rock mass of considerable volume from the parent rock mass by jackhammer drilling and blasting, hydraulic excavators are used for loading the Rough Stone from pithead to the needy crushers and rock breakers to avoid secondary blasting.

2.2 LOCATION OF THE PROJECT

The lease applied area is located about 16.0 km Southwest side of Tiruppur, 11.0 km Northwest side of Palladam and 700m Northwestern side of Ichipatti Village.

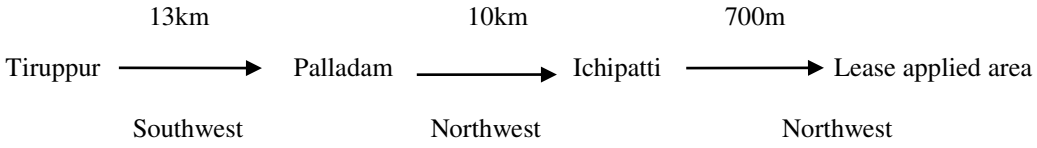


TABLE 2.1: SITE CONNECTIVITY

Nearest Roadway	NH (81) - Coimbatore – Trichy - 4.5 km – South West SH (165) - Kamanaikenpalayam – Annur Road- 830m –West
Nearest Village	Kombakadu 450m-W
Nearest Town	Sulur – 9.0 km-SW
Nearest Railway Station	Somanur – 4.0 km – North West
Nearest Airport	Coimbatore– 27.0 km –South West
Seaport	Kochi– 161.0 km – South West

Source: Survey of India Toposheet

TABLE 2.2: CO-ORDINATES – PROJECT BOUNDARY

Corner Nos.	Latitude	Longitude
1	11° 03' 26.39"N	77° 12' 04.38"E
2	11°03' 29.67"N	77° 12' 03.41"E
3	11°03′ 31.48″N	77° 12' 12.57"E
4	11° 03′ 28.22"N	77° 12' 13.44"E
5	11° 03′ 27.66"N	77° 12' 09.76"E

Datum: UTM-WGS84, Zone 43 North

Source: Approved Mining Plan

FIGURE 2.1: TOPOGRAPHICAL VIEW OF PROJECT AREA

FIGURE 2.1A PHOTOS OF GREEN BELT & FENCING

FIGURE 2.2: GOOGLE IMAGE OF THE PROJECT AREA

Source: Google Earth Imagery

FIGURE 2.3: QUARRY LEASE PLAN / SURFACE PLAN

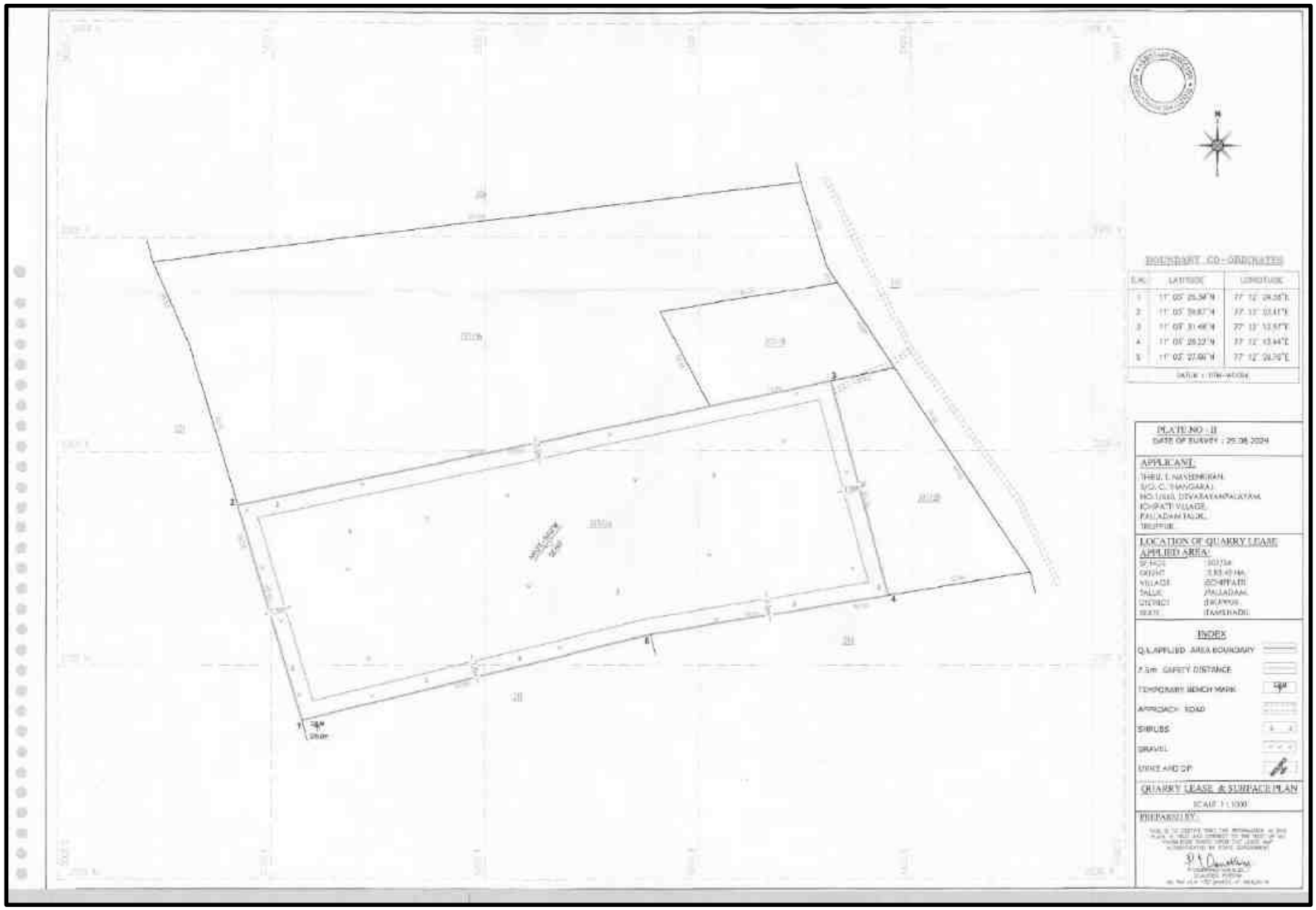


FIGURE 2.4: VILLAGE MAP SUPERIMPOSED ON GOOGLE EARTH IMAGE

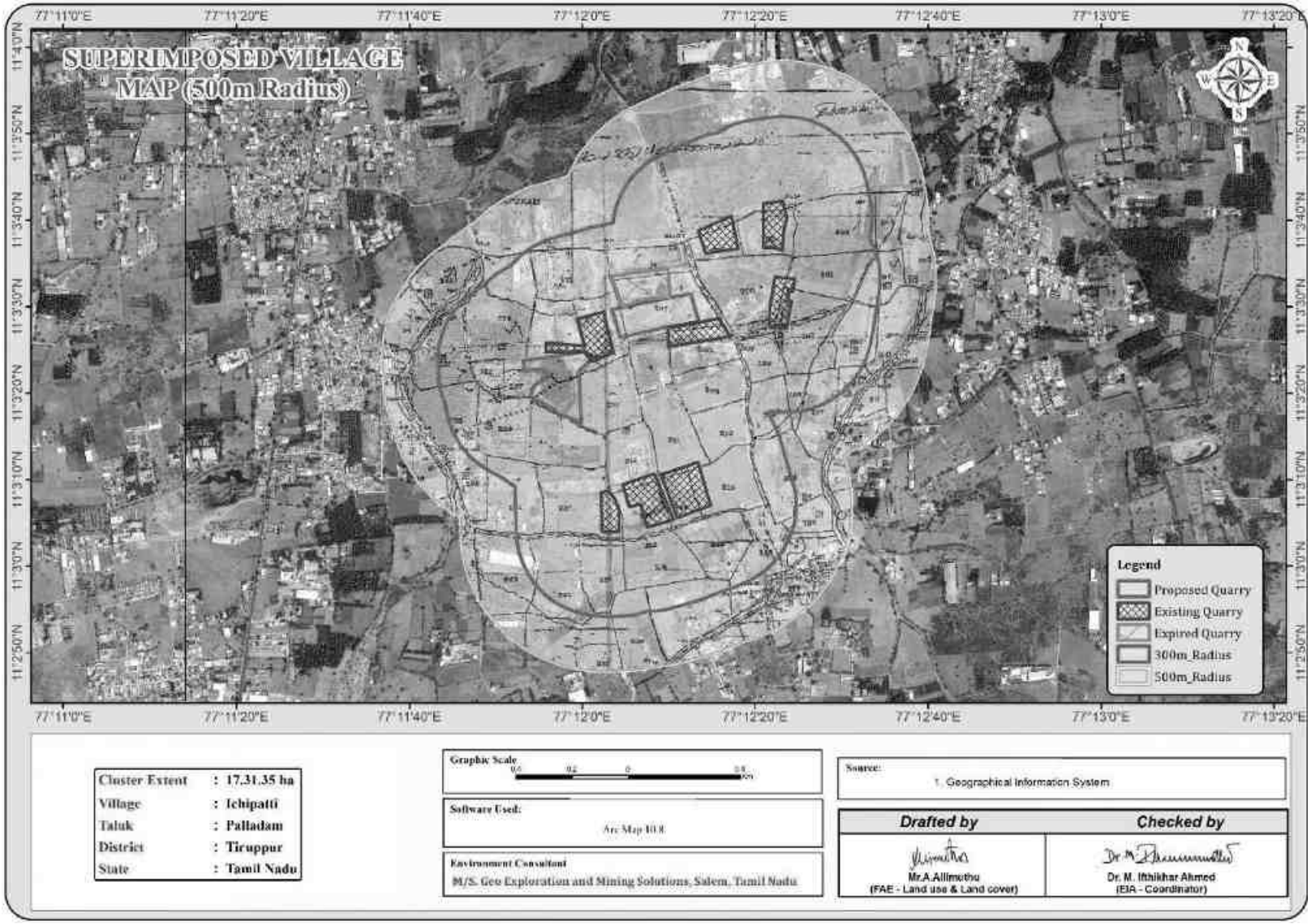


FIGURE 2.5: IMAGE SHOWING SURFACE FEATURES AROUND 10 KM RADIUS

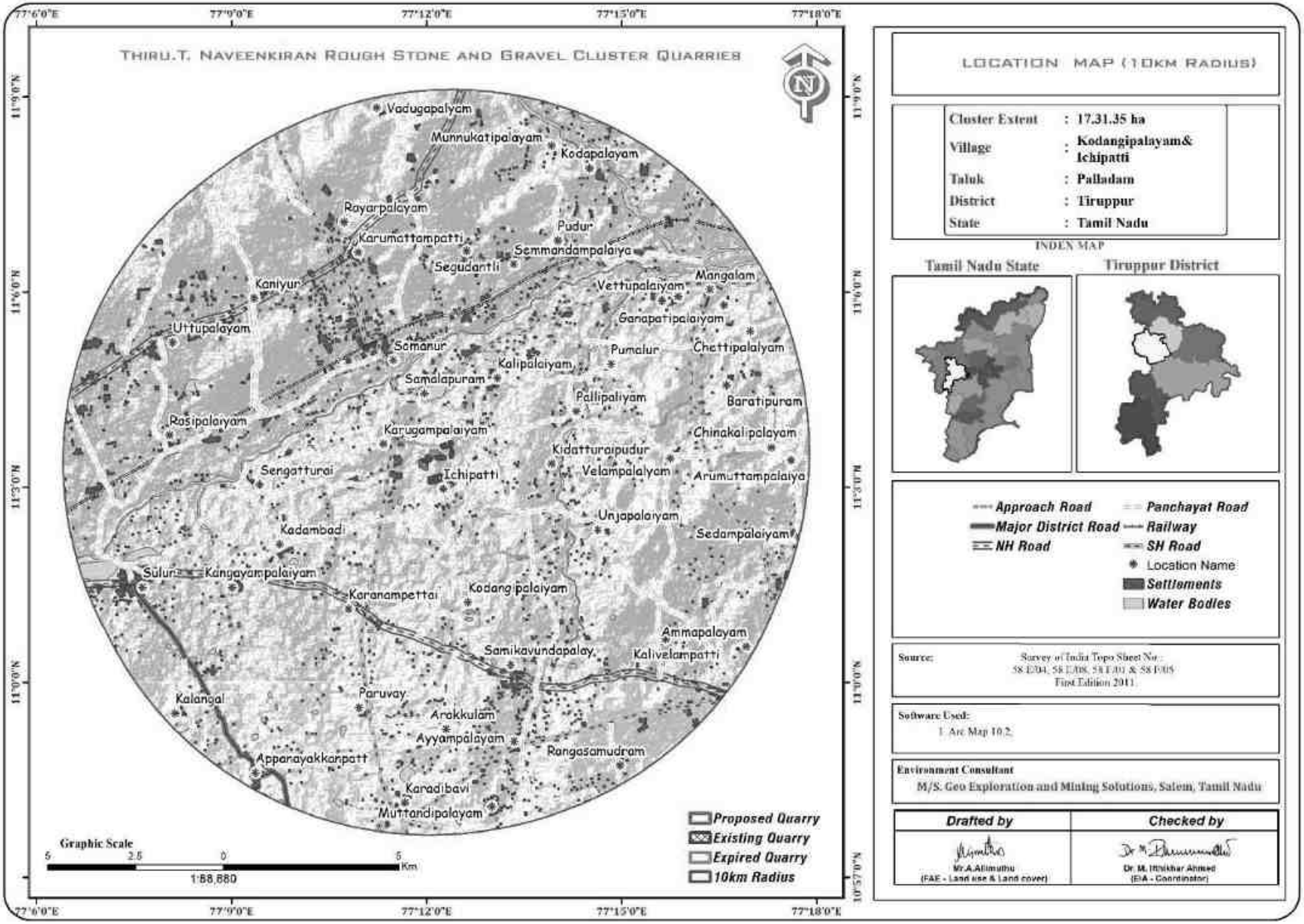


FIGURE 2.6: IMAGE SHOWING SURFACE FEATURES AROUND 5 KM RADIUS

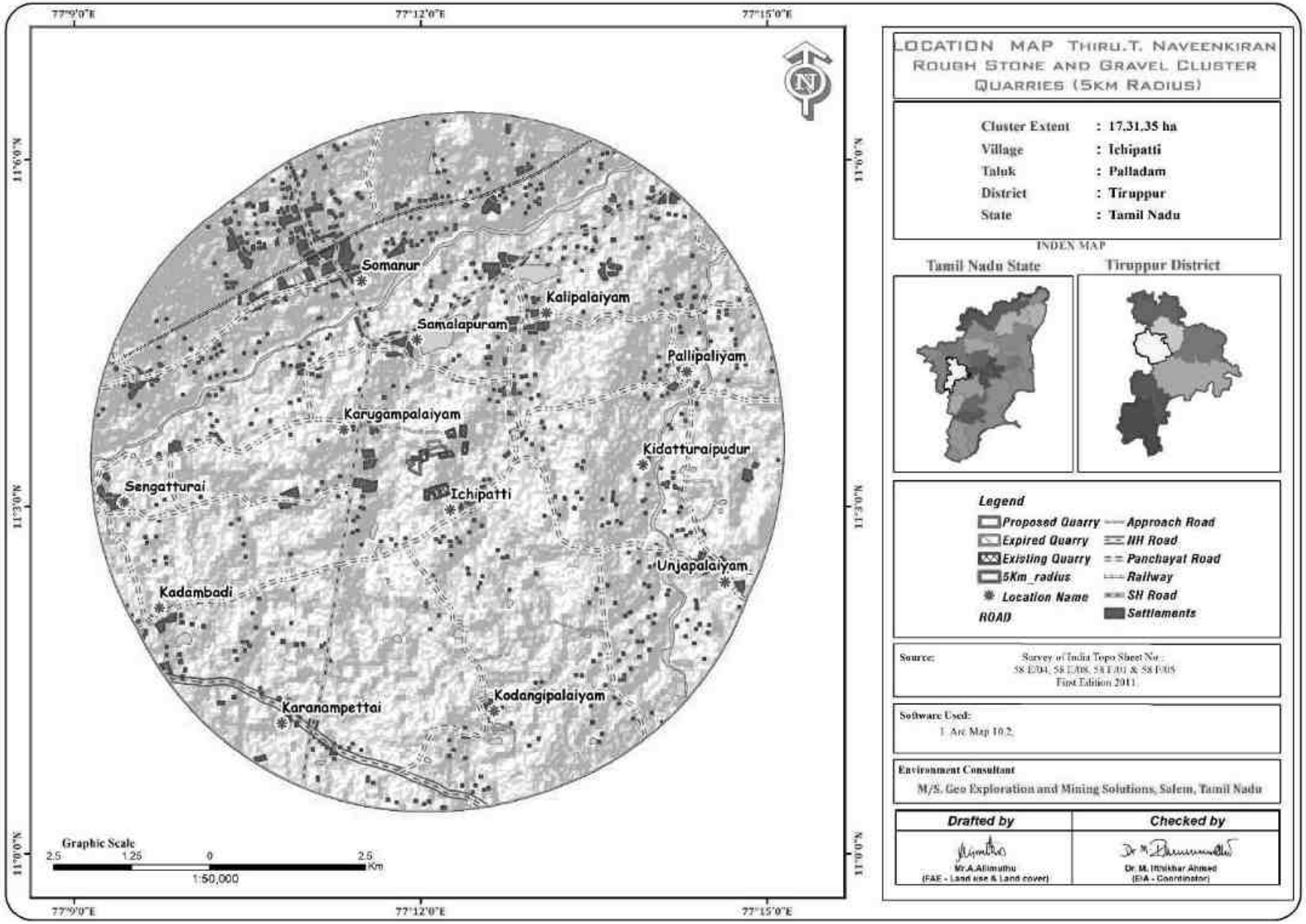
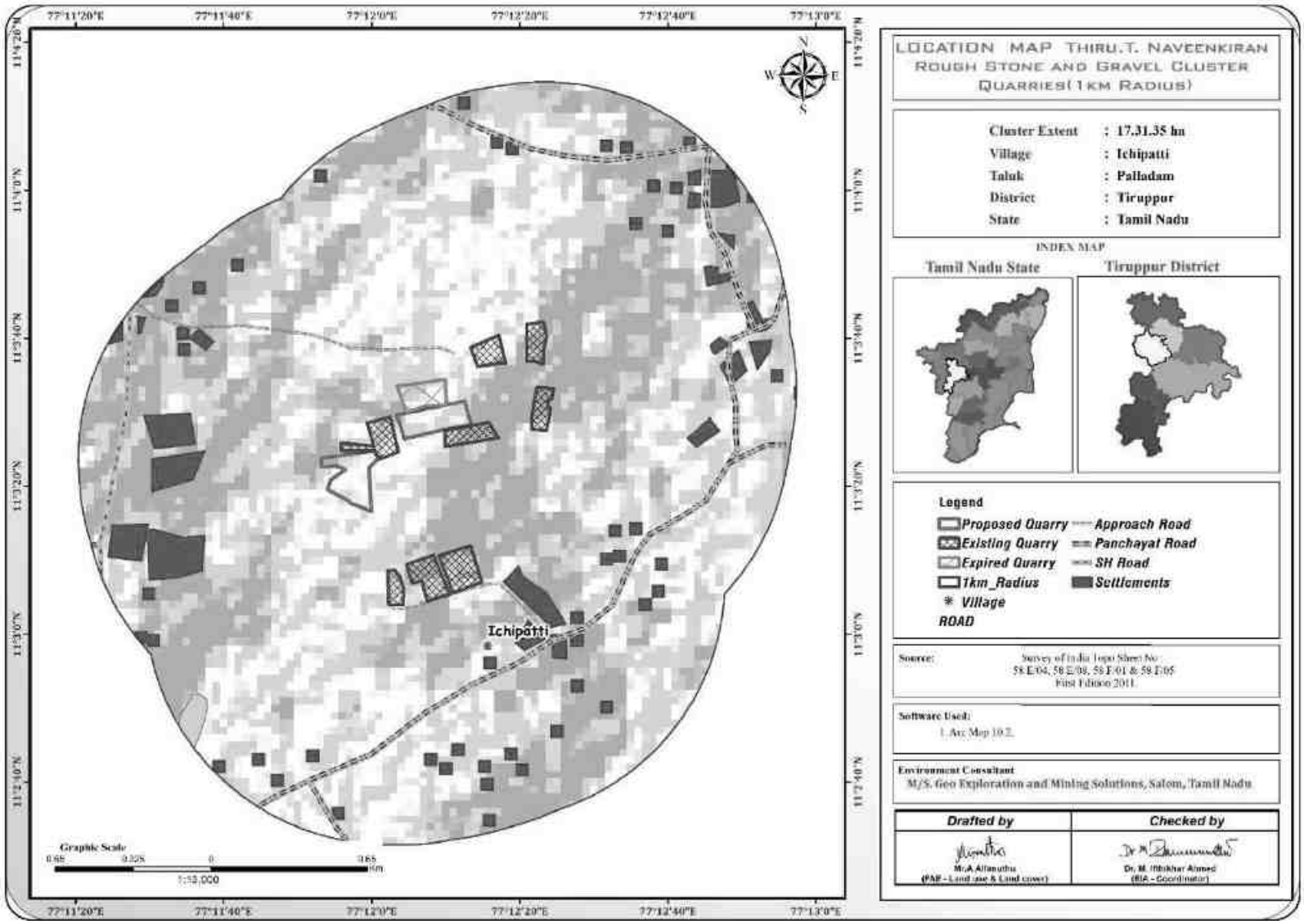


FIGURE 2.6A: IMAGE SHOWING SURFACE FEATURES AROUND 1 KM RADIUS



2.2.1 Project Area

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

TABLE 2.3: LAND USE PATTERN

Description	Present area (Ha)	Area required during first five years (Ha)	Area at the end of the lease period (Ha)
Area Under Quarrying	Nil	2.29.78	2.29.78
Infrastructure	Nil	0.01.00	0.01.00
Roads	Nil	0.02.00	0.02.00
Green Belt	Nil	0.31.65	0.50.62
Unutilized Area	2.83.40	0.18.97	Nil
Grand Total	**2.83.40**	**2.83.40**	**2.83.40**

Source: Approved Mining Plan

2.2.2 Size or Magnitude of Operation

TABLE 2.4: RESOURCES AND RESERVES FOR 1ST FIVE YEARS

PARTICULARS	DETAILS	
	Rough Stone in m^3	Gravel in m^3 (3 years)
Geological Resources	9,91,900	56,680
Mineable Reserves	4,38,060	44,520
Production for1st five-year plan period	2,90,640	44,520
Production for 2nd five-year plan period	147420	-
Peak Production	66,090	15,960
Mining Plan Period / Lease Applied Period	5 Years	
Number of Working Days	300 Days	
Production per day	292	49
No of Lorry loads ($12m^3$ per load)	24	4
Total Depth of Mining	37m below ground level	

Source: Approved mining plan.

2.3 GEOLOGY

2.3.1 Regional Geology

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

I. Charnockite Group represented by Charnockite, Pyroxene Granulite and Magnetite Quartzite,

II. Peninsular Gneissic Complex (II) comprising hornblende-biotite gneiss,

III. Basic intrusive include Pyroxinite / Dunite

IV. Younger intrusive comprising, Nepheline-Syenite, Pink Granite, Pegmatite and Quartz veins and

V. Quaternary sediments of Kankar and soil.

Stratigraphy of the area

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

Tiruppur District is predominantly occupied by hornblende Biotite gneisses of PGC (II) with enclaves of Magnetite Quartzite, Pyroxene Granulite and Charnockite. The area exposes several bands of Pyroxene Granulite which is medium grained, medium to dark grey in colour and stand out prominently in the gneissic country generally parallel to regional foliation. Charnockite is coarse grained, massive, many places it is foliated, grey colored and greasy and exposed as boulder outcrops and small knolls. It is well exposed in Central, Western and Southern parts of the Tiruppur District. The general strike of foliation varies from ENE-WSW, E-W with dipping towards NW and N respectively.

Hornblende-Biotite gneiss is well foliated, medium to coarse grained, pale grey and exposed as sheets and small knolls. Pink Granite gneiss occurs as thin bands and lensoidal bodies. It is a medium grained rock composed of alternating bands of mafic (mainly of biotite and hornblende) and felsic (Feldspar and Quartz) minerals. It is well recognized in Avinasi area.

Basic intrusives such as pyroxinite/dunite occurs as Outcrop and lensoidal bodies in the country rock and mostly concordant to the regional foliation. Many basic intrusive are reported in south and south-east of Tiruppur town. The trend of these bodies is east-west.

Nepheline syenite is a leucocratic, coarse-grained rock and composed mainly of Feldspar with Nepheline and shows pitted appearance due to removal of Nepleline. This alkaline rock is available in and around Sivanmalai area only. Acid intrusives comprising pink granite, pegmatite and quartz veins are traversed country rocks in micro (cm wide-meter long) to meso-scale (few meters wide and several meter long) extend. Granite is exposed around 9 km SW of Avanashi. Small scale pegmatite and quartz veins are noticed almost in all the rock types. Acid intrusives are overlain by sediments of Quaternary age, represented by Kankar and black cotton soil with Gypsum. Most of the area is covered by brown and red brown soil. Some part of the area covered with black cotton soil contains Gypsum as lumps. Black cotton soil covers south-western part of the district.

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

https://cdn.s3waas.gov.in/s3d1f255a373a3cef72e03aa9d980c7eca/uploads/2019/05/2019052585.pdf

2.3.2 Local Geology: -

The lease applied area is a Plain terrain. The area has gentle sloping towards Northeastern side and altitude of the area is 378m (max) above from Mean Sea level. The area is covered by 2m thickness of Gravel, 3m thickness of weathered rock and followed by Massive Charnockite which is clearly inferred from the existing quarry pit.

Peninsular gneiss forms the oldest rock formations, in which the massive formation of Charnockite lies over with rich accumulation of recent quaternary formation. On regional scale of the Charnockite body is N40°E – S40°W with dipping towards SE60º.

The general geological sequences of the rocks in this area are given below:

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

2.3.3 Hydrogeology

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

Quaternary - Laterites, Sands and Clays

Tertiary - Sandstone, Gravels and Clays

Cretaceous - Limestone, Calcareous Sandstone and Clay unconformity.

Archaean - Charnockites, Gneisses, Granites, Dolerites and Pegmatite

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

The Cretaceous formation is represented by Arenaceous Lime stone, Calcareous sand - stone and marl. The Tertiary formation is argillaceous comprising of Silty clay stones, argillaceous Lime stone.

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

Aquifer Systems:

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

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

Alluvial Formations

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

Tertiary Cuddalore sandstone

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

Cretaceous Formations

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

Hard Rock Formations

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

Granitic Gneiss

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

Charnockite

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

Aquifer Parameters

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

TABLE 2.5: RANGE OF AQUIFER PARAMETERS

Name	Sp. Capacity (lpm/d)	Specific Yield (%)	T (m^2/d)	K (m/day)	Yield of wells (lps)
Alluvium	2.08	7.2	98	19.7	2.5
Tertiary	78-173	1.4-3.5	46-134	16-33	2-3.3
Cretaceous	33-782	0.3-2.56	33-782	10-66	1.1-3.5
Crystalline	27-224	0.8-2.5	16-60	5-20	1-2

Source: http://nwm.gov.in/sites/default/files/Notes%20on%20Trippur%20District.pdf

The Ground Water levels from the 38 number of observation wells of TWAD have been analyzed for Post-Monsoon and Pre-Monsoon.

FIGURE 2.7: GROUND WATER LEVEL VARIATIONS OF TIRUPPUR DISTRICT

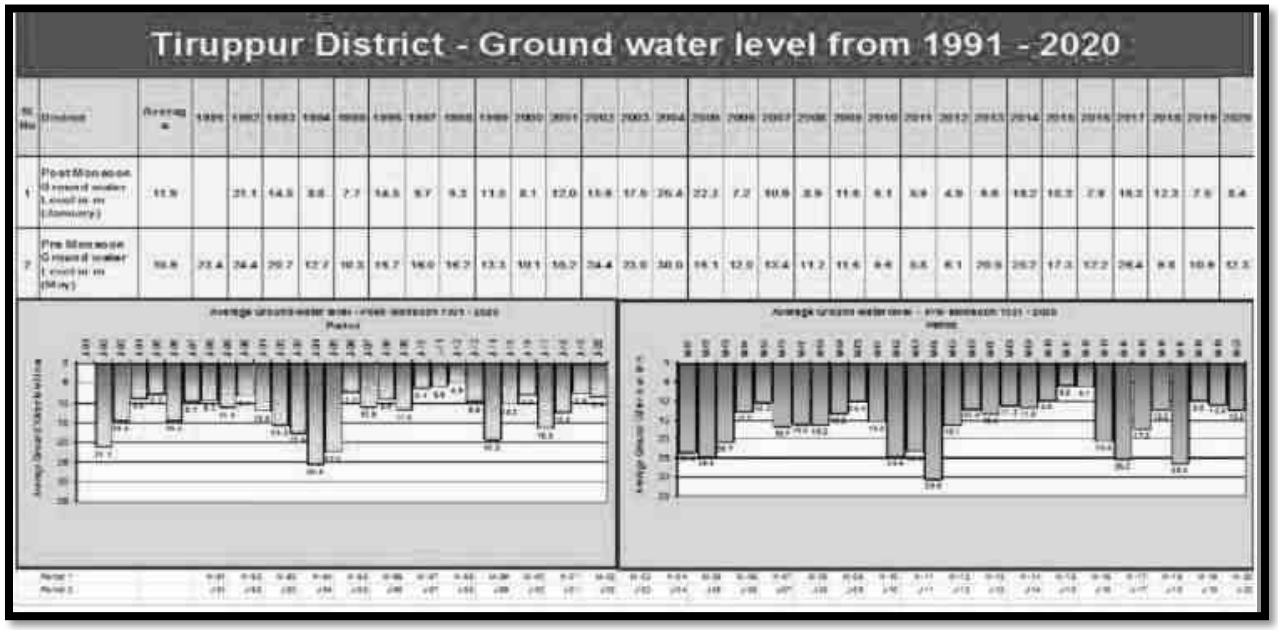


TABLE 2.6: GROUND WATER LEVEL VARIATIONS OF TIRUPPUR DISTRICT

Jan 2017	May 2017	Jan 2018	May 2018	Jan 2019	May 2019	Jan 2020	May 2020	Jan 2021	May 2021	5 Years Pre-Monsoon Average	5Years Post Monsoon Average

16.3	26.4	12.4	9.8	7.6	10.9	8.4	12.3	7.1	10.6	11.9	8.8

Source: https://www.twadboard.tn.gov.in/content/tiruppur

FIGURE 2.8: REGIONAL GEOLOGY MAP

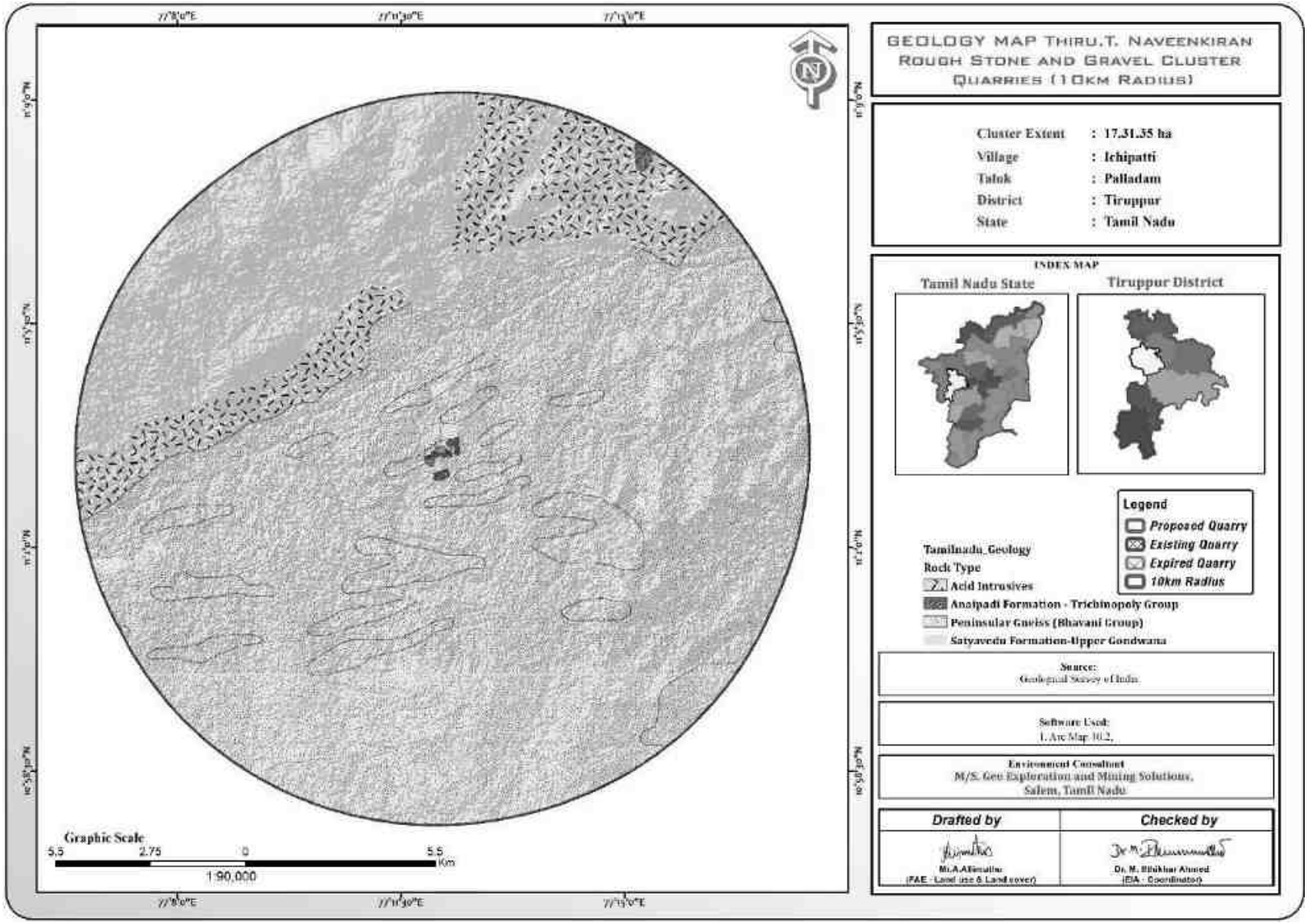
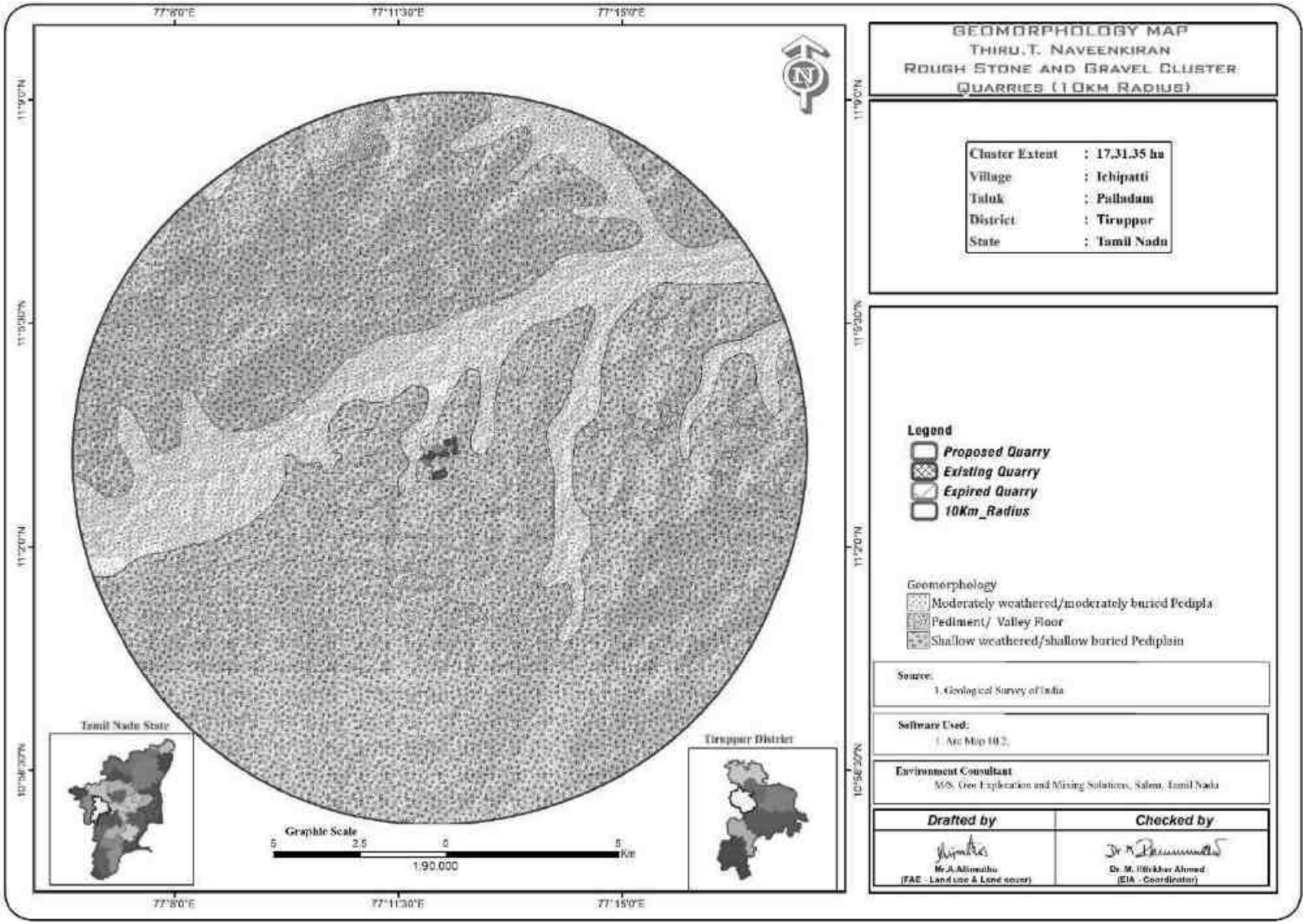


FIGURE 2.9: GEOMORPHOLOGY MAP



2.4 RESOURCES AND RESERVES

The Resources and Reserves of Rough Stone and Gravel were calculated based on Cross-Section Method by plotting sections to cover the maximum lease area. Based on the availability of Geological Resources the Mineable Reserves are calculated by considering excavation system of bench formation and leaving essential safety distance of 7.5 m (Safety Barrier all around the applied area) and safety distance as per precise area communication letter and deducting the locked up reserves during bench formation (Also called as Bench Loss) and the Mineable Reserves is calculated considering there is no waste / overburden / side burden (100% Recovery Anticipated).

TABLE 2.7: RESOURCES AND RESERVES

Description	Rough Stone in m^3	Gravel in m^3 (3 years)
Geological Resource in m^3	9,91,900	44,520
Mineable Resource in m^3	4,38,060	44,520
Year wise production for 1st five-year plan period	2,90,640	44,520
Year wise production for 2nd five-year plan period	1,47,420	-
Peak Production	66,090	15,960

Source: Approved Mining Plan

TABLE 2.8: YEAR-WISE PRODUCTION PLAN

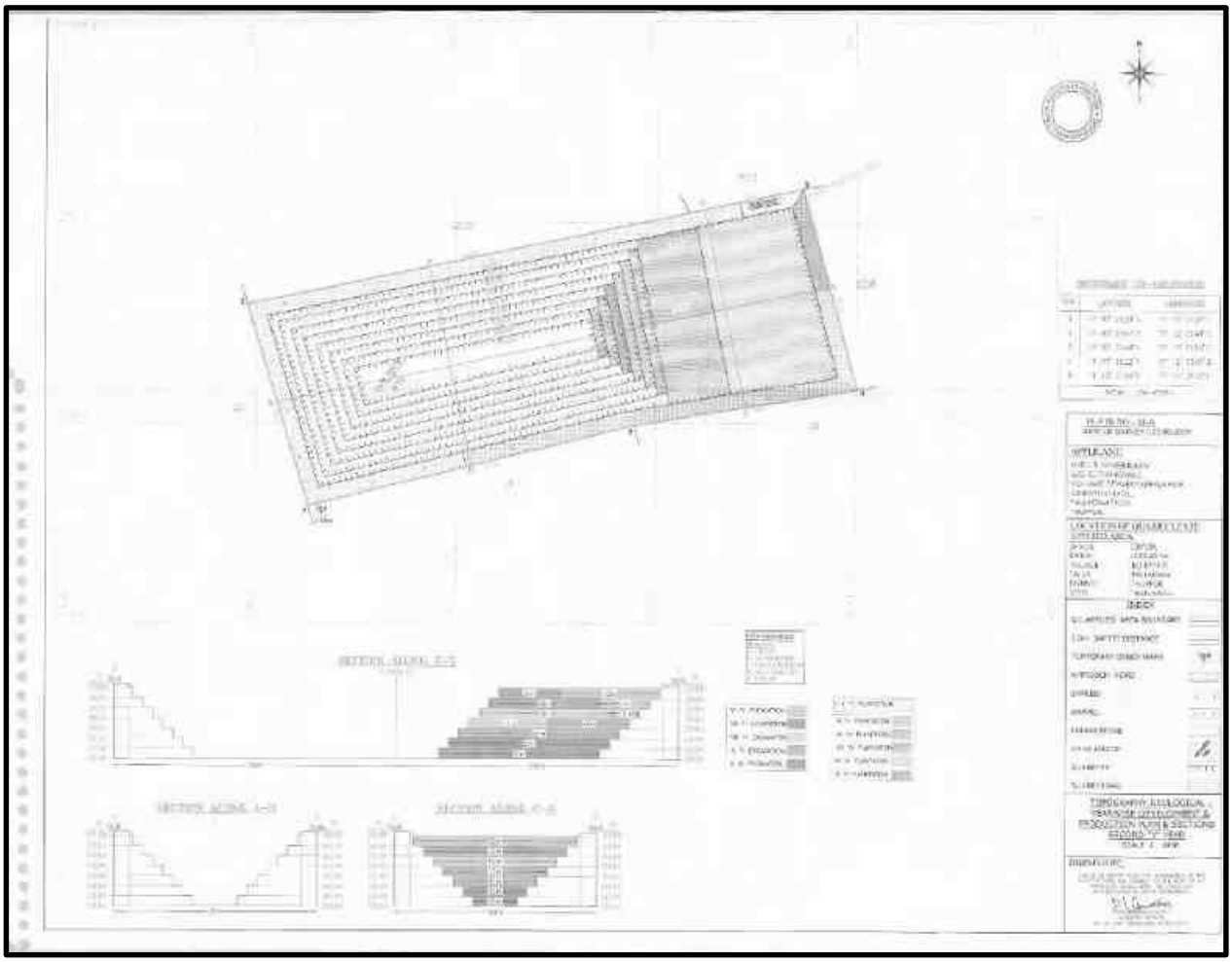
Year	Rough Stone in m^3	Gravel in m^3
I	55,000	14,280
II	55,000	14,280
III	64,050	15,960
IV	66,090	-
V	50,500	-
VI	34,150	-
VII	32,870	-
VIII	31,120	-
IX	27,410	-
X	21,870	-
Total	**4,38,060**	**44,520**

Source: Approved Mining Plan

Disposal of Waste

The overburden in the form of Gravel is about 44,520m^3 up to depth 2m.The quarried-out Gravel will be directly loaded into tippers for the filling and levelling of low-lying areas.

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



Conceptual Mining Plan/ Final Mine Closure Plan

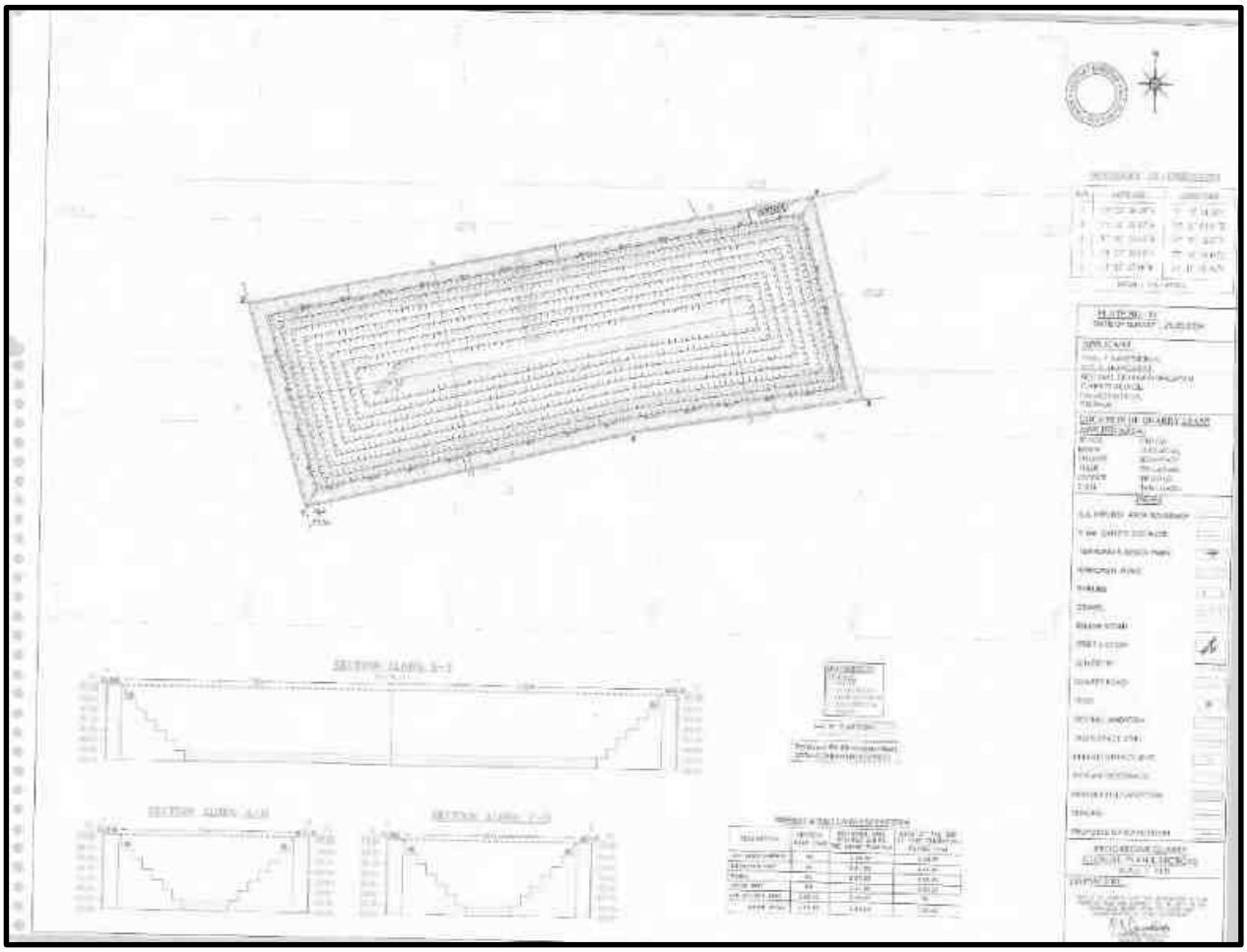
The ultimate pit size is designed based on certain practical parameters such as economical depth of mining, safety zones, permissible area, etc.

TABLE 2.9: ULTIMATE PIT DIMENSION

Pit	Length (Max) (m)	Width (Max) (m)	Depth (Max)
I	265	84	37m bgl

Source: Approved Mining Plan

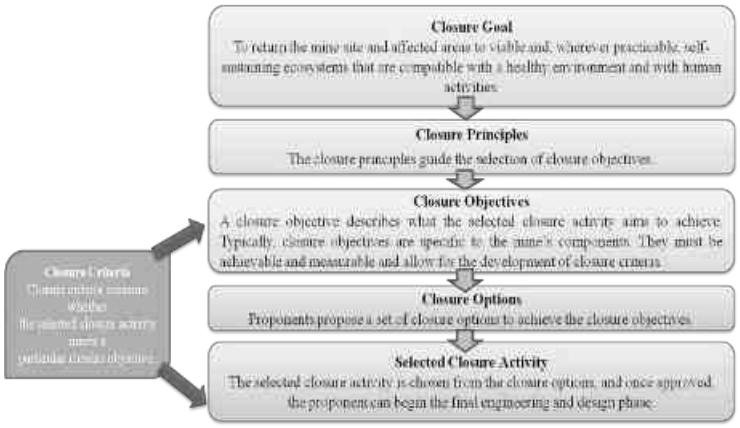
FIGURE 2.11: CLOSURE PLAN AND SECTIONS



Source: Approved Mining Plan

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

Closure Objectives –



- Access to be limited, for the safety of humans and wildlife.
- The open pit mine workings and pit boundary are physically and geo-technically stable.
- Water quality in flooded pits is safe for humans, aquatic life, and wildlife.
- Discharge of contaminated drainage has been minimized and controlled.
- Original or desired new surface drainage patterns have been established.
- For flooded pits, in-pit aquatic habitat has been established where practical and feasible.
- Emergency access and escape routes from flooded pits for humans and wildlife are in place.
- Dust levels are safe for people, vegetation, aquatic life, and wildlife.

Closure Planning & Options Considerations in Mine Design –

- The closure of mine is well planned at the initial stage of planning & design consideration by the internal and external stake holders
- Construction of 2m height bund all along the mine pit boundary and ensure its stability all time & construction of garland drain along the natural slope to avoid sliding and collection of soil to the pit & surface runoff during rainfall
- After complete exploitation of mineral, the lowest bench foot wall side will be maintained as plain surface without any sump pits to avoid any accidents
- All the sharp edges will be dressed to smoother face before the closure of mine and ensure no loose debris on hanging wall side
- The project proponent as a part of social responsibilities assures to supply the stored mine pit water to the nearby villages after effective treatment process as per the standards of TNPCB & TWAD
- Native species will be planted in 3 row patterns on the boundary barriers and 1st bench, a full-time sentry will be appointed at the gate to prevent inherent entry of public & cattle.
- The access road to the quarry will be cut-off immediately after the closure
- The layout design shall be prepared and get approved from Department of Geology and Mining.
- The proponent is instructed to construct as per the layout approved
- Physical and chemical stability of structures left in place at the site, the natural rehabilitation of a biologically diverse, stable environment, the ultimate land use is optimized and is compatible with the surrounding area and the requirements of the local community, and taking the needs of the local community into account and minimizing the socio-economic impact of closure
- There will be a positive change in the environmental and ecology due to the mine closure

2.5 METHOD OF MINING

Opencast Mechanized Mining Method is proposed by formation of 5.0-meter height bench with a bench width not less than the bench height. Bench slope will be maintained as 60^0.

The Rough Stone is a batholith formation and the splitting of rock mass of considerable volume from the parent rock mass will be carried out by deploying jackhammer drilling and Slurry Explosives will be used for blasting. Hydraulic Excavator attached with rock breaker/ bucket with tipper combination will be involved for the excavation/breaking of Rough stone after blasting. Hydraulic excavators attached with bucket unit will be deployed for loading the Rough Stone into the tippers and then the stone is transported from pithead to the nearby crushers.

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

2.5.1 Drilling & Blasting Parameters

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

Spacing	–	1.2m
Burden	–	1.0 m
Depth of hole	–	1.5 m
Charge per hole	–	0.50 – 0.75kg
Powder factor	–	6.0 tonnes/kg
Diameter of hole	–	32 mm
Peak production Capacity	=	$180m^3$ of Rough stone per day
Spacing X Burden X Depth	=	1.2m X 1.0m X 1.5m = $1.8m^3$
	=	$1.8m^3$ X 2.6 (Bulk Density) = 4.6Ts per hole

hence for the peak production per day of $180m^3$ (468Ts) = 150 Nos of holes to be drilled per day

Explosives per hole = ½ kg hence 75 kg of Explosives will be utilized maximum considering the peak production

Type of Explosives to be used –

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

Storage of Explosives –

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

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

2.5.2 Extent of Mechanization

TABLE 2.10 PROPOSED MACHINERY DEPLOYMENT

S.NO.	TYPE	NOS	SIZE/CAPACITY	MOTIVE POWER
1	Jack hammers	8	1.2m to 2.0m	Compressed air
2	Compressor	2	400psi	Diesel Drive

3	Excavator with Bucket and Rock Breaker	2	300 HP	Diesel Drive
4	Tippers	3	20 Tonnes	Diesel Drive

Source: Approved Mining Plan

2.6 GENERAL FEATURES

2.6.1 Existing Infrastructures

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

2.6.2 Drainage Pattern

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

2.6.3 Traffic Density

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

Traffic density measurements were performed at two locations

1. Village Road
2. State Highway_Annur to Pollachi Road

Traffic density measurement was made continuously for 24 hours by visual observation and counting of vehicles under three categories, viz., Heavy motor vehicles, light motor vehicles and two/three wheelers. As traffic densities on the roads are high, two skilled persons were deployed simultaneously at each station during each shift- one person on either direction for counting the traffic. At the end of each hour, fresh counting and recording was undertaken.

TABLE.2.11: TRAFFIC SURVEY LOCATIONS

Station Code	Road Name	Distance and Direction	Type of Road
TS-1	Village Road	650m_NW	Village Road
TS-2	State Highway_Annur to Pollachi Road	2.0km SW	State Highway Road

Source: On-site monitoring by GEMS FAE & TM

TABLE 2.12: EXISTING TRAFFIC VOLUME

Station code	HMV		LMV		2/3 Wheelers		Total PCU
	No	PCU	No	PCU	No	PCU	
TS1	60	180	90	90	130	60	330
TS2	240	720	110	110	240	120	950

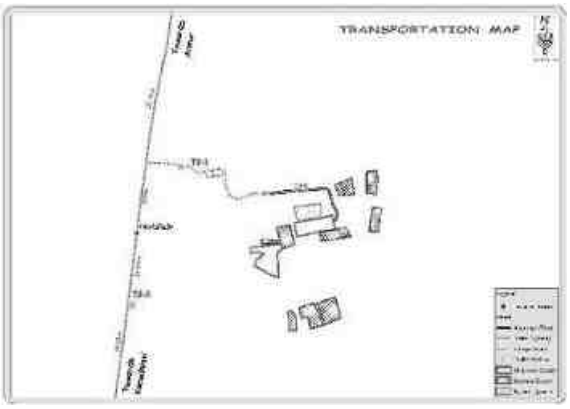
Source: On-site monitoring by GEMS FAE & TM

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

TABLE 2.13: ROUGH STONE & GRAVEL HOURLY TRANSPORTATION REQUIREMENT

Transportation of Rough Stone & Gravel per day		
Capacity of trucks	No. of Trips per day	Volume in PCU
20 tonnes	17	51

FIGURE.2.12: MINERAL TRANSPORTATION ROUTE MAP



*Transportation of Rough Stone from quarry is to crusher located in Northern direction of the quarry.

TABLE 2.14: SUMMARY OF TRAFFIC VOLUME

Route	Existing Traffic volume in PCU	Incremental traffic due to the project	Total traffic volume	Hourly Capacity in PCU as per IRC – 1960guidelines
Panchayat Road	330	51	381	1200
State Highway_Annur to Pollachi Road	990	51	1001	1500

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

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

2.6.4 Mineral Beneficiation and Processing

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

2.7 PROJECT REQUIREMENT

2.7.1 Water Source & Requirement

Detail of water requirements in KLD as given below:

TABLE 2.15: WATER REQUIREMENT FOR THE PROJECT

Purpose	**Quantity**	**Source**
Dust Suppression	0.9KLD	From the existing pit or from the water vendors
Green Belt	0.8KLD	From the existing pit or from the water vendors
Sanitation & Drinking	0.7KLD	From the existing pit or from the water vendors.
Total	**2.4 KLD**	

Source: Prefeasibility report

2.7.2 Power and Other Infrastructure Requirement

Power is not required for the mining operation; the mining operation will be carried out using Diesel Generator and Earth moving machineries using diesel. The quarrying activity is proposed during day time only

(General Shift 8 AM – 5 PM, Lunch Break 1 PM – 2 PM). Electricity for use in office and other internal infrastructure will be obtained from TNEB by project proponent.

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

2.7.3 Fuel Requirement

One Excavator will excavate 25m^3 of Broken up Rough stone per hour and 60m^3 of Gravel per hour.

Peak production of Rough stone = 180m^3

Peak production of Gravel = 12m^3

Peak production for the overburden (Gravel) = 13m^3

Type of machinery	Working hours	Average Diesel consumption/ Hour	Quantity of Diesel in Ltrs
Working hours of Excavator (Aprx)	180m^3/20m^3=9hrs (Rough stone)	18 Ltrs	162
	15m^3/60m^3 = 0.5-1 Hrs	18 Ltrs	18
	11/60m^3 = 0.5-1Hrs	18 Ltrs	18
Compressor	Working hours per day 2Hrs	8 Ltrs	16
Tippers, Motor pumps to drain water	Occasionally		20
Total Diesel Consumption			**234**

The Maximum diesel consumption is around 234Ltrs per day considering the peak production.

2.7.4 Project Cost

The Environmental Management plan has been prepared considering the mode of working, Safety of the employees and Monitoring periods the Total cost is 1,90,83,000/-

2.8 EMPLOYMENT REQUIREMENT:

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

TABLE 2.16: PROPOSED MANPOWER DEPLOYMENT

Designation	No of persons
Mines Manager	1
Geologist	1
Mines Foreman	1
Mate/Blaster	1
Jack hammer operator	16
Excavator Operator	2
Tipper Driver	3
Labour & Helper	2
Cleaner & Co-operator	6
Security	1
Total	**35**

Source: Approved Mining Plan

2.9 PROJECT IMPLEMENTATION SCHEDULE

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

TABLE 2.17: EXPECTED TIME SCHEDULE

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

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

3. DESCRIPTION OF ENVIRONMENT

3.0 GENERAL

The baseline environment quality represents the background environmental scenario of various environmental components such as Land, Water, Air, Noise, Biological and Socio-economic status of the study area. Field monitoring studies to evaluate the base line status of the project site were carried out covering March 2024 to May 2024 with CPCB guidelines for the following attributes –

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

Environmental data has been collected with reference to cluster quarries by Global Lab and Consultancy Services, – An accredited by ISO/IEC 17025:2017 (NABL) Laboratory

Study Area

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

- Core zone is considered as cluster area
- Buffer zone taken as 10km radius from the periphery of the Cluster. Both Core zone and Buffer zone is taken as the study area.

Study Period

The baseline study was conducted during the season **Post monsoon** i.e., Oct 2024 to Dec 2024.

Study Methodology

- The project area was surveyed in detail with the help of Total Station Survey instruments and pillars were marked. The boundary coordinates were superimposed on the satellite imagery to understand the relief of the area, besides Land use pattern of the area was studied through the Bhuvan (ISRO)
- Soil samples were collected and analysed for relevant physio-chemical characteristics in order to assess the impact due to mining activities and to recommend saplings for Greenbelt development.
- Ground water samples were collected from the existing bore wells, Surface water was collected from water bodies in the buffer zone and analysed as per CPCB Guidelines.
- An onsite meteorological station was setup in cluster area, to collect data about wind speed, wind direction, temperature, relative humidity, rainfall and general weather conditions were recorded throughout the study period.
- Air quality Data were collected by installation of Respiratory Dust Samplers (RDS) for Fugitive dust, PM_{10} and SO_2, NO_X with gaseous attachments & Fine Dust Samplers (FDS) for $PM_{2.5}$ and other parameters as per NAAQ norms and analysed for primary air pollutants to work out the existing status of air quality.
- The Noise level measurements were also made at various locations in different intervals of time with the help of sound level meter to establish the baseline noise levels in the impact zone.
- Baseline biological studies were carried out to assess the ecology of the study area to study the existing flora and fauna pattern of the area.

- Socio-Economic survey was conducted at village and household level in the study area to understand the present socio-economic conditions and assess the extent of impact due to the proposed mining project.

The sampling methodologies for the various environmental parameters required for the study, frequency of sampling, method of samples analysis, etc., are given below Table 3.1.

TABLE 3.1: MONITORING ATTRIBUTES AND FREQUENCY OF MONITORING

Attribute	Parameters	Frequency of Monitoring	No. of Locations	Protocol
Land-use Land cover	Land-use Pattern within 10 km radius of the study area	Data from census handbook 2011 and from the satellite imagery	Study Area	Satellite Imagery Primary Survey
*Soil	Physio-Chemical Characteristics	Once during the study period	6 (1 core & 5 buffer zone)	IS 2720 Agriculture Handbook - Indian Council of Agriculture Research, New Delhi
*Water Quality	Physical, Chemical and Bacteriological Parameters	Once during the study period	6 (2 surface water & 4 ground water)	IS 10500& CPCB Standards
Meteorology	Wind Speed Wind Direction Temperature Cloud cover Dry bulb temperature Rainfall	1 Hourly Continuous Mechanical/Automatic Weather Station	1	Site specific primary data& Secondary Data from IMD Station
*Ambient Air Quality	PM10 PM2.5 SO2 NOX Fugitive Dust	24 hourlies twice a week (March to May 2024)	7 (1 core & 6 buffer)	IS 5182 Part 1-23 National Ambient Air Quality Standards, CPCB
*Noise Levels	Ambient Noise	Hourly observation for 24 Hours per location	7 (1 core & 6 buffer zone)	IS 9989 As per CPCB Guidelines
Ecology	Existing Flora and Fauna	Through field visit during the study period	Study Area	Primary Survey by Quadrate & Transect Study Secondary Data – Forest Working Plan
Socio Economic Aspects	Socio–Economic Characteristics, Population Statistics and Existing Infrastructure in the study area	Site Visit & Census Handbook, 2011	Study Area	Primary Survey, census handbook & need based assessments.

Source: On-site monitoring/sampling by Global Lab and Consultancy Services

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

3.1 LAND ENVIRONMENT

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

3.1.1 Land Use/ Land Cover

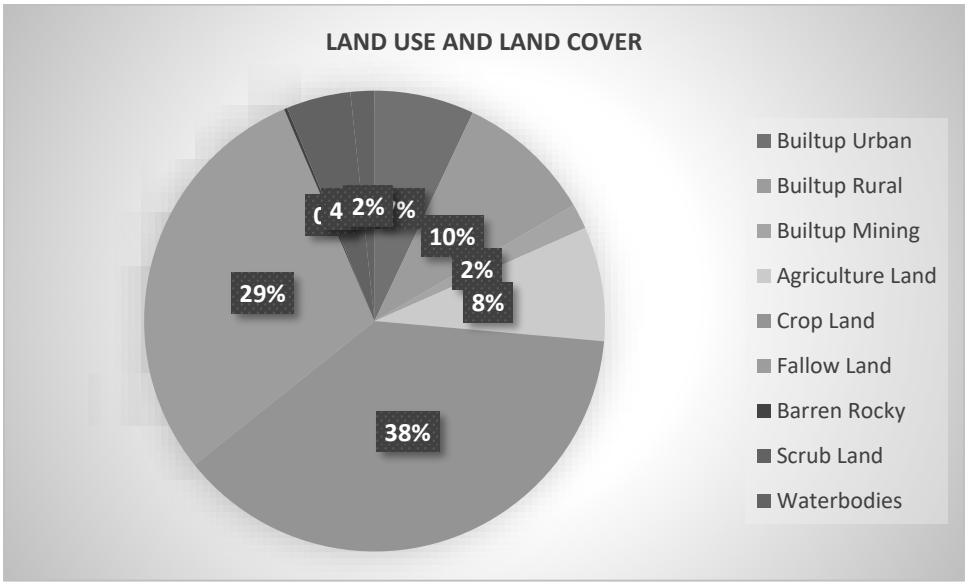
A visual interpretation technique has been adopted for land use classification based on the keys suggested in the chapter – V of the guidelines issued by NNRMS Bangalore & Level III classification with 1:50,000 scale for the preparation of land use mapping. Land use pattern of the area was studied through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

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

S.No	CLASSIFICATION	AREA_HA	AREA_%
BUILTUP			
1	Builtup Urban	2245.24	7.01
2	Builtup Rural	3074.90	9.60
3	Builtup Mining	566.42	1.77
AGRICULTURAL LAND			
4	Agricultural Land	2570.26	8.02
5	Crop Land	12131.63	37.87
6	Fallow Land	9391.44	29.32
BARREN/WASTE LANDS			
7	Barren Rocky	70.32	0.22
8	Scrub Land	1447.70	4.52
WETLANDS/ WATER BODIES			
9	Waterbodies	536.91	1.68
TOTAL		**31904.02**	**100**

Source: Survey of India Toposheet and Landsat Satellite Imagery

FIGURE 3.1: PIE DIAGRAM OF LAND USE AND LAND COVER



From the above table, pie diagram and land use map it is inferred that the majority of the land in the study area is Agriculture and fallow land (includes crop land) 75.21 % followed by Built-up Lands – 18.38 %, Scrub land – 4.52%, and Water bodies 1.68%.

The total mining area within the study area is 566.42 ha i.e., 1.77%. The cluster area of 17.31.35ha contributes about 2.19% of the total mining area within the study area. This small percentage of Mining Activities shall not have any significant impact on the environment.

3.1.2 Topography

The lease applied area is exhibits plain topography. The area has gentle sloping towards Northeastern side. The altitude of the area is 375m (max) above Mean Sea level. The area is covered by 2m thickness of Gravel formation and followed by Massive Charnockite which is clearly inferred from the adjacent existing quarry pits.

3.1.3 Drainage Pattern of the Area

The drainage pattern of the area is dendritic – sub dendritic. Drainage pattern is the pattern formed by the streams, rivers, and lakes in a particular drainage basin. They are governed by the topography of the land, whether a particular region is dominated by hard or soft rocks, and the gradient of the land. There are no streams, canals or water bodies crossing within the project area.

3.1.4 Seismic Sensitivity

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

3.1.5 Environmental Features in the Study Area

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

FIGURE 3.2: PHYSIOGRAPHIC MAP 10KM RADIUS

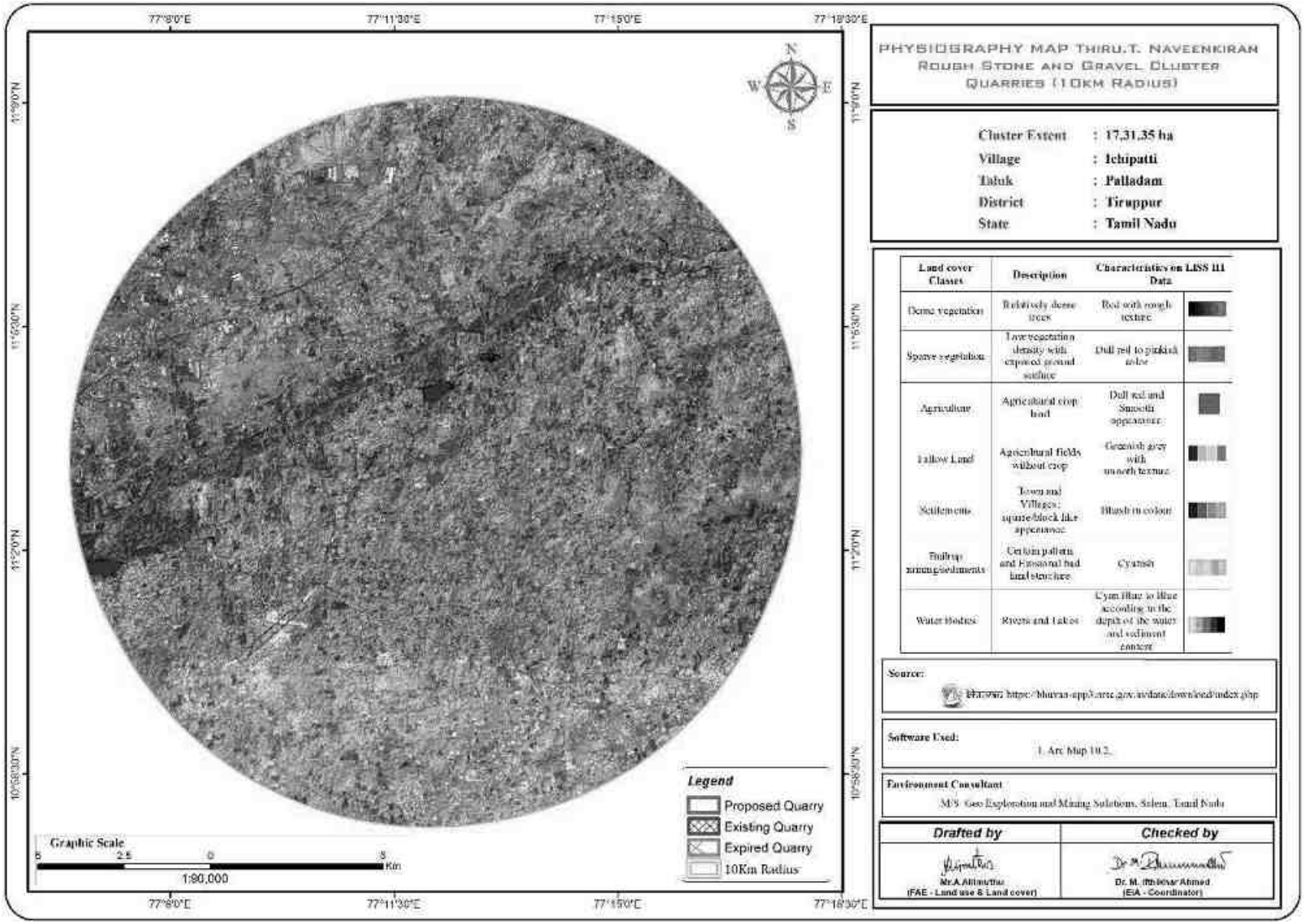
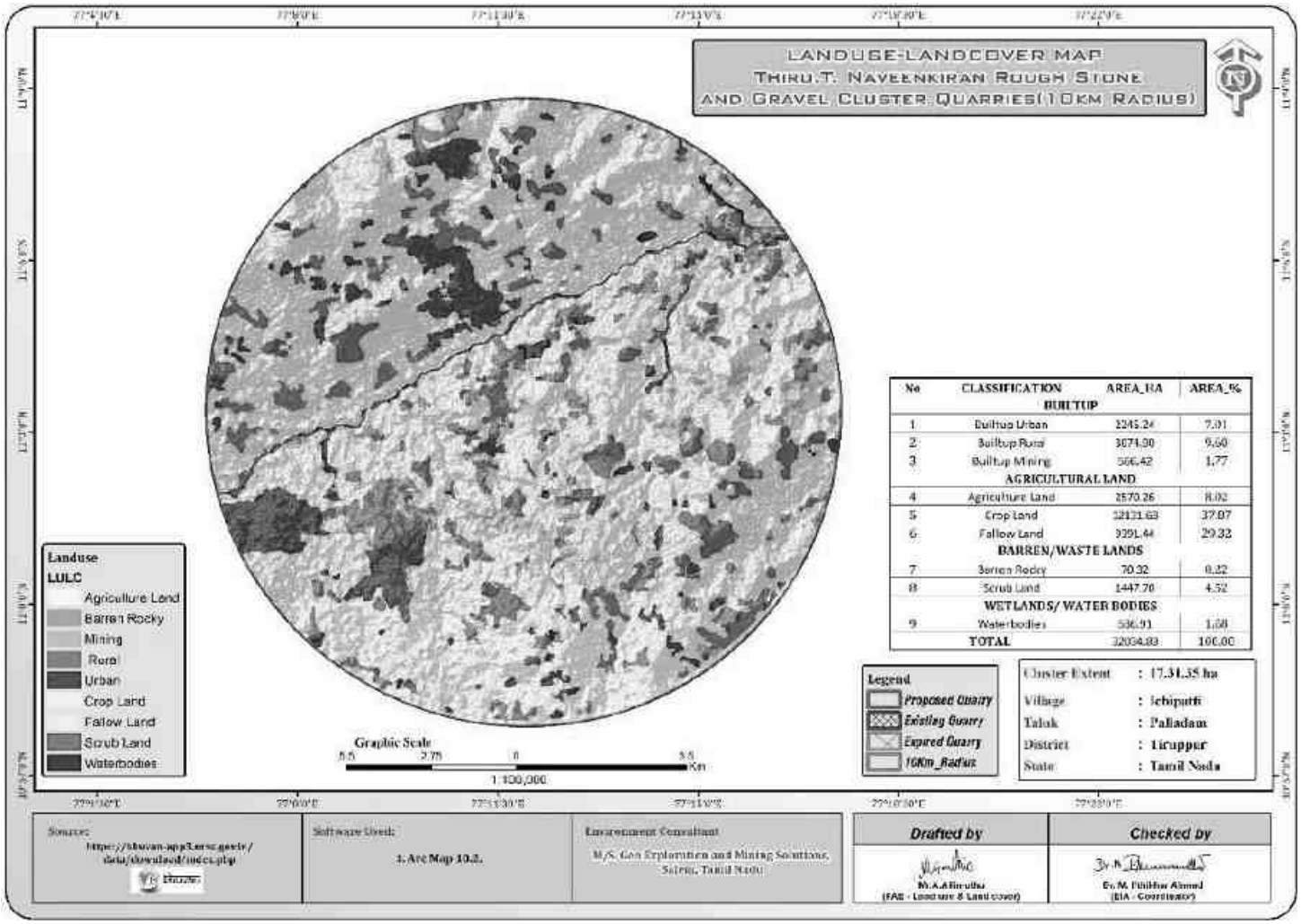


FIGURE 3.3: LAND USE LAND COVER MAP 10KM RADIUS



No	CLASSIFICATION	AREA_HA	AREA_%
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6	Fallow Land	9351.44	29.22
	BARREN/WASTE LANDS		
7	Barren Rocky	70.32	0.22
8	Scrub Land	1447.70	4.52
	WETLANDS/ WATER BODIES		
9	Waterbodies	536.91	1.68
	TOTAL	32004.83	100.00

TABLE 3.3: DETAILS OF ENVIRONMENT SENSITIVITY AROUND THE CLUSTER

Sl.No	Sensitive Ecological Features	Name	Arial Distance in km from Cluster
1	National Park / Wild life Sanctuaries	Nanjarayan Bird Sanctuary	20.8km- NE
2	Reserve Forest	Bolampatti R.F	31.5km- South West
3	Tiger Reserve/ Elephant Reserve/ Biosphere Reserve	Sathiyamangalam Tiger Reserve	46.0km - NW
4	Critically Polluted Areas	Coimbatore - SIDCO Industrial Estate	Around 26.5 km- South West
5	Mangroves	None	Nil within 10km Radius
6	Mountains/Hills	None	Nil within 10km Radius
7	Notified Archaeological Sites	None	Nil within 10km Radius
8	Industries/ Thermal Power Plants	None	Nil within 10km Radius
9	Defence Installation	None	Nil within 10km Radius

Source: Survey of India Toposheet

TABLE 3.4: NEARBY WATER BODIES FROM THE PROPOSED PROJECT SITE

Sl.No	NAME	DISTANCE & DIRECTION
1	Vaikkal	210m – N
2	Odai	480m – NW
3	Odai	600m – SE
4	Odai	3.3km-SE
5	Samalapuram Lake	1.5km-NE
6	Noyyal River	2.5Km-NW
7	Canal	3.0Km-SW
8	Sulur Lake	8.2km-SW

Source: Village Cadastral Map and Field Survey

Land use Landcover of the area within 500m radius were studied in detailed that the majority of the land within 500m is Agriculture land followed by Barren land and Built-up mining area are contributing majority of the land use.

3.1.6 Soil Environment

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

The objective of the soil sampling is -

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

TABLE 3.5: SOIL SAMPLING LOCATIONS

S. No	Location Code	Monitoring Locations	Distance & Direction	Coordinates
1	S-1	Project Area	Core Zone	11° 3'27.80"N 77°12'6.74"E
2	S-2	Kallapalayam	2km NW	11° 4'3.60"N 77°11'0.55"E
3	S-3	Velampalayam	6.5km East	11° 3'25.39"N 77°15'51.28"E

4	S-4	Sadapalayam	4km North	11° 5'41.04"N 77°12'36.28"E
5	S-5	Sengathurai	5km SW	11° 2'50.21"N 77° 9'19.36"E
6	S-6	Samygoundanpalayam	6.3km SE	11° 0'21.46"N 77°13'39.84"E

Source: On-site monitoring/sampling by Global Lab and Consultancy Services

Methodology –

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

TABLE 3.6: METHODOLOGY OF SAMPLING COLLECTION

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

Source: On-site monitoring/sampling by EHS360 Labs Private Limited in association with GEMS

Soil Testing Result –

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

FIGURE 3.5: SOIL SAMPLING LOCATIONS AROUND 10 KM RADIUS

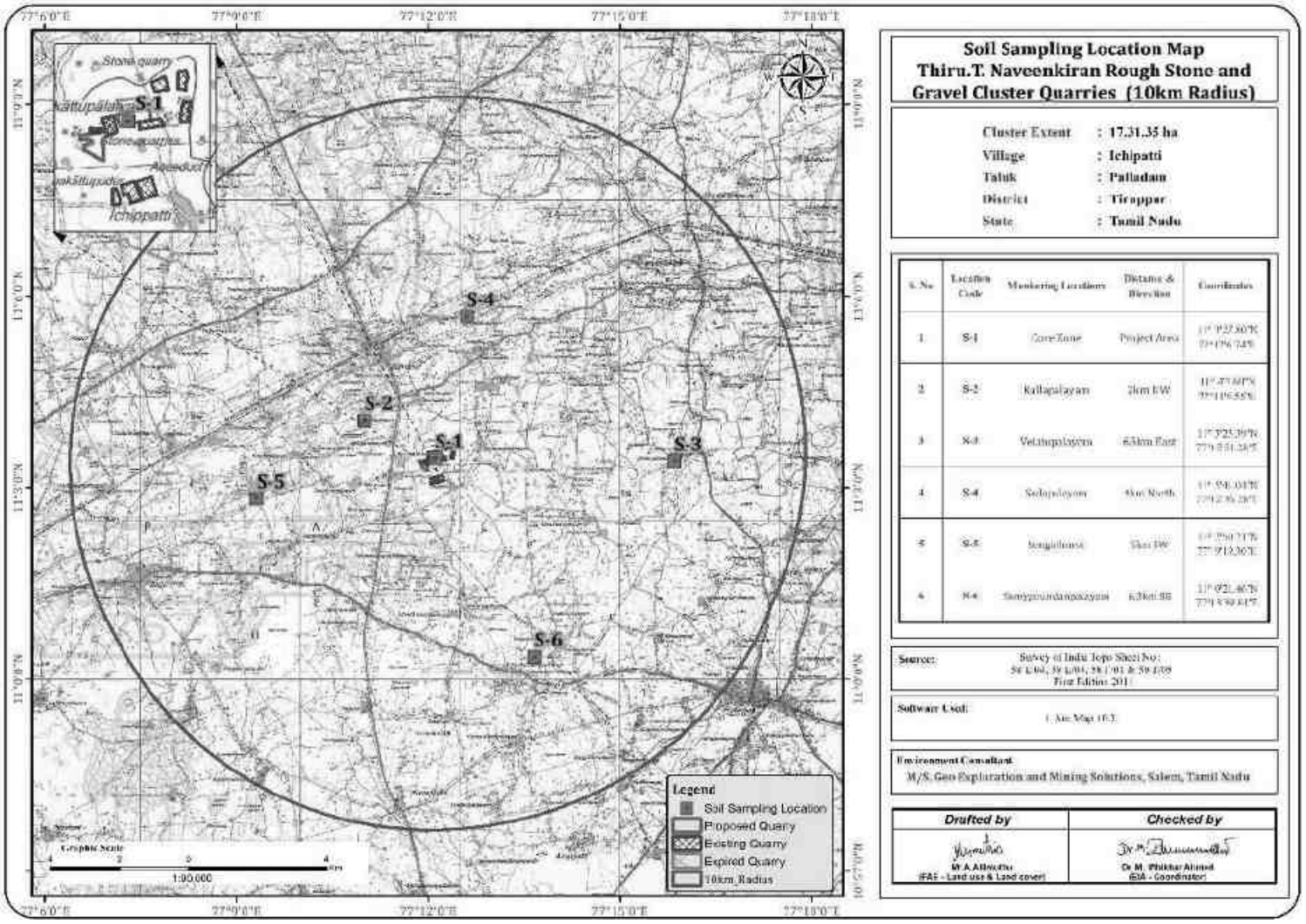


FIGURE 3.6: SOIL MAP

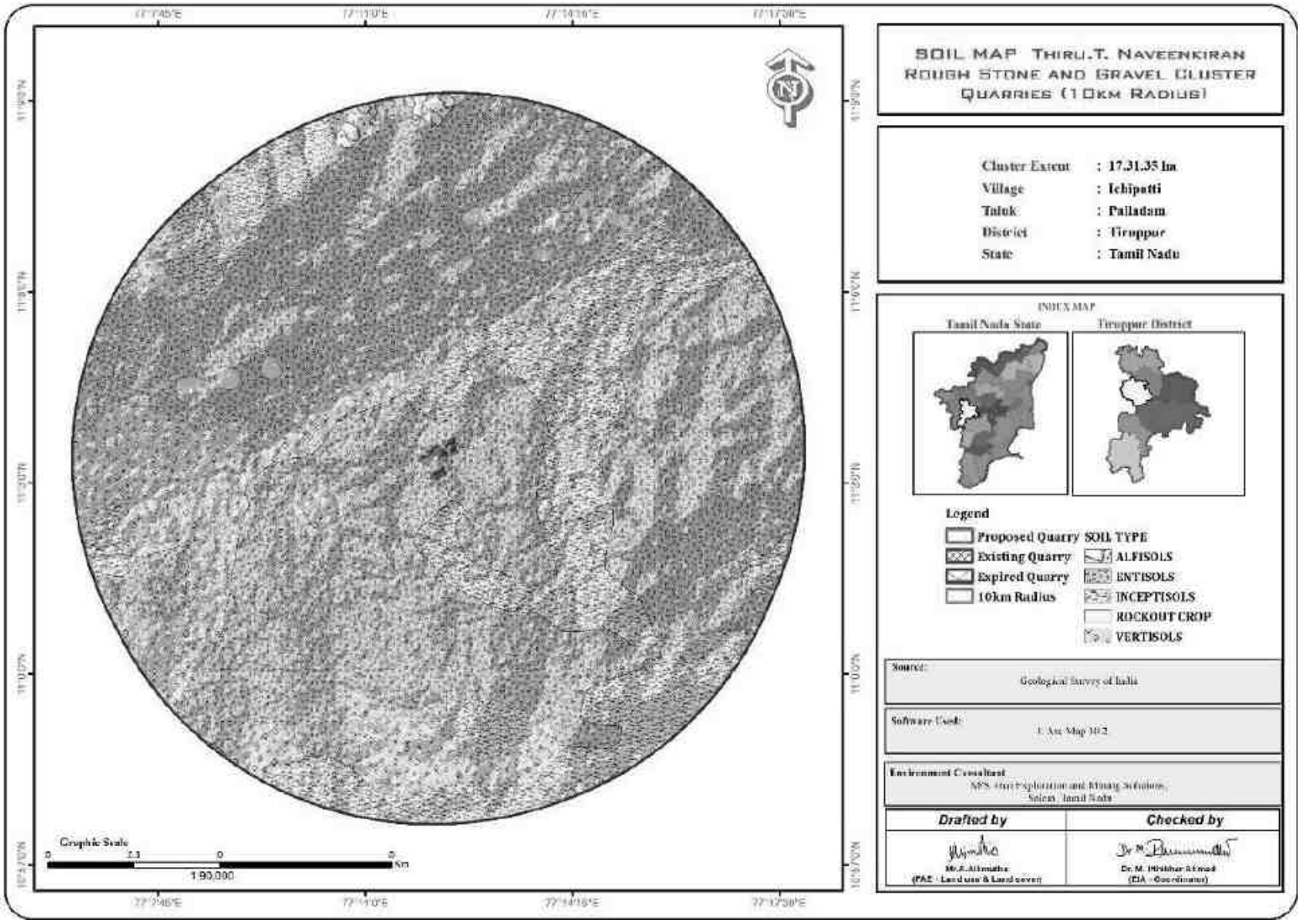


TABLE 3.7: SOIL QUALITY OF THE STUDY AREA

Sl. No	TEST PARAMETERS	TEST METHOD	UNIT	S-1 Project Area	S-2 Kallapalayam	S-3 Velampalayam	S-4 Sadapalayam	S-5 Sengathurai	S-6 Samygoundanpalaym
1	Available Nitrogen as N	GLCS/SOP/S/029 ;Issue no.02: 2024	kg/ha	464	351	238.3	263.4	213.2	188.2
2	Available Phosphorous(as P)	GLCS/SOP/S/005 ; Issue no:02: 2024	mg/kg	20.4	18.8	8.9	2.8	6.2	6.8
3	Boron	USEPA-6010D:2014	mg/kg	BDL (DL:0.5)	BDL (DL:0.5)	BDL (DL:0.5)	BDL (DL:0.5)	BDL (DL:0.5)	BDL (DL:0.5)
4	Bulk Density	GLCS/SOP/S/017; Issue no:02: 2024	g/cc	1.14	1.13	1.15	1.18	1.14	1.136
5	Cadmium	USEPA-6010 D-2014	mg/kg	12	16	15.0	11.7	4.7	12.3
6	Cation Exchange Capacity	GLCS/SOP/S/024; Issue no:02: 2024	meq/100g	39.2	37.8	41.2	33.4	45.0	34
7	Chlorides (as Cl-) in saturation extract	GLCS/SOP/S/004; Issue no:02: 2024	meq/l	4.8	3.7	2.9	5.8	4.0	3.6
8	Chromium	USEPA-6010D-2014	mg/kg	17.5	13.7	13.5	15.8	21.4	30.5
9	Copper	USEPA-6010D :2014	mg/kg	8.5	5.5	5.5	5.8	1.74	10.5
10	Exchangeable Calcium (as Ca)	GLCS/SOP/S/020; Issue no:02: 2024	meq/100g	2.8	2.2	2.6	2.6	2.6	2.3
11	Exchangeable Magnesium (as Mg)	GLCS/SOP/S/021; Issue no:02: 2024	meq/100g	1.4	1.7	0.6	1.9	0.8	1.8
12	Iron	USEPA-6010 D-2014	mg/kg	59.9	36	36.0	44.4	33.1	57.0
13	Lead	USEPA-6010D-2014	mg/kg	BDL (DL:0.5)	1.98	1.0	BDL (DL:0.5)	BDL (DL:0.5)	BDL (DL:0.5)
14	Manganese	USEPA-6010 D-2014	mg/kg	22.7	19.1	19.3	14.6	18.4	17.5
15	Organic Carbon	GLCS/SOP/S/003; Issue no: 02: 2024	%	0.77	0.54	1.18	0.71	0.51	0.72
16	Organic Matter	GLCS/SOP/S/003; Issue no:02: 2024	%	1.33	0.93	2.03	1.2	0.88	1.24
17	pH Value	IS 2720 (Part 26): 1987(Reaffirmed 2021)	-	7.84	7.68	8.12	7.49	7.91	7.58
18	Soluble Potassium (as K) in saturation extract	GLCS/SOP/S/006; Issue no:02 : 2024	mg/100g	1.6	1.06	0.87	1.08	0.45	0.76
19	Specific Electrical Conductivity	IS 14767: 2000(Reaffirmed 2021)	µS/cm	436	369	464	410	427	373
20	Sulphate (as SO4)	GLCS/SOP/S/009; Issue no:02: 2024	mg/100g	6.3	3.7	2.9	3.0	2.7	3.2

21	Texture : Clay	GLCS/SOP/S/015 ;Issue no:02: 2024	%	23	25.5	27.5	26.0	22.5	30.0
22	Texture : Sand	GLCS/SOP/S/015; Issue no:02: 2024	%	34	35.72	38.0	33.79	32.5	35.37
23	Texture : Silt	GLCS/SOP/S/015 ; Issue no:02: 2024	%	43	38.78	34.5	40.21	45.0	34.63
24	Water Holding Capacity	GLCS/SOP/S/016; Issue no:02: 2024	%	68	60	54	56	48	42
25	Zinc	USEPA-6010D-2014	mg/kg	8.07	8.07	8.8	10.7	11.5	10.0

Source: Sampling Results by Global Lab and Consultancy Services

Interpretation & Conclusion

Physical Characteristics –

The physical properties of the soil samples were examined for texture, bulk density, porosity and water holding capacity. The soil texture found in the study area is Clay (22.5 % to 30%) to Sandy Loam Soil and Bulk Density of Soils in the study area varied between 1.13 to 1.98 g/cc. The Water Holding Capacity is found to be medium i.e., ranging from 42 – 68 %.

Chemical Characteristics –

- The nature of soil is slightly alkaline to strongly alkaline with pH range 7.49 to 8.12
- The available Nitrogen content range between 188.2 to 464 mg/kg
- The available Phosphorus content range between 2.08 to 20.4 mg/kg
- The available Potassium range between 0.45 to 1.6 mg/100g

Observation:

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

3.2 WATER ENVIRONMENT

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

3.2.1 Surface Water Resources:

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

3.2.2 Ground Water Resources:

Groundwater occurs in all the crystalline formations of oldest Achaeans and Recent Alluvium. The occurrence and behaviour of groundwater are controlled by rainfall, topography, geomorphology, geology, structures etc., The weathering is controlled by the intensity of weathering and fracturing. Dug wells as wells as bore wells are more common ground water abstraction structures in the area. The diameter of the dug well is in the range of 7 to 10 m and depth of dug wells range from 7.2 to 13 m bgl. The dug wells yield up to 1 lps in summer months and few wells remains dry. The yield is adequate for irrigation for one or two crops in monsoon period.

3.2.3 Methodology

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

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

Two (2) surface water and Four (4) ground water samples were collected from the study area and were analysed for physio-chemical, heavy metals and bacteriological parameters in order to assess the effect of mining and other activities on surface and ground water. The samples were analysed as per the procedures specified by CPCB, IS-10500:2012 and 'Standard methods for the Examination of Water and Wastewater' published by American Public Health Association (APHA). The water sampling locations are given in Table 3.8 and shown as Figure 3.5.

TABLE 3.8: WATER SAMPLING LOCATIONS

S.NO	CODE	LOCATIONS	DISTANCE & DIRECTION	CO-ORDINATES
SURFACE WATER				
1	SW-1	Samalapuram Lake	1.8km North	11° 4'21.62"N 77°12'12.08"E
2	SW-2	Noyyal River Sendevipalayam	3.5km West	11° 4'3.25"N 77°10'13.50"E
GROUND WATER				
3	WW-1	Near Project Area	150m South	11° 3'22.42"N 77°12'10.15"E
4	WW-2	Velampalayam	6.5km East	11° 3'25.93"N 77°15'46.74"E
5	BW-1	Near Project Area	310m NW	11° 3'36.03"N 77°11'55.63"E
6	BW-2	Samygoundanpalayam	6.3km SE	11° 0'24.18"N 77°13'40.51"E

Source: On-site monitoring/sampling by Global Lab and Consultancy Services

FIGURE 3.8: WATER SAMPLING LOCATIONS AROUND 10 KM RADIUS

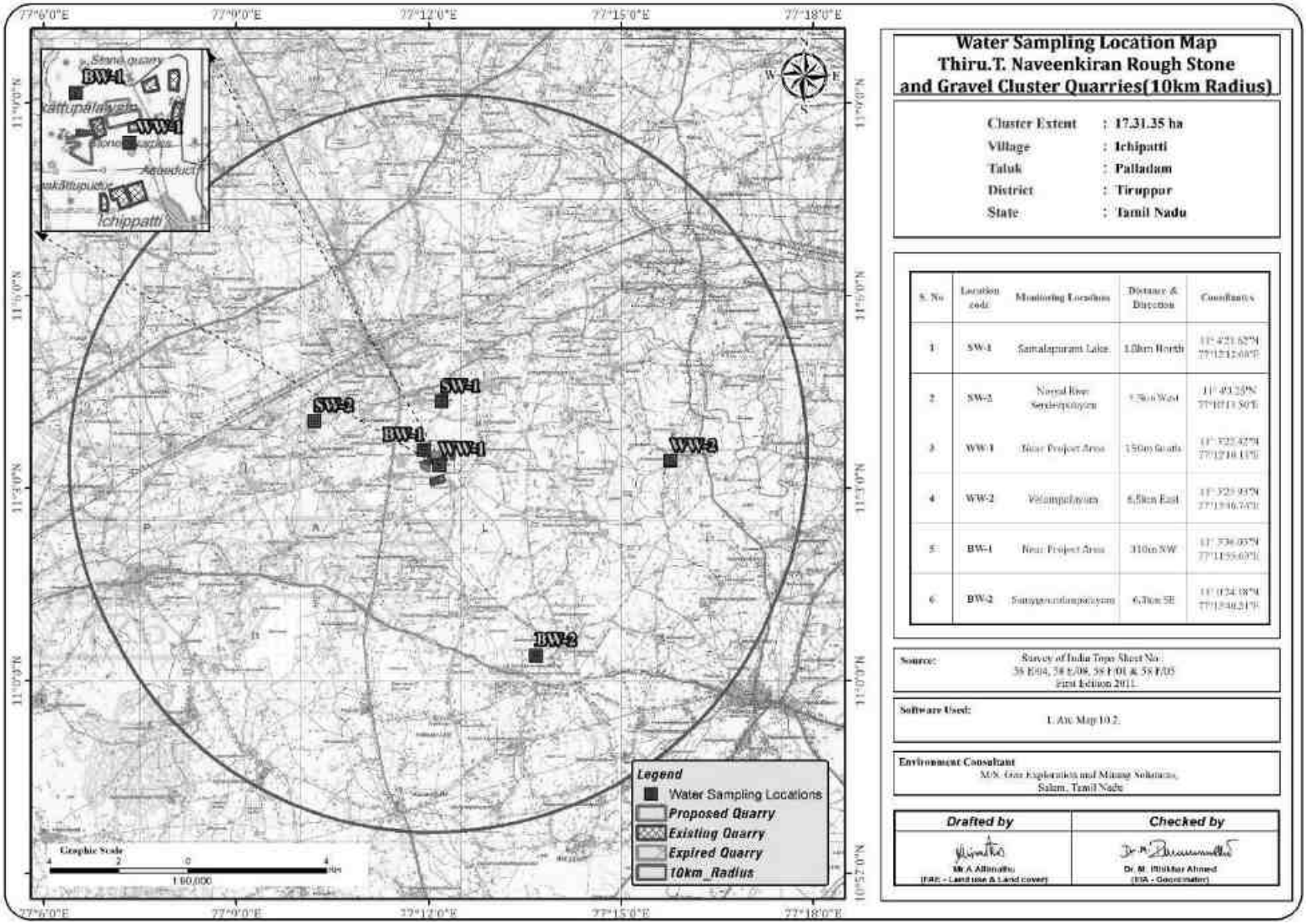


TABLE 3.9: GROUND WATER SAMPLING RESULTS

S.No	Parameters	Units	WW-1	WW-2	BW-1	BW-2	Acceptable limit	Permissible limit
1	Aluminium	mg /l	0.049	0.093	BDL (DL:0.01)	BDL (DL:0.01)	0.03	0.2
2	Ammoniacal Nitrogen as NH3-N	mg /l	BDL (DL:1.0)	BDL (DL:1.0)	BDL (DL:1.0)	BDL (DL:1.0)	0.5	No Relaxation
3	Arsenic as As	mg /l	BDL (DL:0.002)	BDL (DL:0.002)	BDL (DL:0.002)	BDL (DL:0.002)	0.01	0.05
4	Barium as Ba	mg /l	0.042	0.19	BDL (DL:0.01)	BDL (DL:0.01)	0.7	No Relaxation
5	Boron as B	mg /l	BDL (DL:0.1)	BDL (DL:0.1)	BDL (DL:0.1)	BDL (DL:0.1)	0.5	1.0
6	Cadmium as Cd	mg /l	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)	0.003	No Relaxation
7	Calcium as Ca	mg /l	116	92	84	100	75	200
8	Chloride as Cl-	mg/l	280	180	160	240	250	1000
9	Chromium as Cr	mg/l	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)	0.05	No Relaxation
10	Color	CU	Agreeable	<1	<1	<1	5	15
11	Copper as Cu	mg/l	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)	0.05	1.5
12	Cyanide as CN	mg/l	BDL (DL:0.02)	BDL (DL:0.02)	BDL (DL:0.02)	BDL (DL:0.02)	0.05	No Relaxation
13	Electrical Conductivity (EC)	µS/cm	1470	1306	1348	1428	2000	2000
14	Fluoride as F-	mg/l	0.32	0.4	0.23	0.3	1.0	1.5
15	Free Residual Chlorine as Cl_2	mg/l	BDL (DL:1.0)	BDL (DL:1.0)	BDL (DL:1.0)	BDL (DL:1.0)	0.2	1
16	Iron as Fe	mg/l	0.2	BDL (DL:0.1)	0.28	0.24	0.3	No Relaxation
17	Lead as Pb	mg/l	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)	0.01	No Relaxation
18	Magnesium as Mg	mg/l	56	61	41	54	30	100
19	Manganese as Mn	mg/l	BDL (DL:0.1)	BDL (DL:0.1)	BDL (DL:0.01)	BDL (DL:0.1)	0.1	0.3
20	Mercury as Hg	mg/l	BDL (DL:0.002)	BDL (DL:0.002)	BDL (DL:0.002)	BDL (DL:0.002)	0.001	No Relaxation
21	Molybdenum as Mo	mg/l	0.042	0.024	0.024	0.025	0.07	No Relaxation
22	Nitrate as NO3	mg/l	BDL (DL:2.0)	BDL (DL:2.0)	BDL (DL:2.0)	BDL (DL:2.0)	45	No Relaxation
23	Odor	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
24	pH	-	7.57	7.48	7.28	7.36	6.5-8.5	No Relaxation
25	Phenols	mg/l	BDL (DL:0.1)	BDL (DL:0.1)	BDL (DL:0.1)	BDL (DL:0.1)	0.001	0.002
26	Selenium as Se	mg/l	BDL (DL:0.005)	BDL (DL:0.005)	BDL (DL:0.005)	BDL (DL:0.005)	0.01	No Relaxation
27	Sulphate as SO4	mg/l	61	80	51	54	200	400
28	Sulphide as S (IodometricMethod)	mg/l	BDL (DL:1.0)	BDL (DL:1.0)	BDL (DL:1.0)	BDL (DL:1.0)	0.05	No Relaxation

29	Total Alkalinity as CaCO3	mg/l	380	370	360	420	200	600
30	Total Dissolved Solids (TDS)	mg/l	956	847	878	927	500	2000
31	Total Hardness as CaCO3	mg/l	520	480	380	470	200	600
32	Total Suspended Solids (TSS)	mg/l	BDL (DL:2.0)	BDL (DL:2.0)	BDL (DL:2.0)	<2	500	2000
33	Turbidity	NTU	<1	<1	<1	<1	1	5
34	Zinc as Zn	mg/l	BDL (DL:0.01)	0.014	BDL (DL:0.01)	BDL (DL:0.01)	5	15
35	Escherichia coli	MPN/ 100ml	Absent	Absent	Absent	Absent	Shall not be detectable in any100 ml	-
36	Total Coliforms		Absent	Present	Present	Present		-

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

TABLE 3.10: SURFACE WATER SAMPLING RESULTS

S.No	Parameters	Units	SW-1 Samalapuram Lake	SW-2 Noyyal River	Acceptable limit	Permissible limit
1	Aluminium	mg /l	0.051	BDL (DL:0.01)	0.03	0.2
2	Ammoniacal Nitrogen as NH3-N	mg /l	BDL (DL:1.0)	BDL (DL:1.0)	0.5	No Relaxation
3	Arsenic as As	mg /l	BDL (DL:0.002)	BDL (DL:0.002)	0.01	0.05
4	Barium as Ba	mg /l	0.053	0.36	0.7	No Relaxation
5	Biochemical Oxygen Demand (BOD) at 27ºC for 3 Days	mg /l	6.0	12	30	30
6	Boron as B	mg /l	BDL (DL:0.1)	BDL (DL:0.1)	0.5	1.0
7	Cadmium as Cd	mg /l	BDL (DL:0.01)	BDL (DL:0.01)	0.003	No Relaxation
8	Calcium as Ca	mg /l	128	112	75	200
9	Chemical Oxygen Demand (COD)	mg /l	20	40	250	250
10	Chloride as Cl-	mg/l	340	235	250	1000
11	Chromium as Cr	mg/l	BDL (DL:0.01)	0.012	0.05	No Relaxation
12	Color	CU	<1	<1	5	15
13	Copper as Cu	mg/l	BDL (DL:0.01)	0.012	0.05	1.5
14	Cyanide as CN	mg/l	BDL (DL:0.02)	BDL (DL:0.02)	0.05	No Relaxation
15	Dissolved Oxygen (DO)	mg/l	5.2	4.8	4-6	4-6
16	Electrical Conductivity (EC)	µS/cm	1862	1580	2000	2000
17	Fluoride as F-	mg/l	0.31	0.32	1.0	1.5
18	Free Residual Chlorine as Cl_2	mg/l	BDL (DL:1.0)	BDL (DL:1.0)	0.2	1
19	Iron as Fe	mg/l	0.38	0.4	0.3	No Relaxation
20	Lead as Pb	mg/l	BDL (DL:0.01)	BDL (DL:0.01)	0.01	No Relaxation
21	Magnesium as Mg	mg/l	78	68	30	100
22	Manganese as Mn	mg/l	BDL (DL:0.1)	BDL (DL:0.1)	0.1	0.3
23	Mercury as Hg	mg/l	BDL (DL:0.002)	BDL (DL:0.002)	0.001	No Relaxation
24	Molybdenum as Mo	mg/l	0.023	0.024	0.07	No Relaxation
25	Nitrate as NO3	mg/l	BDL (DL:2.0)	BDL (DL:2.0)	45	No Relaxation
26	Odor	-	Agreeable	Agreeable	Agreeable	Agreeable

27	pH	-	8.26	7.69	6.5-8.5	No Relaxation
28	Phenols	mg/l	BDL (DL:0.1)	BDL (DL:0.1)	0.001	0.002
29	Selenium as Se	mg/l	BDL (DL:0.005)	BDL (DL:0.005)	0.01	No Relaxation
30	Sulphate as SO4	mg/l	40	62	200	400
31	Sulphide as S (IodometricMethod)	mg/l	BDL (DL:1.0)	BDL (DL:1.0)	0.05	No Relaxation
32	Total Alkalinity as CaCO3	mg/l	550	480	200	600
33	Total Dissolved Solids (TDS)	mg/l	1210	1027	500	2000
34	Total Hardness as CaCO3	mg/l	640	560	200	600
35	Total Suspended Solids (TSS)	mg/l	16	32	500	2000
36	Turbidity	NTU	5	<1	1	5
37	Zinc as Zn	mg/l	BDL (DL:0.01)	0.069	5	15
38	Escherichia coli	MPN/ 100ml	Absent	Absent	Shall not be detectable in any100 ml	-
39	Total Coliforms		Present	Present		-

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

3.2.4 Interpretation& Conclusion

Surface Water

The pH varied from 7.69 to 8.26 while turbidity found within the standards (Optimal pH range for sustainable aquatic life is 6.5 to 8.5 pH).

Total Dissolved Solids:

Total Dissolved Solids varied from 1027 to 1210 mg/l, the TDS mainly composed of carbonates, bicarbonates, Chlorides, phosphates and nitrates of calcium, magnesium, sodium and other organic matter.

Other parameters:

Chloride content is 235–340 mg/l. Nitrates varied from BDL (DL:2.0), while sulphates varied from BDL (DL:1.0)

Ground Water

The pH of the water samples collected ranged from 7.28 to 7.57 and within the acceptable limit of 6.5 to 8.5. pH, Sulphates and Chlorides of water samples from all the sources are within the limits as per the Standard. On Turbidity, the water samples meet the requirement. Total Dissolved Solids were found in the range of 847 – 956 mg/l in all samples. Total hardness varied between 380– 520mg/l for all samples.

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

3.2.5 Hydrology and Hydrogeological studies

The district is underlain by hard rock formation fissured and fractured crystalline rocks constitute the important aquifer systems in the district. Geophysical prospecting was carried out in that area by SSRMP-ATS Instrument by qualified Geo physicist with the help of IGIS software and it was inferred that the low resistance encountered at the depth between 58-62m. The maximum depth proposed out of proposed projects is 45m below ground level.

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

In general, the ground water movement is based on the gradient i.e., water moves from the highest static ground water elevation to lowest static ground water elevation point. The ground water movement is important aspect to locating the recharge and discharge areas. Therefore, the data has been collected in the study area. Water level measured in the 11 open well and 9 borewells.

The average water level in the open well is varies from = 11.35m to 11.95m bgl

The water level in the bore well is varies from = 56.52to 57.12m bgl

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

The water level in the area is above 55m hence there is no possibilities of water table intersection during the entire mine life period besides it is also inferred topographically that there are no major water bodies intersecting the project area.

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

S.NO	LABEL	LONGITUDE	LATITUDE	Oct-24	Nov-24	Dec-24
1	OW1	77° 11' 42.0767" E	11° 03' 30.0077" N	11.4	12	12.6
2	OW2	77° 11' 48.2368" E	11° 03' 47.7926" N	12.2	12.8	13.4
3	OW3	77° 11' 53.3708" E	11° 03' 51.6271" N	11.9	12.5	13.1
4	OW4	77° 12' 07.6023" E	11° 04' 00.7311" N	12	12.6	13.2
5	OW5	77° 12' 20.6226" E	11° 03' 53.2179" N	11.6	12.2	12.8
6	OW6	77° 12' 28.0113" E	11° 03' 15.0307" N	11.8	12.4	13
7	OW7	77° 11' 52.2510" E	11° 02' 40.1596" N	11.5	12.1	12.7
8	OW8	77° 11' 57.1291" E	11° 03' 12.3288" N	11.9	12.5	13.1
9	OW9	77° 12' 40.6266" E	11° 03' 40.8811" N	11.4	12	12.6

Source: Onsite monitoring data

FIGURE 3.9: OPEN WELL CONTOUR MAP (Oct to Dec 2024)

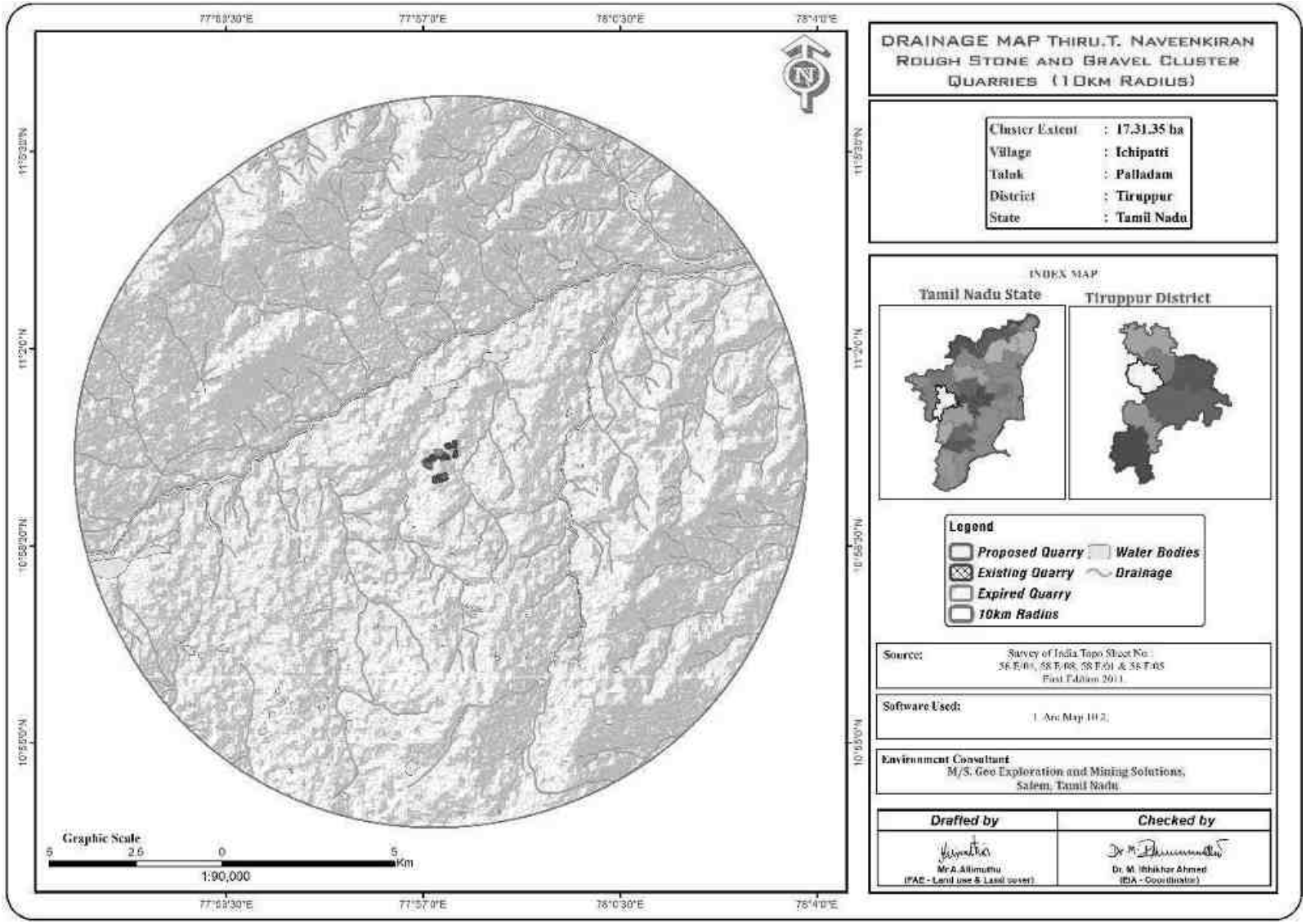
TABLE 3.12: POST MONSOON SEASON WATER LEVEL OF BOREWELLS 1 KM RADIUS

S.NO	LABEL	LONGITUDE	LATITUDE	Oct-24	Nov-24	Dec-24
1	BW1	77° 12' 40.3300" E	11° 03' 34.5294" N	63.7	64.3	64.9
2	BW2	77° 11' 37.1086" E	11° 03' 39.6093" N	63	63.6	64.2
3	BW3	77° 11' 45.9029" E	11° 03' 57.2776" N	62.6	63.2	63.8
4	BW4	77° 12' 16.9223" E	11° 03' 51.7157" N	63.4	64	64.6
5	BW5	77° 12' 25.9291" E	11° 03' 14.0711" N	61.9	62.5	63.1
6	BW6	77° 12' 19.1308" E	11° 02' 54.4066" N	63.6	64.2	64.8
7	BW7	77° 11' 59.4579" E	11° 02' 57.7683" N	62.7	63.3	63.9
8	BW8	77° 11' 35.1755" E	11° 03' 09.9830" N	63	63.6	64.2

Source: Onsite monitoring data

FIGURE 3.10: BOREWELL CONTOUR MAP (Oct- May 2024)

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



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

FIGURE 3.11A: DEM CONTOUR MAP 25KM RADIUS

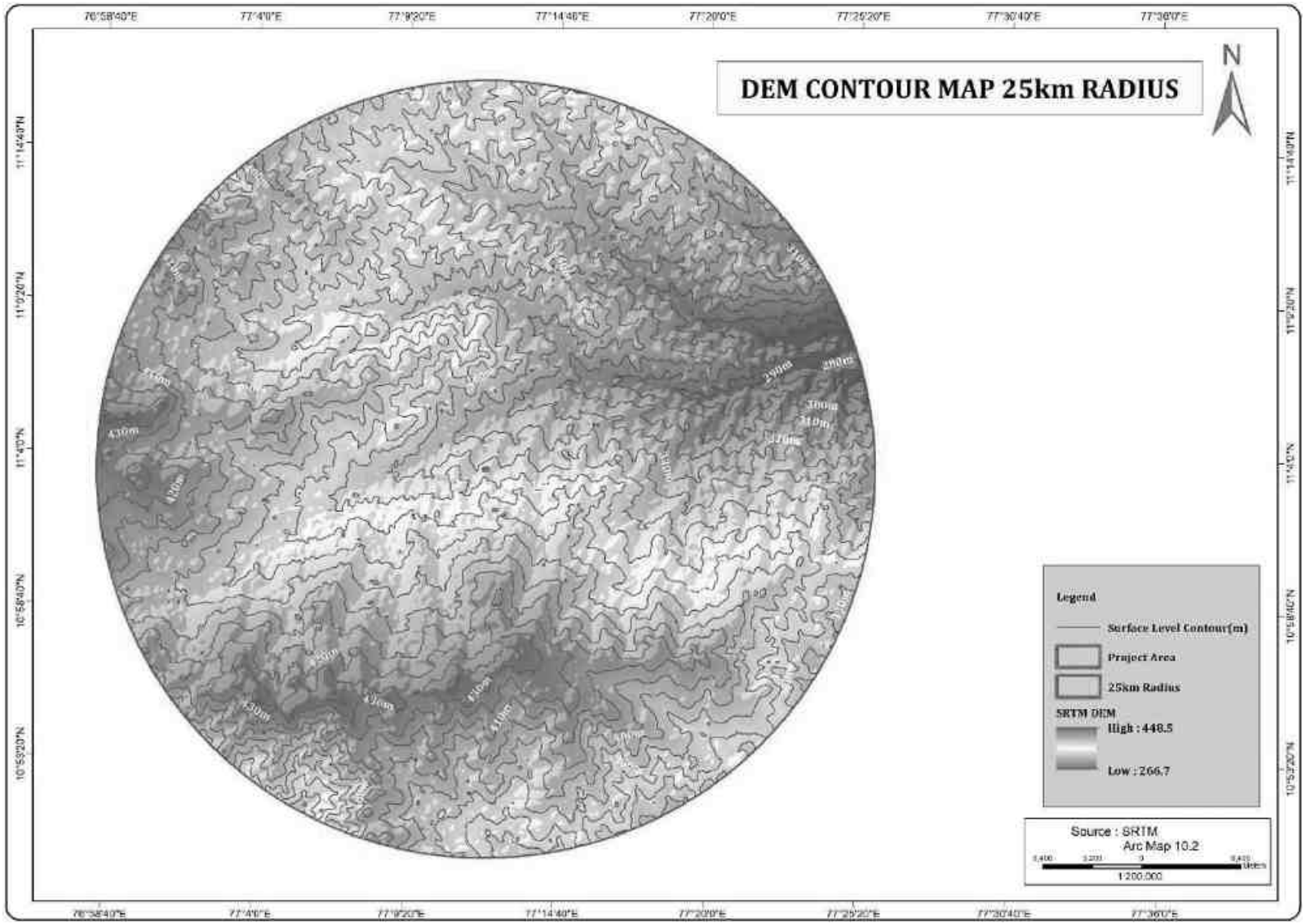


FIGURE 3.11B: STREAM ORDER MAP 25KM RADIUS

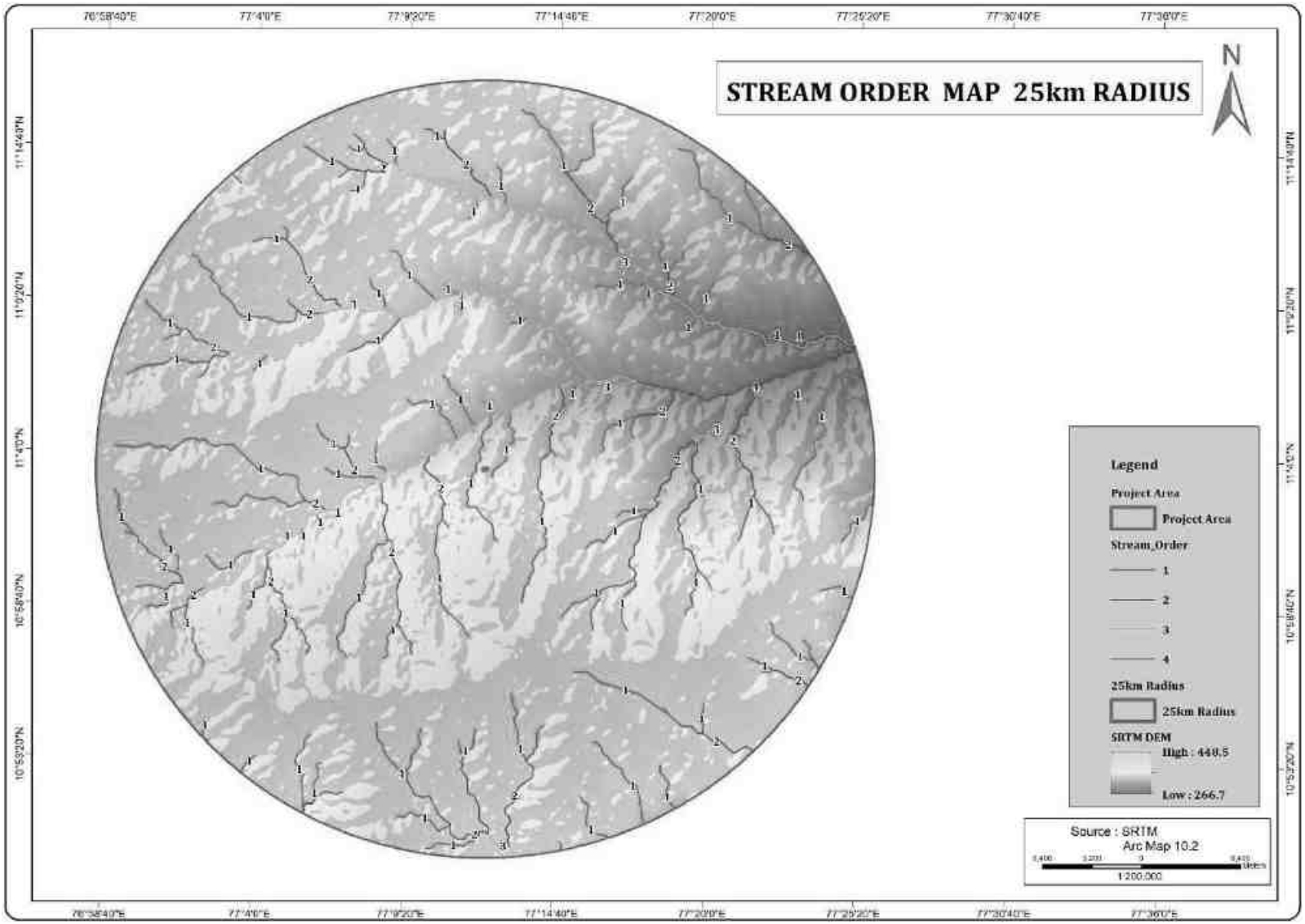


FIGURE 3.11C: WATERBODIES MAP 25KM RADIUS

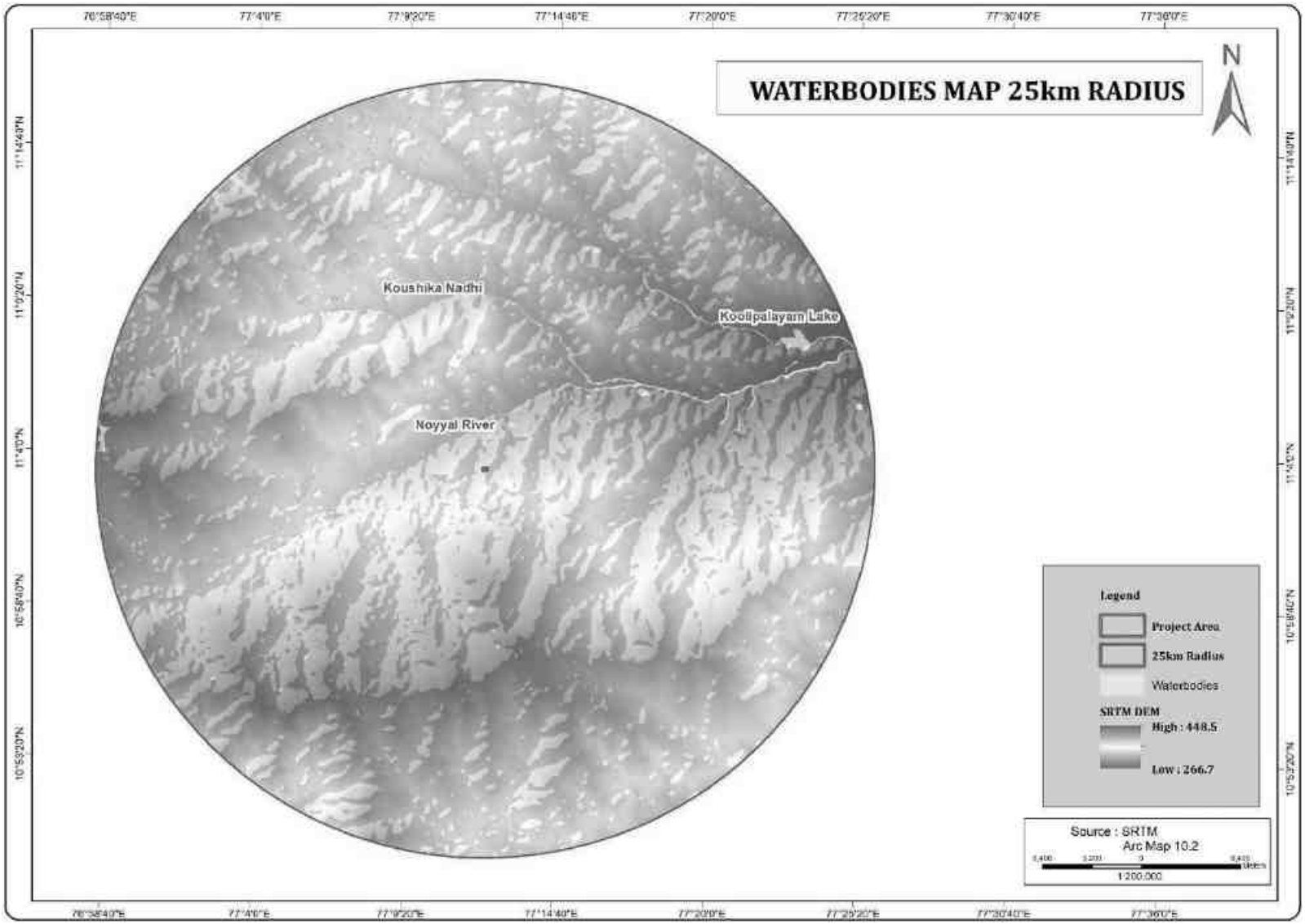


FIGURE 3.12: GROUND WATER PROSPECT MAP

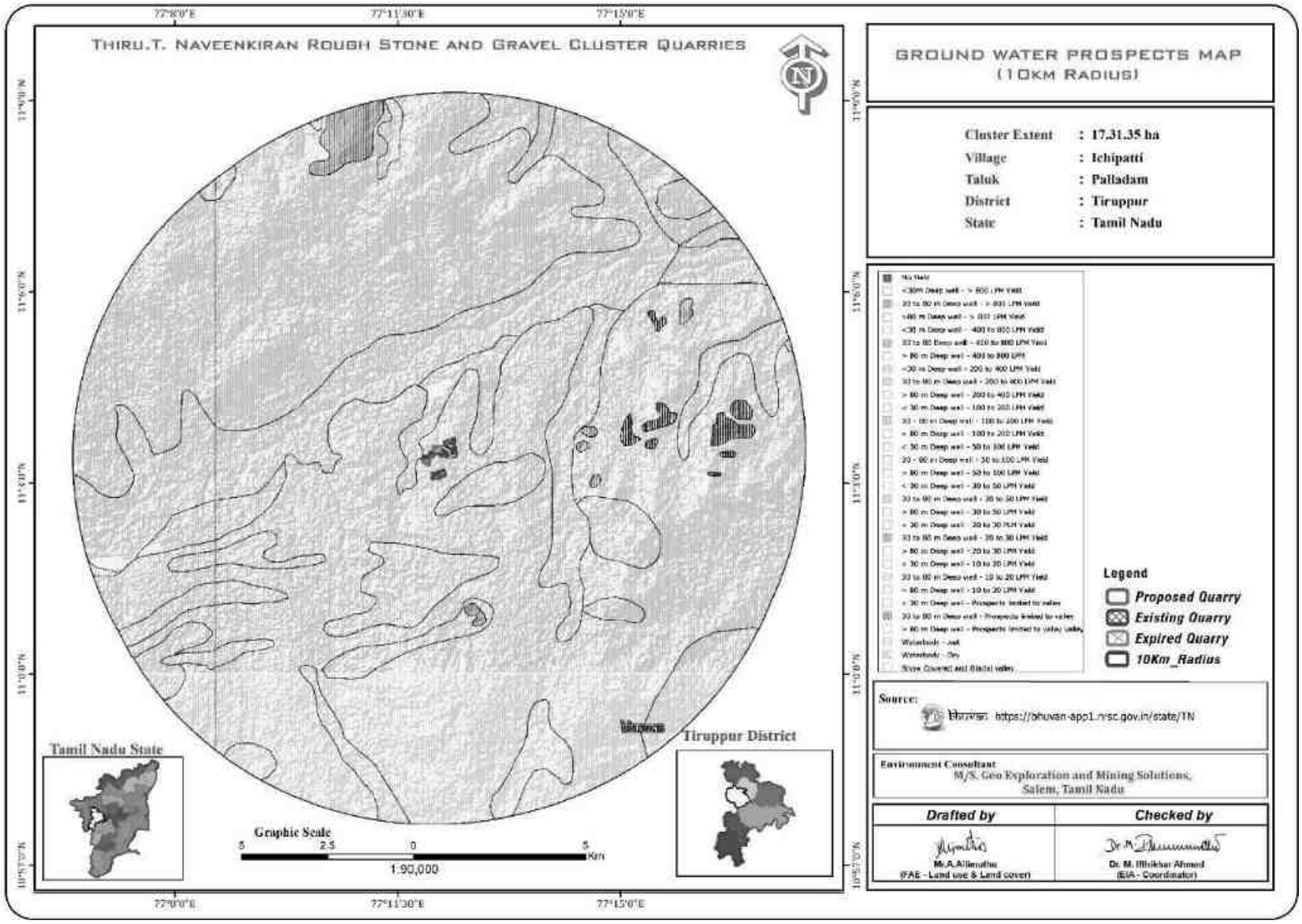


FIGURE 3.12: WATER QUALITY MONITORING PHOTOGRAPHS

Geophysical Resistivity Survey

3.2.5.1 Methodology and Data Acquisition

The Geophysical Electrical Resistivity survey conducted in the area Schlumberger configuration, Vertical Electrical Sounding (VES) method. Schlumberger electrode set up was employed for making sounding measurements. Since it is least influenced by lateral in homogeneities and is capable of providing higher depth of investigation. This is four electrodes collinear set up where in the outer electrodes send current into the ground and the inner electrodes measure the potential difference.

The present study utilizes maximum current electrode separation AB/2. The data from this survey are commonly arranged and contoured in the farm of Pseudo-section that gives an approximate of the subsurface resistivity. This technique is used for the inversion of Schlumberger VES data to predict the layer parameter namely layer resistivity and Geo electric layer thickness. The main goal of the present study is to search the vertical in homogeneities that is consistent with the measured data.

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

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

ΔV = potential difference between receiving electrodes

G = Geometric Factor.

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

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

ρr = Resistivity of Rocks

ρw = Resistivity of water in pores of rock

F = Formation Factor

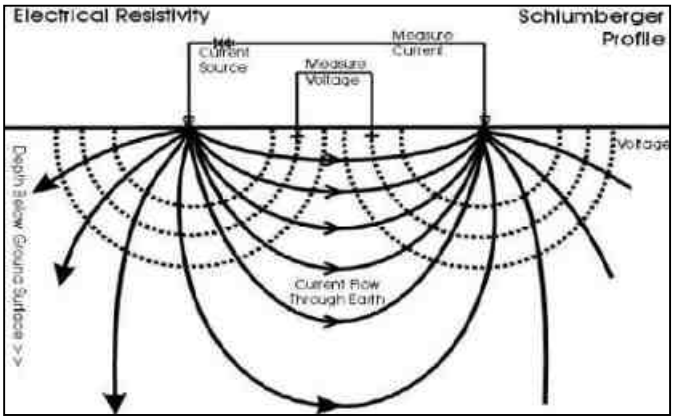
Ø = Fractional pore volume

A = Constants with values ranging from 0.5 to 2.5

3.2.5.2 Survey Layout

The field equipment deployed for the study is in a deep resistivity meter with a model of SSR – MP – AT. This Signal stacking Resistivity meter is a high-quality data acquisition system incorporating several innovation features for Earth resistivity. In the presence of random earth Noises the signal to nose ration can be enhanced by √N where N is the number of stacked readings. This SSR meter in which running averages of measurements [1, (1+2)/2, (1+2+3)/3 … (1+2...+16/16)] up to the chosen stacks are displayed and the final average is stored automatically, in memory utilizing the principles of stacking to achieve the benefit of high signals to noise ratio. Based on these above significations the signal stacking resistivity meter was used for (VES) Vertical Electric Resistivity Sounding.

RESISTIVITY SURVEY PROFILE



Measurements of ground Resistivity is essentially done by sending a current through two electrodes called current electrodes (C_1& $C_{2)}$ and measuring the resulting potential by two other electrodes called potential electrode (P_1& P_2). The amount of current required to be sent into the ground depends on the contact resistance at the current electrode, the ground resistivity and the depth of interest.

3.2.5.3 Data Presentation

It was inferred that the low resistance encountered at the depth between 58-62m. The maximum depth proposed out of proposed projects 45m BGL. Hence there is no possibilities of water table intersection during the entire mine life period besides it is also inferred topographically that there are no major water bodies intersecting the project area.

3.2.5.4 Geophysical Data Interpretation

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

It is inferred that the existing quarries in the surrounding area reaches maximum of 42m and the water table is not intersected, only the seepage water during rainy season encountered from the upper layer and it will be used for the Greenbelt development, Dust suppression and quarrying operation.

3.3 AIR ENVIRONMENT

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

The baseline studies on air environment include identification of specific air pollution parameters and their existing levels in ambient air. The ambient air quality with respect to the study zone of 10 km radius around the cluster forms the baseline information. The prime objective of the baseline air quality study was to establish the existing ambient air quality of the study area. These will also be useful for assessing the conformity to standards of the ambient air quality during the operation of proposed projects in cluster.

3.3.1 Meteorology & Climate

Meteorology is the key to understand the Air quality. The essential relationship between meteorological condition and atmospheric dispersion involves the wind in the broadest sense. Wind fluctuations over a very wide range of time, accomplish dispersion and strongly influence other processes associated with them.

A temporary meteorological station was installed at project site by covering cluster quarries. The station was installed at a height of 3 m above the ground level in such a way that there are no obstructions facilitating flow of wind, wind speed, wind direction, humidity and temperature are recorded on hourly basis.

Climate

- The atmospheric conditions prevailing in this region are of a tropical nature. In Tiruppur, the precipitation during summers is significantly higher in comparison to winters. This location is classified as Aw by Köppen and Geiger. In Tiruppur, the average annual temperature is 26.4 °C | 79.6 °F. Approximately 943 mm | 37.1 inch of rainfall occurs on a yearly basis.
- Due to its proximity to the equator, it is quite challenging to precisely delineate summers in Tiruppur. The period of January, February, March, June, July, August, September, October, November, December is widely regarded as the peak season for visitation.
- The month with the least amount of precipitation is January exhibiting a mere 13 mm | 0.5-inch rainfall. The maximum quantity of rainfall is observed during the month of October, exhibiting an average value of 209 mm | 8.2 inch.
- The month of April boasts the highest average temperature, with a recorded maximum of 30.0 °C | 86.0 °F. During the month of December, there is a notable drop in temperature, with an average low of approximately 23.7 °C | 74.7 °F.

  https://en.climate-data.org/asia/india/tamil-nadu/tiruppur-2789/

Rainfall

TABLE 3.13: RAINFALL DATA

Actual Rainfall in mm					Normal Rainfall in mm
2017	2018	2019	2020	2021	
679.8	716.2	488.1	748.8	845.1	606.8

Source: https://www.twadboard.tn.gov.in/content/tiruppur

TABLE 3.14: METEOROLOGICAL DATA RECORDED AT SITE

S.No	Parameters		Oct-2024	Nov-2024	Dec-2024
1	Temperature (^{0}C)	Max	28.91	25.88	25.35
		Min	23.85	23.27	21.38
		Avg	26.38	24.57	23.36
2	Relative Humidity (%)	Avg	78.54	82.81	85.47
3	Wind Speed (m/s)	Max	4.8	3.47	3.84
		Min	0.9	1.32	0.9
		Avg	2.85	2.39	2.37
4	Cloud Cover (OKTAS)		0-8	0-8	0-8
5	Wind Direction		WSW,W	ENE,E	ENE,E

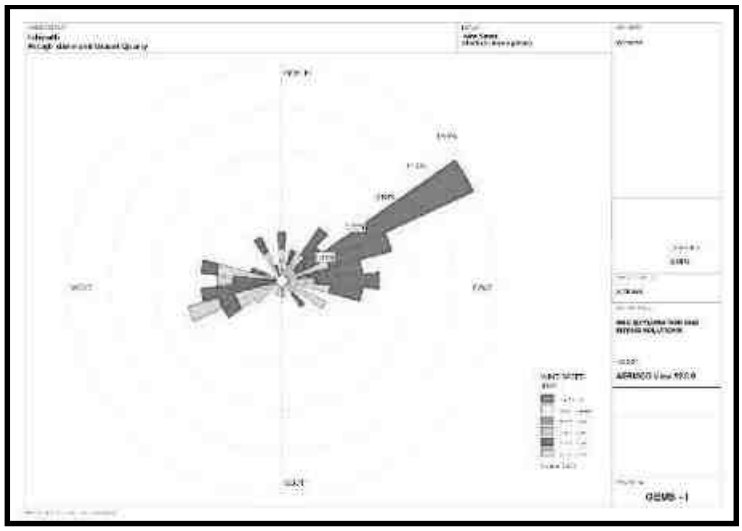
Source: On-site monitoring/sampling by Global Lab and Consultancy Services

Correlation between Secondary and Primary Data

The average rain fall over the period of five years is 606.8mm. The meteorological data collected at the site is almost similar to that of secondary data collected from IMD Tiruppur_agro. A comparison of site data generated during the three months with that of IMD, Tiruppur_agro

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

FIGURE 3.13: WINDROSE DIAGRAM



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

1. Predominant winds were from ESE, SE, WSW, W
2. Wind velocity readings were recorded between 0.50 to 5.70m/s

3. Calm conditions prevail of about 0 % of the monitoring period
4. Temperature readings ranging from 23.36 to 26.38 °C
5. Relative humidity ranging from 78.54- 85.47%
6. The monitoring was carried out continuously for three months.

3.3.2 Methodology and Objective

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

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

3.3.3 Sampling and Analytical Techniques

TABLE 3.15: METHODOLOGY AND INSTRUMENT USED FOR AAQ ANALYSIS

Parameter	Method	Instrument
PM2.5	Gravimetric Method Beta attenuation Method	Fine Particulate Sampler Make – Thermo Environmental Instruments – TEI 121
PM10	Gravimetric Method Beta attenuation Method	Respirable Dust Sampler Make –Thermo Environmental Instruments – TEI 108
SO2	IS-5182 Part II (Improved West & Gaeke method)	Respirable Dust Sampler with gaseous attachment
NOx	IS-5182 Part II (Jacob & Hochheiser modified method)	Respirable Dust Sampler with gaseous attachment
Free Silica	NIOSH – 7601	Visible Spectrophotometry

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

TABLE 3.16: NATIONAL AMBIENT AIR QUALITY STANDARDS

Sl.No.	Pollutant	Time Weighted Average	Concentration in ambient air	
			Industrial, Residential, Rural & other areas	Ecologically Sensitive area (Notified by Central Govt.)
1	Sulphur Dioxide (µg/m3)	Annual Avg.* 24 hours**	50.0 80.0	20.0 80.0
2	Nitrogen Dioxide (µg/m3)	Annual Avg. 24 hours	40.0 80.0	30.0 80.0
3	Particulate matter (size less than 10µm) PM10 (µg/m3)	Annual Avg. 24 hours	60.0 100.0	60.0 100.0
4	Particulate matter (size less than 2.5 µm PM2.5 (µg/m3)	Annual Avg. 24 hours	40.0 60.0	40.0 60.0

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

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

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

3.3.4 Frequency & Parameters for Sampling

Ambient air quality monitoring has been carried out with a frequency of two samples per week at eight (8) locations, adopting a continuous 24 hourly (3 shift of 8-hour) schedule for the period March – May 2024. The baseline data of ambient air has been generated for PM_{10}, $PM_{2.5}$, Sulphur Dioxide (SO_2) & Nitrogen Dioxide (NO_2) Monitoring has been carried out as per the CPCB, MoEF guidelines and notifications.

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

3.3.5 Ambient Air Quality Monitoring Stations

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

TABLE 3.17: AMBIENT AIR QUALITY (AAQ) MONITORING LOCATIONS

S. No	Location Code	Monitoring Locations	Distance & Direction	Coordinates
1	AAQ-1	Core Zone	Project Area	11° 3'28.44"N 77°12'4.37"E
2	AAQ-2	Near Project Area	220m SE	11° 3'23.24"N 77°12'18.35"E
3	AAQ-3	Kallapalayam	2km NW	11° 4'4.61"N 77°11'1.22"E
4	AAQ-4	Velampalayam	6.5km East	11° 3'25.61"N 77°15'50.07"E
5	AAQ-5	Sadapalayam	4km North	11° 5'40.74"N 77°12'35.97"E
6	AAQ-6	Sengathurai	5km SW	11° 2'49.89"N 77° 9'18.67"E
7	AAQ-7	Samygoundanpalayam	6.3km SE	11° 0'21.50"N 77°13'44.23"E

Source: On-site monitoring/sampling by Global Lab and Consultancy Services

FIGURE 3.14: PHOTOGRAPHS OF AMBIENT AIR QUALITY MONITORING

FIGURE 3.15: AMBIENT AIR QUALITY LOCATIONS AROUND 10 KM RADIUS

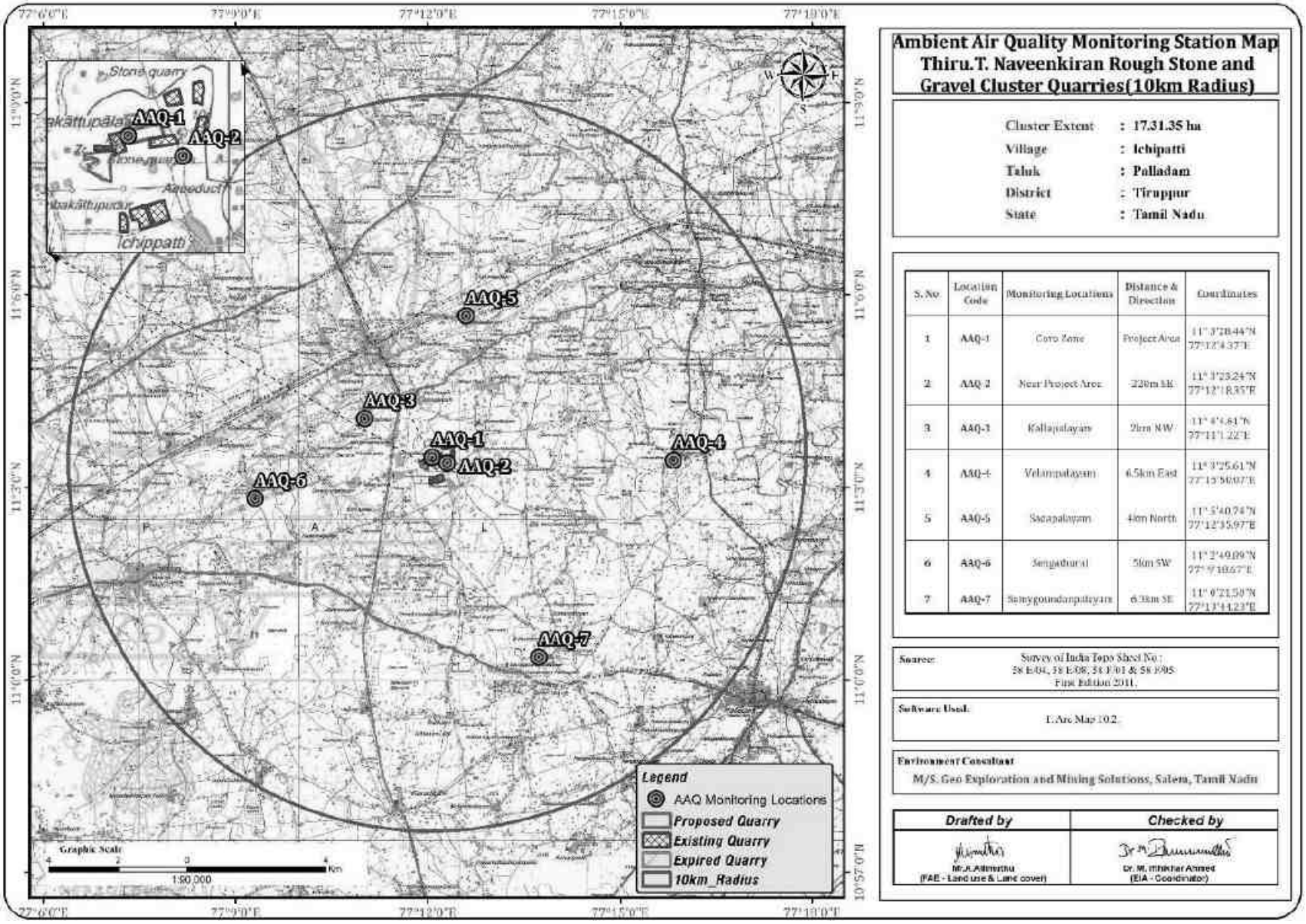


TABLE 3.18: AMBIENT AIR QUALITY DATA LOCATION AAQ1

Monitoring		Particulates, µg/m³		Gaseous Pollutants, µg/m³					Other Pollutants (Particulate Phase) , µg/m³				
Date	Period, hrs.	PM_{10}	$PM_{2.5}$	SO_2	NO_2	NH_3	O_3 (8-hly Avg.)	CO (8-hly Avg.)	Pb, µg/m³	As, ng/m³	Ni, ng/m³	C_6H_6, ng/m³	BaP, ng/m³
NAAQ Norms*		100 (24 hrs)	60 (24 hrs.)	80 (24 hrs.)	80 (24 hrs.)	400 (24 hrs.)	100 (8 hrs.)	2.0 (8hrs.)	1.0 (24 hrs.)	6.0 (annual)	20 (annual)	5.0 (annual)	1.0 (annual)
23/10/2024	10.00-10.00	44.6	19.5	4.2	22.3	BDL(DL:20.0)	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
24/10/2024	10.10-10.10	42.9	19.5	BDL(DL;4.0)	17.3	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
30/10/2024	12.30-12.30	41.7	21.2	BDL(DL:4.0)	20.7	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
31/10/2024	12.40-12.40	40.8	19.1	BDL(DL:4.0)	21.2	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
06/11/2024	12.30-12.30	42.5	19.5	4.6	23.3	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
07/11/2024	12.40-12.40	40.6	20.4	4.6	20.4	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
13/11/2024	12.30-12.30	40.7	20.4	BDL(DL:4.0)	19.1	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
14/11/2024	12.40-12.40	42.0	22.9	5.0	19.3	BDL(DL:20.0)	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
20/11/2024	12.30-12.30	41.0	19.5	BDL(DL:4.0)	20.6	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
21/11/2024	12.40-12.40	40.0	19.5	4.4	20.0	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
27/11/2024	12.30-12.30	40.3	21.6	4.4	18.9	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
28/11/2024	12.40-12.40	42.4	22.0	4.1	18.8	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
04/12/2024	12.30-12.30	41.6	19.5	4.5	18.2	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
05/12/2024	12.40-12.40	42.4	21.2	4.3	18.8	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
11/12/2024	12.30-12.30	42.2	21.6	4.3	22.8	BDL(DL:20.0)	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
12/12/2024	12.40-12.40	42.1	21.2	BDL(DL:4.0)	19.8	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)

18/12/2024	12.30-12.30	40.1	20.4	4.2	20.7	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
19/12/2024	12.40-12.40	41.5	20.8	BDL(DL:4.0)	19.8	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
25/12/2024	12.40-12.40	41.7	20.4	4.3	20.2	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
26/12/2024	12.50-12.50	41.8	21.2	4.2	19.4	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
01/01/2025	12.00-12.00	40.1	21.2	BDL(DL:4.0)	18.8	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
02/01/2025	12.10-12.10	41.9	20.8	4.4	17.4	BDL(DL:20.0)	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
08/01/2025	12.00-12.00	42.4	20.4	4.3	19.0	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
09/01/2025	12.10-12.10	42.7	21.6	4.9	18.5	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
15/01/2025	12.30-12.30	41.4	21.2	4.7	18.4	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
16/01/2025	12.34-12.34	42.5	22.5	4.2	19.4	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)

TABLE 3.19: AMBIENT AIR QUALITY DATA LOCATION AAQ2

Monitoring		**Particulates, µg/m³**		**Gaseous Pollutants, µg/m³**					**Other Pollutants (Particulate Phase) , µg/m³**				
Date	**Period, hrs.**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**NO_2**	**NH_3**	**O_3 (8-hly Avg.)**	**CO (8-hly Avg.)**	**Pb, µg/m³**	**As, ng/m³**	**Ni, ng/m³**	**C_6H_6, ng/m³**	**BaP, ng/m³**
NAAQ Norms*		**100 (24 hrs)**	**60 (24 hrs.)**	**80 (24 hrs.)**	**80 (24 hrs.)**	**400 (24 hrs.)**	**100 (8 hrs.)**	**2.0 (8hrs.)**	**1.0 (24 hrs.)**	**6.0 (annual)**	**20 (annual)**	**5.0 (annual)**	**1.0 (annual)**
23/10/2024	10.20-10.20	43.7	20.3	BDL(DL:4.0)	22.0	BDL(DL:20.0)	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
24/10/2024	10.30-10.30	43.5	20.4	4.2	19.9	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
30/10/2024	13.00-13.00	43.1	22.0	4.7	19.5	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
31/10/2024	13.10-13.10	44.1	21.6	4.1	20.7	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
06/11/2024	13.00-13.00	41.9	20.8	4.2	19.6	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)

07/11/2024	13.10-13.10	42.6	21.2	4.8	20.2	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
13/11/2024	13.00-13.00	42.6	21.6	4.3	17.6	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
14/11/2024	13.10-13.10	41.6	22.0	BDL(DL:4.0)	17.6	BDL(DL:20.0)	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
20/11/2024	13.00-13.00	41.8	20.4	4.5	17.7	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
21/11/2024	13.10-13.10	41.3	21.2	4.9	19.6	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
27/11/2024	13.00-13.00	41.1	22.9	BDL(DL:4.0)	17.5	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
28/11/2024	13.10-13.10	42.5	21.2	4.4	17.7	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
04/12/2024	13.00-13.00	42.1	21.2	4.4	17.9	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
05/12/2024	13.10-13.10	44.4	22.9	4.5	18.4	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
11/12/2024	13.00-13.00	41.6	20.8	4.7	20.7	BDL(DL:20.0)	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
12/12/2024	13.10-13.10	41.6	22.5	4.3	20.1	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
18/12/2024	13.00-13.00	42.1	21.6	4.6	18.9	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
19/12/2024	13.10-13.10	43.0	22.0	4.1	19.2	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
25/12/2024	13.10-13.10	42.1	21.6	4.2	18.2	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
26/12/2024	13.00-13.00	42.9	22.5	4.8	20.8	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
01/01/2025	12.15-12.15	42.2	22.9	4.5	20.2	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
02/01/2025	12.25-12.25	42.9	21.6	4.1	17.5	BDL(DL:20.0)	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
08/01/2025	12.15-12.15	42.1	21.2	4.9	18.1	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
09/01/2025	12.25-12.25	43.3	23.3	4.1	19.1	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
15/01/2025	13.50-13.50	42.0	22.0	5.2	18.1	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)

16/01/2025	14.00-14.00	41.8	20.8	BDL(DL:4.0)	19.1	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)

TABLE 3.20: AMBIENT AIR QUALITY DATA LOCATION AAQ3

Monitoring		**Particulates, µg/m³**		**Gaseous Pollutants, µg/m³**					**Other Pollutants (Particulate Phase) , µg/m³**				
Date	**Period, hrs.**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**NO_2**	**NH_3**	**O_3 (8-hly Avg.)**	**CO (8-hly Avg.)**	**Pb, µg/m³**	**As, ng/m³**	**Ni, ng/m³**	**C_6H_6, ng/m³**	**BaP, ng/m³**
NAAQ Norms*		**100 (24 hrs)**	**60 (24 hrs.)**	**80 (24 hrs.)**	**80 (24 hrs.)**	**400 (24 hrs.)**	**100 (8 hrs.)**	**2.0 (8hrs.)**	**1.0 (24 hrs.)**	**6.0 (annual)**	**20 (annual)**	**5.0 (annual)**	**1.0 (annual)**
23/10/2024	10.40-10.40	43.9	21.6	4.6	21.9	BDL(DL:20.0)	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
24/10/2024	10.50-10.50	45.3	22.0	4.8	19.6	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
30/10/2024	13.20-13.20	46.4	24.5	5.3	19.6	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
31/10/2024	13.30-13.30	42.6	20.4	5.3	19.6	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
06/11/2024	13.20-13.20	44.1	22.5	4.8	20.2	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
07/11/2024	13.30-13.30	44.1	22.5	4.3	19.3	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
13/11/2024	13.20-13.20	45.1	26.2	4.6	20.8	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
14/11/2024	13.30-13.30	44.3	24.1	BDL(DL:4.0)	19.0	BDL(DL:20.0)	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
20/11/2024	13.20-13.20	44.4	24.1	5.0	21.3	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
21/11/2024	13.30-13.30	43.4	23.3	4.4	19.8	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
27/11/2024	13.20-13.20	44.8	23.7	4.3	19.7	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
28/11/2024	13.30-13.30	44.9	23.3	4.9	20.1	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
04/12/2024	13.20-13.20	43.7	22.5	5.0	19.4	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)

05/12/2024	13.30-13.30	46.4	26.6	4.8	18.6	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
11/12/2024	13.20-13.20	44.0	23.3	4.8	21.0	BDL(DL:20.0)	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
12/12/2024	13.30-13.30	44.6	24.5	4.4	20.0	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
18/12/2024	13.20-13.20	42.9	23.2	5.5	19.0	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
19/12/2024	13.30-13.30	43.6	22.9	4.7	20.3	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
25/12/2024	13.30-13.30	43.9	25.0	5.2	19.7	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
26/12/2024	13.20-13.20	43.7	24.1	4.7	20.7	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
01/01/2025	12.35-12.35	46.1	23.7	4.4	19.2	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
02/01/2025	12.45-12.45	45.5	22.5	4.2	20.2	BDL(DL:20.0)	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
08/01/2025	12.35-12.35	45.4	24.1	4.2	21.5	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
09/01/2025	12.45-12.45	45.9	25.0	4.6	18.6	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
15/01/2025	14.00-14.00	44.6	24.1	4.1	18.7	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
16/01/2025	14.10-14.10	45.5	23.3	4.2	17.7	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)

TABLE 3.21: AMBIENT AIR QUALITY DATA LOCATION AAQ4

Monitoring		**Particulates, µg/m³**		**Gaseous Pollutants, µg/m³**					**Other Pollutants (Particulate Phase) , µg/m³**				
Date	**Period, hrs.**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**NO_2**	**NH_3**	**O_3 (8-hly Avg.)**	**CO (8-hly Avg.)**	**Pb, µg/m³**	**As, ng/m³**	**Ni, ng/m³**	**C_6H_6, ng/m³**	**BaP, ng/m³**
NAAQ Norms*		**100 (24 hrs)**	**60 (24 hrs.)**	**80 (24 hrs.)**	**80 (24 hrs.)**	**400 (24 hrs.)**	**100 (8 hrs.)**	**2.0 (8hrs.)**	**1.0 (24 hrs.)**	**6.0 (annual)**	**20 (annual)**	**5.0 (annual)**	**1.0 (annual)**
23/10/2024	11.00-11.00	46.4	22.5	4.7	21.7	BDL(DL:20.0)	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
24/10/2024	11.10-11.10	44.4	22.9	5.6	19.4	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)

30/10/2024	13.45-13.45	41.9	20.8	5.3	20.5	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
31/10/2024	13.55-13.55	43.2	22.0	4.9	20.4	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
06/11/2024	13.45-13.45	43.3	22.0	5.2	18.0	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
07/11/2024	13.55-13.55	45.5	24.5	5.6	18.9	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
13/11/2024	13.45-13.45	44.3	23.7	5.4	22.6	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
14/11/2024	13.55-13.55	43.9	23.2	4.9	19.9	BDL(DL:20.0)	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
20/11/2024	13.45-13.45	45.0	25.8	5.5	19.3	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
21/11/2024	13.55-13.55	44.4	24.9	4.2	19.5	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
27/11/2024	13.45-13.45	46.4	26.6	6.5	21.9	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
28/11/2024	13.55-13.55	44.2	24.1	5.1	18.7	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
04/12/2024	13.45-13.45	44.9	24.1	5.2	21.5	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
05/12/2024	13.55-13.55	45.3	24.9	4.7	20.2	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
11/12/2024	13.45-13.45	44.7	25.4	BDL(DL:4.0)	19.5	BDL(DL:20.0)	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
12/12/2024	13.55-13.55	45.9	26.2	4.7	19.1	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
18/12/2024	13.45-13.45	44.9	24.5	4.5	19.1	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
19/12/2024	13.55-13.55	45.6	24.5	5.2	20.5	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
25/12/2024	13.55-13.55	45.0	25.0	4.7	20.5	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
26/12/2024	13.45-13.45	44.7	25.4	4.9	21.0	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
01/01/2025	13.20-13.20	47.4	26.6	5.0	20.6	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
02/01/2025	13.30-13.30	46.3	24.5	4.5	19.2	BDL(DL:20.0)	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)

08/01/2025	13.20-13.20	46.2	25.0	5.0	21.3	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
09/01/2025	13.30-13.30	46.5	26.2	5.3	20.4	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
15/01/2025	14.15-14.15	45.8	25.4	5.1	19.6	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
16/01/2025	14.25-14.25	44.3	22.0	5.1	19.3	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)

TABLE 3.22: AMBIENT AIR QUALITY DATA LOCATION AAQ5

Monitoring		Particulates, µg/m³		Gaseous Pollutants, µg/m³					Other Pollutants (Particulate Phase) , µg/m³				
Date	Period, hrs.	PM_{10}	$PM_{2.5}$	SO_2	NO_2	NH_3	O_3 (8-hly Avg.)	CO (8-hly Avg.)	Pb, µg/m³	As, ng/m³	Ni, ng/m³	C_6H_6, ng/m³	BaP, ng/m³
NAAQ Norms*		100 (24 hrs)	60 (24 hrs.)	80 (24 hrs.)	80 (24 hrs.)	400 (24 hrs.)	100 (8 hrs.)	2.0 (8hrs.)	1.0 (24 hrs.)	6.0 (annual)	20 (annual)	5.0 (annual)	1.0 (annual)
23/10/2024	11.20-11.20	42.7	20.8	4.3	22.0	BDL(DL:20.0)	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
24/10/2024	11.30-11.30	46.4	21.6	4.1	19.3	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
30/10/2024	14.10-14.10	46.2	23.3	4.2	21.2	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
31/10/2024	14.20-14.20	44.5	23.7	4.2	20.7	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
06/11/2024	14.10-14.10	45.6	25.4	4.9	23.6	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
07/11/2024	14.20-14.20	45.0	24.1	5.2	17.4	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
13/11/2024	14.10-14.10	43.3	22.9	5.6	20.0	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
14/11/2024	14.20-14.20	46.5	25.8	BDL(DL:4.0)	20.5	BDL(DL:20.0)	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
20/11/2024	14.10-14.10	44.5	24.5	4.7	20.4	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
21/11/2024	14.20-14.20	46.2	27.0	5.1	17.0	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
27/11/2024	14.10-14.10	45.0	24.9	4.2	20.4	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)

28/11/2024	14.20-14.20	47.4	27.4	5.2	20.8	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
04/12/2024	14.10-14.10	45.3	26.2	4.2	18.3	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
05/12/2024	14.20-14.20	47.0	27.4	BDL(DL:4.0)	20.4	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
11/12/2024	14.10-14.10	46.8	26.2	5.7	18.7	BDL(DL:20.0)	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
12/12/2024	14.20-14.20	46.3	25.4	5.8	19.6	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
18/12/2024	14.10-14.10	45.5	25.8	BDL(DL:4.0)	19.7	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
19/12/2024	14.20-14.20	45.5	25.0	4.9	20.7	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
25/12/2024	14.20-14.20	45.9	25.8	4.7	18.7	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
26/12/2024	14.10-14.10	45.6	24.5	5.1	19.5	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
01/01/2025	13.35-13.35	47.7	24.5	5.6	24.7	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
02/01/2025	13.45-13.45	41.9	22.9	5.2	19.6	BDL(DL:20.0)	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
08/01/2025	13.35-13.35	45.2	23.7	5.0	20.9	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
09/01/2025	13.45-13.45	47.3	27.0	5.1	21.5	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
15/01/2025	14.40-14.40	45.7	24.1	4.8	19.4	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
16/01/2025	14.50-14.50	46.9	24.5	5.1	21.3	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)

TABLE 3.23: AMBIENT AIR QUALITY DATA LOCATION AAQ6

Monitoring		Particulates, µg/m³		Gaseous Pollutants, µg/m³					Other Pollutants (Particulate Phase) , µg/m³				
Date	Period, hrs.	PM_{10}	$PM_{2.5}$	SO_2	NO_2	NH_3	O_3 (8-hly Avg.)	CO (8-hly Avg.)	Pb, µg/m³	As, ng/m³	Ni, ng/m³	C_6H_6, ng/m³	BaP, ng/m³
NAAQ Norms*		100 (24 hrs)	60 (24 hrs.)	80 (24 hrs.)	80 (24 hrs.)	400 (24 hrs.)	100 (8 hrs.)	2.0 (8hrs.)	1.0 (24 hrs.)	6.0 (annual)	20 (annual)	5.0 (annual)	1.0 (annual)
23/10/2024	11.45-11.45	43.8	21.6	BDL(DL:4.0)	22.9	BDL(DL:20.0)	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
24/10/2024	11.55-11.55	44.6	22.8	5.1	22.2	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
30/10/2024	14.25-14.25	46.5	24.1	4.5	20.2	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
31/10/2024	14.35-14.35	45.8	24.9	4.9	20.5	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
06/11/2024	14.25-14.25	43.8	23.7	5.5	20.5	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
07/11/2024	14.35-14.35	42.0	21.2	5.1	19.5	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
13/11/2024	14.25-14.25	43.8	25.4	4.7	20.5	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
14/11/2024	14.35-14.35	44.8	24.5	4.8	20.7	BDL(DL:20.0)	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
20/11/2024	14.25-14.25	46.3	27.0	5.0	19.3	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
21/11/2024	14.35-14.35	44.3	24.1	4.5	17.6	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
27/11/2024	14.25-14.25	44.4	24.1	4.4	19.5	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
28/11/2024	14.35-14.35	45.4	25.4	5.0	22.2	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
04/12/2024	14.25-14.25	45.6	27.0	5.5	19.7	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
05/12/2024	14.35-14.35	45.3	26.2	5.0	21.2	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
11/12/2024	14.25-14.25	45.2	25.8	BDL(DL:4.0)	18.1	BDL(DL:20.0)	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
12/12/2024	14.35-14.35	46.8	27.4	4.7	19.2	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)

18/12/2024	14.25-14.25	45.0	25.0	5.3	20.0	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
19/12/2024	14.35-14.35	46.2	25.8	5.3	21.2	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
25/12/2024	14.35-14.35	46.8	24.5	4.8	21.2	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
26/12/2024	14.25-14.25	46.3	25.4	4.7	21.3	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
01/01/2025	14.10-14.10	46.4	27.0	4.9	20.0	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
02/01/2025	14.20-14.20	47.0	26.6	4.8	20.7	BDL(DL:20.0)	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
08/01/2025	14.10-14.10	45.5	24.5	5.1	23.0	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
09/01/2025	14.20-14.20	44.7	23.7	6.3	19.8	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
15/01/2025	15.00-15.00	46.2	26.2	4.3	19.6	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
16/01/2025	15.10-15.10	47.6	26.6	5.1	20.7	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)

TABLE 3.24: AMBIENT AIR QUALITY DATA LOCATION AAQ7

Monitoring		Particulates, µg/m³		Gaseous Pollutants, µg/m³					Other Pollutants (Particulate Phase) , µg/m³				
Date	Period, hrs.	PM_{10}	$PM_{2.5}$	SO_2	NO_2	NH_3	O_3 (8-hly Avg.)	CO (8-hly Avg.)	Pb, µg/m³	As, ng/m³	Ni, ng/m³	C_6H_6, ng/m³	BaP, ng/m³
NAAQ Norms*		100 (24 hrs)	60 (24 hrs.)	80 (24 hrs.)	80 (24 hrs.)	400 (24 hrs.)	100 (8 hrs.)	2.0 (8hrs.)	1.0 (24 hrs.)	6.0 (annual)	20 (annual)	5.0 (annual)	1.0 (annual)
23/10/2024	12.00-12.00	43.2	22.5	4.6	22.1	BDL(DL:20.0)	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
24/10/2024	12.10-12.10	44.2	22.0	BDL(DL:4.0)	20.2	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
30/10/2024	14.45-14.45	43.1	22.0	5.2	21.8	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
31/10/2024	14.55-14.55	42.6	22.8	4.8	20.5	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
06/11/2024	14.45-14.45	42.4	22.8	4.8	22.7	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
07/11/2024	14.55-14.55	42.9	22.0	4.8	19.2	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
13/11/2024	14.45-14.45	44.5	24.5	4.2	20.6	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
14/11/2024	14.55-14.55	42.7	22.5	4.7	20.4	BDL(DL:20.0)	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
20/11/2024	14.45-14.45	43.4	23.3	4.6	19.9	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
21/11/2024	14.55-14.55	45.7	26.2	4.3	20.3	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
27/11/2024	14.45-14.45	45.6	27.0	4.8	19.9	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
28/11/2024	14.55-14.55	45.8	25.8	5.4	20.6	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
04/12/2024	14.45-14.45	45.4	24.5	4.8	19.0	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
05/12/2024	14.55-14.55	46.6	27.0	4.8	23.2	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
11/12/2024	14.45-14.45	46.1	23.7	5.7	22.8	BDL(DL:20.0)	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
12/12/2024	14.55-14.55	45.1	24.1	5.0	18.8	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)

18/12/2024	14.45-14.45	45.8	24.1	5.3	20.8	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
19/12/2024	14.55-14.55	45.3	24.1	4.6	21.1	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
25/12/2024	14.55-14.55	47.8	26.2	4.9	21.5	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
26/12/2024	14.45-14.45	44.3	23.7	4.8	19.6	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
01/01/2025	14.30-14.30	46.0	24.1	5.0	20.6	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
02/01/2025	14.40-14.40	45.7	25.4	5.0	20.5	BDL(DL:20.0)	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
08/01/2025	14.30-14.30	47.2	26.2	5.1	21.6	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
09/01/2025	14.40-14.40	46.2	25.4	4.8	20.2	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
15/01/2025	15.15-15.15	47.5	23.7	4.2	20.7	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)
16/01/2025	15.25-15.25	46.4	25.8	5.3	19.1	BDL(DL:20.0	BDL(DL:5.0)	BDL(DL:1.15)	BDL (DL:0.01)	BDL (DL:1)	BDL (DL:.1)	BDL (DL:1.0)	BDL (DL:0.5)

TABLE 3.25: SUMMARY OF AAQ 1 to AAQ 7

PM10	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7
Arithmetic Mean	41.7	42.7	44.6	45.0	45.6	45.4	45.1
Minimum	40.0	41.1	42.6	41.9	41.9	42.0	42.4
Maximum	44.6	44.4	46.4	47.4	47.7	47.6	47.8
NAAQ Norms	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
PM2.5	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7
Arithmetic Mean	20.7	21.6	23.6	24.3	24.8	25.0	24.3
Minimum	19.1	20.3	20.4	20.8	20.8	21.2	22.0
Maximum	22.9	23.3	26.6	26.6	27.4	27.4	27.0
NAAQ Norms	**60.0**	**60.0**	**60.0**	**60.0**	**60.0**	**60.0**	**60.0**
SO2	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7
Arithmetic Mean	4.4	4.5	4.7	5.1	4.9	5.0	4.9
Minimum	4.1	4.1	4.1	4.2	4.1	4.3	4.2
Maximum	5.0	5.2	5.5	6.5	5.8	6.3	5.7
NAAQ Norms	**80.0**	**80.0**	**80.0**	**80.0**	**80.0**	**80.0**	**80.0**
NO2	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7
Arithmetic Mean	19.7	19.1	19.8	20.1	20.2	20.4	20.7
Minimum	17.3	17.5	17.7	18.0	17.0	17.6	18.8
Maximum	23.3	22.0	21.9	22.6	24.7	23.0	23.2
NAAQ Norms	**80.0**	**80.0**	**80.0**	**80.0**	**80.0**	**80.0**	**80.0**

TABLE 3.26: ABSTRACT OF AMBIENT AIR QUALITY DATA

1	Parameter	PM10	PM2.5	SO_2	NO_2
2	No. of Observations	260	260	260	260
3	10th Percentile Value	41.7	20.8	4.2	18.2
4	20th Percentile Value	43.1	22.0	4.3	18.9
5	30th Percentile Value	43.8	22.9	4.5	19.3
6	40th Percentile Value	44.4	23.5	4.7	19.6
7	50th Percentile Value	44.9	24.1	4.8	20.0
8	60th Percentile Value	45.3	24.5	4.9	20.3
9	70th Percentile Value	45.7	25.0	5.0	20.6
10	80th Percentile Value	46.2	25.8	5.2	20.9
11	90th Percentile Value	46.6	26.6	5.4	21.8
12	95th Percentile Value	47.3	27.0	5.6	22.7
13	98th Percentile Value	47.7	27.4	6.2	23.4
14	Arithmetic Mean	45.2	24.5	5.0	20.5
15	Geometric Mean	45.1	24.4	4.9	20.5
16	Standard Deviation	1.8	2.1	0.6	1.6
17	Minimum	41.7	20.8	4.2	18.2
18	Maximum	47.7	27.4	6.2	23.4
19	**NAAQ Norms***	**100.0**	**60.0**	**80.0**	**80.0**
	% Values exceeding Norms*	0.0	0.0	0.0	0.0

FIGURE 3.16: BAR DIAGRAM OF SUMMARY OF AAQ 1 – AAQ7

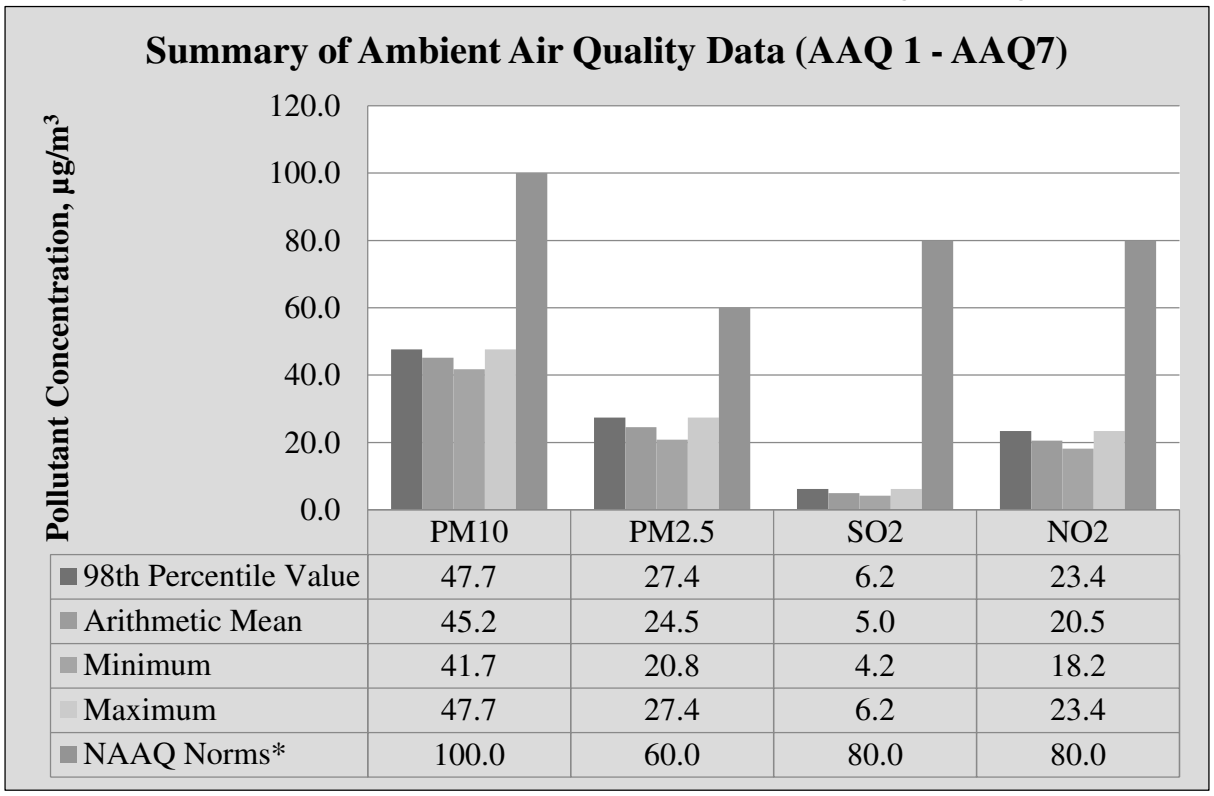
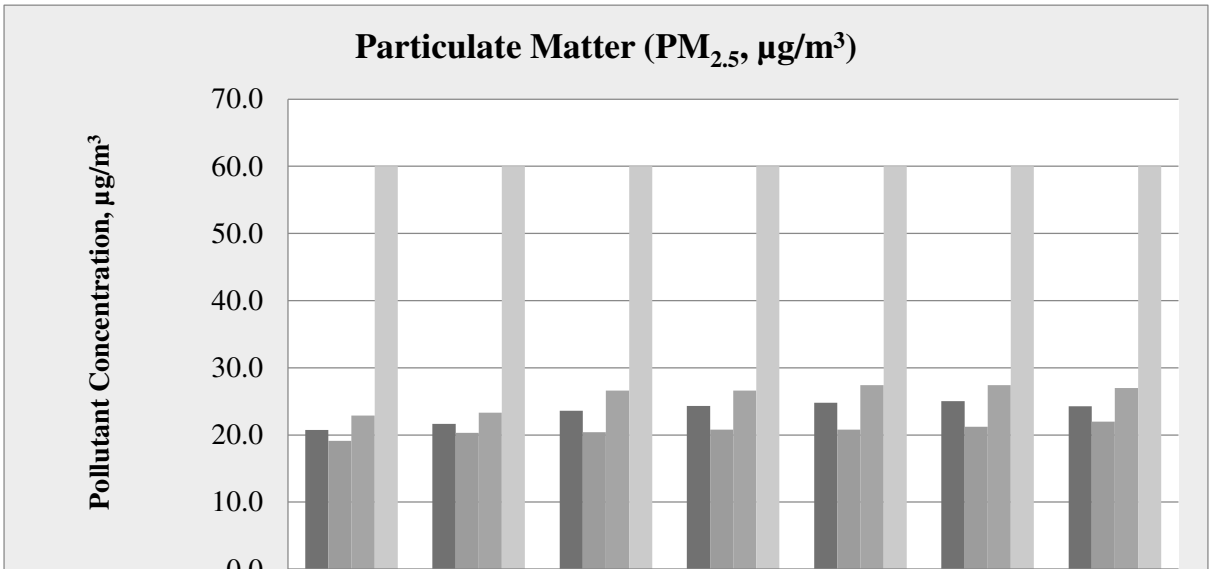
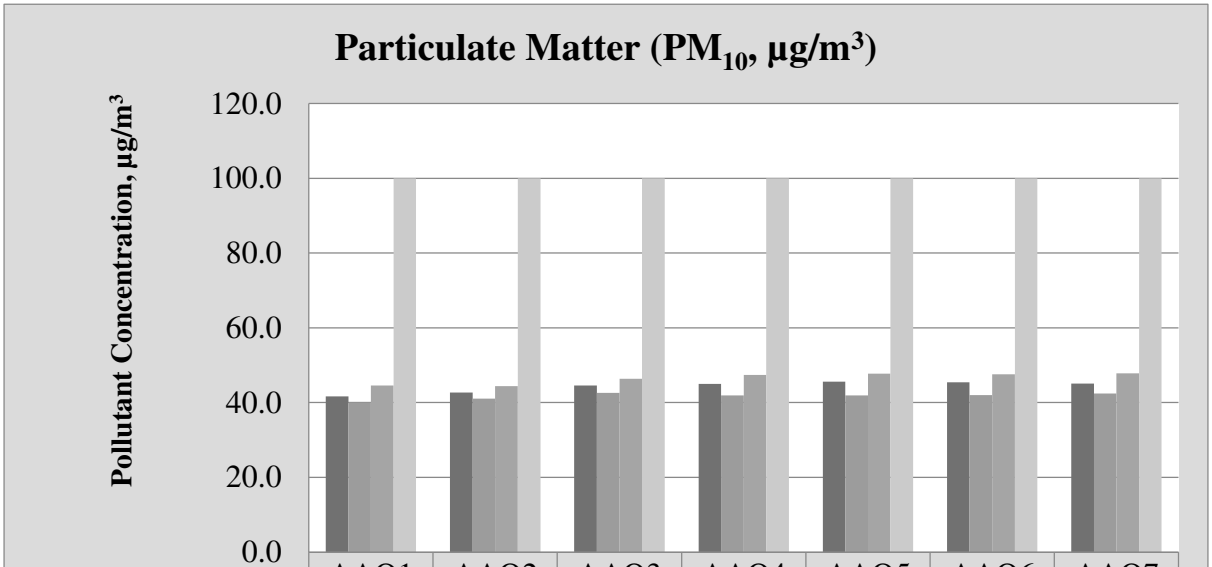


FIGURE 3.17: BAR DIAGRAM OF PARTICULATE MATTER $PM_{2.5}$



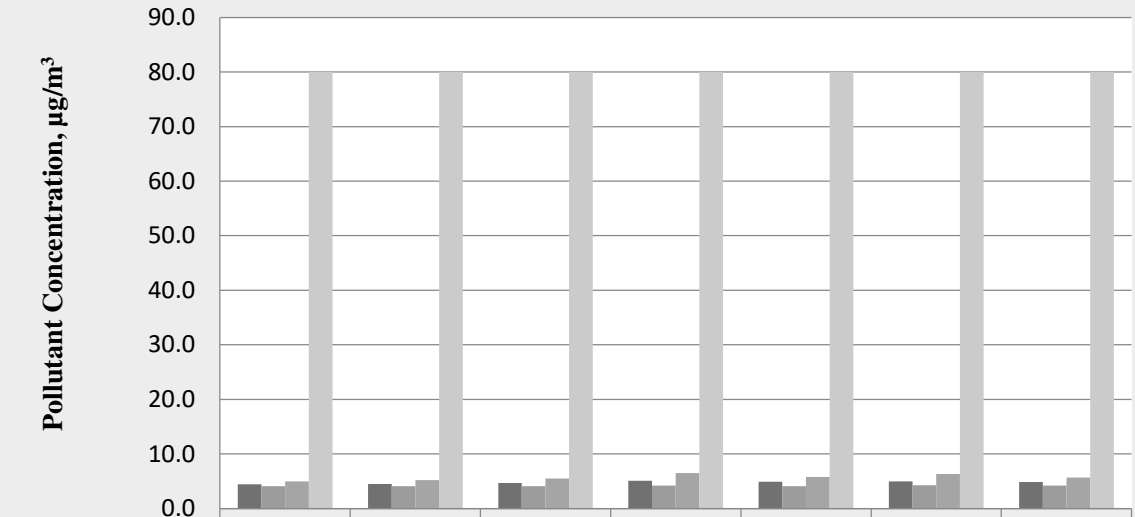
	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7
Arithmetic Mean	20.7	21.6	23.6	24.3	24.8	25.0	24.3
Minimum	19.1	20.3	20.4	20.8	20.8	21.2	22.0
Maximum	22.9	23.3	26.6	26.6	27.4	27.4	27.0
NAAQ Norms	60.0	60.0	60.0	60.0	60.0	60.0	60.0

FIGURE 3.18: BAR DIAGRAM OF PARTICULATE MATTER PM_{10}



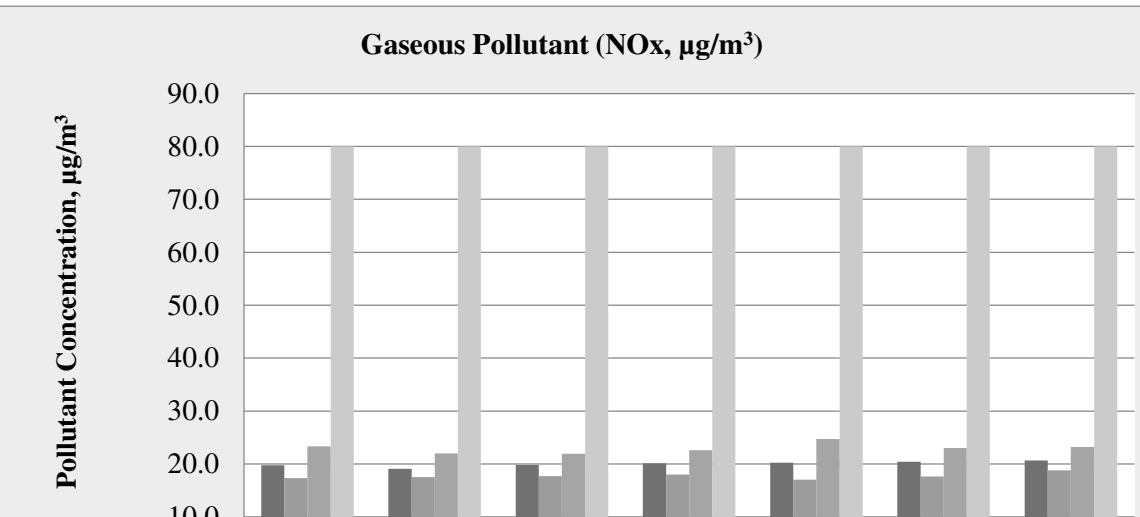
	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7
Arithmetic Mean	41.7	42.7	44.6	45.0	45.6	45.4	45.1
Minimum	40.0	41.1	42.6	41.9	41.9	42.0	42.4
Maximum	44.6	44.4	46.4	47.4	47.7	47.6	47.8
NAAQ Norms	100.0	100.0	100.0	100.0	100.0	100.0	100.0

FIGURE 3.19: BAR DIAGRAM OF GASEOUS POLLUTANT SO_2



	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7
Arithmetic Mean	4.4	4.5	4.7	5.1	4.9	5.0	4.9
Minimum	4.1	4.1	4.1	4.2	4.1	4.3	4.2
Maximum	5.0	5.2	5.5	6.5	5.8	6.3	5.7
NAAQ Norms	80.0	80.0	80.0	80.0	80.0	80.0	80.0

FIGURE 3.20: BAR DIAGRAM OF GASEOUS POLLUTANT NO_x



	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7
Arithmetic Mean	19.7	19.1	19.8	20.1	20.2	20.4	20.7
Minimum	17.3	17.5	17.7	18.0	17.0	17.6	18.8
Maximum	23.3	22.0	21.9	22.6	24.7	23.0	23.2
NAAQ Norms	80.0	80.0	80.0	80.0	80.0	80.0	80.0

3.3.6 Interpretations & Conclusion

As per monitoring data, PM_{10} ranges from 41.7 µg/m³ to 45.6 µg/m³, $PM_{2.5}$ data ranges from 20.7 µg/m³ to 25.0 µg/m³, SO_2 ranges from 4.4µg/m³ to 5.1µg/m³ and NO_2 data ranges from 19.1 µg/m³ to 20.7

µg/m^3. The concentration levels of the above criteria pollutants were observed to be well within the limits of NAAQS prescribed by CPCB.

3.4 NOISE ENVIRONMENT

The vehicular movement on road and mining activities is the major sources of noise in study area, the environmental assessment of noise from the mining activity and vehicular traffic can be undertaken by taking into consideration various factors like potential damage to hearing, physiological responses, and annoyance and general community responses. The main objective of noise monitoring in the study area is to establish the baseline noise level and assess the impact of the total noise expected to be generated during the project operations around the project site.

3.4.1 Identification of Sampling Locations

In order to assess the ambient noise levels within the study area, noise monitoring was carried out at Seven (7) locations. The noise level measurement was carried out at each ambient air quality station. The main aim of the noise level monitoring is

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

The noise level monitoring locations were carried out by covering commercial, residential, rural areas within the radius of 10km. A noise monitoring methodology was chosen such that it best suited the purpose and objectives of the study.

TABLE 3.27: DETAILS OF SURFACE NOISE MONITORING LOCATIONS

S. No	Location Code	Monitoring Locations	Distance & Direction	Coordinates
1	N1	Core Zone	Project Area	11° 3'28.68"N 77°12'12.90"E
2	N2	Near Project Area	200m SW	11° 3'22.73"N 77°11'59.39"E
3	N3	Kallapalayam	2km NW	11° 4'4.07"N 77°11'1.06"E
4	N4	Velampalayam	6.5km East	11° 3'25.76"N 77°15'51.40"E
5	N5	Sadapalayam	4km North	11° 5'39.27"N 77°12'36.92"E
6	N6	Sengathurai	5km SW	11° 2'49.56"N 77° 9'18.76"E
7	N7	Samygoundanpalayam	6.3km SE	11° 0'21.56"N 77°13'43.68"E

Source: On-site monitoring/sampling by Global Lab and Consultancy Services

FIGURE 3.23: PHOTOGRAPHS OF AMBIENT NOISE MONITORING

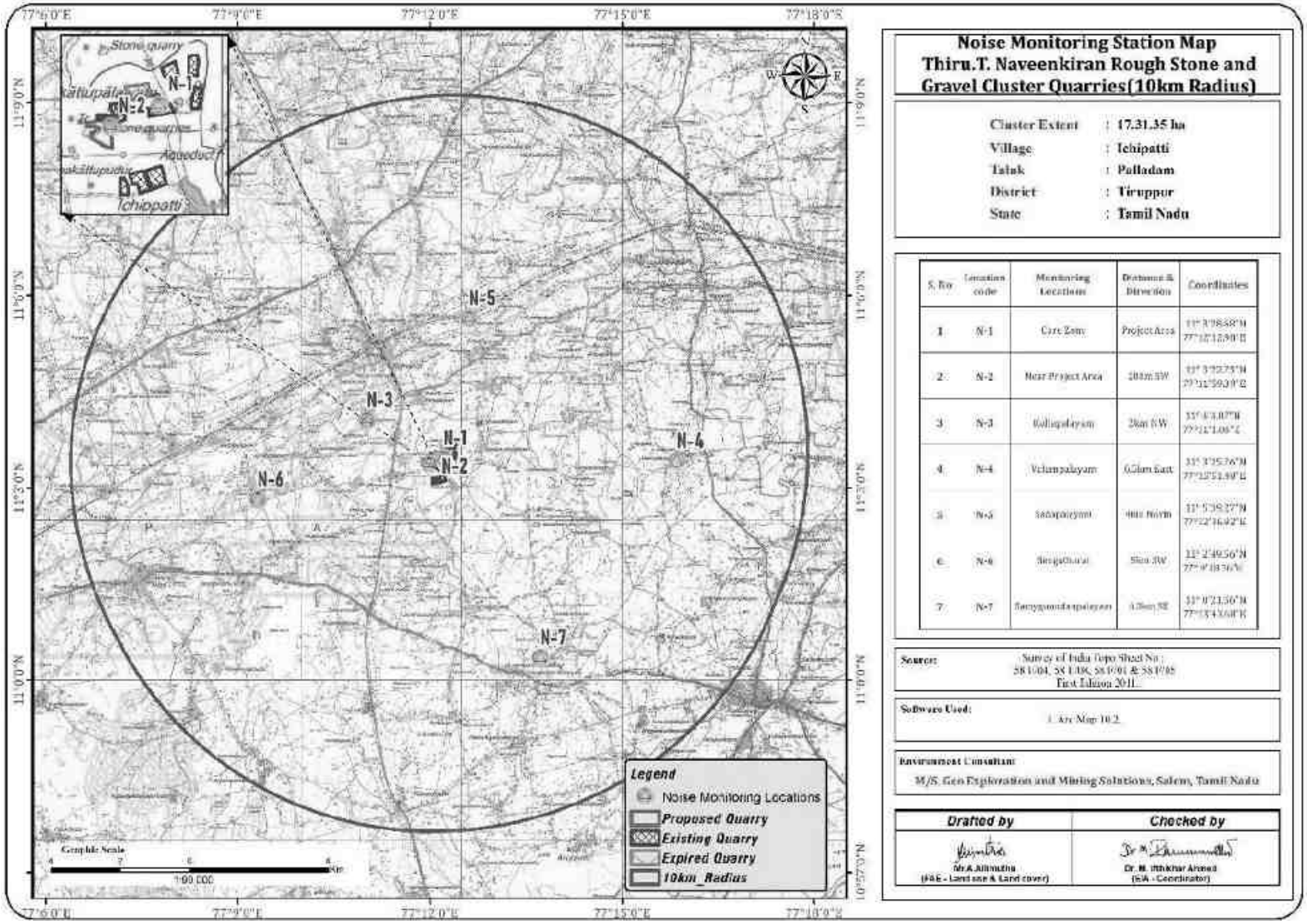
3.4.2 Method of Monitoring

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

Leq = 10 Log L / T$\sum$ (10Ln/10)
Where L = Sound pressure level at function of time dB (A)
T = Time interval of observation

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

FIGURE 3.24: NOISE MONITORING STATIONS AROUND 10 KM RADIUS



3.4.3 Analysis of Ambient Noise Level in the Study Area

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

Day time: 6:00 hours to 22.00 hours.

Night time: 22:00 hours to 6.00 hours.

TABLE 3.28: AMBIENT NOISE QUALITY RESULT

S. No	Locations	Noise level (dB (A) Leq)		Ambient Noise Standards
		Day Time	Night Time	
1	Core Zone	48.1	37.5	**Industrial Day Time- 75 dB (A) Night Time- 70 dB (A)**
2	Near Project Area	44.1	37.1	
3	Kallapalayam	47.4	39.5	
4	Velampalayam	44.4	38.1	
5	Sadapalayam	43.8	39.2	**Residential Day Time– 55 dB (A) Night Time- 45 dB (A)**
6	Sengathurai	45.8	37.9	
7	Samygoundanpalayam	47.5	38.9	

Source: On-site monitoring/sampling by Global Lab and Consultancy Services

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

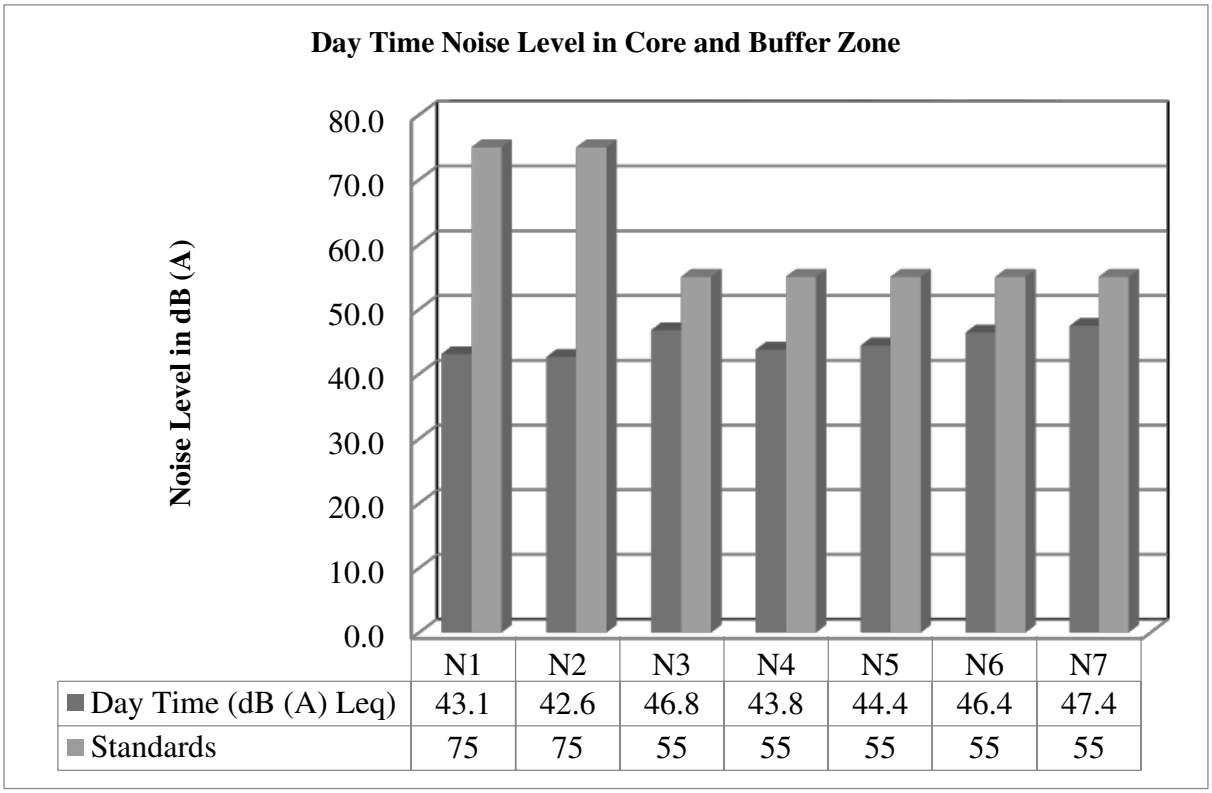
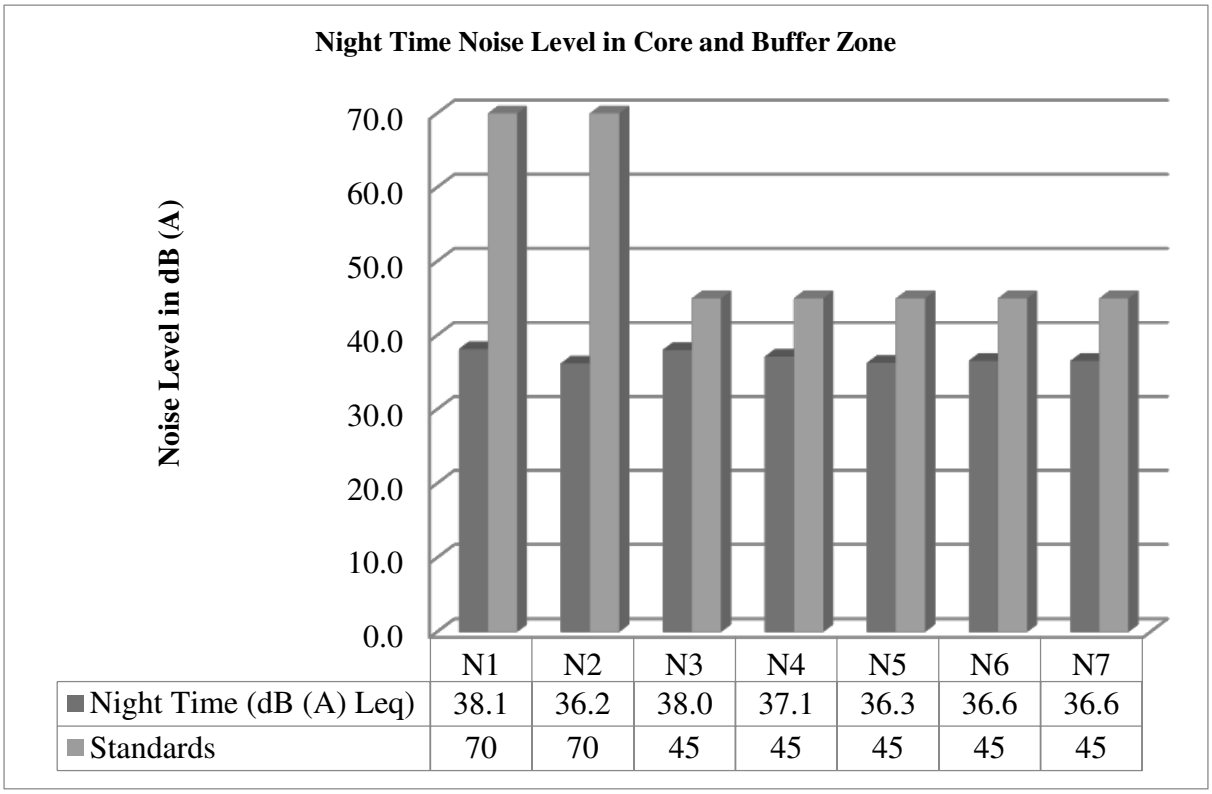


FIGURE 3.26: NIGHT TIME NOISE LEVELS IN CORE AND BUFFER ZONE



	N1	N2	N3	N4	N5	N6	N7
Night Time (dB (A) Leq)	38.1	36.2	38.0	37.1	36.3	36.6	36.6
Standards	70	70	45	45	45	45	45

3.4.4 Interpretation & Conclusion:

Ambient noise levels were measured at 7 (Seven) locations around the proposed project area. Noise levels recorded in core zone during day time were from 43.1 dB (A) Leq and during night time were from 38.1 dB (A) Leq. Noise levels recorded in buffer zone during day time were from 42.6 to 47.4dB (A) Leq and during night time were from 36.2 to 38 dB (A) Leq. Thus, the noise level for Industrial and Residential area meets the requirements of CPCB.

3.5 BIOLOGICAL ENVIRONMENT

3.5.1. Study area Ecology

The core area extent of 2.83.4 Ha of has an impact on the diversity of flora and fauna of the surrounding area. But present work was carried out on the detailed study of the impacts of the Rough stone and gravel quarry on the ecology and biodiversity of the core lease area with the proper mitigation and sustainable management plan. The proposed mine lease area is situated on a plain terrain. The following methods were applied during the baseline study of flora, fauna and diversity assessment.

3.5.2. Objectives of Biological Studies

a) To study the likely impact of the proposed mining project on the local biodiversity and to suggest mitigation measures, if required, for vulnerable biota.

b) Undertake intensive field survey to assess the status of floral & faunal component in different habitats in the core and buffer areas of the project site.

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

d) Suggest Wildlife conservation (species specific/habitat specific) and management plan for the threatened (critically endangered & endangered species - schedule I) faunal species if any reported within the study area.

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

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

g) Devise management & conservation measures for biodiversity.

3.5.3. Methodology of Sampling

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

The faunal elements (animal species) of core and buffer zone were identified by direct sightings or indirect evidences viz. pug marks, skeletal remains, scats and droppings etc. (Jayson and Easa 2004). Standard binocular was used for the observations. The authenticity of faunal elements occurrence was confirmed by interaction with the local people. Avifauna identification was done with pictorial descriptions of published literature. Information pertaining to existence of any migratory corridors and paths were obtained from local inhabitants. The status of each faunal element was determined and wildlife schedule category was ascertained as per the IUCN-Red Data Book and Indian wildlife (Protection) Act, 1972.

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

Direct observations and bird calls were used for bird documentation. Same transects were used for counting butterflies. Opportunistic observations were made for Amphibians, reptiles and ordinates. The presence of mammals was recorded by direct and indirect signs. All possible transects were taken for birds and butterflies. Birds and butterflies were classified into species level. Recorded bird species were identified to species level using standard books (Ali & Ripley 1987, Grimmett et al., 2016).

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

1. Forest working plan
2. Schedule I to V: Indian Wildlife (Protection) Act, 1972
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5. Ali, S and Ripley. handbook of the Birds of India and Pakistan together with those of Nepal, Sikkim and Bhutan, Oxford University Press, Bombay.
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7. Birds Life Data Zone
8. Ebird.org
9. Global Biodiversity Information Facility

3.5.3.1. Sampling

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

3.5.3.2. Sampling Size

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

3.5.3.3. Timing of Study

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

3.5.3.4. Observations from Sampling

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

3.5.3.5. Equipment/ References

Following tools/equipment were used for conducting phytosociological study.

- Ballpoint pen, Field bags, Field notebooks, field shoes, gloves, GPS, Measuring tapes and scales, Plant cutters, packet lens, ropes etc.
- Canon Mark III Camera with 50-500mm lens– Snap shots taken
- Leica Binoculars (8x 20) to spot/identify species
- IUCN Red Data Book – https://www.iucnredlist.org/species

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

3.5.4. Part I Field Sampling Techniques

3.5.4.1. Transect walk – Birds

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

3.5.4.2. Modified Pollard Walk – for Butterflies

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

3.5.4.3. Visual Encounter Survey (VES) - reptiles and amphibians

VES is a time-constrained sampling technique (Campbell and Christman, 1982; Corn and Bury, 1990). It needs a systematic search through an area or habitat for a prescribed time period (Campbell and Christman, 1982). The result of VES is measured against the time spent for search. VES technique is one of the simplest methods and an appropriate technique for both inventory and monitoring Herpetofauna (Heyer et al. 1994).

3.5.4.4. Observational methods- Mammals

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

3.5.4.5. Multiple Stage Quadrat – Vegetation

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

3.5.5. Flora

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

3.5.5.1. Flora Composition in the Core Zone

Core zone flora samplings were conducted between 12.30 pm to 1.30 pm in three locations. The applied area is a plain terrain, so we used quadrat sampling methods. Taxonomically a total a total of 13 species belonging to 8 families have been recorded from the core mining lease area. It is exhibit plain topography. Based on habitat classification of the enumerated plants the majority of species were Herbs 6 (46%) followed by Shrubs 1 (8%), Trees 2 (15%), Grasses 3 (23%), and Climbers/Creepers 1 (8%). Details of flora with the scientific name were mentioned in Table No. 3.23. The result of the core zone of flora studies shows that Poaceae and Lamiaceae are the main dominating species in the study area mentioned in Table No.3.53. No species were found as a threatened category (Table No. 3.23). The% distribution of floral life forms in Core Zone is given in Fig No.3.27.

Table No: 3.29. Flora in the Core zone of Ichipatti Village, Rough stone and Gravel quarry, Palladam Taluk, Tiruppur District (Primary data)

SI. No	English Name	Vernacular Name	Scientific Name	Family Name
Trees				
1.	Neem	Vembu	*Azadirachta indica*	Meliaceae
2.	Mesquite	Mullu maram	*Prosopis juliflora*	Fabaceae
Shrubs				
1.	Milk Weed	Erukku	*Calotropis gigantea*	Apocynaceae
Herbs				
1.	Common leucas	Thumbai	*Leucas aspera*	Lamiaceae
2.	Indian Catmint Plant	Pei viratti	*Anisomeles malabarica*	Lamiaceae
3.	Indian mallow	Thuthi	*Abutilon indicum*	Meliaceae
4.	Holy basil	Thulasi	*Ocimum tenuiflorum*	Lamiaceae
5.	Prickly chaff flower	Nayuruv	*Achyranthes aspera*	Amaranthaceae
6.	Coat buttons	Thatha poo	*Tridax procumbens*	Asteraceae
Creeper /Climbers				
1	Stemmed vine	Perandai	*Cissus quadrangularis*	Vitaceae
Grass				
1.	Eragrostis	Pullu	*Eragrostis ferruginea*	Poaceae
2.	Great brome	Thodappam	*Bromus diandrus*	Poaceae
3.	Nut grass	Korai	*Cyperus rotandus*	Poaceae

Sources: Species observation in the field study

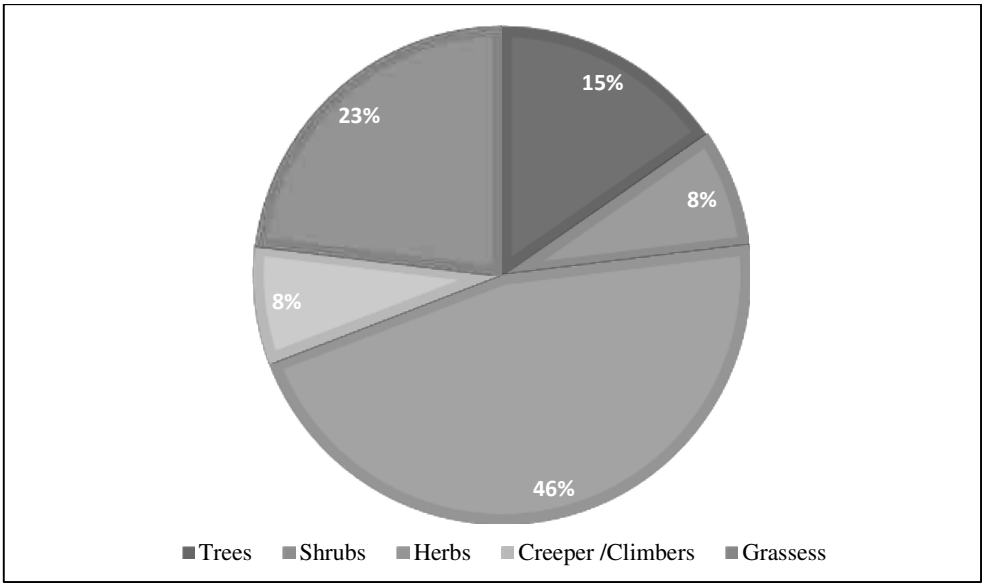
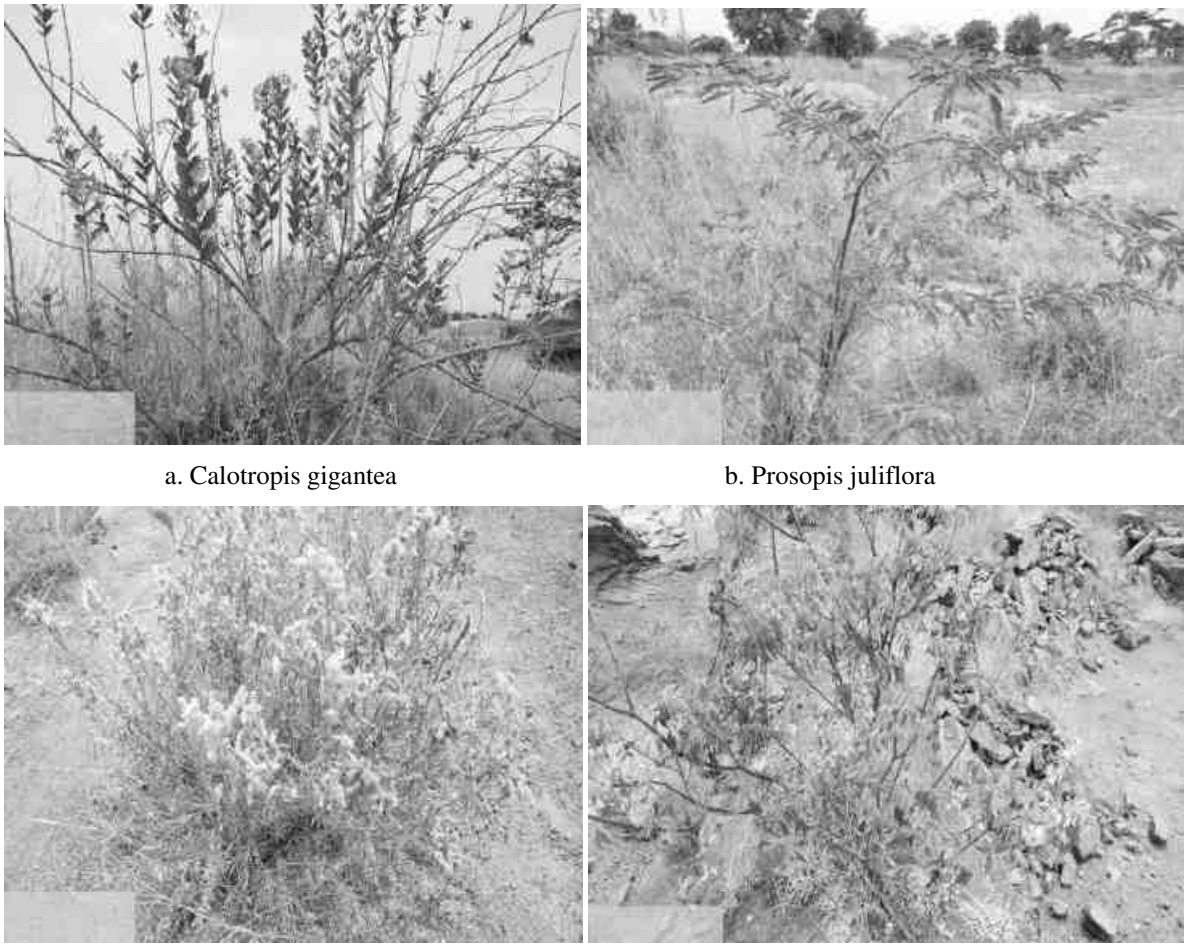


Figure No. 3.27 Graph Showing % Distribution of Floral Life Forms (Core Zone)



a. Calotropis gigantea b. Prosopis juliflora

c. Anisomeles malabarica Azadirachta indica

Figure No: 3.28. Flora species observation in the Core zone area

Table No: 3.30. Flora in the Buffer zone of Ichipatti Village, Rough stone and Gravel quarry, Palladam Taluk, Tiruppur District. (Primary data & Secondary data)

Sl.No.	English Name	Vernacular Name	Scientific Name	Resource use type *(E, M, EM)
Trees				
1.	Millettia pinnata	Pongam oiltree	Pongamia pinnata	E
2.	Tamarind	Puliyamaram	Tamarindus indica	EM
3.	Asian Palmyra palm	Panai maram	Borassus flabellifer	E
4.	Wild Date Palm	Pericham	Phoenix sylvestris	E
5.	Coconut	Thennai maram	Cocos nucifera	EM
6.	River tamarind	Savunda	Leucaenaleucocephala	E
7.	Lemon	Ezhumuchaipalam	Citrus lemon	EM
8.	Mango	Manga	Mangifera indica	E
9.	Banyan tree	Alamaram	Ficus benghalensis	E
10.	Neem or Indian lilac	Vembu	Azadirachta indica	M
11.	Creamy Peacock flower	Vadanarayani	Delonix elata	M
12.	Mesquite	Sema Karuvelam	Prosopis juliflora	E
13.	Beauty leaf	Punnai	Calophyllu inophyllum	M
14.	Madras Thorn	Kodukapuli	Pithecellobium dulce	E
15.	Castor oil plant	Amanakku	Ricinus communis	M
16.	Gum arabic tree	Karuvelam	Acacia nilotica	NE
17.	False ashoka	Asoka maram	Polyalthia longifolia	E
18.	Monkey pod tree	Thungumoonchi	Samanea saman	E
19.	Bitter Albizia	Arappu	Albizia amara	M
20.	Giant thorny bamboo	Perumungil	Bambusa bambos	M
21.	Wood-apple	Vilamaram	Limonia acidissima	M
22.	Orange jessamine	Venkarai	Murraya paniculata	E
23.	Black plum	Navalmaram	Sygygium cumini	EM
24.	Eucalyptus	Eucalyptus	Eucalyptus globules	EM
25.	Custard apple	Seethapazham	Annona reticulata	E
26.	Copperpod	Iyal Vaagai	copperpod	E
27.	Acacia Nilotica	Karuvelam maram	Vachellia nilotica	M
28.	Indian gooseberry	Nelli	Emblica officinalis	EM
29.	Henna	Marudaani	Lawsonia inermis	EM
30.	Sacred fig	Arasan	Ficus religiosa	E
31.	Indian mulberry	Nuan	Morinda tinctoria	E
32.	Teak	Thekku	Tectona grandis	E

33.	Papaya	Pappali maram	Carica papaya	EM
34.	Chinese chaste tree	Nochi	Vitex negundo	E
35.	Peepal	Arasanmaram	Ficus religiosa	M
36.	Indian fir tree	Nettilinkam	Polylathia longifolia	E
37.	Guava	Koyya	Psidium guajava	EM
38.	Curry tree	Velipparuthi	Murraya koenigii	EM
39.	Bamboo	Moonghil	Bambusa bambo	E
40.	Drumstick tree	Murunga maram	Moringa oleifera	EM
41.	Indian almond	Padam maram	Terminalia catappa	EM
42.	Mesquite	Velikathan maram	Prosopis juliflora	M
43.	Portia tree	Poovarasan	Thespesia populnea	E
Shrubs				
1.	Avaram	Avarai	Senna auriculata	M
2.	Night shade plan	Sundaika	Solanum torvum	EM
3.	Lantana	Unnichedi	Lantana camara	M
4.	Rough cocklebu	Ottarachedi	Xanthium strumarium	M
5.	Triangular spruge	Chaturakalli	Euphorbia antiquorum	NE
6.	Indian jujube	Elanthai	Ziziphus mauritiana	M
7.	Prickly pear	Nagathali	Opuntia dillenii	M
8.	Coffee senna	Kattuttakarai	Senna occidentalis	M
9.	Rosy Periwinkle	Nithyakalyani	Cathranthus roseus	M
10.	Bush Morning Glory	Neyvelik Kattamanakku	Ipomoea carnea	E
11.	Chinese chastetree	Nochi	Vitex negundo	M
12.	Water spinach	Nalikam	Ipomoea aquatica	E
13.	Indian Oleander	Arali	Nerium indicum	M
14.	Shoe flower	Chemparuthi	Hibiscu rosa-sinensis	EM
15.	Puriging nut	Kattamanakku	Jatropha curcas	EM
16.	Columnar Cactus	Sappathikalli	Cereus pterogonus	M
17.	Thorn apple	Oomathai	Datura stramonium	E
18.	Century plant	Anaikathalai	Agave americana	M
19.	Jackal jujube	Soorai pazham	Ziziphus oenopolia	M
20.	Indian mallow	Thuthi	Abutilon indicum	M
21.	Flame of the Woods	Idlipoo	Xoracoc cinea	M
22.	Peacock Flower	Mayil Kontai	Caesalpinia pulcherrima	M
23.	Datura metel	Uumaththai	Datura metel	NE
24.	Milk Weed	Erukku	Calotropis gigantea	M
25.	Cassava	Maravalli kizhangu	Manihot esculenta	EM

26.	Hopbush	Virali	Dodonaea viscosa	E
27.	Paper flower	Kahitha poo	Bougainvillea glabra	M
28.	Tiger nail	Eli verandi	Martynia annua	M
Herbs				
1.	Prickly chaff flower	Nayuruv	Achyranthes aspera	M
2.	Tridax daisy	Veetukaayapoondu	Tridax procumbens	M
3.	Indian Copperleaf	Kuppaimeni	Acalypha indica	M
4.	Indian doab	Arugampul	Cynodon dactylon	E
5.	Copperleaf	Kuppaimeni	Acalypha indica	M
6.	Indian Catmint Plant	Pei viratti	Anisomeles malabarica	M
7.	Cleome viscosa	Nai kadugu	Celome viscosa	M
8.	Common Wireweed	Arivalmanai poondu	Sida acuta	M
9.	Punarnava	Mukkirattai	Boerhaavia diffusa	EM
10.	Mexican prickly poppy	Kudiyotti	Argemone mexicana	M
11.	Common leucas	Thumbai	Leucas aspera	M
12.	Licorice weed	Kallurukki	Scoparia dulcis	M
13.	Chay root	Chaaya ver	Oldenlandia umbellata	M
14.	Slender dwarf morning-glory	Vittunu-k-kiranti	Evolvulus alsinoides	M
15.	Marsh barbel	Neermulli	Hygrophila auriculata	M
16.	Yellow-fruit nightshade	Kandakathirika	Solanum surattense	M
17.	Shameplant	Thottachenunki	Mimosa pudica	M
18.	Water willow	Kodakasalai	Justicia procumbens	M
19.	Threadstem carpetweed	Parpatakam	Mollugo cerviana	M
20.	Node Flower	Kumattikkirai	Allmania nodiflora	M
21.	Asthma-plant	Ammanpacharisi	Euphorbia hirta	M
22.	Pignut	Nattapoochedi	Hyptis suaveolens	M
23.	Holy basil	Thulasi	Ocimum tenuiflorum	M
24.	Madagascar Periwinkle	Nithykalyani Podi	Catharanthus roseus	E
25.	Asian spiderflower	Naaikaduku	Cleome viscosa L	M
26.	Digeria muricata	Thoiya keerai	Digeria muricata	EM
27.	Carrot grass	Parttiniyam	Parthenium hysterophorus	NE
28.	Europeanblack nightshade	Manathakkali	Solanumnigrum	EM
29.	Mountain knotgrass	Thengaipoo kirai	Aerva lanata	M
30.	Bindii	Nerunchi	Tribulus terrestris	M
31.	Fish poison	Kolinchi	Tephrosia purpurea	M
32.	East Indian globe thistle	Kottakaranthai	Sphaeranthus indicus	M
33.	Tomato	Thakkali	Solanum lycopersicum	EM

34.	False daisy	Karisalankanni	Eclipta alba	M
35.	Chilli	Milakai	Capsicum annuum	EM
36.	Red Spiderling	Mukirattai	Boerhavia diffusa	M
37.	Aloe	Katrazhai	Aloe vera	M
38.	Coat buttons	Thatha poo	Tridax procumbens	M
39.	Indian mint	Karpura valli	Coleus amboinicus	EM
Climber/ Creeper				
1.	Stemmed vine	Perandai	Cissus quadrangularis	M
2.	Wild bitter	Pavarkai	Momordica charantia	EM
3.	Pointed gourd	Kovakkai	Trichosanthes dioica	EM
4.	Ivy gourd	Kovai	Coccinia grandis	M
5.	Bottle Guard	Sorakkai	Lagenaria siceraria	EM
6.	Ground Spurge	Sithrapaalavi	Euphorbia prostrata	EM
Grass				
1.	Jungle rice	Kuthirai vaalKattu arusi	Echinochloa colona	NE
2.	Mauritian Grass	Moongil pul	Apluda mutica	NE
3.	Swollen Windmill Grass	Kondai Pul	Chloris barbata	NE
4.	Needle Grass	Thodappam	Aristida adscensionis	E
5.	Eragrostis	Pullu	Eragrostis ferruginea	E
6.	Windmill grass	Chevvarakupul	Chloris barbata	NE
7.	Sugarcane	Karumbu	Saccharum	E

Sources: Species observation in the field study and secondary data

The trees surveys were conducted around 300m radius from the proposed project site cluster are of Ichipatti village. This is the standard scientific method followed by various workers in respect of phytosociological studies (Cottom and Curtis 1956; Ralhan et al. 1982; Saxena and Sing 1982; Nayak et al. 2000; Lu et al. 2004; Nautiyal 2008). While sampling, circumference at breast Height (CBH) of tree species was measured at 1.30m from ground level, along with the name of the species, phenology (flowering, fruiting, and flushes), and uses. After surveying areas, a detailed trees inventory has been compiled. A list of all plants from the study area was prepared and their habitats were recorded. The species of trees were documented during this base line survey. The dominant plant species growing in this area were Cocos nucifera Prosopis juliflora, etc. Please refer the Table No.3.25.

Table No: 3.25. Tree survey around 300m radius from the proposed project site (Primary data)

S.No	English Name	Vernacular Name	Scientific Name	No of trees
Trees				
1.	Acacia Nilotica	Karuvelammaram	*Vachellianilotica*	6
2.	Mesquite	Mullumaram	*Prosopis juliflora*	15
3.	Neem	Vembu	*Azadirachta indica*	32
4.	Coconut	Thennai maram	*Cocos nucifera*	68

5.	Banyan tree	Alamaram	*Ficus benghalensis*	3
6.	White Bark Acacia	Vela maram	*Vachellia leucophloea*	16

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

3.5.6. Flora Composition in the Buffer Zone

The Buffer zone flora samplings were conducted between 3.00 pm to 6.00 pm in different locations. Similar habitats may be found in the buffer area as well, although there is a wider variety of plants there than in the core zone area. The proposed project site there are 123 species in the buffer zone study area in total, based on records. The floral (123) varieties among them Trees 43, Herbs 39, Shrubs 28, Climbers/ Creepers 6, Grasses 7 were identified. The result of the buffer zone of flora studies shows that Fabaceae and Cucurbitaceous, Euphorbiaceae is the main dominating species in the study area mentioned in Table No.3.24. There are no impacts due to this mining activity. There are no Rare, Endangered, and Threatened Flora species in the mining area and their surrounding study area. Apart from the proposed project area, there is agricultural land. Horticulture and agricultural land are untouched. There are no Rare, Endangered, and Threatened Flora species in the mining area and their surrounding study area. A list of floral species has been prepared based on primary survey (site observations) and discussion with local people. The total number of different plant life forms under trees, shrubs, herbs, and climbers is shown in Table No 3.26 and their % distribution is shown in Figure 3.29.

Table No. 3.31: Number of floral life forms in the Study Area

S. No	Plant Life Form	Number of Species
1	Trees	43
2	Shrubs	28
3	Herbs	39
4	Climber/Creepers	6
6	Grasses	7
Total No. of Species		**123**

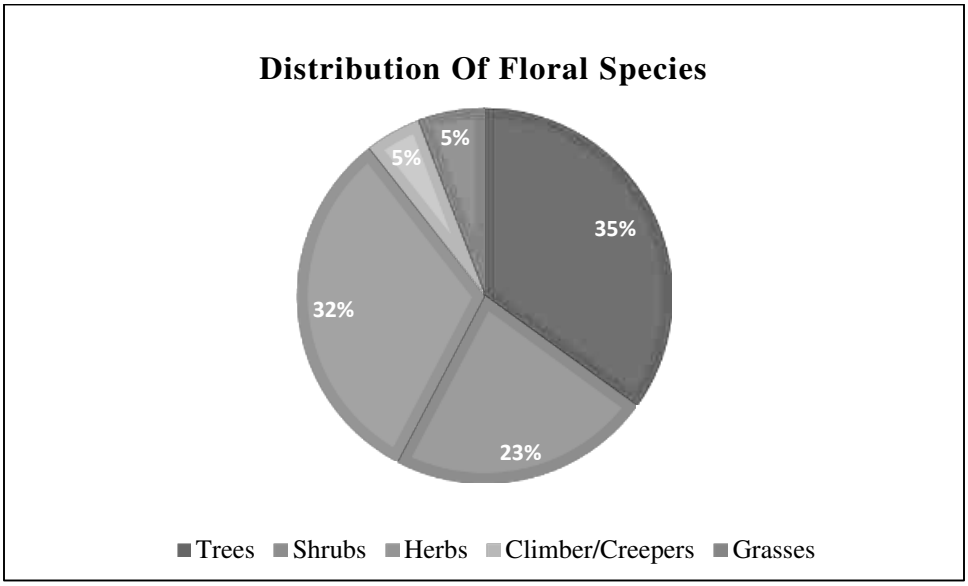


Figure No. 3.29: Diagram showing % distribution of floral life forms

3.5.6.1. Major Agricultural Crops

Tiruppur district though an industrial district plays important role in Agriculture also. The food production required to be enhanced to provide food and nutritional security to the growing district population. In Tiruppur more than 80% of the farmers belong to small and marginal category and they play a key role in overall development in Agriculture. The total area of cultivation is around 2,28,556 hectares, mainly food and commercial crops. The chief food crops are paddy, millets and pulses. The non-food or commercial crops in the district are cotton, oil seeds and coconut. Details of the major crops are given in Table No: 3.27.

Table No: 3.32. Major crops in Tiruppur District

S.No	Major crops	Scientific name	Families
1	Paddy	*Oryza sativa*	Grasses
2	Sorghum	*Sorghum bicolor*	Grasses
3	Maize	*Zea mays*	Grasses

(**Source:** Agriculture Contingency Plan– Tiruppur-2013)

3.5.6.2. Horticulture

Major horticulture crops cultivated in this district are fruits crops like mango, banana, aonla, sapota and papaya, vegetables like bhendi, tomato, brinjal, onion, tapioca, moringa, spices and condiments like chillies and turmeric, plantation crops like cocoa, flower crops like jasmine, tube rose, marigold, cock's comb and medicinal plants like gloriosa and coleus. Details of major field crops and horticulture in Tiruppur district is given in Table No: 3.28.

Table No: 3.33. Major Field crops & horticulture in Tiruppur District.

Sl.No	Common Name	Scientific Name	Family
Major Horticultural Crops			
1	Banana	*Musa*	Musaceae
2	Mango	*Mangifera indica*	Anacardiaceae
3	Jack	*Artocarpus heterophyllus*	Mulberry
4	Guava	*Psidium guajava*	Myrtle
5	Sapota	*Manilkara zapota*	Sapotaceae
6	Lemon	*Citrus × limon*	Rutaceae
Vegetables			
7	Onion	*Allium cepa*	Amaryllidaceae
8	Tapioca	*Manihot esculenta*	Spurges
9	Brinjal	*Solanum melongena*	Nightshade
10	Tomato	*Solanum lycopersicum*	Nightshade
11	Gourds	*Lagenaria siceraria*	Cucurbits
12	Bhendi	*Abelmoschus esculentus*	Mallows
13	Moringa	*Moringa oleifera*	Moringaceae

Medicinal and Aromatic Plants			
14	Gloriosa superba	*Colchicaceae*	Colchicaceae
15	Coleus	*Plectranthus scutellarioides*	Mints
Flowers			
16	Jasmine	*Jasminum*	Jasminaceae
17	Crossandra	*Crossandra infundibuliformis*	
18	Crysanthimum	*Asteraceae*	Asteraceae
19	Rose & Jathi	*Rosa*	Rosaceae
20	Tuberose	*Polianthes tuberosa*	Asparagus
Spices and Condiments			
21	Chillies	*Capsicum frutescens*	Solanaceae
22	Turmeric	*Curcuma longa*	Zingiberaceae
23	Tamarind	*Tamarindus indica*	Legumes
24	Curry leaf	*Murraya koenigii*	Rutaceae
Plantation Crops			
25	Cashew	*Anacardium occidentale*	Cashews
26	Cocoa	*Theobroma cacao*	Mallows

(**Source**: Statistical handbook of Tamil Nadu-2013)

3.5.6.3. of Irrigation

Irrigation is the artificial application of water to the soil for normal growth of plants. Water is an important determinant factor for production of crops in agriculture sector. Intensive and extensive cultivation of land depends mainly on the availability of water. Medium and minor irrigation schemes are implemented in the state for augmenting the water supply for agriculture. The various sources of irrigation are canals, tanks, tube wells, ordinary wells, springs and channels. The Following Table No: 3.29. Shows the area irrigated in Tiruppur District.

Table No: 3.34. Area irrigated in the district

S.No	Irrigation	Area ('000 ha)
1	Net irrigated area	119.3
2	Gross irrigated area	123.1
3	Rain fed area	72.9

(**Source:** Statistical handbook of Tamil Nadu-2013)

Dug wells are the major source of water for irrigation in Tiruppur district, accounting for about 59.97 percent of the total area irrigated in this district. Tube wells accounting for about 9.48 percent of the total area irrigated in this district. Of the net area irrigated, the canal irrigated area is only 29.45 percent. The area irrigated under tank is 1.10 percent.

(**Source**: Statistical handbook of Tamil Nadu-2013)

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

There are neither reserved (RF) nor protected (PF) forests either in the mine lease area or in the buffer zone. Thus, no forest land is involved in any manner. Hence, no certificate from the Forest department is required. There are no impacts due to this mining activity.

There are no protected or ecologically sensitive areas such as National parks or Important Bird Areas (IBAs), or Wetlands or migratory routes of fauna or water bodies or human settlements within the proposed mine lease area. There are no Biosphere reserves or wildlife sanctuaries or National parks or Important Bird Areas (IBAs), or migratory routes of fauna. Thus, the area under study (Mine lease area and the 10 Km buffer zone) is not ecologically sensitive. It is away from the proposed project site.

There are neither forests nor forest dwellers nor forest-dependent communities in the mine lease area. There shall be no forest-impacted families (PF) or people (PP). Thus, the rights of Traditional Forest Dwellers will not be compromised on account of the project.

3.6. Fauna

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

3.6.1. Fauna Composition in the Core Zone (Primary data)

Core zone fauna samplings were conducted between 12.30 pm to 1.30 pm in three locations. A total of 16 varieties of species were observed in the Core zone of Ichipatti Village, Rough stone and gravel quarry (Table No.3.60) among them numbers of Insects 5 (31%), Reptiles 2 (13%), Mammals 2 (12%) and Avian 7 (44%). A total of 15 species belonging to 13 families have been recorded from the core mining lease area. None of these species are threatened or endemic in the study area and surroundings. There is no Schedule I species and six species are under schedule IV according to the Indian wild life Act 1972. A total of 7 species of bird were sighted in the mining lease area. There are no critically endangered, endangered, vulnerable and endemic species were observed. Details of fauna in core zone with the scientific name were mentioned in Table No. 3.30.

Table No: 3.35. Fauna in the Core zone of Ichipatti Village, Rough stone and Gravel quarry, Palladam Taluk, Tiruppur District (Primary data)

SI. No	Common name/English Name	Scientific Name	Schedule list wildlife Protection act 1972
Insects/ Butterflies			
1.	Mottled emigrant	Catopsilia pyranthe	NL
2.	Striped tiger	Danaus plexippus	Schedule IV
3.	Common Tiger	Danaus genutia	NL
4.	Red-veined darter	Sympetrum fonscolombii	NL
5.	Danaid egg fly	Hypolimnasmisippus	Schedule IV
Reptiles			
1.	Garden lizard	Calotes versicolor	Schedule IV
2.	Common skink	Mabuya carinatus	Schedule IV

Mammals			
1.	Indian Field Mouse	Mus booduga	Schedule IV
2.	Common rat	Rattus rattus	Schedule IV
Aves			
1.	Common myna	Acridotheres tristis	Schedule IV
2.	House crow	Corvussplendens	Schedule IV
3.	Common quail	Coturnix coturnix	Schedule IV
4.	Koel	Eudynamys	Schedule IV
5.	Cattle egret	Bubulcus ibis	Schedule IV
6.	Asian green bee-eater	Meropsorientalis	Schedule IV
7.	Black drongo	Dicrurus macrocercus	Schedule IV

(Sources: Species observation in the field study)

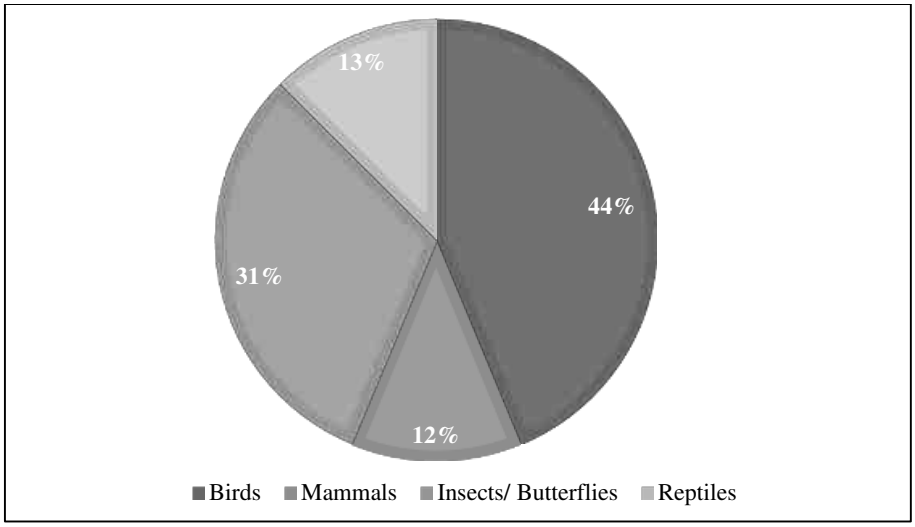


Figure No.3.30. Graph Showing % Distribution of Fauna Life Forms (Core Zone)

3.6.2. Fauna Composition in the Buffer Zone

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

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

The list of Mammals (*directly sighted animals & Secondary data) is given in table No.3.31. The list of bird species recorded during the field survey and literature from the study area are given in Table 3.32. The list of reptilian

species recorded during the field survey and literature from the study area is given in Table 3.33. The list of insect species recorded during the field survey and literature from the study area are given in Table 3.34. The list of Butterflies species recorded during the field survey and literature from the study area are given in Table 3.35. It is apparent from the list that none of the species either spotted or reported is included in Schedule I of the Wildlife Protection Act. Similarly, none of them comes under the REET category.

Taxonomically a total of 63 species recorded were from the buffer zone area. Based on habitat classification the majority of species were birds 29, followed by Butterflies 12, Reptiles 7, Insects 5, Mammals 5, and Amphibians 4. There are three Schedule II species, two species are under the Schedule III and fifty-four species are under Schedule IV according to the Indian Wildlife Act 1972. A total of 29 species of bird were sighted in the study area. There are no critically endangered, endangered, vulnerable, and endemic species were observed. There are no impacts on nearby fauna species.

Dominant species are mostly birds, butterflies, and insects, and four amphibians was observed during the extensive field visit Sphaerotheca breviceps, Euphlyctis hexadactylus, Bufomelanostictus, etc. There is no Schedule I Species in the study area. There are no critically endangered, endangered, vulnerable, and endemic species were observed.

Table No. 3.36. List of Fauna & Their Conservation Status, Mammals: (*directly sighted animals & Secondary data)

SI. No	Common Name/English Name	Scientific Name	Schedule list wildlife Protection act 1972
1.	Indian palm squirrel	Funambulus palmarum	Schedule IV
2.	Indian Field Mouse	Mus booduga	Schedule IV
3.	Asian Small Mongoose	Herpestes javanicus	Schedule (Part II)
4.	Indian hare	Lepus nigricollis	Schedule (Part II)
5.	Brown rat	Rattus norwegicus	Schedule IV

Table No. 3.37. Listed birds (Primary & Secondary data)

SI. No	Common Name/English Name	Scientific Name	Schedule list wildlife Protection act 1972
1.	Black kite	Milvus migrans	Schedule IV
2.	Jungle babbler	Turdoides striata	Schedule IV
3.	Indian robin	Saxicoloides fulicatus	Schedule IV
4.	Asian Koel	Eudynamys	Schedule IV
5.	Cattle egret	Bubulcus ibis	Schedule IV
6.	Rock pigeon	Columbidae	Schedule IV
7.	Common myna	Acridotheres tristis	Schedule IV
8.	House crow	Corvussplendens	Schedule V
9.	Red Vented Bulbul	Pycnonotus cafer	Schedule IV

10.	Small Bee Eater	Merops orientalis	Schedule IV
11.	Purple sunbird	Cinnyris asiaticus	Schedule IV
12.	House sparrow	Passer domesticus	Schedule IV
13.	Brahminy myna	Temenuchus pagodarum	Schedule IV
14.	Small blue Kingfisher	Alcedo atthis	Schedule IV
15.	Rose-ringed parkeet	Psittacula krameri	Schedule IV
16.	Common quail	Coturnix coturnix	Schedule IV
17.	Pond herons	Ardeola grayii	Schedule IV
18.	Black drongo	Dicrurus macrocercus	Schedule IV
19.	Woodpecker bird	Picidae	Schedule IV
20.	Weaver bird	Ploceus philippines	Schedule IV
21.	Two-tailed Sparrow	Dicrurus macrocercus	Schedule IV
22.	Grey drongo	Dicrurus longicaudatus	Schedule IV
23.	Grey Francolin	Francolinus pondicerianus	Schedule IV
24.	Wood Sandpiper	Tringa glareola	Schedule IV
25.	Blue-Tailed Bee Eater	Merops philippinus	Schedule IV
26.	Indian Roller	Coracias benghalensis	Schedule IV
27.	Common Swallow	Hirundo rustica	Schedule IV
28.	Purple Rumped Sunbird	Leptocoma zeylonica	Schedule IV
29.	Purple Sunbird	Cinnyris asiaticus	NL

Table No. 3.38. List of Reptiles either spotted or reported from the study area.

(*indicates direct observations & Secondary data)

SI. No	Common Name/English Name	Scientific Name	Schedule list wildlife Protection act 1972
1.	Oriental garden lizard	Calotes versicolor	III
2.	House lizards	Hemidactylus flaviviridis	Schedule IV
3.	Indian cobra	Naja naja	Sch II (Part II)
4.	Green vine snake	Ahaetulla nasuta	Schedule IV
5.	Rat snake	Ptyas mucosa	III
6.	Common krait	Bungarus caeruleus	Schedule IV
7.	Common skink	Mabuya carinatus	NL

Table No. 3.39. List of insects either spotted or reported from the study area

SI. No	Common Name/English Name	Scientific Name	Schedule list wildlife Protection act 1972
1.	Indian honey bee	Apis cerana	-
2.	Termite	Hamitermes silvestri	NE

3.	Grasshopper	Hieroglyphus sp	NL
4.	Ant	Camponotus Vicinus	NL
5.	Dragonfly	Ceratogomphus pictus	-

Table No.3.40. List of Butterflies reported from the study area (Primary data & Secondary data)

SI. No	Common Name/English Name	Scientific Name	Schedule
1.	Indian palm bob	Suastusgremius	Schedule IV
2.	Common Mormon	Papilio polytes	Schedule IV
3.	Common rose	Pachlioptaaristolochiaee	Schedule IV
4.	Spotless grass yellow	Eurema laeta	Schedule IV
5.	Common Tiger	Danaus genutia	Schedule IV
6.	Common emigrant	Catopsiliapomona	Schedule IV
7.	Crimson tip	Colotisdanae	Schedule IV
8.	Common Indian crow	Euploea core	Schedule IV
9.	Lime Butterfly	Papilio demoleus	Schedule IV
10.	Yellow Pansy	Junonia hierta	Schedule IV
11.	Chocolate Pansy	Junonia iphita	Schedule IV
12.	Double-branded Black Crow	Euploea sylvester	Schedule IV

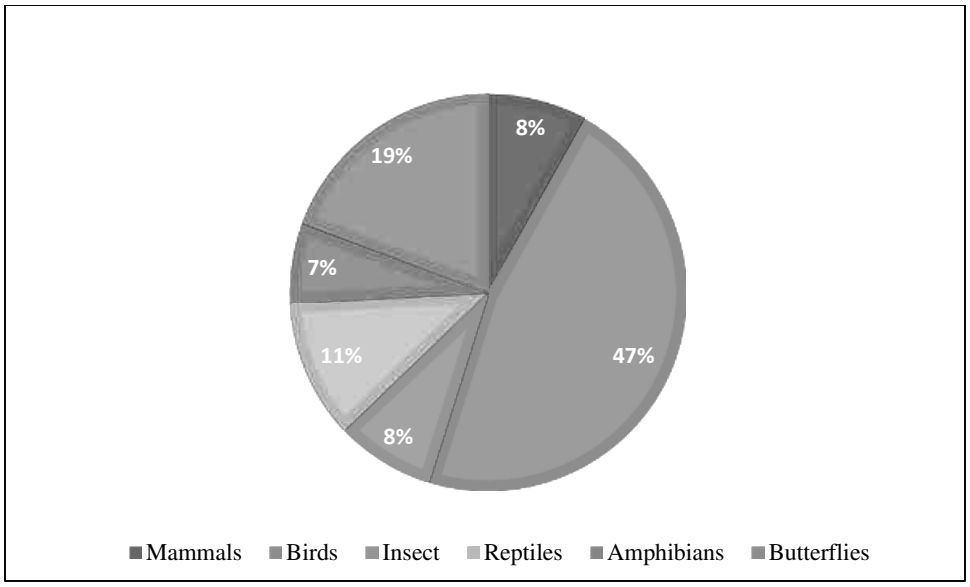


Figure No. 3.41: Diagram showing % Distribution of Faunal Communities

Livestock like cattle, buffalo, goat, poultry, duck and pig are reared for dairy products, meat, and egg and for agriculture purpose. Majority of cattle and buffalo are of local variety. Backyard poultry farms are mostly common in this area; however, some commercial poultry farms are also recorded in the study area.

The study area is marked with moderate population of flora and fauna. With reference to the Wildlife Protection Act 1972 total number of wildlife tabulated in this study can be characterized as given in the Table No. 3.36.

Table No: 3.41. Characterization of Fauna in the Study Area (As Per W.P Act, 1972)

S.No	Schedule of Wildlife Protection Act 1972	No. of species	Remark
1.	Schedule I	0	-
2.	Schedule II	3	-
3.	Schedule III	2	-
4.	Schedule IV	50	-
5.	Schedule V	1	-
6.	Schedule VI	0	-

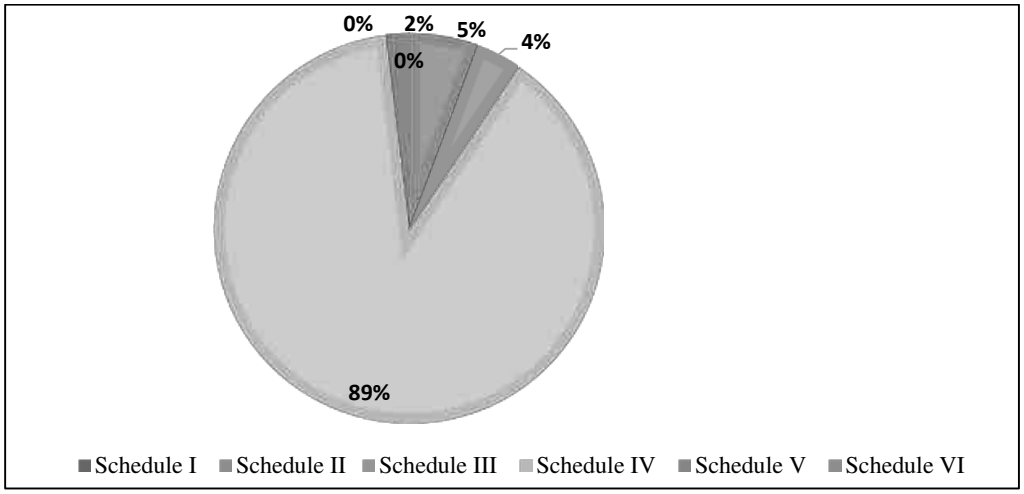


Figure No:3.32. Schedule of Wildlife Protection Act 1972

Table 3.42: Description of Flora & Fauna

S.No	Type of Species	Name	Local Name
Flora			
1.	Endangered species	None	None
2.	Threatened species	None	None
3.	Near Threatened species	None	None
4.	Vulnerable species	None	None
Fauna			
5.	Endangered species	None	None
6.	Threatened species	None	None
7.	Near Threatened species	None	None

8.	Vulnerable species	None	None
9.	Migratory Corridors & Flight Paths	No corridors & flight paths	-
10.	Breeding & Spawning grounds	None	-

A comprehensive Central Legislation Namely Wild Life (Protection) Act was enforced in 1972 to provide protection to wild animals. Schedule-I of this act contains the list of rare and endangered species, which are completely protected throughout the country. The list of wild animals and their conservation status as per Wild Life Act (1972) presented in Table 3.32 are the species recorded/reported from the study area, out of which three species belongs to schedule-II, 2 species belong to schedule-III, 1 species belongs to Schedule-V and rest of the species belongs to schedule-IV of Wildlife Protection Act, 1972.

3.6.3. Aquatic Ecology

Mining activities will not have an impact on aquatic ecosystems because no effluent discharge from the Limestone mine is planned. There are no natural perennial surface water bodies, such as marshes, rivers, streams, lakes, or agricultural sites, inside the mining lease area. The study region contains a few seasonal bodies of water. There is no aquatic flora and, aquatic faun. Hence, it does not harbour any significant aquatic life. Therefore, the project is not likely to affect the aquatic ecology. Aquatic weeds are found to be growing everywhere in 10 km radius area, in every water bog, pond, etc. Typha angustata can be found growing all along the drains of villages, small water-logged depressions, and agricultural fields lacking water but containing enough moisture to support its growth. And where water is present, Eichhornia crassipes has taken its roots and covers the entire water surface by its sprawl and invasion.

3.6.3.1. Objectives of Aquatic Studies

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

3.6.3.2. Macrophytes

The macrophytes observed within the study area are tabulated in Table No. 3.38

Table No.3.43 Description of Macrophytes

Sl.No	Scientific name	Common Name	Vernacular Name (Tamil)	IUCN Red List of Threatened Species
1.	*Eichornia crassipe*	Water hyacinth	Agayatamarai	NA
2.	*Aponogetonnatans*	Floating lace plant	Kottikizhnagu	NA
3.	*Nymphaea nouchali*	Blue water lily	Nellambal	LC
4.	*Typha angustifolia*	Sambu	Narrowleaf cattail	LC
5.	*Carex cruciata*	Cross Grass	Koraipullu	NA
6.	*Cyperus exaltatus*	Tall Flat Sedge	Koraikizhangu	LC

Sources: Species observation in the field study

3.6.3.3. Aquatic Faunal Diversity

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

Table No. 3.44. Amphibians Observed/Recorded from the Study Area

SI. No	Common Name/English Name	Scientific Name	Schedule list wildlife Protection act 1972
1.	Indian Burrowing frog	Sphaerotheca breviceps	Schedule IV
2.	Green pond frog	Euphlyctis hexadactylus	Schedule IV
3.	Indian Toad	Bufomelanostictus	Schedule IV
4.	Skipper	Euphlyctiscynophlyctis	Schedule IV

3.6.3.4. Other Aquatic Fauna

3.6.3.5. Fishes

The study area has low aquatic diversity, with few types of fish living. The species of fish reported during the primary visit are Rohu, Catla, Catfish, etc. Species of fish reported in the study area are given in Table No 3.40.

Table No. 3.45. Based on Actual Sighting, based on inputs from locals and Perused from Secondary Data

S.No	Common name	Scientific name	Family
1.	Ponthia	Puntius sophore	Cyprinidae
2.	Catla	Catla Catla	Cyprinidae
3.	Catfish	Siluriformes	-
4.	Rohu	Labeo rohita	Cyprinidae
5.	Eel fish	Electrophorus electricus	Gymnotidae

3.7. Findings/Results

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

Records of threatened species in the area

No threatened species were observed

Endangered Species as per Wildlife (Protection) Act

No Endangered fauna was recorded in the project area**.**

Endemic Species of the Project areas

No endemic species were observed in the project area.

Migratory species of the Project areas

No migratory fauna observed in project area.

Migratory corridors and Flight paths

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

Breeding and spawning grounds

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

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

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

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

3.8. Conclusion

The observations and assessment of the overall ecological scenario involve details such as classification of Biogeographic zone, eco-region, habitat types and land cover, distances from natural habitats, vegetation/forest types, and sensitive ecological habitats such as Wetlands sites, Important Bird areas, migration corridors of important wildlife etc. Such baseline information provides better understanding of the situation and overall ecological importance of the area. This baseline information viewed against proposed project activities help in predicting their impacts on the wildlife and their habitats in the region. Data collected and information gathered from secondary literature on flora, fauna, protected area, natural habitats, and wildlife species etc., and consulted and discussed with local people, from the villages, herders and farmers who inhabit close to the proposed project area.

Sources:

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

3.6 SOCIO ECONOMIC ENVIRONMENT

The major developmental activities in mining sector are required for economic development as well as creation of employment opportunities (direct and indirect) and to meet the basic/modern needs of the society, which ultimately results in overall improvement of the quality of life through upliftment of social, economic, health, education and nutritional status in the project region, state as well as the country. In this manner all developmental projects have direct as well as indirect relationships with socioeconomic aspects, which also include public acceptability for new developmental projects. Thus, the study of socioeconomic component incorporating various facets related to prevailing social and cultural conditions and economic status of the rough stone and gravel quarry project is an important part of the EIA study. The study of these parameters helps in identification, prediction and evaluation of the likely impacts on the socio economics and parameters of human interest due to the project.

3.6.1 Objectives of the Study

The objectives of the socio-economic impact assessment are as follows:

a) To study the socio-economic status of the people living in the study area of the project.

b) To identify the basic needs of the nearby villages within the study area.

c) To assess the impact on socio-economic environment due to the project.

d) To provide the employment and improved living standards.

g) To analysis of impact of socio economic and Environmental Infrastructure facilities and road accessibility.

3.6.2 Scope of Work

- To study the Socio-economic Environment of area from the secondary sources
- Data Collection and Analysis
- Identification of impacts due to the mining projects
- Mitigation Measures

3.6.3 Methodology

The methodology adopted for the socio-economic impact assessment is as follows:

a) The details of the activities and population structure have been obtained from Census 2001 and 2011 and analyzed.

b) Based on the above data, impacts due to plant operation on the community have been assessed and recommendations for further improvement have been made.

3.6.4 Sources of Information and Data Base

To achieve the above objectives, the information has been collected from both primary and secondary sources. Both primary data and secondary data have been analyzed by means of suitable statistical techniques for the purpose of verifying the above selected hypotheses concerned with the surrounding area.

3.6.5 Primary Survey

The primary data collection includes the collection of data through a structured interview schedule by direct observation method. The questionnaire survey includes both open and closed methods. The sample size is limited respondents, who were selected on the basis of simple random sampling from Ichipatti Village, Palladam Taluk, Tiruppur District, Tamil Nadu State, in the field survey has been divided into three major segments namely Primary Zone (0 - 3 km), Secondary Zone (3 - 7 km) and tertiary Zone (7 - 10 km).

The questionnaires were designed to suit the subjects considering their rural background enabling to furnish correct information and data as far as possible. Data were collected at village level and household level by questionnaires and focused group discussions.

The study area for the field survey has been divided into three major segments namely Primary Zone (0 - 3 km), Secondary Zone (3 - 7 km) and Outer Zone (7 - 10 km).

Table 3.46 Segment wise Sample in Percentage

Segment Radius	*No of Village*	*% Of sample*
0-3km	3	11
3-7km	8	29
7-10km	13	61
Total	**24**	**100%**

Source: census of India 2011.

3.6.6 Collection of Data from Secondary Sources

Data from secondary sources were collected on following aspects:

- Demographic profile of the area
- Economic profile of the area

Table 3.47 Type of Information and Sources

Information	Source
Demography	District Census Handbook, Govt. of India
Economic profile of the area	Census of India, Tamil Nadu State

b) Data Presentation and Analysis

The data collected were presented in a suitable, concise form i.e., tabular or diagrammatic or graphic form for further analysis. These tabulated data were interpreted and analyzed with the help of various qualitative techniques and ideographic approaches.

3.7 Background Information of the Area

Tamil Nadu is the 11th largest states in India in terms of area. The state is the seventh most populous state in the country and its main language Tamil has origins that date back to 500 BC. Chennai is the capital of Tamil Nadu and lies on the eastern coast line of India. Tamil Nadu is famous for its wonderful temples and monuments that have been built 1000s of years ago and has places that have been marked as heritage sites by the United Nations. In a 180degree paradigm shift, this state with a rich historical importance is also one of the fastest developing centre for technology and trade.

The State can be divided broadly into two natural divisions (a) the Coastal plains of South India and (b) the hilly western area. Parallel to the coast and gradually rising from it is the broad strip of plain country. It can further be subdivided into coromandal plains comprising the districts of Kancheepuram, Tiruppur, Cuddalore and Vellore. The alluvial plains of the Cauvery Delta extending over Thanjavur and part of Tiruchirappalli districts and dry southern

plains in Madurai, Dindigul, Ramanathapuram, Sivaganga, Virudhunagar, Tirunelveli and Tuticorin districts. It extends a little beyond Western Ghats in Kanyakumari District. The Cauvery Delta presents some extremely distinctive physical and human features, its power being a main factor in the remarkable growth, the towns of Tamilnadu have witnessed.

3.8 Geography of the Area

Tamil Nadu is one of the 28 states of India, located in the southernmost part of the country. It extends from 8°4'N to 13°35'N latitudes and from 76°18'E to 80°20'E longitudes. Its extremities are

• in eastern - Point Calimere

• in western - hills of Anaimalai

• in northern - Pulicat lake

• in southern - Cape Comorin

It covers an area of 1,30,058 sq.km and 11th largest state in India. It covers 4% of the area of our country. Tamil Nadu is bounded by the Bay of Bengal in the east, Kerala in the west, Andhra Pradesh in the north, Tamil Nadu in the northwest and Indian Ocean in the south. Gulf of Mannar and Palk Strait separate Tamil Nadu from the Island of Sri Lanka, which lies to the southeast of India.

Already we have learnt that the state of Tamil Nadu had only 13 districts at the time of its formation. After that, the state was reorganised several times for the administrative convenience. At present there are 37 districts in Tamil Nadu, including the newly created districts such as Kallakurichi, Tenkasi, Chengalpet, Ranipet and Tirupathur.

3.9 Population Growth Rate

In 1991, there were only 21 districts in the State of Tamil Nadu. In 2001, eight new districts were created by reorganising the territorial jurisdiction. The nine districts are – Tiruppur, Namakkal, Tiruppur, Perambalur, Viluppuram, Thiruvarur, Nagapattinam, and Theni. The population and its growth trend are important economic factors in a developing economy.

Year	Tamil Nadu	India
1941	11.91	14.22
1951	14.66	13.31
1961	11.85	21.51
1971	22.30	24.80
1981	17.50	24.66

1991	15.39	23.86
2001	11.19	21.34
2011	15.61	5.96
2021	5.96	1.0

3.10 Tiruppur District

During 1990's, Exports have been increased tremendously in Tiruppur Area and the infrastructure and other basic amenities available is not enough for fast growth city like Tiruppur. Therefore, the people of the region demanded Separate Corporation and District for Tiruppur to fulfil the aspiration of the people in the region.

Accordingly, the Government have issued G.O.Ms.No.617 and 618, Revenue [R.A.1(1)] Department, dated 24.10.2008 to bring district administration closer to be people and to fulfil the aspiration of industrialist by reorganizing Tiruppur and Erode Districts into Tiruppur, Erode and Tiruppur Districts. Subsequently, the New District was inaugurated on 22.02.2009 by the hon'ble minister for Rural Development.

Agriculture continues to be the most predominant sector of the district economy, around 30 percent of the working population is engaged in Agriculture and allied activities for their livelihood. The district has an area of 4,72,629 Ha. with net cultivated area of around 1,84,645 Ha.

3.11 Study Area

Detailed socio-economic survey was conducted in the study area (Core and buffer zone) within 10 km radius of the area at Ichipatti Village, Palladam Taluk, Tiruppur District, Tamil Nadu State. In order to determine the impact of the proposed project on nature and inhabitant. To get an overview of the villagers and their perspectives about this proposed activity, different demographic parameters and social aspects such population density, sex ratio, literacy rate, worker ratio etc. has been identified, analyzed, studied together. These impacts may be beneficial or disadvantageous. If disadvantageous anticipated suggestions measures are advocated in order to have collective development.

3.12 Demographic pattern of 10km study area characteristics a comparative analysis

Table 3.48 Shows the socio-economic profile of the study area as compared to district, state and national level socio-economic profile

Particular	India	Tamil Nadu	Tiruppur District	Study Area (10km Radius)
Area (in sq. km.)	3,287,263	130058	5087	318

Particular	India	Tamil Nadu	Tiruppur District	Study Area (10km Radius)
Population Density/ sq. Km.	368	554	487	992
No. of Households	249454252	13357027	712210	89362
Population	1210569573	72147030	2479052	315480
Male	623121843	36137975	1246159	159251
Female	587447730	36009055	1232893	156229
Scheduled Tribes	104281034	794697	5458	264
Scheduled Castes	201378086	14438445	395876	41138
Literacy Rate	**72.99%**	**80%**	**71%**	**82.6%**
Sex Ratio (Females per 1000 Males)	**943**	**996**	**989**	**981**

Source: Census of India, 2011

Table no 3.12.1 show demographic pattern of India, Tamil Nadu, Tiruppur District & Study area (10km Radius). In India had total area of 3.2 sqkm, State of Tamil Nadu area was 130058 sqkm, District of Tiruppur area was 5087 sqkm and study area is about 318sqkm. Population density is total population per sqkm. So, India population density was 368 sqkm, state of Tamil Nadu density was 554 sqkm, District had density about 487 sqkm and study area density is about 992sqkm. State level Literacy rate is 80%, district level is 71% but study area has decreased about 82.6% (crude literacy rate). There is literacy rate is study area decrease comparing district level decrease in the study area. Sex ratio female per thousand males about state level is 996, District level is 980 and study area is 981.

The study area has population density 992persons per sq.km of total population about 315480 as per census 2011. There were about 50.48 percent male and 49.52% female population. Study area has literate rate is about 82.6%. District had about 71% of literate rate as per census 2011.

3.13 Population Projection of the Study Area

A population projection is an estimation of the number of people expected to be alive at a future date that is made based on assumptions of population structure, fertility, mortality and migration. It is an essential to assess the need for new jobs, schools, doctors and nurses, planning urban housing, foods, clothing and requirements of energy and resources. It is also needed for policy discourse i.e., helps to the policy-makers to understand the existing problems and finally supports to develop the suitable solutions.

A population projection gives a picture of what the future size and structure of the population by sex and age might look like. It is based on knowledge of the past trends and for the future, on assumptions made for three components: fertility, mortality and migration.

Table 3.49 Total Population of Study Area

Sl No.	Population in 2001	Population in 2011
1	293520	315480

Source: https://censusindia.gov.in/census.website/

Table 3.50 Population Projection of Study Area

S. No	Year	Projected Population (Approximately)
1.	2021	3,37,440
2.	2031	3,59,400
3.	2041	3,81,360
4.	2051	4,03,320

Source: Calculated by SPSS V23.

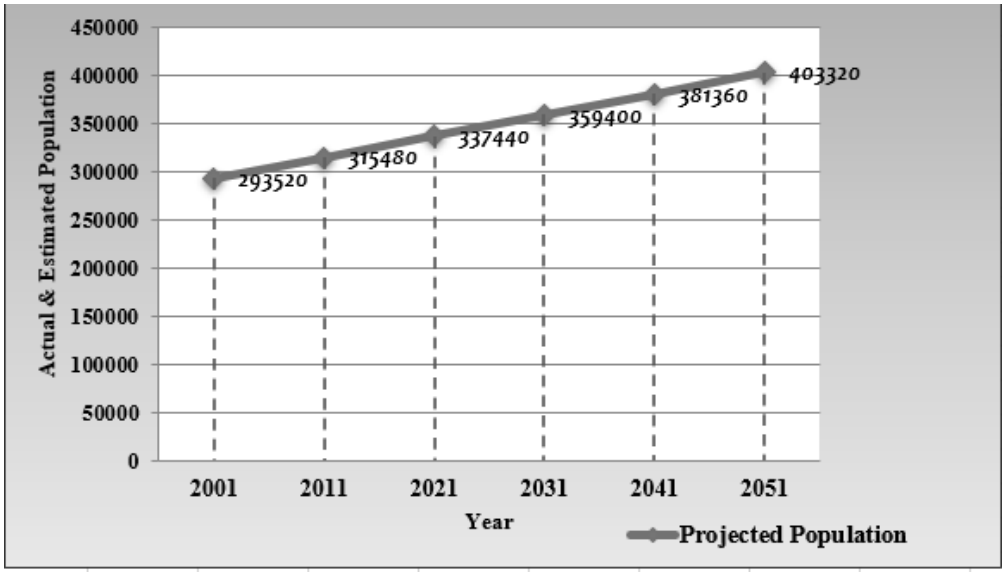


Figure No. 3.33 Graph Showing Population Projection

Following formula has been used for the projection of population.

$$Y=a+b_t$$

Where: Y= Dependent variable (Population)

a=Intercept

b=Slope

t=Interdependent variables (Time)

Above formula is applied to project population for the years (2021, 2031,2041,2051). Due to avoid the errors in manual calculation the statistical software SPSS (demo version 23) is used to calculate the intercept and the slope.

Due to the shortage of data on population the results show same value of growth for the years (2021,2031,2041,2051). If the researcher gets enough the data on population for earlier years the data projection will be accurate.

- Ref: Indian Economic survey, the SLR (Simple Linear Regression) techniques are used by statistical department, Government of India to project population.
- Source: https://www.ibm.com/in-en/analytics/spss-statistics-software

3.14 Population Growth of the Study Area

Table 3.51 Population Growth rate in Study area

Year	Actual Population	Growth Rate %
2001	**2,93,520**	-
2011	**3,15,480**	10.75
2021	3,37,440	10.70
2031	3,59,400	10.65
2041	3,81,360	10.61
2051	4,03,320	10.58

Source: Compiled by Author-2022

Above table no 3.46 is showing the growth rate of population since 2001, as per census in 2001 the population of study area was 293520 and 2011 it was 315480 if the population growth rate is 10.75%, it will approximately gradually decrease 3,37,440 in year 2021 and 4,03,320 in the year of 2051. It has approximately population growth rate decline will be 10.58%.

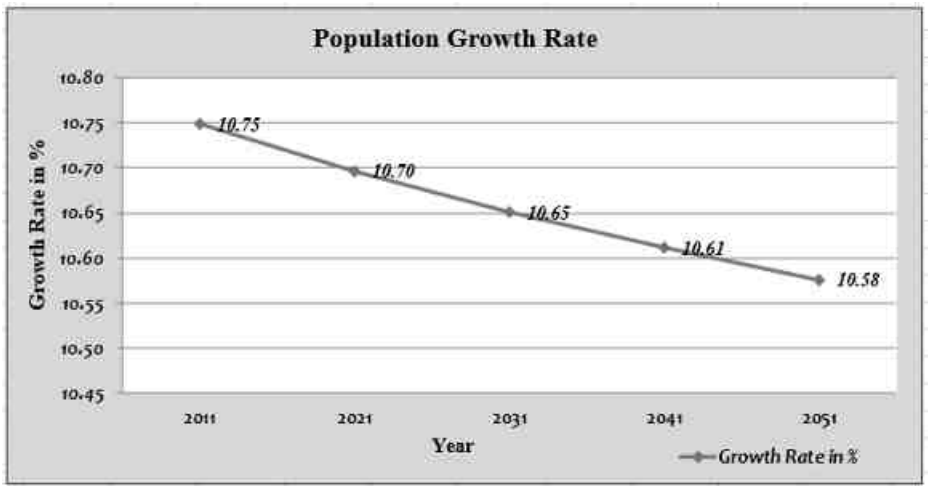


Figure No.3.34 Graph Showing Population Growth Rate

Planning Analysis:

Calculating Growth Rates

The percent change from one period to another is calculated from the formula:

Where:

$$PR = \frac{(V_{Present} - V_{Past})}{V_{Past}} x100$$

PR=Percent Rate

$V_{Present}$ =Present or Future Value

V_{Past} = Past or Present Value

The *annual* percentage growth rate is simply the percent growth divided by N, the number of years.

Source: https://pages.uoregon.edu/rgp/PPPM613/class8a.htm

3.15 Population Distribution and Composition of Study Area

The population as per 2011 Census records is 315480 (for 10 km radius buffer zone). Total no. of household is 9716, 25929 and 53717 respectively, in primary, secondary and tertiary zone. Sex ratio is 977, 977 and 984 (females per 1000 males) observed in primary, secondary and tertiary zone respectively. SC population distribution is 5453,13469,22216 respectively in primary, secondary and tertiary zone. ST population distribution is 60, 35, 169 respectively in primary, secondary and tertiary. Average household size is 4. Zone wise Demographic profile of study area is given in the table 3.47 below:

Source: https://censusindia.gov.in/census.website/data/census-tables

Table 3.52 Zone wise Demographic Profile of Study Area

Zone	No. of Villages	Total Household	Total Population	Male Population	%	Female Population	%

Primary Zone (0 - 3 Km)	3	9716	33648	17024	50.59	16624	49.41
Secondary Zone (3 - 7 Km)	8	25929	90912	45992	50.59	44920	49.41
Tertiary Zone (7 - 10 km)	13	53717	190920	96235	50.41	94685	49.59
Study Area (0-10 km)	**24**	**89362**	**315480**	**159251**	**50.48**	**156229**	**49.52**

Source: Census of India, 2011

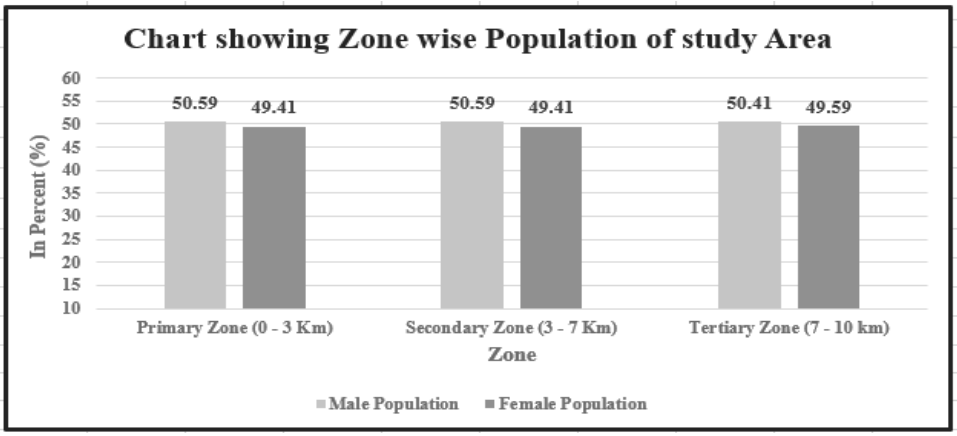


Figure 3.35 Population of study area

- ✓ Above table identifies the presence of villages and their subsequent population divided under three zones from plant boundary (i.e., Primary, secondary and tertiary zone
- ✓ Primary zone has 3 villages where as much as 9716 households with 33648 population are located. Mostly lying on Built-up land for their livelihood and substance.
- ✓ Secondary and tertiary zone both comprise of 8 and 13villages having a total population of 90,912 and 190920 respectively.

Table 3.53 Village wise Demographic Profile of the Study Area (Core and Buffer Zone)

Sno	Village Name/Town Panchayat	No.of Households	Total population	Total Male	Total Female	Sex Ratio	Population below 6	Male below 6	Female below 6	SC population	SC Male	SC Female	ST population	ST Male	ST Female	Literate population	Male Literate	Female Literate	Total workers	Main workers	Marg workers	Non workers
0-3KM																						
1	Ichipatti	Rural	2754	9527	4892	4635	1026	527	499	1426	716	710	16	8	8	6315	3577	2738	4980	4825	155	4547
2	Samalapuram (TP)	Urban	5938	20691	10404	10287	2153	1086	1067	3201	1620	1581	44	21	23	14332	7879	6453	10508	10021	487	10183
3	Kasba Ayyampalayam	Rural	1024	3430	1728	1702	290	147	143	826	424	402	0	0	0	2451	1358	1093	1692	1372	320	1738
		Total	**9716**	**33648**	**17024**	**16624**	**3469**	**1760**	**1709**	**5453**	**2760**	**2693**	**60**	**29**	**31**	**23098**	**12814**	**10284**	**17180**	**16218**	**962**	**16468**
3-7KM																						
1	Poomalur	Rural	2209	7605	3829	3776	786	373	413	1797	880	917	10	4	6	4602	2614	1988	3960	3563	397	3645
2	Sukkampalayam	Rural	1247	4420	2238	2182	408	210	198	1136	569	567	0	0	0	2947	1665	1282	2760	2290	470	1660
3	Semmipalayam (CT)	Urban	2380	8429	4285	4144	814	403	411	1216	616	600	0	0	0	6413	3467	2946	4231	4053	178	4198
4	Kadampadi	Rural	2370	8147	4131	4016	760	417	343	1747	926	821	13	7	6	5913	3184	2729	3832	3397	435	4315
5	Kangayampalayam	Rural	2247	8251	4394	3857	921	470	451	1163	570	593	5	2	3	6485	3643	2842	3493	2753	740	4758
6	Karumathampatti (TP)	Urban	10071	35062	17593	17469	3473	1734	1739	3440	1741	1699	5	3	2	26180	14098	12082	15723	14654	1069	19339
7	Kaniyur (CT)	Urban	3444	12011	6028	5983	1341	667	674	1763	864	899	2	1	1	8648	4728	3920	5650	5268	382	6361
8	Kodangipalayam	Rural	1961	6987	3494	3493	770	382	388	1207	595	612	0	0	0	4614	2568	2046	3595	3146	449	3392
		Total	**25929**	**90912**	**45992**	**44920**	**9273**	**4656**	**4617**	**13469**	**6761**	**6708**	**35**	**17**	**18**	**65802**	**35967**	**29835**	**43244**	**39124**	**4120**	**47668**
7-10KM																						
1	Velampalayam (M)	Urban	24381	87427	44353	43074	10272	5259	5013	5257	2609	2648	139	53	86	68208	36246	31962	40043	38419	1624	47384
2	Mangalam (CT)	Urban	4782	17699	8847	8852	2138	1064	1074	2666	1333	1333	4	3	1	12970	6907	6063	7393	7211	182	10306
3	velampalayam	Rural	971	3512	1789	1723	369	185	184	497	247	250	6	3	3	2101	1212	889	1873	1852	21	1639
4	Naranapuram	Rural	3862	14018	7047	6971	1674	871	803	2010	1013	997	4	1	3	10117	5456	4661	6577	6251	326	7441
5	Karadibavi	Rural	1040	3647	1809	1838	313	167	146	958	495	463	0	0	0	2479	1327	1152	1842	1678	164	1805
6	Paruvai	Rural	1098	3778	1909	1869	340	179	161	856	440	416	0	0	0	2682	1470	1212	1889	1778	111	1889
7	Rasipalayam	Rural	1364	4407	2208	2199	415	200	215	702	351	351	0	0	0	3164	1757	1407	2016	1735	281	2391
8	Appanaickenpatti	Rural	1121	3992	1998	1994	337	170	167	947	478	469	0	0	0	2665	1413	1252	2199	2006	193	1793
9	Kalangal	Rural	1639	5590	2853	2737	500	272	228	784	400	384	0	0	0	3889	2158	1731	3112	2784	328	2478
10	Sulur (TP)	Urban	8014	27909	13835	14074	2636	1351	1285	4231	2104	2127	12	6	6	21951	11435	10516	12178	10514	1664	15731
11	Arasur (CT)	Urban	3306	11510	5798	5712	1343	706	637	1576	815	761	4	2	2	8477	4539	3938	5136	4701	435	6374
12	Manickapuram (CT)	Urban	1739	6215	3150	3065	672	357	315	1386	687	699	0	0	0	4325	2370	1955	3005	2864	141	3210
13	Kurukkapalayam	Rural	400	1216	639	577	82	45	37	346	182	164	0	0	0	729	440	289	804	492	312	412
		Total	**53717**	**190920**	**96235**	**94685**	**21091**	**10826**	**10265**	**22216**	**11154**	**11062**	**169**	**68**	**101**	**143757**	**76730**	**67027**	**88067**	**82285**	**5782**	**102853**
		G.Total	**89362**	**315480**	**159251**	**156229**	**33833**	**17242**	**16591**	**41138**	**20675**	**20463**	**264**	**114**	**150**	**232657**	**125511**	**107146**	**148491**	**137627**	**10864**	**166989**

Source: Village Wise Demographic Profile of the Study Area*, Census of India, 2011*

3.16 Gender and Sex Ratio

Sex ratio is used to describe the number of females per 1000 of males. Sex ratio is a valuable source for finding the population of women in India and what is the ratio of women to that of men in India. In the Population Census of 2011, it was revealed that the population ratio in India 2011 is 940 females per 1000 of males. The study area has 992 females per 1000 males. Gender and sex ratio determine the Human Development Index (HDI) of an area thereby understanding the status of women in that region. Following table entails information about sex ratio of 14 villages lying in study area (buffer zone) as primary, secondary and tertiary zone.

Table 3.54 Sex ratio of the study area

S. No.	Buffer Zone	Sex Ratio of Study area Female/ 1000 Male
1	Primary Zone (0-3 km)	**977**
2	Secondary zone (3-7 km)	**977**
3	Tertiary Zone (7-10 km)	**984**

Source: Census of India, 2011

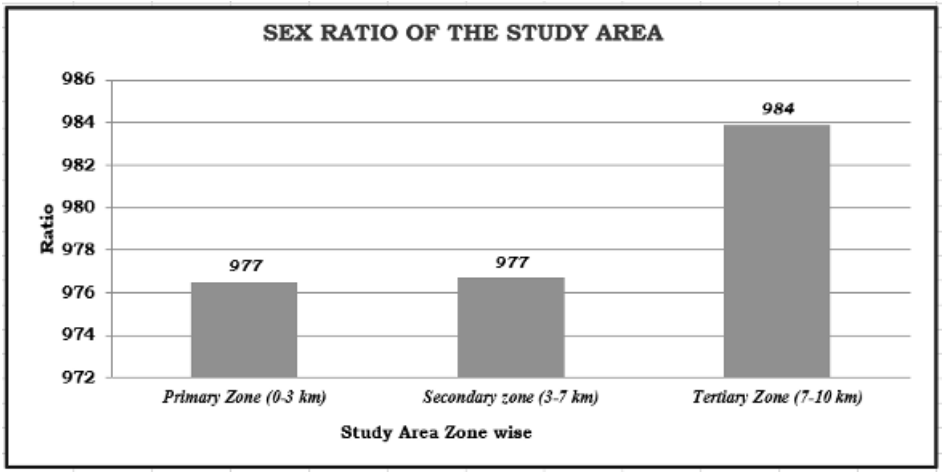


Figure No. 3.36 Sex Ratio within 10 Km study area

Table 3.55 Child Sex ratio of the study area

S. No.	Buffer Zone	Sex Ratio of Study area Female/ 1000 Male
1	Primary Zone (0-3 km)	**971**
2	Secondary zone (3-7 km)	**992**
3	Tertiary Zone (7-10 km)	**948**

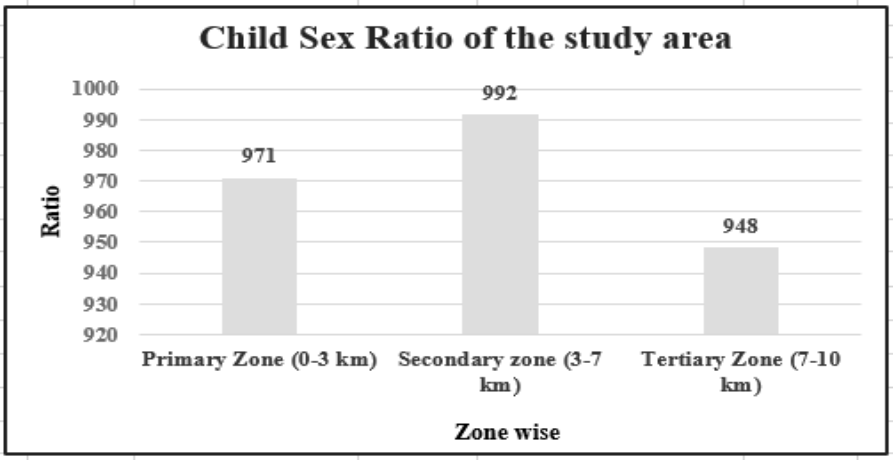


Figure No.3.37 Child Sex Ratio within 10 Km study area

3.17 Literacy Rate in Study Area

Literacy Rate is the percentage of people in a country with the ability to read and write. The analysis of the literacy levels is done in the study area. The 10 km radius of study area demonstrates a literacy rate of 82.61% as per census data 2011. The male literacy rate in the study area indicates 88.38% whereas the female literacy rate, which is an important indicator for social change, is observed to be 76.73% as per the census data 2011. This needs to focus on the region and enhance further development focusing on education. (Table no 3.33).

Table 3.56 Literacy Rate of the Study Area

Zone	No. of Villages	Male Literacy Population	Male literacy Rate	Female Literacy Population	Female literacy Rate	Total Literacy	Total Literacy Rate
Primary Zone (0 - 3 Km)	3	12814	83.95	10284	68.95	23098	76.54
Secondary Zone (3 - 7 Km)	8	35967	87.01	29835	74.03	65802	80.60
Tertiary Zone (7 - 10 Km)	13	76730	89.84	67027	79.40	143757	84.65
Study Area (0-10km)	**24**	**125511**	**88.38**	**107146**	**76.73**	**232657**	**82.61**

Source: Census of India, 2011

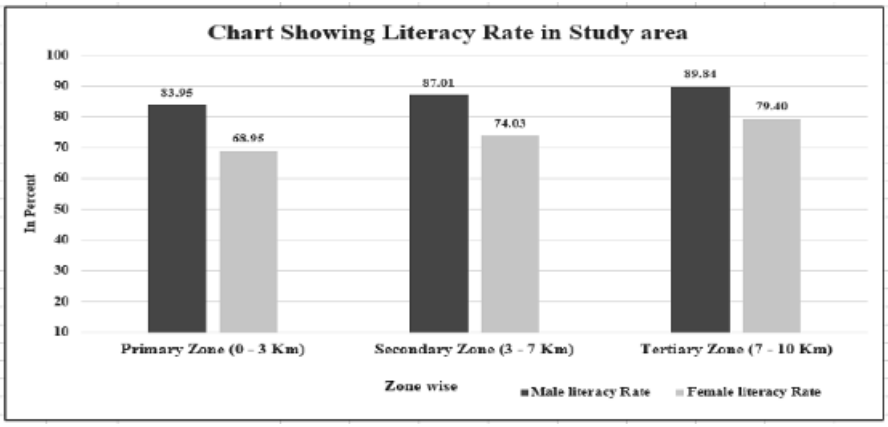


Figure No 3.38 Gender wise Literacy Rate in the study area

3.18 Family Size

Size of family also describes about family functioning, resource consumption, total income generated and their expenditure pattern. Census 2011 data suggests that most of these households have a family size of up to 4members, knowing the size of family also give fair understanding of relating how much resource consumption is being incurred, and annual income being generated and spent.

3.19 Vulnerable Group

While developing an action plan, it is very important to identify the population who fall under the marginalized and vulnerable groups and special attention has to be given towards these groups while making action plans. Special provisions should be made for them. In the observed villages schedule caste (SC) population is 13.04% and Schedule Tribe population 0.08 %, Other Population is 86.88% in total study area.

Table 3.57 vulnerable groups of the study area

Zone	No. of Villages	Vulnerable Groups					
		SC Population	%	ST Population	%	Other Population	%
Primary Zone (0 - 3 Km)	3	5453	16.21	60	0.18	28135	83.62
Secondary Zone (3 - 7 Km)	8	13469	14.82	35	0.04	77408	85.15
Tertiary Zone (7 - 10 Km)	13	22216	11.64	169	0.09	168535	88.28
Total area (10km)	**24**	**41138**	**13.04**	**264**	**0.08**	**274078**	**86.88**

Source: Census of India, 2011

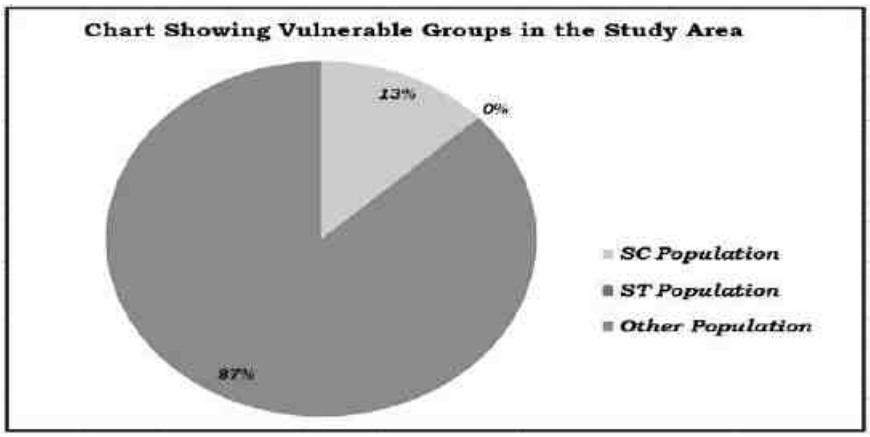


Figure No 3.39 Vulnerable groups

3.20 Economic Activities

The economy of an area is defined by the occupational pattern and income level of the people in the area. The occupational structure of residents in the study area is studied with reference to work category. The population is divided occupation wise into three categories, viz., Total workers, Main workers and non-workers. The main workers include cultivators, agricultural laborers, those engaged in household industry and other services. The non-workers include those engaged in unpaid household duties like, students, retired persons, dependents, beggars, vagrants etc. besides Institutional intimates or all other non-workers who do not fall under the above categories.

Table.3.58 Shows the work force of the study area

Zone	No. of Villages	Total Workers	%	Main Workers	%	Marginal Workers	%	Non-Workers	%
Primary Zone (0 - 3 Km)	3	17180	51.06	16218	48.20	962	2.86	16468	48.94
Secondary Zone (3 - 7 Km)	8	43244	47.57	39124	43.04	4120	4.53	47668	52.43
Tertiary Zone (7 - 10 Km)	13	88067	46.13	82285	43.10	5782	3.03	102853	53.87
Study Area (10 Km)	**24**	**148491**	**47.07**	**137627**	**43.62**	**10864**	**3.44**	**166989**	**52.93**

Source: Census of India, 2011

The above table shows that out of the total working population, the percentage of main workers is 43.6 % while 3.44% are marginal workers. Number of working populations is 47.07% and non-working population is 52.9% in the study area. As per the data obtained from the survey (as mentioned previously in occupational structure) most of these people are employed for major period of the year. Also, to mention the natural environment also restricts the people in finding stable business is performed for only certain months. Thus, proposed project will act as possible exposure for them to get enrol and earn sustain livelihood.

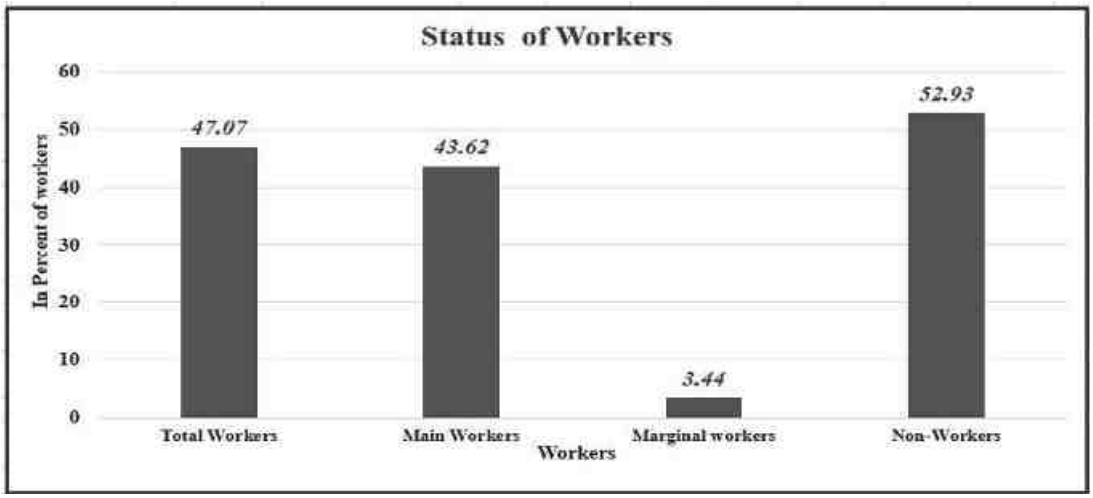


Figure No 3.40. Working population in the study area

3.21 Infrastructure Base

A better network of physical infrastructure facilities (built up and roads, irrigation, power and social infrastructure support, viz. health and Education, water and sanitation are essential for the development of the rural economy.

A review of infrastructural facilities available in the area has been done based on the information from baseline survey & census data of the study area. Infrastructural facilities available in the area are described in the subsequent sections.

- Administrative offices are located in Tamil Nadu, Tiruppur district (16km-NE) from site which by local transport.
- Noyyal River Northern side 2km from mine lease boundary and Samalpuram Lake is 1.5km-Northern side from mine lease boundary.
- Availability of Government high school Karungampalayam Village (NW-1.5km), Government high school Kangeyampalayam Village (SW-6.0km), Government High school, Poomalur village (NE-6km), Government High School, Semmipalayam village (SE-6.3km), Government High School, Naduvelampalayam Village (SE-5.0km) Tiruppur, Palladam and Sulur Taluk many Engineering college and Training institute found in study area.
- Health facilities covered in the area Somanur PHC (NW-3.2km), Karumathampatti Urban PHC (6.0km-NW) and Government Primary health centre Mangalam Village (9.5km-NE), Buffer zone area like Government Hospital like Sulur and Palladam taluks. Other private clinics and Pharmacy available in the buffer zone.

TABLE 3.59: EDUCATIONAL FACILITIES IN THE STUDY AREA

SI	Village Name	PPS		PS		MS		SS		SSS		DC		EC		MC		MI		PT		VTS		SSD	
		G	P	G	P	G	P	G	P	G	P	G	P	G	P	G	P	G	P	G	P	G	P	G	P
1	Mangalam (CT)	1	2	1	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
2	Andipalayam (CT)	1	2	1	2	1	2	1	2	2	2	2	2	2	1	2	1	2	1	2	2	2	2	2	2
3	Iduvai (CT)	1	2	1	2	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	1	2	2	2	2
4	Muruganpalayam (CT)	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
5	velampalayam	1	2	1	2	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
6	Naranapuram	1	1	1	1	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
7	Sukkampalayam	1	2	1	1	1	1	2	2	2	2	2	2	2	1	2	2	2	2	2	2	2	2	2	2
8	Ichipatti	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
9	Kodangipalayam	1	2	1	2	1	2	2	2	2	2	2	2	2	1	2	2	2	2	2	1	2	2	2	2
10	Anuppatti	1	2	1	1	1	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2
11	Kasba Ayyampalayam	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
12	Karadibavi	1	2	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
13	Paruvai	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
14	Samalapuram (TP)	1	2	1	2	1	1	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
15	Palladam (M)	1	1	1	1	1	1	2	2	2	2	2	1	2	1	2	2	2	2	2	1	2	2	2	2

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

TABLE 3.60: MEDICAL FACILITIES IN THE STUDY AREA

SI. No.	Village Name	CHC	PHC	PHSC	MCW	TBC	HA	HAM	D	VH	MHC	FWC	NGM-I/O
1	Mangalam (CT)	1	1	1	0	0	0	0	0	0	0	0	b
2	Andipalayam (CT)	1	1	1	0	0	0	0	0	0	0	0	b
3	Iduvai (CT)	0	1	1	1	1	0	0	1	0	0	1	
4	Muruganpalayam (CT)	0	1	0	0	0	0	0	0	0	0	0	c
5	Velampalayam	0	0	1	0	0	0	0	0	0	0	0	c
6	Naranapuram	0	1	1	0	0	0	0	0	0	0	0	c
7	Sukkampalayam	0	0	1	0	0	0	0	0	0	0	0	a
8	Ichipatti	0	0	0	0	0	0	0	0	0	0	0	b
9	Kodangipalayam	0	1	1	1	1	0	0	1	0	0	1	
10	Anuppatti	0	0	1	1	0	0	0	0	0	0	0	a
11	Kasba Ayyampalayam	0	0	0	0	0	0	0	0	1	0	0	c
12	Karadibavi	0	0	1	0	0	0	0	0	1	0	0	c
13	Paruvai	0	0	1	0	0	0	0	0	1	0	0	c
14	Samalapuram (TP)	0	1	1	0	0	0	0	0	0	0	0	b
15	Palladam (M)	1	1	3	0	0	0	0	0	0	0	0	a

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

Source: www.censusindia.gov.in

3.22. Other Issues in the Study Area

1. Deforestation of Land (Cutting Trees or Plant etc.)
2. Agriculture Land decreases
3. Lack of awareness among vulnerable groups for their welfare
4. Medical/Clinic facilities and PHC need for the Core area
5. Environmental clean with solid wastage pin each village.
6. Functioning of Hospital facilities with Sub Health care centers.
7. Need proper drainage system with public toilet men and women separately.
8. Avoid Road damage during carriage by mine vehicles (tipper Lorry).
9. Use sprinkler water when loading mine materials, to avoid water pollution during dust emission.

3.23 Interpretation

Based on the data, following inferences could be drawn:

- Total literacy rate in the study area is 82.61 %.
- The study area had average educational facilities. The overall status depicts that the education is limited to primary and middle level.
- The schedule tribe community forms 0.08% and Scheduled Caste forms 13.04% of the total population of study area.
- The Other Population forms 87% of the total population of study area.
- The study area is well connected by District/Village Road.
- The study area not well health facilities of primary level.
- Considering the above facts, the proposed project will boost the socio-economic development activities in the area and hence will leave positive impact.
- The study area has mobile connectivity.

3.24 Recommendation and Suggestions

The village development plans are made in consultation with the community through Gram Sabha; these appear to address the needs of the community. However, it may be noted that at the implementation stage these plans often are fraught with problem of inadequate funds, lack of proper planning, corruption, vested interests and political agendas. Hence while ascertaining the scope for convergence with the government activities, care must be taken to ascertain realistic possibilities for implementation.

- **Women empowerment**– Home based income generation activities, vocational training programs and common education centre for increasing the literacy rate.
- **Education –** Free uniform, construction of common rooms and library, computer education and physical education, additional schools for girls, furniture and equipment in schools, up-gradation of existing school infrastructure.
- **Agriculture/livestock –** Infrastructure such as agricultural practices, electricity connections, assistance with buying improved tools and equipment, capacity building, supply and/or knowledge of better

variety of seeds, pasture land development and trainings on animal husbandry& facility of veterinary doctor.

- **Health –** Improvements in sanitary conditions of villages, assistance with construction of latrines, improvement in drainage system, health camps and awareness campaigns for diseases like Covid-19, malaria, typhoid, tuberculosis, yellow fever and pneumonia. Repairing of PHCs and Anganwadi centers.
- **People with disability –** Establishment of center for special education, sensitization of the community towards disabled and awareness on Government schemes.
- While **Developing an Action Plan**, it is very important to identify the population who falls under the marginalized and vulnerable groups. So that special attention can be given to these groups with special provisions while making action plans.
- **Connectivity –**Transport connectivity to easiness accessibility to the region.

3.24.1 Structure Map 300m Radius

Table No 3.61 Structures details in the study area around 300m Radius

STRUCTURE ENUMURATION **0 - 300m**
Number of Structures -

Structure Numbers	Type of Structure	Usage Purpose	Commercial / industry / residential / farm house / Govt. building	Occupants of Building/ Structure	Structure belongs to owner	Structure Not belongs to owner	Remarks
1	Mines Office- 10m- NW	Maintain the Mines Documents	Commercial	4	Yes	No	For Mines Records
2	Crusher – 30m –NE	Used to produce M-sand, P – Sand & Jelly	Industry	5	No	Yes	Working Time: 8 AM – 5 PM 5 Nos of Employees
3	Mines Shed 70m - W	Used for the storage of waste materiala	Commercial	Nil	No	Yes	No stay
	Crusher Shed 130m - SE	Used for the storage of Mines materials	Commercial	Nil	No	Yes	No stay
	Labour House- 140m- S	Shelter For Workers	Commercial	5	No	Yes	Workers Staying
	Store room- 140m - S	Used for the storage of Mines materials	Commercial	Nil	No	Yes	No stay
	Shed 160m- NE	Used for the storage of Mines materials	Commercial	Nil	No	Yes	No stay
	Farm House & Cattle Shed 180m - S	Used to store agriculture goods and materials	Commercial	Nil	No	Yes	Used as store Room
	Shed 200m - SW	Used for the storage of waste materials	Commercial	Nil	No	Yes	No stay
	Crusher 210m –NW	Used to produce M-sand, P – Sand & Jelly	Industry	5	No	Yes	Working Time: 8 AM – 5 PM 5 Nos of Employees

	Shed 230m – S	Used for the storage of waste materials	Commercial	Nil	No	Yes	No stay
	Crusher Office- 240m- NE	Used to maintain the office records	Commercial	4	No	Yes	No stay
	Tiled House 260m – S	Residential	Residential	2	No	Yes	Staying
	Labour Shed 280m- NW	Shelter For Workers	Commercial	3	No	Yes	Staying

3.24.1 Structure Map 300m to 1km Radius

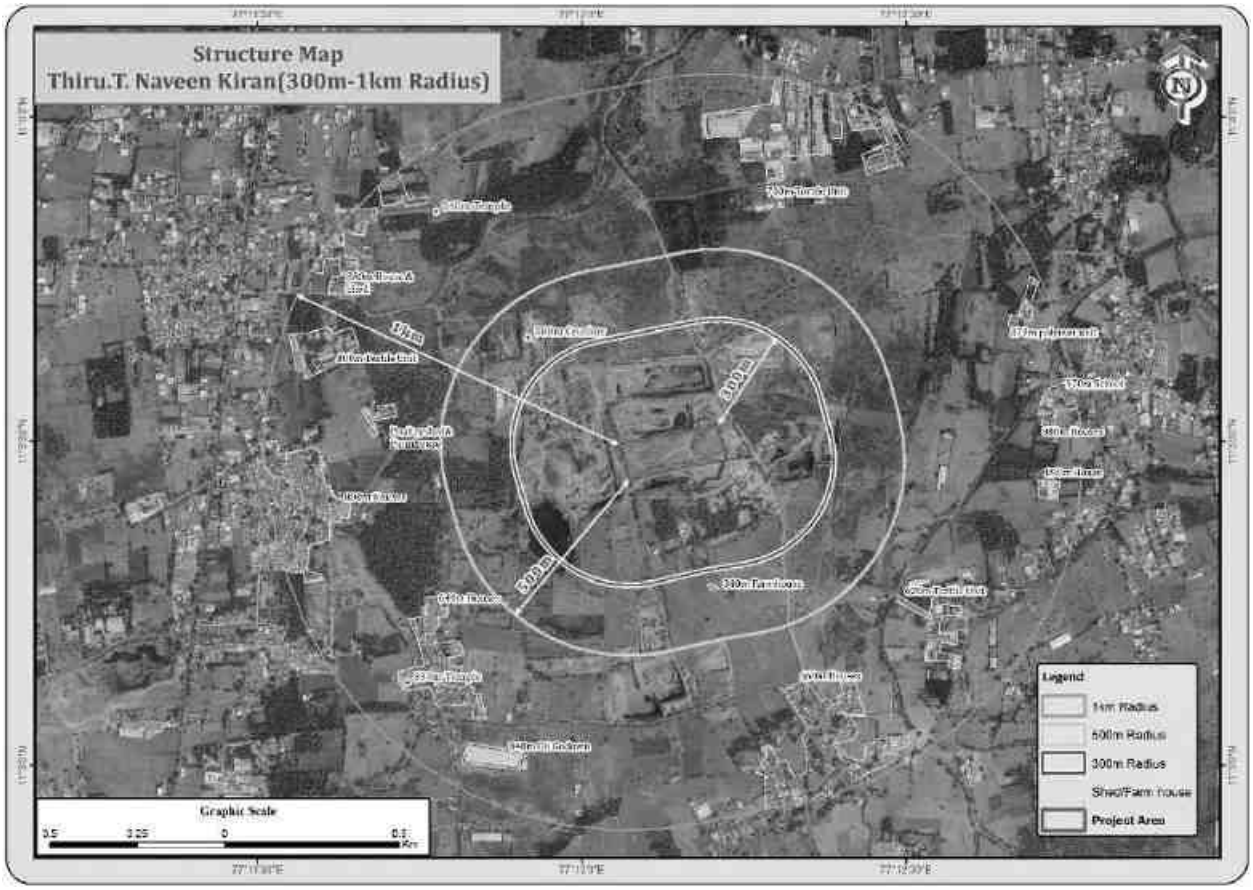


Table No 3.62 Structures details in the study area around 300-1km Radius

STRUCTURE ENUMURATION **300 – 1km** Number of Structures -							
Structure Numbers	**Type of Structure**	**Usage Purpose**	**Commercial / industry / residential / farm**	**Occupants of Building/**	**Structure belongs to owner**	**Structure Not belongs to owner**	**Remarks**

			house / Govt. building	**Structure**			
1	Farm house 340m - S	Used to store agriculture goods and materials	Commercial	Nil	No	Yes	Used as store Room
2	Crusher 380m - NW	Used to produce M-sand, P – Sand & Jelly	Industry	6	No	Yes	Working Time: 8 AM – 5 PM 6 Nos of Employees
3	Textile Unit 620m- SE	Quantify the various elements of textile.	Industry	6	No	Yes	No Stay
	Poultry Shed & Farm house 630m - NW	Production for eggs	Commercial	Nil	No	Yes	For Chicks
	Houses 640m - SW	Residential	Residential	2	No	Yes	Staying
	Houses 660m - SE	Residential	Residential	3	No	Yes	Staying
	Textile Unit 700m - NE	Quantify the various elements of textile.	Industry	6	No	Yes	No Stay
	Textile Unit 800m - NW	Quantify the various elements of textile.	Industry	5	No	Yes	No Stay
	Temple 830m - SW	Seasonal worship	Commercial	Nil	No	Yes	For worship
	Oil Godown 840m-	Used to Storage of oils	Commercial	Nil	No	Yes	No Stay
	Temple 840m - NW	Seasonal worship	Commercial	Nil	No	Yes	For worship
	Polymer Unit 870m - NE	Manufacturing of polymer	Industry	5	No	Yes	No Stay

	Houses 880m- E	Residential	Residential	4	No	Yes	Staying
	House & Shed 880m- NW	Residential	Residential	2	No	Yes	Staying
	Houses 890m - SE	Residential	Residential	3	No	Yes	Staying

3.25 Conclusion

To evaluate the impacts of proposed quarry project on the surrounding area, it is vital to assess the baseline status of the environmental quality in the locality of the site. Hence it can be concluded that the present environment status of the study area will not be affected by the project as **Thiru.T. Naveen Kiran Rough Stone and Gravel quarry 2.83.4Ha** will adopt adequate control measures to protect the surrounding environment and will contribute in development of the study areas.

Socio Economic/demographic status of the study area reveals that area further require improvement in the Economy and Infrastructure Development of the area. Hence it can be concluded that the present baseline environment status of the study area will not be affected by the proposed project. The proposed project will aim to provide preferential employment to the local people there by improving the employment opportunity in the area and in turn the social standards will improve.

4. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

4.0 GENERAL

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

In order to maintain the environmental commensuration with the mining operation, it is essential to undertake studies on the existing environmental scenario and assess the impact on different environmental components. This would help in formulating suitable management plans sustainable resource extraction.

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

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

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

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

4.1 LAND ENVIRONMENT:

4.1.2 Anticipated Impact

- 2.83.4 Ha of the land will be under mining since the Permanent or temporary change on land use and land cover will occur
- Movement of heavy vehicles sometimes cause problems to agricultural land, human habitations due to dust, noise and it also causes traffic hazards.
- Due to degradation of land by pitting the aesthetic environment of the core zone may be affected.
- Earthworks during the rainy season increase the potential for soil erosion and sediment laden water entering the water ways.

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

4.1.2 Mitigation Measures

- The 2.83.4 Ha of the land will be converted into temporary reservoir which will full fill the water scarcity in the drought season and the nearby agriculture land will have benefitted by the supply of water
- About 1420 Nos of trees will be planted in the lease area and approach road will retain the ecosystem
- The mining activity will be gradual confined in blocks and excavation will be undertaken progressively along with other mitigative measures like phase wise development in the production
- Construction of garland drains all around the quarry pits and construction of silt trap at strategic location in lower elevations to prevent erosion due to surface runoff during rainfall and also to collect the storm water for various uses within the proposed area.
- Green belt development along the boundary within safety zone. The small quantity of water stored in the mined-out pit will be used for greenbelt.
- Thick plantation will be carried out on unutilized area, top benches of mined out pits, on safety barrier, etc.,
- Fencing will be constructed before starting the mining operation and it will be maintained in the conceptual stage Security will be posted round the clock, to prevent inherent entry of the public and cattle.

4.1.3 Soil Environment

4.1.4 Impact on Soil Environment

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

4.1.5 Mitigation Measures

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

4.1.6 Waste Dump Management

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

4.2 WATER ENVIRONMENT

4.2.1 Anticipated Impact

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

- Abstraction of water may lead to depletion of water table
- 2.4 KLD water will be utilized for the quarrying operation

4.2.2 Mitigation Measures

- Water for the quarrying operation such as sprinkling on haul roads, Greenbelt development will be sourced from the lower part of the mine pit which is specifically allotted to collect the rain water.
- Garland drain, settling tank will be constructed along the proposed mining lease area. The Garland drain will be connected to settling tank and sediments will be trapped in the settling traps and only clear water will be discharged out to the natural drainage
- Rainwater will be collected in sump in the mining pits and will be allowed to store and pumped out to surface setting tank of 15 m x 10m x 3m to remove suspended solids if any. This collected water will be judiciously used for dust suppression and such sites where dust likely to be generated and for developing green belt. The proponent will collect and judicially utilize the rainwater as part of rainwater harvesting system.
- Periodic (every 6 months once) analysis of quarry pit water and ground water quality in nearby villages.
- Domestic sewage from site office & urinals/latrines provided in ML is discharged in septic tank followed by soak pits.
- Waste water discharge from mine will be treated in settling tanks before using for dust suppression and tree plantation purposes.
- De-silting will be carried out before and immediately after the monsoon season.

4.3 AIR ENVIRONMENT

4.3.1. Anticipated Impact

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

4.3.1.1. Modelling of Incremental Concentration from all Proposed Projects

Wind erosion of the exposed areas and the air borne particulate matter generated by quarrying operation, and transportation are mainly PM_{10} & $PM_{2.5}$ and emissions of Sulphur dioxide (SO_2) & Oxides of Nitrogen (NOx) due to excavation/loading equipment and vehicles plying on haul roads are the cause of air pollution in the project area.

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

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

AERMOD Software.

Prediction of impacts on air environment has been carried out taking into consideration cumulative production all the quarries fall in the Cluster. Air environment and net increase in emissions by Open pit source modelling in AERMOD Software AERMOD 12.

4.3.2.1 Emission Estimation

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

The general equation for emissions estimation is:

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

Where:
E = emissions;
A = activity rate;
EF = emission factor, and
ER =overall emission reduction efficiency, %

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

4.3.2 Frame work of Computation & Model details

Suspended Particulate Matter (SPM) is the major pollutant occurred during quarrying activities. The prediction included the impact of Excavation, Drilling, Blasting (Occasionally), loading and movement of vehicles during transportation and meteorological parameters such as wind speed, wind direction, temperature, rainfall, humidity and Cloud cover.

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

TABLE 4.1: ESTIMATED EMISSION RATE

PM_{10}			
Activity	**Source type**	**Value**	**Unit**
Drilling	Point Source	0.085816323	g/s
Blasting	Point Source	0.001125807	g/s
Mineral Loading	Point Source	0.041990717	g/s
Haul Road	Line Source	0.002491073	g/s/m
Overall Mine	Area Source	0.062836506	g/s
So2	Point Source	0.000644729	g/s
Nox	Point Source	0.000044886	g/s

FIGURE 4.1: AERMOD TERRAIN MAP

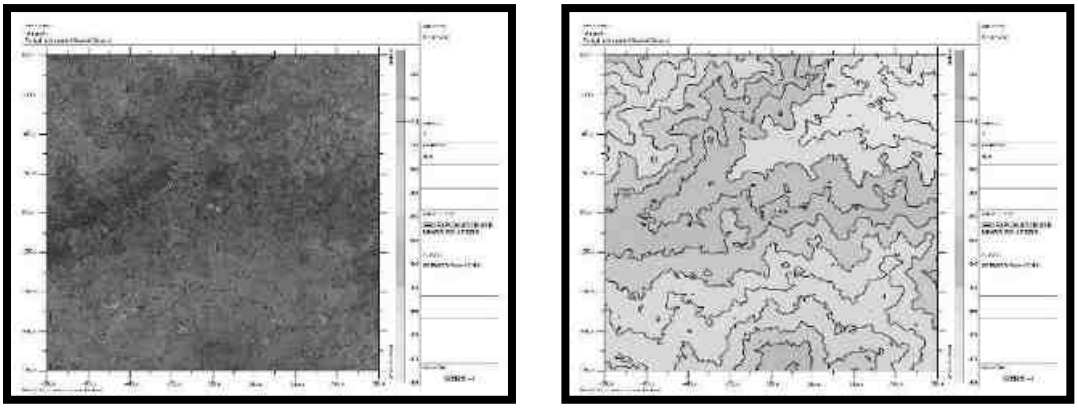


FIGURE 4.2: PREDICTED INCREMENTAL CONCENTRATION OF PM_{10}

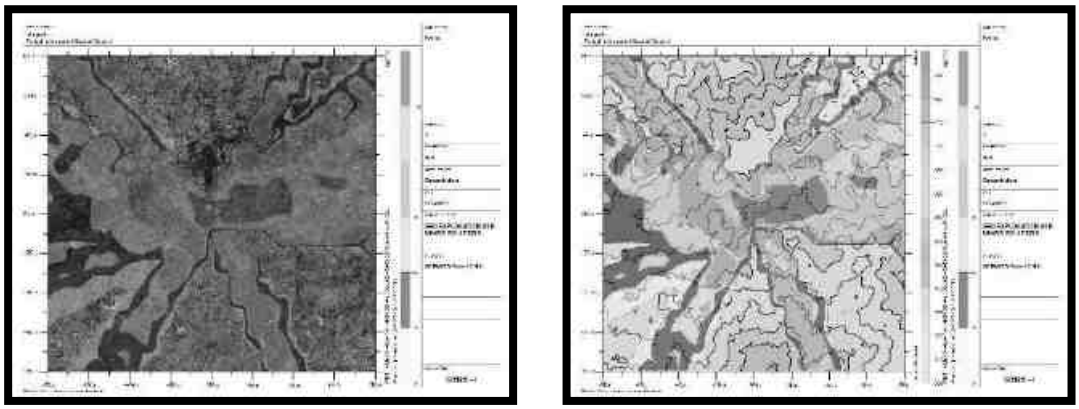


FIGURE 4.3: PREDICTED INCREMENTAL CONCENTRATION OF PM_{25}

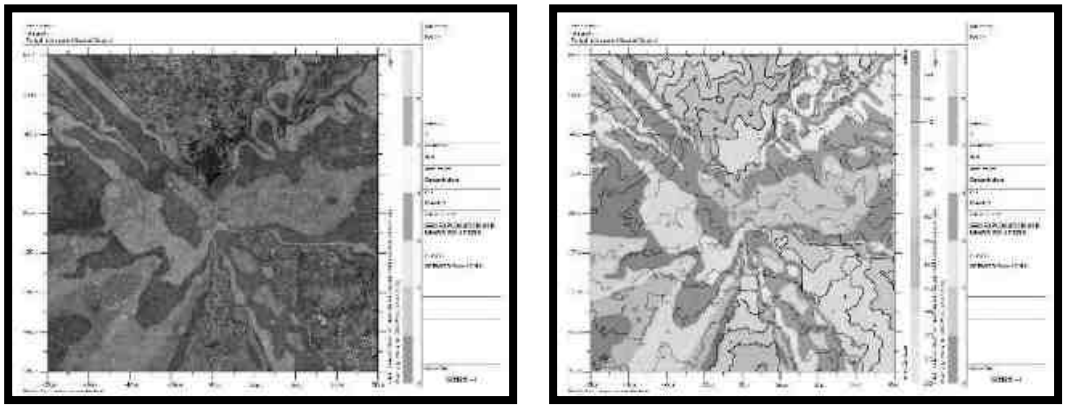


FIGURE 4.4: PREDICTED INCREMENTAL CONCENTRATION OF NO_X

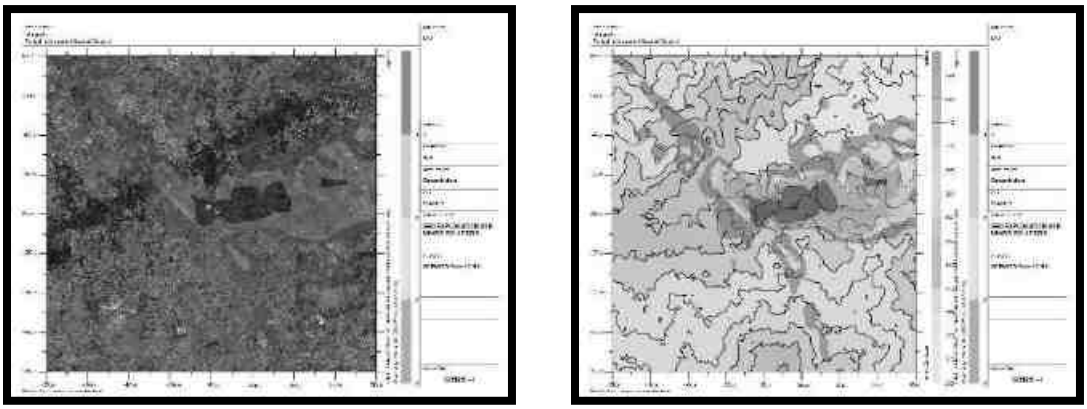


FIGURE 4.5: PREDICTED INCREMENTAL CONCENTRATION OF So2

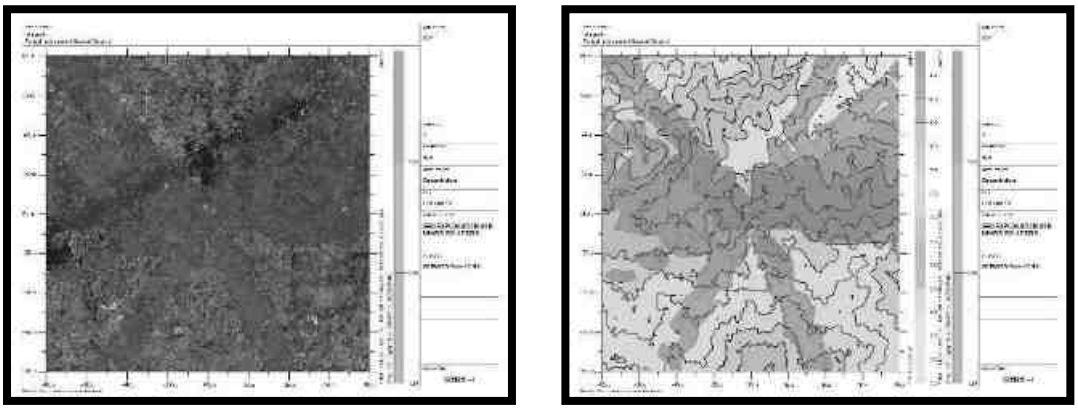
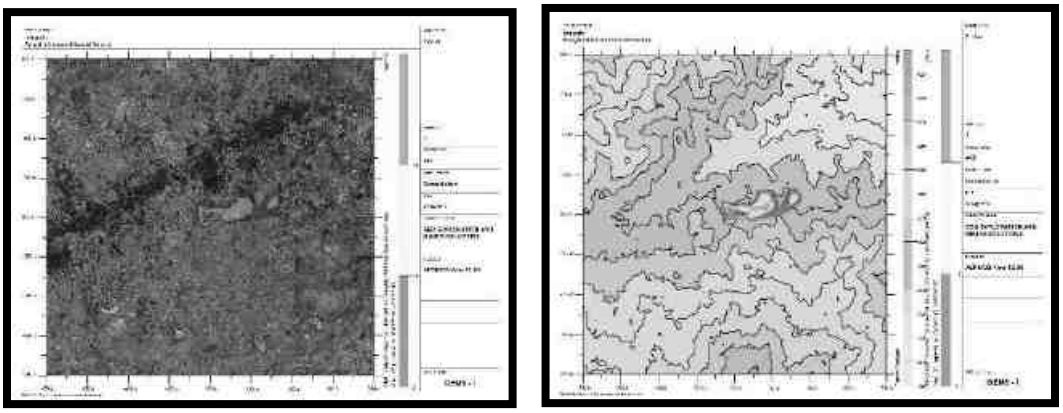


FIGURE 4.6: PREDICTED INCREMENTAL CONCENTRATION OF FUGITIVE DUST



4.3.2.1 Model Results

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

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

Station Code	Location	X Coordinate (m)	Y Coordinate (m)	Average Baseline PM_{10} ($\mu g/m^3$)	Incremental value of PM_{10} due to mining ($\mu g/m^3$)	Total PM_{10} ($\mu g/m^3$)
AAQ1	11° 3'28.44"N 77°12'4.37"E	-110	-21	41.7	14.47	56.17
AAQ2	11° 3'23.24"N 77°12'18.35"E	317	-176	42.7	10.89	53.59
AAQ3	11° 4'4.61"N 77°11'1.22"E	-2042	1099	44.6	13.00	57.6
AAQ4	11° 3'25.61"N 77°15'50.07"E	6781	-103	45.0	12.33	57.33
AAQ5	11° 5'40.74"N 77°12'35.97"E	853	4078	45.6	0	45.6
AAQ6	11°2'49.89"N 77° 9'18.67"E	-5170	-1214	45.4	4.74	50.14
AAQ7	11° 0'21.50"N 77°13'44.23"E	2939	-5802	45.1	9.00	54.1

TABLE 4.3: INCREMENTAL & RESULTANT GLC OF PM2.5

Station Code	Location	X Coordinate (m)	Y Coordinate (m)	Average Baseline $PM_{2.5}$ ($\mu g/m^3$)	Incremental value of $PM_{2.5}$ due to mining ($\mu g/m^3$)	Total $PM_{2.5}$ ($\mu g/m^3$)
AAQ1	11° 3'28.44"N 77°12'4.37"E	-110	-21	20.7	6.91	27.61
AAQ2	11° 3'23.24"N 77°12'18.35"E	317	-176	21.6	5.37	26.97
AAQ3	11° 4'4.61"N 77°11'1.22"E	-2042	1099	23.6	6.00	29.6
AAQ4	11° 3'25.61"N 77°15'50.07"E	6781	-103	24.3	5.83	30.13
AAQ5	11° 5'40.74"N 77°12'35.97"E	853	4078	24.8	0	24.8
AAQ6	11°2'49.89"N 77° 9'18.67"E	-5170	-1214	25.0	2.70	27.70
AAQ7	11° 0'21.50"N 77°13'44.23"E	2939	-5802	24.3	5.00	29.3

TABLE 4.4: INCREMENTAL & RESULTANT GLC OF SO2

Station Code	Location	X Coordinate (m)	Y Coordinate (m)	Average Baseline SO_2 ($\mu g/m^3$)	Incremental value due to mining ($\mu g/m^3$)	Total SO_2 ($\mu g/m^3$)
AAQ1	11° 3'28.44"N 77°12'4.37"E	-110	-21	4.4	1.79	6.19
AAQ2	11° 3'23.24"N 77°12'18.35"E	317	-176	4.5	1.52	6.02
AAQ3	11° 4'4.61"N 77°11'1.22"E	-2042	1099	4.7	1.75	6.45
AAQ4	11° 3'25.61"N 77°15'50.07"E	6781	-103	5.1	1.70	6.8
AAQ5	11° 5'40.74"N 77°12'35.97"E	853	4078	4.9	0	4.9
AAQ6	11°2'49.89"N 77° 9'18.67"E	-5170	-1214	5.0	0	5.0
AAQ7	11° 0'21.50"N 77°13'44.23"E	2939	-5802	4.9	1.12	6.02

TABLE 4.5: INCREMENTAL & RESULTANT GLC OF NO_X

Station Code	Location	X Coordinate (m)	Y Coordinate (m)	Average Baseline NOx ($\mu g/m^3$)	Incremental value due to mining ($\mu g/m^3$)	Total NOx ($\mu g/m^3$)
AAQ1	11° 3'28.44"N 77°12'4.37"E	-110	-21	19.7	9.50	29.2
AAQ2	11° 3'23.24"N 77°12'18.35"E	317	-176	19.1	0	19.1
AAQ3	11° 4'4.61"N 77°11'1.22"E	-2042	1099	19.8	7.16	26.96
AAQ4	11° 3'25.61"N 77°15'50.07"E	6781	-103	20.1	5.00	25.1
AAQ5	11° 5'40.74"N 77°12'35.97"E	853	4078	20.2	0	20.2
AAQ6	11°2'49.89"N 77° 9'18.67"E	-5170	-1214	20.4	0	20.4
AAQ7	11° 0'21.50"N 77°13'44.23"E	2939	-5802	20.7	1.00	21.7

From the resultant of cumulative concentration i.e., Background + Incremental Concentration of pollutant in all the receptor locations without effective mitigation measures are still within the prescribed NAAQ limits of 100, 80 & 80 µg/m3 for PM10, SO2 & NOX respectively. By adopting suitable mitigation measures, the pollutant levels in the atmosphere can be further being controlled.

4.3.4. Mitigation Measures

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

Advantages of Wet Drilling: -

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

Blasting –

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

Haul Road & Transportation –

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

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

Green Belt –

- 1600Nos of trees will be planted through this project in the lease area and village roads (Approach Road) to prevent the generation of dust due to movement of dumpers/trucks
- Green belt of adequate width will be developed around the project areas

Occupational Health –

- Dust mask will be provided to the workers and their use will be strictly monitored
- Annual medical checkups, trainings and campaigns will be arranged to ensure awareness about importance of wearing dust masks among all mine workers & tipper drivers
- Ambient Air Quality Monitoring will be conducted six months once to assess effectiveness of mitigation measures proposed

4.4 NOISE ENVIRONMENT

Noise pollution is mainly due to operation like drilling & blasting and plying of trucks & HEMM. These activities will not cause any problem to the inhabitants of this area because there is no human settlement within 300m radius from the project site. Noise modelling has been carried out considering blasting and compressor operation (drilling) and transportation activities.

Predictions have been carried out to compute the noise level at various distances around the working pit due to these major noise-generating sources. Noise modelling has been carried out to assess the impact on surrounding ambient noise levels.

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

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

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

Where:

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

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

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

4.4.1 Anticipated Impact

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

- Source data
- Receptor data
- Attenuation factor

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

TABLE 4.7: ACTIVITY AND NOISE LEVEL PRODUCED BY MACHINERY

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

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

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

TABLE 4.8: PREDICTED NOISE INCREMENTAL VALUES

Location ID	**N1**	**N2**	**N3**	**N4**	**N5**	**N6**	**N7**
Maximum Monitored Value (Day) dB(A)	49.7	46.2	46.8	45.9	49.8	48.1	47.9
Incremental Value dB(A)	56.6	52.1	43.8	33.9	24.2	25.7	25.3
Total Predicted Noise level dB(A)	54.5	53.1	48.6	46.2	49.8	48.1	47.9

The incremental noise level is found within the range of 56.6 dB (A) in Core Zone and 24.2 to 52.1 dB (A) in Buffer zone. The noise level at different receptors in buffer zone is lower due to the distance involved and other topographical features adding to the noise attenuation. The resultant Noise level due to monitored values and calculated values at the receptors are based on the mathematical formula considering attenuation due to Green Belt as 4.9 dB (A) the barrier effect. From the above table, it can be seen that the ambient noise levels at all the locations are within permissible limits of Industrial area (core zone) & Residential area (buffer zone) as per THE NOISE POLLUTION (REGULATION AND CONTROL) RULES, 2000 (The Principal Rules were published in the Gazette of India, vide S.O. 123(E), dated 14.2.2000 and subsequently amended vide S.O. 1046(E), dated 22.11.2000, S.O. 1088(E), dated 11.10.2002, S.O. 1569 (E), dated 19.09.2006 and S.O. 50 (E) dated 11.01.2010 under the Environment (Protection) Act, 1986.).

4.4.2 Mitigation Measures

The following noise mitigation measures are proposed for control of Noise

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

4.4.3 Ground Vibrations

Ground vibrations due to the proposed mining activities are anticipated due to operation of Mining Machines like Excavators, drilling and blasting, transportation vehicles, etc., However, the major source of ground vibration from the quarry is blasting. The major impact of the ground vibrations is observed on the domestic houses located in the villages nearby the mine lease area. The kuchha houses are more prone to cracks and damage due to the vibrations induced by blasting whereas RCC framed structures can withstand more ground vibrations. Apart from this, the ground vibrations may develop a fear factor in the nearby settlements.

Another impact due to blasting activities is fly rocks. These may fall on the houses or agricultural fields nearby the mining lease area and may cause injury to persons or damage to the structures. Nearest habitation from the proposed project areas is listed in below table. The ground vibrations due to the blasting in the quarry are calculated using the empirical equation.

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

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

Where –

V = peak particle velocity (mm/s)

K = site and rock factor constant

Q = maximum instantaneous charge (kg)

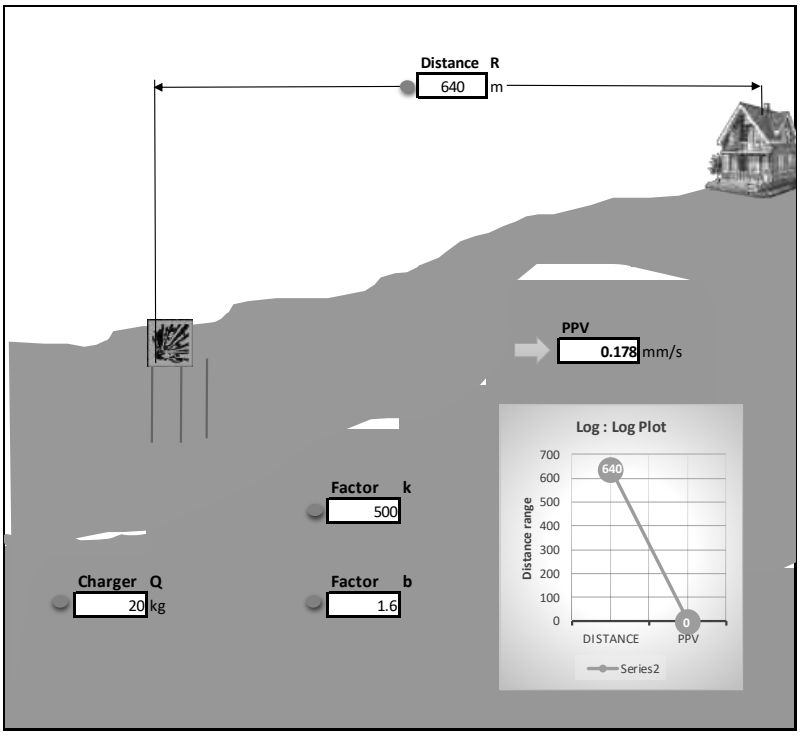
B = constant related to the rock and site (usually 1.6)

R = distance from charge (m)

TABLE 4.9: PREDICTED PPV VALUES DUE TO BLASTING

Location ID	Maximum Charge in kgs	Nearest Habitation in m	PPV in m/ms
P1	20	640-SW	0.178

FIGURE 4.6: GROUND VIBRATION PREDICTION



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

4.4.3.1 Mitigation Measures

- It is proposed to carry out blasting operation 20kg per round so that the vibration will be minimal
- The mining operation will be carried out without deep hole drilling, 25mm small dia cartridge will be utilized for the blasting
- The blasting operations in the project site without deep hole drilling and blasting using delay detonators, which reduces the ground vibrations;
- Proper quantity of explosive, suitable stemming materials and appropriate delay system will be adopted to avoid overcharging and for safe blasting;
- Adequate safe distance from blasting will be maintained as per DGMS guidelines;
- Blasting shelter will be provided as per DGMS guidelines;
- Blasting operations will be carried out only during day time;
- The charge per delay will be minimized and preferably a greater number of delays will be used per blasts;
- During blasting, other activities in the immediate vicinity will be temporarily stopped;
- Drilling parameters like depth, diameter and spacing will be properly designed to give proper blast;

- A fully trained explosives blast man (Mining Mate, Mines Foreman, 2nd Class Mines Manager/ 1st Class Mines Manager) will be appointed.
- A set of shot firing rules will be drawn up and blasting shall commence outlining the detailed operating procedures that will be followed to ensure that shot firing operations on site take place without endangering the workforce or public.
- The detonators will be connected in a predetermined sequence to ensure that only one charge is detonated at any one time and a NONEL or similar type initiation system will be used.
- The detonation delay sequence shall be designed so as to ensure that firing of the holes is in the direction of free faces so as to minimise vibration effects.
- Appropriate blasting techniques shall be adopted such that the predicted peak particle velocity shall not exceed 8 mm/s.
- Vibration monitoring will be carried out every 6 months to check the efficacy of blasting practices

4.5 IMPACT ON THE BIOLOGICAL ENVIRONMENT

4.5.1. Anticipated Impact on agricultural land associated with flora

1. Dust particle settle on neighbouring agricultural land & coconut farms it is located about 200m on the east side. Mostly dust emission from nearby crusher unit and during operation and minerals are transported in approach roads.
2. Dust deposition on leaf observed on nearby lease boundary local plant species which may result in decline the rate of photosynthesis and retards the plant growth.

4.5.2. Mitigation Measures

4.5.2.1. General Guidelines for Green Belt Development

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

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

4.5.3.2. Proposed Green Belt

Extensive green belt development will be started during the construction phase, which will continue till the operation of the plant. About 1600 trees will be planted per hectare all around the plant, approach roads, and township premises. Locally available types of trees that are resistant to pollutants will be planted. In addition to the above, all open spaces available within the premises will be developed as nurseries, parks, gardens, and other forms of greenery. 5 m wide greenbelt will be developed along the plant premises, as per land available.

4.5.3.3. Development of Green Belt

The plantation matrix adopted for the green belt development includes pit of 0.3 m x 0.3 m in size with a spacing of 2 m x 2 m. In addition, earth filling and manure may also be required for the proper nutritional balance and nourishment of the sapling. It is also recommended that the plantation has to be taken up randomly and the landscaping

aspects could be taken into consideration. Multi-layered plantations comprising of medium height trees (7 m to 10 m) and shrubs (5 m height) are proposed for the green belt.

4.5.3.4. Selection of Plant Species for Green Belt Development

It is also recommended that the plantation has to be taken up randomly and the landscaping aspects could be taken into consideration. Multi-layered plantations comprising of medium height trees (7 m to 10 m) and shrubs (5 m height) are proposed for the green belt. Green belt is plantation of trees for reducing the air pollution as they absorb both gaseous and particulate pollutant, thus removing them from atmosphere. Green plants form a surface capable of absorbing air pollutants and forming sinks for pollutants. It improves the aesthetic value of local environment. Under present project, green belts have been planned with emphasis on creating biodiversity; enhance natural surroundings and mitigating pollution. Regional tree saplings in eco-friendly bags like Pterocarpus marsupium, Pongamia pinnata, Limonia acidissima, and Cassia roxburghii will be planted along the Lease boundary and avenues as well as over non-active dumps with intervals 3m in between with the GPS Coordinates. The greenbelt development plan aims to overall improvement in the environmental conditions of the region Native plant species will be preferred.

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

Table No 4.10. List of plant species proposed for Greenbelt development

S. No	Scientific name	Tamil Name
1	Aegle marmelos	Vilva maram
2	Albizia lebbeck	Vaagai maram
3	Cassia fistula	Konrai tree
4	Lannea coromandelica	Othiyam
5	Limonia acidissima	Vila maram
6	Syzygium cumini	Naval maram
7	Toona ciliata	Santhana Vembu
8	Ficus hispida	Aththi maram
9	Borassus flabellifer	Panai-maram
10	Madhuca longifolia	Illupai maram

(*Source: Term of Reference-ToR)

Table No 4.11. Species suitable for abatement of noise and dust pollution

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

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

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

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

4.5.4. Anticipated Impact on Fauna

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

4.5.4.1. Measures for protection and conservation of wildlife species

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

4.5.3. Impact on Aquatic Biodiversity

- The major lake and river along the project sites don't have a rich biodiversity and almost all the species of both fauna and flora listed are either least concerned or not evaluated.

- There is no impact on fish habitats and the food WEB/ food chain in the water body and Reservoir.

Table No. 4.12. Overall Ecological impact assessments of Ichipatti Village, Rough stone Quarry, Palladam Taluk, Tiruppur District and Tamil Nadu.

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

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

TABLE 4.13: RECOMMENDED SPECIES FOR GREENBELT DEVELOPMENT PLAN

SI.No	Name of the plant (Botanical)	Family Name	Common Name	Habit
1	*Azadirachta indica*	Meliaceae	Neem, Vembu	Tree
2	*Albiziafalcatoria*	Fabaceae	Tamarind, Puliyamaram	Tree
3	*Polyalthialongifolia*	Annonaceae	Kattumaram	Tree
4	*Borassus Flabellifer*	Arecaceae	Palmyra Palm	Tree

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

TABLE 4.14: GREENBELT DEVELOPMENT PLAN

Year	No. of tress proposed to be planted	Area to be covered in m^2	Name of the species
I	1600	The safety zone along the boundary barrier has been identified to be utilized for Greenbelt development.	Neem, Pongamia Pinnata etc.,

4.6 SOCIO ECONOMIC

4.6.1 Construction Phase

Anticipated Impacts:

♣ No. of people will get employment during the construction stage resulting in the ancillary development and growth. Nearby Local people will be given preference for employment on the basis of their skill and experience.

♣ Further due to proposed project, influx of working community will also generate an indirect employment through development of nearby market/ shops, trade centers, activities, transportation etc.

♣ Population influx during the construction phase can introduce various water and vector borne diseases which can lead to various unhygienic health problems in the area by disturbing the existing sanitation infrastructure.

♣ Rapid diverse population influx at the project site can create unusual behavioural activity such as worker-community conflicts, increase violence such as theft/ stabbing, and increased consumption of drugs/alcohol within the area.

♣ Impacts on the health of nearby villagers can be envisaged due to the transportation activities leading to short term exposure of fugitive dust, resulting in various acute diseases such as increased eye irritation, nausea, headache etc.

4.6.2 Mitigation measures:

♣ Deploying of mobile toilets or the construction of temporary toilets will be done near to the construction site with the adequate water supply.

♣ Awareness programme will be conducted before the monsoon season regarding the spread of water borne/ vector diseases.

♣ Mosquito repellents will be provided in the nearby villages and at construction site to avoid the spread of diseases.

♣ To overcome behavioural impact, proper site in charge with timely supervision will be done. In advance, facilities with equipped medical and safety services will be provided to take a control over the incident/violence if any caused.

♣ To overcome behavioural impact, supervision will be done by site in charge. In advance, emergency cell will be formed with fully equipped communication system, medical and safety services to take control over the incident/violence caused.

4.6.3 Operation Phase:

Anticipated Impacts:

♣ Long term exposure to the pollutants such as PM, SO2 and NO2 Cement dust have a potential to create health impacts such as risk of cardiovascular and respiratory disease, eye irritation, bronchitis, lung damage, increased heart ailments, etc.

♣ Other impacts, associated with the Proposed Rough stone and gravel quarry Project will create a positive impact as it will result in the overall development of the area in respect to the infrastructure development, educational growth, health facilities etc. as a part of the CSR activity.

Mitigation Measures:

♣ In order to mitigate the long-term health impacts, efficient Air Pollution Control Equipment (APCE) like Bag House / Bag Filter / ESP will be installed at all major stacks to keep the emissions within the permissible limits. To reduce the gaseous emission, Pyro-process itself acts as a long SO2 scrubber and De - NOx system will be installed for fuel burning along with calciner for low NOx formation. To reduce fugitive emission from vehicles and machineries will be regularly monitored and maintained.

♣ For emergency, proposed to develop an occupational health center for its employees and nearby villagers.

4.6.4 Impact Evaluation:

Table 4.15 Impact Evaluation

Impact Evaluation Element	Impact on socio economics due to the Proposed project Thiru. T.Naveen Kiran Rough Stone and Gravel quarry 2.83.4Ha, Ichipatti Village, Palladam Taluk, Tiruppur District.
Potential Effect/ Concern	Proposed project will provide direct & indirect employment opportunities to the local residents, which will help to increase their earning and better living standard as well as further up-liftment of socio-economic status of the area.
Characteristics of Impacts	

Nature	Positive		Nagative	Netural
	✓			
Type	Direct	Indirect	Cumulative	
Extent	Project area	Local	Zonal	Regional
	✓			
Duration	Short time		Long term	
			✓	
Intensity	Low		Medium	High
			✓	
Frequency	Remote (R)	Occasional (O)	Periodic (P)	Continuous (C)
				✓
Significance of Impact				
Significance	Insignificant	Minor	Moderate	Major
			✓	

4.7 OCCUPATIONAL HEALTH AND SAFETY

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

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

4.7.1 Respiratory Hazards

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

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

4.7.2 Noise

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

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

4.7.3 Physical Hazards

The following measures are proposed for control of physical hazards

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

4.7.4 Occupational Health Survey

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

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

Essential medicines will be provided at the site. The medicines and other test facilities will be provided at free of cost. The first aid box will be made available at the mine for immediate treatment. First aid training will be imparted to the selected employees regularly. The lists of first aid trained members shall be displayed at strategic places.

4.8 MINE WASTE MANAGEMENT

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

4.9 MINE CLOSURE

The ultimate depth of the mine is 45m bgl and the life of the mine is 5years, after completion of mining operation the following action will be taken in the project site as a part of Mine closure plan

- The total Mined out land would be around 2.70.0Ha this land will be converted into temporary water reservoir which will facilitate to collect the rain water
- The stagnant water will be supplied to the nearby agriculture land during drought seasons
- Fencing will be re constructed around the pit after closure, the warning/ danger display board will be placed on all the sides of the project site
- The un utilized area and haul roads will be converted as plantation area, fruit bearing trees will be planted to retain the eco system of the area
- Final Mine closure plan will be prepared and submitted to the concerned authority

Mine closure plan is the most important environmental requirement in mining project. The mine closure plan should cover technical, environmental, social, legal and financial aspects dealing with progressive and post closure activities. The closure operation is a continuous series of activities starting from the decommissioning of the project.

As progressive mine closure is a continuous series of activities, it is obvious that the proposals of scientific mining have included most of the activities to be included in the closure plan. While formulating the closure objectives for the site, it is important to consider the existing or the pre-mining land use of the site; and how the operation will affect this activity.

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

- To create a productive and sustainable after-use for the site, acceptable to mine owners, regulatory agencies, and the public

- To protect public health and safety of the surrounding habitation
- To minimize environmental damage
- To conserve valuable attributes and aesthetics
- To overcome adverse socio-economic impacts.

4.9.1 Mine Closure Criteria

The criteria involved in mine closure are discussed below:

4.9.1.1 Physical Stability

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

4.9.1.2 Chemical Stability

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

4.9.1.3 Biological Stability

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

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

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

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

5. ANALYSIS OF ALTERNATIVES (TECHNOLOGY AND SITE)

5.0 INTRODUCTION

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

5.1 FACTORS BEHIND THE SELECTION OF PROJECT SITE

The surrounding areas already undergone quarrying operation, there are 4-5 Crushers within the radius of 1km. Most of the quarries in the regions are Existing quarries. Hence this quarry will feed the rough stone material to the crushing units.

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

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

5.2 ANALYSIS OF ALTERNATIVE SITE

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

5.3 FACTORS BEHIND SELECTION OF PROPOSED TECHNOLOGY

The existing quarries in the area operated by Opencast Mechanised Mining operation with drilling and blasting method will be used to extract Rough Stone in the area. All the applied mining lease areas have following advantages –

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

5.4 ANALYSIS OF ALTERNATIVE TECHNOLOGY

Open cast mechanized method has been selected for these projects. This technology is having least gestation period, economically viable, safest and less labour intensive. The method has inbuilt flexibility for increasing or decreasing the production as per market condition.

6. ENVIRONMENTAL MONITORING PROGRAMME

6.0 GENERAL

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

6.1 METHODOLOGY OF MONITORING MECHANISM

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

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

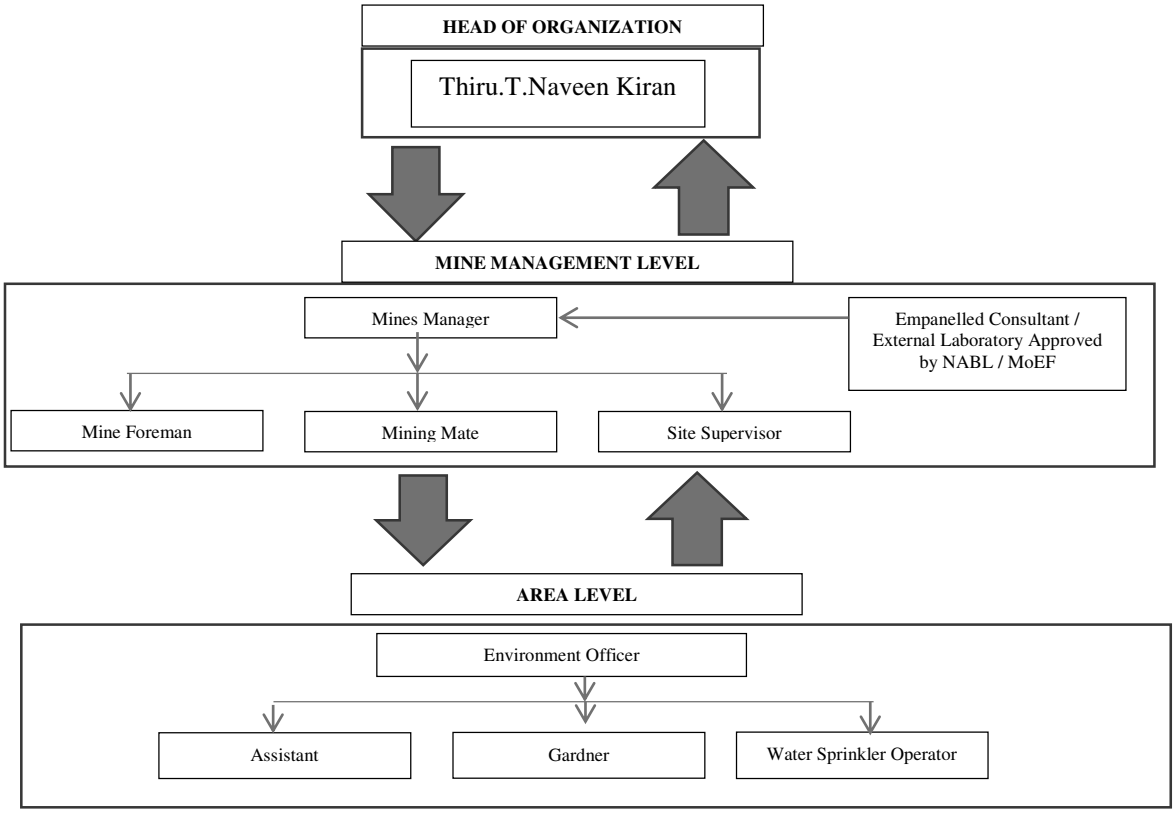
The responsibilities of this cell will be:

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

The environmental monitoring cell will co-ordinate all monitoring programs at site and data thus generated will be regularly furnished to the State regulatory agencies as compliance status reports. The sampling and analysis report of the monitored environmental attributes will be submitted to the Tamil Nadu Pollution Control Board (TNPCB) at a frequency of half-yearly and yearly by each proposed project proponent. The half-yearly reports are submitted to Ministry of Environment and Forest, Regional Office and SEIAA as well.

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

FIGURE 6.1: PROPOSED ENVIRONMENTAL MONITORING CELL



6.2 IMPLEMENTATION SCHEDULE OF MITIGATION MEASURES

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

TABLE 6.1 IMPLEMENTATION SCHEDULE

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

6.3 MONITORING SCHEDULE AND FREQUENCY

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

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

The details of monitoring are detailed in Table 6.2

TABLE 6.2: PROPOSED MONITORING SCHEDULE POST EC

S.No.	Environment Attributes	Location	Monitoring		Parameters
			Duration	Frequency	
1	Air Quality	2 Locations (1 Core & 1 Buffer)	24 hours	Once in 6 months	Fugitive Dust, $PM_{2.5}$, PM_{10}, SO_2 and NO_x.
2	Meteorology	At mine site before start of Air Quality Monitoring & IMD Secondary Data	Hourly / Daily	Continuous online monitoring	Wind speed, Wind direction, Temperature, Relative humidity and Rainfall
3	Water Quality Monitoring	2 Locations (1 SW & 1 GW)	-	Once in 6 months	Parameters specified under IS:10500, 1993 & CPCB Norms
4	Hydrology	Water level in open wells in buffer zone around 1 km at specific wells	-	Once in 6 months	Depth in bgl
5	Noise	2 Locations (1 Core & 1 Buffer)	Hourly – 1 Day	Once in 6 months	L eq, L max, L min, L eq Day & L eq Night
6	Vibration	At the nearest habitation (in case of reporting)	–	During blasting Operation	Peak Particle Velocity
7	Soil	2 Locations (1 Core & 1 Buffer)	–	Once in six months	Physical and Chemical Characteristics
8	Greenbelt	Within the Project Area	Daily	Monthly	Maintenance

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

6.4 BUDGETARY PROVISION FOR EMP

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

The proposed capital cost for Environmental Monitoring Programme is Rs 76,000/- and the recurring cost is Rs 3,80,000/- per annum for each Proposed Project.

TABLE 6.3 ENVIRONMENT MONITORING PROGRAM BUDGET

Sl.No.	Parameter	Capital Cost	Recurring Cost per annum
1	Air Quality	Rs. 76,000/-	Rs. 3,80,000/-
2	Meteorology		
3	Water Quality		
4	Hydrology		

5	Soil Quality		
6	Noise Quality		
7	Vibration Study		
Total		**Rs 76,000/-**	**Rs 3,80,000/-**

Source: Approved Mining Plan

6.5 REPORTING SCHEDULES OF MONITORED DATA

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

Periodical reports to be submitted to: -

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

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

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

7. ADDITIONAL STUDIES

7.0 GENERAL

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

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

7.1. PUBLIC CONSULTATION

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

7.2 RISK ASSESSMENT

The methodology for the risk assessment has been based on the specific risk assessment guidance issued by the Directorate General of Mine Safety (DGMS), Dhanbad, vide Circular No.13 of 2002, dated 31st December, 2002. The DGMS risk assessment process is intended to identify existing and probable hazards in the work environment and all operations and assess the risk levels of those hazards in order to prioritize those that need immediate attention. Further, mechanisms responsible for these hazards are identified and their control measures, set to timetable are recorded along with pinpointed responsibilities.

The whole quarry operation will be carried out under the direction of a Qualified Competent Mine Manager holding certificate of competency to manage a metalliferous mine granted by the DGMS, Dhanbad for all proposed projects. Risk Assessment is all about prevention of accidents and to take necessary steps to prevent it from happening.

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

TABLE 7.1 RISK ASSESSMENT& CONTROL MEASURES

S. No	Risk factors	Causes of risk	Control measures
1	Accidents due to explosives and heavy mining machineries	Improper handling and unsafe working practice	All safety precautions and provisions of Mine Act, 1952, Metalliferous Mines Regulation, 1961 and Mines Rules, 1955 will be strictly followed during all mining operations; Workers will be sent to the Training in the nearby Group Vocational Training Centre Entry of unauthorized persons will be prohibited; Fire-fighting and first-aid provisions in the mine office complex and mining area; Provisions of all the safety appliances such as safety boot, helmets, goggles etc. will be made available to the employees and regular check for their use

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

7	Failure of Mine Benches and Pit Slope	Slope geometry, Geological structure	Ultimate or over all pit slope shall be below 60° and each bench height shall be 5m height.

Source: Analysed and Proposed by FAE & EC

7.3 DISASTER MANAGEMENT PLAN

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

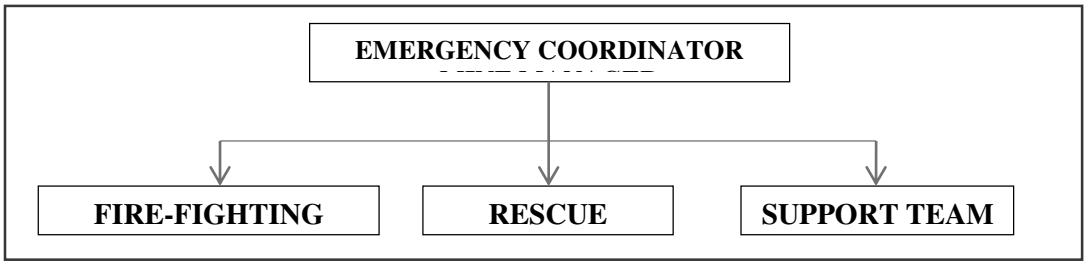
The Disaster Management Plan is aimed to ensure safety of life, protection of environment, protection of installation, restoration of production and salvage operations in this same order of priorities.

The objective of the Disaster Management Plan is to make use of the combined resources of the mine and the outside services to achieve the following:

- Rescue and medical treatment of casualties;
- Safeguard other people;
- Minimize damage to property and the environment;
- Initially contain and ultimately bring the incident under control;
- Secure the safe rehabilitation of affected area; and
- Preserve relevant records and equipment for the subsequent inquiry into the cause and circumstances of the emergency.

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

FIGURE 7.1: DISASTER MANAGEMENT TEAM LAYOUT



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

TABLE 7.2: PROPOSED TEAMS TO DEAL WITH EMERGENCY SITUATION

DESIGNATION	QUALIFICATION
FIRE-FIGHTING TEAM	
Team Leader/ Emergency Coordinator (EC)	Mines Manager
Team Member	Mines Foreman
Team Member	Mining Mate

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

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

Roles and responsibilities of emergency team –

(a) Emergency coordinator (EC)

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

(b) Incident controller (IC)

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

(c) Communication and advisory team

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

(d) Roll call coordinator

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

(e) Search and rescue team

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

(f) Emergency security controller

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

Emergency control procedure –

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

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

Proposed fire extinguishers at different locations –

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

TABLE 7.3: PROPOSED FIRE EXTINGUISHERS AT DIFFERENT LOCATIONS

LOCATION	TYPE OF FIRE EXTINGUISHERS
Electrical Equipment's	CO_2 type, foam type, dry chemical powder type
Fuel Storage Area	CO_2 type, foam type, dry chemical powder type, Sand bucket
Office Area	Dry chemical type, foam type

Alarm system to be followed during disaster –

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

7.4 CUMULATIVE IMPACT STUDY

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

TABLE 7.4: LIST OF QUARRIES WITHIN 500 METER RADIUS

PROPOSED QUARRIES					
Code	**Name of the Owner**	**Village**	**S.F. Nos**	**Extent in Ha**	**Status**
P1	Thiru.T.Naveen Kiran	Ichipatti	207/2A	2.83.4	File No.11252 TOR Identification No. TO24B0108TN5875455N Dated:22.10.2024
P2	Thiru.S. A. Ramachandran	Ichipatti	220/1A,223/2F	3.21.5	Public Hearing Completed
	TOTAL EXTENT			**6.04.9**	
EXISTING QUARRIES					
Code	**Name of the Owner**	**Village**	**S.F. Nos**	**Extent in Ha**	**Status**
E-1	C.Rakkiappan	Ichipatti	216/2B2	0.81.0	16.12.2021 to 15.12.2026
E-2	M.Muthurathinam	Ichipatti	215/4,3A	1.81.5	28.02.2022 to 27.02.2027
E-3	M.Lakshmanasamy	Ichipatti	203/2,204/3	1.21.45	10.01.2022 to 09.01.2027
E-4	V.Velmurugan	Ichipatti	213/1A,214/2	1.66.5	05.11.2020 to 04.11.2025
E-5	S.P.Palanisamy	Ichipatti	221/1B,223/2E2	1.87.5	07.03.2022 to 06.03.2027
E-6	.V.Velmurugan	Ichipatti	203/4(P)	1.21.0	08.03.2022 to 07.03.2027
E-7	M.Thangavel	Ichipatti	208/1,2,3	1.52.0	11.05.2022 to 10.05.2027
E-8	S.Balakumar	Ichipatti	197/1,2,10,11, 201/2	1.15.5	29.01.2024 to 28.01.2029
	TOTAL EXTENT			**11.26.45**	
ABANDONED / EXPIRED QUARRIES					
Code	**Name of the Owner**	**Village**	**S.F. Nos**	**Extent in Ha**	**Status**
Ex-1	C. Thangaraj	Ichipatti	207/1A(P)	1.92.0	13.10.2017-12.10.2022
	TOTAL EXTENT			**1.92.0**	
	TOTAL CLUSTER EXTENT			**17.31.35Ha**	

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

TABLE 7.5: SALIENT FEATURES OF PROPOSAL "P1"

Name of the Project	Thiru. T.Naveen Kiran Rough stone and Gravel quarry	
S.F. No.	**207/2A**	
Extent	2.83.4 ha	
Village Taluk and District	Ichipatti Village, Palladam Taluk, Tiruppur District.	
Land Type	Proponent own patta land	
Land Ownership	It is a Patta lands. Registered in the name of the applicant (Thiru.T.Naveen Kiran), vide Patta Nos. 3110	
Toposheet No	58 - E/04	
Latitude between	**11° 03' 26.39"N to 11° 03' 31.48"N**	
Longitude between	**77° 12' 03.41"E to 77° 12' 13.44"E**	
Elevation of the area	375m(Max) AMSL	
Lease period	10 Years	
Mining Plan period	5 years	
Proposed Depth of Mining	37m Bgl	
	Rough Stone in m^3	Gravel m^3
Geological Resources	9,91,900	56,680
Mineable Reserves	4,38,060	44,520
Year wise Production First Five Years	2,90,640	44,520
Year wise Production Second Five Years	1,47,420	-
Peak Production	66,090	15,960
Ultimate Pit Dimension	265m(L) x 84m(W) x 37m(D) Bgl	
Water Level in the region	64-68 m bgl	
Method of Mining	Opencast Mechanized Mining Method involving small drilling and Controlled blasting using Slurry Explosives	
Topography	The lease applied area is situated in flat terrain. The area has gentle sloping towards North-eastern side. The altitude of the area is 375m (max) above Mean Sea level. The area is covered by gravel having an average thickness of 2m and followed by Massive Charnockite Which is clearly inferred from the adjacent existing quarry pit	
Machinery proposed	Jack Hammer	8 Nos
	Compressor	2 Nos
	Excavator with Bucket and Rock Breaker	2 No
	Tippers	3 Nos
Blasting Method	Controlled Blasting Method by shot hole drilling and small dia of 25mm slurry explosive are proposed to be used for shattering and heaving effect for removal and winning of Rough Stone. No deep hole drilling is proposed.	
Proposed Manpower Deployment	35 Nos	
Project Cost	Rs.1,83,23,000/-	
EMP Cost	Rs. 7,60,000/-	
Total Project cost	Rs. 1,90,83,000/-	
CER Cost	Rs. 5,00,000/-	
Nearby Water Bodies	Vaikkal	210m_N
	Odai	480m- NW
	Samalpuram Lake	1.5km – North

	Noyyal River	2km – North West
	Sendevipalayam Dam	3.7km – North West
Greenbelt Development Plan	Proposed to plant 1420Nos of trees considering 500 Nos of trees/ Ha criteria The plantation will be developed around the project site and nearby village roads	
Proposed Water Requirement	2.4 KLD	
Nearest Habitation	640m – South West	
Nearest Reserve Forest	Boluvampatti R.F – 31.5 km – South West	
Nearest Wild Life Sanctuary	Nanjarayan bird Sanctuary – 21km – NE Sathiyamangalam Tiger Reserve- 46km NW	

TABLE 7.5: SALIENT FEATURES OF PROPOSAL "P2"

Name of the Project	Thiru. S.A. Ramachandran Rough stone and Gravel quarry		
S.F. No.	**220/1A, 220/1C & 223/2F**		
Extent	3.21.5 ha		
Village Taluk and District	Ichipatti Village, Palladam Taluk, Tiruppur District.		
Land Type	Proponent own patta land		
Land Ownership	It is a Patta lands. Registered in the name of the applicant (Thiru. S.A. Ramachandran), vide Patta Nos. 1611 & 1365.		
Existing quarry operation	Lessee Name – Thiru. S. A. Ramachandran Lease Period: 23.09.2016 to 22.09.2021 **S.F.Nos: 220/1A & 223/2F** Extent: 2.02.5 Ha Rc.No. 430/Mines/2015, Dated: 23.09.2016 Lease Period: 23.09.2016 to 22.09.2021 EC: SEIAA-TN/F.No.5480/1(a)/EC. No:3543/2016, Dated: 10.08.2016 **S.F.No: 220/1C** Extent: 1.19.0Ha Rc.No. 41/Mines/2016, Dated: 23.09.2016 EC: SEIAA-TN/F.No.5481/1(a)/EC. No:3541/2016, Dated: 10.08.2016		
Explosive certificate	Selva Nandhini Explosives and Chemicals Licence No-E/SC/TN/22/654(E85920)		
Toposheet No	58 - E/04		
Latitude between	**11° 03' 16.64"N to 11° 03' 24.76"N**		
Longitude between	**77° 11' 53.17"E to 77° 12' 00.98"E**		
Elevation of the area	355m(Max) AMSL		
Lease period	5 Years		
Mining Plan period	5 years		
Proposed Depth of Mining	45m Bgl		
	Rough Stone in m^3	Weathered Rock in m^3	Gravel m^3
Geological Resources	6,62,765	9,162	6,108
Mineable Reserves	2,57,985	4,611	3,584
Year wise Production	2,57,985	4,611	3,584
Peak Production	53,850	4,611	3,584
Ultimate Pit Dimension	Pit I: 202m(L) x 158m(W) x 45m(D) Bgl Pit II: 65m(L) x 42m(W) x 30m(D) Bgl		
Existing Pit Dimension	Pit I: 202m(L) x 158m(W) x 30m(D) Bgl Pit II: 65m(L) x 42m(W) x 21m(D) Bgl		
Water Level in the region	58-62 m bgl		
Method of Mining	Opencast Mechanized Mining Method involving small drilling and Controlled blasting using Slurry Explosives		

Topography	The lease applied area is exhibits plain topography. The area has gentle sloping towards Northeastern side. The altitude of the area is 355m (max) above Mean Sea level. The area is covered by 2m thickness of Gravel formation and 3m of Weathered Rock. Massive Charnockite is found after 5m (2m Gravel + 3m Weathered Rock) which is clearly inferred from the existing quarry pits.	
Machinery proposed	Jack Hammer	6 Nos
	Compressor	2 Nos
	Excavator with Bucket and Rock Breaker	1 No
	Tippers	3 Nos
Blasting Method	Controlled Blasting Method by shot hole drilling and small dia of 25mm slurry explosive are proposed to be used for shattering and heaving effect for removal and winning of Rough Stone. No deep hole drilling is proposed.	
Proposed Manpower Deployment	28 Nos	
Project Cost	Rs.70,21,000/-	
EMP Cost	Rs. 3,80,000/-	
Total Project cost	Rs. 74,01,000/-	
CER Cost	Rs. 5,00,000/-	
Nearby Water Bodies	Odai	320m_NW
	Samalapuram Lake	1.6Km_N
	Noyyal River	2.5Km_NW
	Sulur Lake	7.6Km_SW
	Kowshika River	9.2Km_NE
Greenbelt Development Plan	Proposed to plant 1600Nos of trees considering 500 Nos of trees/ Ha criteria. The plantation will be developed around the project site and nearby village roads	
Proposed Water Requirement	1.4 KLD	
Nearest Habitation	350m – South West	
Nearest Reserve Forest	Thadagam Block IV R.F – 32.0 km - West	
Nearest Wild Life Sanctuary	Sathiyamangalam Tiger Reserve – 46.0km - NW	

Source: Approved Mining Plan

TABLE 7.10: SALIENT FEATURES OF PROPOSAL "E1"

Name of the Project	Thiru.C. Rakkiappan Rough stone and Gravel quarry	
EC granted	Lr.No. SEIAA-TN/F.No.7215/EC.No: 4912/2020 dated: 03.11.2021	
S.F. No.	216/2B2	
Extent	0.81.0 ha	
Village Taluk and District	Ichipatti Village, Palladam Taluk, Tiruppur District.	
Land Type	Proponent own patta land	
Land Ownership	It is a Patta land, registered name of the (Thiru.C. Rakkiappan) vide patta No 1866.	
Existing quarry operation	It is a fresh lease application.	
Toposheet No	58 - E/04	
Latitude between	11° 03' 04.01"N to 11° 03' 08.73"N	
Longitude between	77° 12' 02.14"E to 77°12' 04.27"E	
Elevation of the area	355m AMSL	
Lease period	5 Years	
Mining Plan period	5 years	
Proposed Depth of Mining	22m Bgl	
	Rough Stone in m^3	Gravel m^3
Approved Quantity	40,900 m^3	7,410 m^3
Ultimate Pit Dimension	95m(L) x 39m(B) x 22m(D) Bgl	
Water Level in the region	50-45 m bgl	

Method of Mining	Opencast Mechanized Mining Method involving small drilling and Controlled blasting using Slurry Explosives	
Topography	The lease applied area is a Plain terrain. The area has gentle sloping towards North-eastern side and altitude of the area is 362m (max) above from Mean Sea level. The area is covered by 2m thickness of Gravel, 3m thickness of weathered rock and followed by Massive Charnockite which is found after 3m(Gravel) which is clearly inferred from the existing quarry pits.	
Machinery proposed	Jack Hammer	2Nos
	Compressor	1 No
	Excavator with Bucket and Rock Breaker	1Nos
	Tipper	1 Nos
Blasting Method	Controlled Blasting Method by shot hole drilling and small dia of 25mm slurry explosive are proposed to be used for shattering and heaving effect for removal and winning of Rough Stone. No deep hole drilling is proposed.	
Proposed Manpower Deployment	12Nos	
Project Cost	Rs. 53,86,825/-	
EMP Cost	Rs. 3,80,000/-	
Total Project cost	Rs. 57,66,825/-	
CER Cost	Rs. 5,00,000/-	
Greenbelt Development Plan	Proposed to plant 400Nos of trees considering 500 Nos of trees/ Ha criteria The plantation will be developed around the project site and nearby village roads.	
Proposed Water Requirement	2.3 KLD	
Nearest Habitation	365m-SW	

Source: Approved Mining Plan

TABLE 7.9: SALIENT FEATURES OF PROPOSAL "E2"

Name of the Project	Thiru.M. Muthurathinam Rough stone and Gravel quarry	
EC granted	Lr.No. SEIAA-TN/F.No.7981/EC. No:4956/2020 dated: 28.01.2022	
S.F. No.	215/4A, 3A	
Extent	1.81.5 ha	
Village Taluk and District	Ichipatti Village, Palladam Taluk, Tiruppur District.	
Land Type	Proponent own patta land	
Land Ownership	It is a Patta land, registered name of the (R.Gowri @ Baby) Vide patta No 1516	
Existing quarry operation	It is a fresh lease application but, the applied area has been considered quarrying operation earlier. The quarry lease was first granted in favour of Thiru. M. Muthurathinam, S/o. Mayilsamy, over an extent of 1.81.5 hectares of Patta lands in S.F.No's. 215/4 & 215/3A of Ichipatti village, Palladam Taluk, Tiruppur District vide Rc.No. 751/Mines/2010, dated: 17.12.2010 for the period of five years from 17.12.2010 to 16.12.2015 for quarrying of Rough stone and Gravel. The quarry lease was Second time granted in favour of Thiru. M. Muthurathinam, S/o. Mayilsamy, over an extent of 1.81.5 hectares of Patta lands in S.F.No's. 215/4 & 215/3A of Ichipatti Village, Palladam Taluk, Tiruppur District vide Rc.No.177/Mines/2015, dated 31.12.2015 for the period of five years form 09.01.2016 to 08.01.2021 for quarrying of Rough stone and Gravel. Now the lessee has applied a quarry lease on 23.03.2020 for the period of five years over an extent of 1.81.5ha.	
Toposheet No	58 - E/04	
Latitude between	11°03'04.53"N to 11°03'10.68"N	
Longitude between	77°12'04.89"E to 77°12'10.58"E	
Elevation of the area	363m AMSL	
Lease period	5 Years	
Mining Plan period	5 years	
Proposed Depth of Mining	32m Bgl	
	Rough Stone in m^3	Gravel m^3

Approved Quantity	59,525 m^3	20,480 m^3
Ultimate Pit Dimension	116m(L) x 108m(B) x 47m(D) Bgl	
Existing Pit Dimension	125m(L) x 90m(B) x 18m(D) Bgl	
Water Level in the region	62-58m bgl	
Method of Mining	Opencast Mechanized Mining Method involving small drilling and Controlled blasting using Slurry Explosives	
Topography	The lease applied area is exhibits Flat topography. The area has gentle sloping towards Eastern side. The altitude of the area is 363m (max) above Mean Sea level. The area is covered by 2m thickness of Gravel formation. Massive Charnockite is found after 2m (Gravel formation) which is clearly inferred from the existing quarrying pit.	
Machinery proposed	Jack Hammer	2Nos
	Compressor	1 No
	Excavator with Bucket and Rock Breaker	1Nos
	Tipper	1 Nos
Blasting Method	Controlled Blasting Method by shot hole drilling and small dia of 25mm slurry explosive are proposed to be used for shattering and heaving effect for removal and winning of Rough Stone. No deep hole drilling is proposed.	
Proposed Manpower Deployment	14 Nos	
Project Cost	Rs. 41,59,000/-	
EMP Cost	Rs. 3,80,000/-	
Total Project cost	Rs. 45,39,000/-	
CER Cost	Rs. 5,00,000/-	
Greenbelt Development Plan	Proposed to plant 910 Nos of trees considering 500 Nos of trees/ Ha criteria The plantation will be developed around the project site and nearby village roads	
Proposed Water Requirement	3.73 KLD	
Nearest Habitation	310m-SE	

Source: Approved Mining Plan

TABLE 7.9: SALIENT FEATURES OF PROPOSAL "E3"

Name of the Mine	M. Lakshmanasamy Rough stone and gravel quarry	
Toposheet No	58-E/04	
Latitude Between	11°03′36.26″N to 11°03′40.56″N	
Longitude Between	77°12′13.39″E to 77°12′18.06″E	
Highest Elevation	358m from AMSL	
Proposed Depth of Mining	39m	
Water Level in the surrounds area	56 – 52 m bgl	
Method of Mining	Opencast Mechanized Mining Method involving drilling and blasting	
Topography	The lease applied area is exhibits plain terrain. The area has gentle sloping towards Northeastern side. The altitude of the area is 358m above MSL.The area is covered by the 2m Gravel formation.2m thickness of weathered Gravel and followed by Massive Charnockite which is clearly inferred from the existing quarry pits.	
Machinery Proposed	Jack Hammer	4
	compressor	1
	Hydraulic Excavator	1
	Tippers	2
Proposed Blasting Method	Controlled Blasting Method by shot hole drilling and small dia of 25mm slurry explosive are proposed to be used for shattering and heaving effect	

	for removal and winning of Rough Stone. No deep hole drilling is proposed.	
Manpower Proposed	20 Nos	
Mining Plan Period / Lease Period	5Years	
Ultimate Pit Dimension	105m(length) 86m(width) 39m(depth)	
Nearby Water Bodies	Noyyal River	2.5Km North western side.
	Odai	600m - North western side
	Samalapuram Lake	1.30Km-North side.
Project Cost	Rs. 37,18,100	
CER Cost @ 2% of Project Cost	Rs74,362	
EMP cost	Rs. 3,80,000/-	
Greenbelt Development Plan	Proposed to plant 200 trees in 1,870Sq.m area in the 7.5 m Safety Zone	
Proposed Water Requirement	3.5KLD	
Nearest Habitation	Pethamuchipalayam – 1.0Km-NE	
	Rough Stone	**Gravel**
Geological Resources in m^3	4,25,075	48,580
Mineable Reserves in m^3	96,600	33,128

Source: Approved Mining Plan

TABLE 7.9: SALIENT FEATURES OF PROPOSAL "E4"

SALIENT FEATURES OF PROPOSAL "E6"		
Name of the Mine	V.Velmurugan Rough stone and gravel quarry	
Survey Nos	213/1A &214/2	
Land Type	Patta land	
Extent	1.66.5Ha	
Mining Plan Period / Lease Period	5 years	
Ultimate Pit Dimension	Pit -127m(length) 86m(width) 22m(depth)	
Latitude between	11°03′12.04″N to 11°03′05.78″N	
Longitude between	77°11′14.52″E to 77°12′09.92″E	
Highest Elevation	360m from MSL	
Machinery Proposed	Jack Hammer	2
	Compressor	1
	Hydraulic Excavator	1
	Tippers	1
Proposed Blasting Method	Controlled blasting	
Manpower Proposed	11	
Total Project Cost	46,00,000	

Source: Approved Mining Plan

TABLE 7.7: SALIENT FEATURES OF PROPOSAL "E5"

Name of the Project	Thiru.S.P. Palanisamy Rough stone and Gravel quarry
EC granted	Lr.No.SEIAA-TN/F.No.6923/EC.No: 4911/2020 dated: 03.11.2021
Explosive certificate	Selva Nandhini Explosives and Chemicals Licence No-E/SC/TN/22/654(E85920)
S.F. No.	221/1B, 223/2E2
Extent	1.87.5 ha
Village Taluk and District	Ichipatti Village, Palladam Taluk, Tiruppur District.

Land Type	Proponent own patta land	
Land Ownership	It is a Patta land. Registered in the name of applicant (S.P. Palanisamy), vide Patta No.1191.	
Existing quarry operation	It is a fresh application; the area has been quarrying in earlier.	
Toposheet No	58 - E/04	
Latitude between	11°03'23.67"N to 11°03'29.41"N	
Longitude between	77°11'55.84"E to 77°12'03.60"E	
Elevation of the area	356m AMSL	
Lease period	5 Years	
Scheme of Mining period	5 years	
Depth of Mining	37m	
	Rough Stone in m^3	Gravel m^3
Approved Quantity	181905m^3	10794m^3
Ultimate Pit Dimension	Pit I : 130m(L) x 16m(B) x 12m(D) below ground level Pit II : 140m(L) x 81m(B) x 42m(D) below ground level	
Water Level in the region	50-45 m bgl	
Method of Mining	Opencast Mechanized Mining Method involving small drilling and Controlled blasting using Slurry Explosives	
Topography	The lease applied area is exhibits Plain topography. The area has gentle sloping towards Northeastern side. The altitude of the area is 356m (Max) above Mean sea level. The area is covered by the Gravel formation. The Gravel formation is about 2.0m. Massive charnockite is found after 2.0m (Gravel formation) which is clearly inferred from the existing quarrying pits.	
Machinery proposed	Jack Hammer	4Nos
	Compressor	1 No
	Excavator with Bucket and Rock Breaker	1Nos
	Tippers	2 Nos
Blasting Method	Controlled Blasting Method by shot hole drilling and small dia of 25mm slurry explosive are proposed to be used for shattering and heaving effect for removal and winning of Rough Stone. No deep hole drilling is proposed.	
Proposed Manpower Deployment	20Nos	
Project Cost	Rs. 64,36,945	
EMP Cost	Rs. 3,80,000/-	
Total Project cost	Rs. 68,16,945	
CER Cost	Rs. 5,00,000/-	
Greenbelt Development Plan	Proposed to plant 950Nos of trees considering 500 Nos of trees/ Ha criteria The plantation will be developed around the project site and nearby village roads	
Proposed Water Requirement	3.73 KLD	
Nearest Habitation	580m-W	

Source: Approved Mining Plan

TABLE 7.7: SALIENT FEATURES OF PROPOSAL "E6"

Name of the Mine	V. Velmurugan Rough stone and gravel quarry
Toposheet No	58-E/04
Latitude Between	11°03'36.47"N to 11°03'42.22"N
Longitude Between	77°12'20.90"E to 77°12'23.64"E
Highest Elevation	352m from AMSL
Proposed Depth of Mining	27m
Water Level in the surrounds area	62– 58m bgl

Method of Mining	Opencast Mechanized Mining Method involving drilling and blasting	
Topography	The lease applied area is exhibits elevated terrain. The area has gentle sloping towards northeastern side. The altitude of area is 352m (Max) above mean sea level.the area covered by gravel which is about 2.0m thickness. Massive charnockite is found after 2.0m (Gravel formation) which is clearly inferred from the nearby existing quarrying pits.	
Machinery Proposed	Jack Hammer	3
	compressor	1
	Hydraulic Excavator	1
	Tippers	2
Proposed Blasting Method	Controlled Blasting Method by shot hole drilling and small dia of 25mm slurry explosive are proposed to be used for shattering and heaving effect for removal and winning of Rough Stone. No deep hole drilling is proposed.	
Manpower Proposed	16Nos	
Mining Plan Period / Lease Period	5Years	
Ultimate Pit Dimension	146m(length) 66m(width) 27m(depth)	
Project Cost	Rs52,52,000	
CER Cost @ 2% of Project Cost	Rs 1,05,040	
EMP cost	Rs. 3,80,000/-	
Greenbelt Development Plan	Proposed to plant 150 trees in 1,530Sq.m area in the 7.5 m Safety Zone	
Proposed Water Requirement	2.0KLD	
Nearest Habitation	Ayyampalayam – 1.0Km-NE	
	Rough Stone	**Gravel**
Geological Resources in m^3	3,02,500	24,200
Mineable Reserves in m^3	1,03,500	17,058

Source: Approved Mining Plan

TABLE 7.6: SALIENT FEATURES OF PROPOSAL "E7"

Name of the Project	Thiru.M. Thangavel Rough stone and Gravel quarry
EC granted	Lr.No.SEIAA-TN/F.No.6913/l(a)/EC.No: 4957/2021 dated: 02.02.2022
S.F. No.	208/1,2,3
Extent	1.52.0 ha
Village Taluk and District	Ichipatti Village, Palladam Taluk, Tiruppur District.
Land Type	Proponent own patta land
Land Ownership	It is a Patta land. Registered in the name of applicant (Thiru. M. Thangavel), vide Patta No.1537
Existing quarry operation	It is a fresh lease application.
Toposheet No	58 - E/04
Latitude between	11°03'25.40"N to 11°03'28.72"N
Longitude between	77°12'09.91"E to 77°12'17.08"E
Elevation of the area	358m AMSL
Lease period	5 Years
Mining Plan period	5 years
Depth of Mining	32m
Production Quantity	125710m^3 of Roughstone and 16510m^3 of Gravel
Ultimate Pit Dimension	Pit I : 195m(L) x 63m(B) x 37m(D) below ground level
Water Level in the region	45-50 m bgl

Method of Mining	Opencast Mechanized Mining Method involving small drilling and Controlled blasting using Slurry Explosives	
Topography	The lease applied area is exhibits plain terrain. The area has gentle sloping towards Northeastern side. The altitude of the area is 358m (max) above Mean sea level. The area is covered by the Gravel formation which is about 2m thickness. Massive Charnockite is found after 2m (Gravel) which is clearly inferred from the existing quarry pits.	
Machinery proposed	Jack Hammer	4Nos
	Compressor	1 No
	Excavator with Bucket and Rock Breaker	1Nos
	Tippers	2 Nos
Blasting Method	Controlled Blasting Method by shot hole drilling and small dia of 25mm slurry explosive are proposed to be used for shattering and heaving effect for removal and winning of Rough Stone. No deep hole drilling is proposed.	
Proposed Manpower Deployment	18 Nos	
Project Cost	Rs.50,35,040/-	
EMP Cost	Rs. 3,80,000/-	
Total Project cost	Rs.54,15,040/-	
CER Cost	Rs. 5,00,000/-	
Greenbelt Development Plan	Proposed to plant 760Nos of trees considering 500 Nos of trees/ Ha criteria The plantation will be developed around the project site and nearby village roads	
Proposed Water Requirement	4.0 KLD	
Nearest Habitation	800m - E	

Source: Approved Mining Plan

TABLE 7.7: SALIENT FEATURES OF PROPOSAL "E8"

Name of the Mine	Thiru. S. Balakumar Rough Stone and Gravel Quarry	
Toposheet No	58-E/04	
Latitude Between	11°03′27.55″N to 11°03′33.40″N	
Longitude Between	77°12′21.61″E to 77°12′24.56″E	
Highest Elevation	352 m from AMSL	
Proposed Depth of Mining	37 m bgl	
Water Level in the surrounding area	58 – 62 m bgl	
Method of Mining	Opencast Mechanized Mining Method involving drilling and blasting	
Geological Reserves	Rough Stone in m^3	Gravel in m^3
	3,01,995	3,222
Mineable Reserves	Rough Stone in m^3	Gravel in m^3
	37,520	-
Yearwise Production (considering safety parameter)	Rough Stone in m^3	
	32,620	
Topography	The lease applied area is exhibits plain terrain. The area has gentle sloping towards North eastern side. The altitude of the area is 352m above MSL. The area is covered by the 2m Gravel formation followed by Massive Charnockite which is clearly inferred from the existing quarry pits.	
Machinery Proposed	Jack Hammer	1
	compressor	1
	Hydraulic Excavator	1
	Tippers	1
Proposed Blasting Method	Controlled Blasting Method by shot hole drilling and small dia of 25mm slurry explosive are proposed to be used for shattering and heaving effect for removal and winning of Rough Stone. No deep hole drilling is proposed.	

Manpower Proposed	12 Nos	
Ultimate Pit Dimension	160 m (L) * 49 m (W) * 42 m (D)	
Nearby Water Bodies	25m safety distance has been provided to the canal passing in the east side	
	Odai	320m SE
	Odai	880m NW
	Samalapuram Lake	1.5km NW
	Noyyal River	2.5km NW
	Odai	3km East
	Sulur Lake	9.8km SW
Project Cost	Rs. 31,75,000/-	
CER Cost	Rs. 5,00,000/-	
Greenbelt Development Plan	Proposed to plant 700 trees the 7.5 m Safety Zone & Villge Roads	
Proposed Water Requirement	2.0 KLD	
Nearest Habitation	480 m South East	

Source: Approved Mining Plan

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

Air Environment –

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

TABLE 7.11: CUMULATIVE PRODUCTION LOAD OF ROUGH STONE

Quarry	Production for five-year plan period	Per Year Production in m^3	Per Day Production in m^3	Number of Lorry Load Per Day
P1	4,38,060	43,806	146	12
P2	2,57,385	51,477	172	14
Total	**6,95,445**	**95,283**	**318**	**26**
E1	40,900	8,180	27	2
E2	59,525	11,905	40	3
E3	96,600	19,320	64	5
E4	40,900	8,180	27	2
E5	1,81,905	36,381	121	10
E6	1,03,500	20,700	69	6
E7	1,25,710	25,142	84	7
E8	37,520	7,504	25	2
Total	**6,86,560**	**1,37,312**	**457**	**37**
Grand Total	**13,82,005**	**2,32,595**	**775**	**63**

TABLE 7.12: CUMULATIVE PRODUCTION LOAD OF GRAVEL

Quarry	Production for one / three-year plan period	Per Year Production in m^3	Per Day Production in m^3	Number of Lorry Load Per Day
P1	44,520	14,840	49	4
P2	3,584	1,195	4	1
Total	**48,104**	**16,035**	**53**	**5**
E1	7,410	2,470	8	1
E2	20,480	6,827	23	2
E3	33,128	11,043	37	3
E4	6,152	2,051	7	1
E5	10,794	3,598	12	1

E6	17,058	5,686	19	2
E7	16,510	5,503	18	2
E8	-	-	-	-
Total	**1,11,532**	**37,178**	**124**	**12**
Grand Total	**1,59,636**	**53,213**	**177**	**17**

TABLE 7.13: CUMULATIVE PRODUCTION LOAD OF WEATHRED ROCK

Quarry	Production for one year plan period	Per Year Production in m^3	Per Day Production in m^3	Number of Lorry Load Per Day
P2	4,611	4,611	15	1
Total	**4,611**	**4,611**	**15**	**1**

On a cumulative basis considering the proposed quarry, it can be seen that the overall production of Rough Stone is 775m^3 per day and overall production of Gravel is 177 m^3 per day with a capacity of 63Trips of Rough Stone per day and 17 Trips per day of Gravel from the cluster.

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

Based on the above production quantities the emissions due to various activities in all mines includes various activities like ground preparation, excavation, handling and transport of ore. These activities have been analysed systematically basing on USEPA-Emission Estimation Technique Manual, for Mining AP-42, to arrive at possible emissions to the atmosphere and estimated emissions are given in Table 7.14.

TABLE 7.14: EMISSION ESTIMATION FROM CLUSTER QUARRIES WITHIN 500 METER RADIUS

EMISSION ESTIMATION FOR QUARRY "P1"				
	Activity	**Source type**	**Value**	**Unit**
Estimated Emission Rate for PM_{10}	Drilling	Point Source	0.091254631	g/s
	Blasting	Point Source	0.001530696	g/s
	Mineral Loading	Point Source	0.043515527	g/s
	Haul Road	Line Source	0.002494893	g/s/m
	Overall Mine	Area Source	0.060543171	g/s
Estimated Emission Rate for SO_2	Overall Mine	Area Source	0.000877502	g/s
Estimated Emission Rate for NOx	Overall Mine	Area Source	0.000055013	g/s
EMISSION ESTIMATION FOR QUARRY "P2"				
	Activity	**Source type**	**Value**	**Unit**
Estimated Emission Rate for PM_{10}	Drilling	Point Source	0.070151617	g/s
	Blasting	Point Source	0.000410963	g/s
	Mineral Loading	Point Source	0.040018016	g/s
	Haul Road	Line Source	0.002487668	g/s/m
	Overall Mine	Area Source	0.045925490	g/s
Estimated Emission Rate for SO_2	Overall Mine	Area Source	0.00036078	g/s
Estimated Emission Rate for NOx	Overall Mine	Area Source	0.000012684	g/s
EMISSION ESTIMATION FOR QUARRY "E1"				
	Activity	**Source type**	**Value**	**Unit**
Estimated Emission Rate for PM_{10}	Drilling	Point Source	0.079151983	g/s
	Blasting	Point Source	0.000751490	g/s
	Mineral Loading	Point Source	0.041154605	g/s

	Haul Road	Line Source	0.002489449	g/s/m
	Overall Mine	Area Source	0.050311742	g/s
Estimated Emission Rate for SO_2	Overall Mine	Area Source	0.000495456	g/s
Estimated Emission Rate for NOx	Overall Mine	Area Source	0.000021140	g/s
EMISSION ESTIMATION FOR QUARRY "E2"				
Estimated Emission Rate for PM_{10}	**Activity**	**Source type**	**Value**	**Unit**
	Drilling	Point Source	0.035535927	g/s
	Blasting	Point Source	0.000013707	g/s
	Mineral Loading	Point Source	0.038682461	g/s
	Haul Road	Line Source	0.002486083	g/s/m
	Overall Mine	Area Source	0.046209504	g/s
Estimated Emission Rate for SO_2	Overall Mine	Area Source	0.000223263	g/s
Estimated Emission Rate for NOx	Overall Mine	Area Source	0.000008062	g/s
EMISSION ESTIMATION FOR QUARRY "E3"				
Estimated Emission Rate for PM_{10}	**Activity**	**Source type**	**Value**	**Unit**
	Drilling	Point Source	0.060829329	g/s
	Blasting	Point Source	0.000201456	g/s
	Mineral Loading	Point Source	0.038605263	g/s
	Haul Road	Line Source	0.002486005	g/s/m
	Overall Mine	Area Source	0.048980782	g/s
Estimated Emission Rate for SO_2	Overall Mine	Area Source	0.000252885	g/s
Estimated Emission Rate for NOx	Overall Mine	Area Source	0.000010385	g/s
EMISSION ESTIMATION FOR QUARRY "E4"				
Estimated Emission Rate for PM_{10}	**Activity**	**Source type**	**Value**	**Unit**
	Drilling	Point Source	0.049321908	g/s
	Blasting	Point Source	0.000070601	g/s
	Mineral Loading	Point Source	0.035765516	g/s
	Haul Road	Line Source	0.00248395	g/s/m
	Overall Mine	Area Source	0.035201641	g/s
Estimated Emission Rate for SO_2	Overall Mine	Area Source	0.000110276	g/s
Estimated Emission Rate for NOx	Overall Mine	Area Source	0.000002180	g/s
EMISSION ESTIMATION FOR QUARRY "E5"				
Estimated Emission Rate for PM_{10}	**Activity**	**Source type**	**Value**	**Unit**
	Drilling	Point Source	0.085816323	g/s
	Blasting	Point Source	0.001125807	g/s
	Mineral Loading	Point Source	0.041990717	g/s
	Haul Road	Line Source	0.002491073	g/s/m
	Overall Mine	Area Source	0.062836506	g/s
Estimated Emission Rate for SO_2	Overall Mine	Area Source	0.000644729	g/s
Estimated Emission Rate for NOx	Overall Mine	Area Source	0.000044886	g/s
EMISSION ESTIMATION FOR QUARRY "E6"				
Estimated Emission Rate for PM_{10}	**Activity**	**Source type**	**Value**	**Unit**
	Drilling	Point Source	0.070151617	g/s
	Blasting	Point Source	0.000410963	g/s
	Mineral Loading	Point Source	0.040018016	g/s
	Haul Road	Line Source	0.002487668	g/s/m
	Overall Mine	Area Source	0.045925490	g/s
Estimated Emission Rate for SO_2	Overall Mine	Area Source	0.00036078	g/s

Estimated Emission Rate for NOx	Overall Mine	Area Source	0.000012684	g/s
EMISSION ESTIMATION FOR QUARRY "E7"				
Estimated Emission Rate for PM_{10}	**Activity**	**Source type**	**Value**	**Unit**
	Drilling	Point Source	0.079151983	g/s
	Blasting	Point Source	0.000751490	g/s
	Mineral Loading	Point Source	0.041154605	g/s
	Haul Road	Line Source	0.002489449	g/s/m
	Overall Mine	Area Source	0.050311742	g/s
Estimated Emission Rate for SO_2	Overall Mine	Area Source	0.000495456	g/s
Estimated Emission Rate for NOx	Overall Mine	Area Source	0.000021140	g/s
EMISSION ESTIMATION FOR QUARRY "E8"				
Estimated Emission Rate for PM_{10}	**Activity**	**Source type**	**Value**	**Unit**
	Drilling	Point Source	0.035535927	g/s
	Blasting	Point Source	0.000013707	g/s
	Mineral Loading	Point Source	0.038682461	g/s
	Haul Road	Line Source	0.002486083	g/s/m
	Overall Mine	Area Source	0.046209504	g/s
Estimated Emission Rate for SO_2	Overall Mine	Area Source	0.000223263	g/s
Estimated Emission Rate for NOx	Overall Mine	Area Source	0.000008062	g/s

Source: Emission Calculation

TABLE 7.15: INCREMENTAL & RESULTANT GLC WITHIN CLUSTER

PM_{10} in µg/m^3	
Background	45.8
Incremental	15.25
Resultant	61.05
NAAQ Norms	**100 µg/m^3**
$PM_{2.5}$ in µg/m^3	
Background	22.2
Incremental	8.30
Resultant	30.5
NAAQ Norms	**60 µg/ m^3**
So2 in µg/m^3	
Background	6.3
Incremental	2.20
Resultant	8.5
NAAQ Norms	**80 µg/ m^3**
No2 in µg/m^3	
Background	25.6
Incremental	11.23
Resultant	36.83
NAAQ Norms	**80 µg/ m^3**

Noise Environment –

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

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

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

Where:

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

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

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

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

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

TABLE 7.16: PREDICTED NOISE INCREMENTAL VALUES FROM QUARRY

Location ID	N1	N2	N3	N4	N5	N6	N7
Maximum Monitored Value (Day) dB(A)	49.7	46.2	46.8	45.9	49.8	48.1	47.9
Incremental Value dB(A)	56.6	52.1	43.8	33.9	24.2	25.7	25.3
Total Predicted Noise level dB(A)	54.5	53.1	48.6	46.2	49.8	48.1	47.9

Source: Lab Monitoring Data

The incremental noise level is found within the range of 24.2 to 52.1 (Buffer zone) – 56.6 dB (A) in Core zone. The noise level at different receptors in buffer zone is lower due to the distance involved and other topographical features adding to the noise attenuation. The resultant Noise level due to monitored values and calculated values at the receptors are based on the mathematical formula considering attenuation due to Green Belt as 4.9 dB (A)the barrier effect. From the above table, it can be seen that the ambient noise levels at all the locations near habitations are within permissible limits of Residential Area (buffer zone) as per THE NOISE POLLUTION (REGULATION AND CONTROL) RULES, 2000 (The Principal Rules were published in the Gazette of India, vide S.O.123(E), dated 14.2.2000 and subsequently amended vide S.O. 1046(E),dated 22.11.2000, S.O. 1088(E), dated 11.10.2002, S.O. 1569 (E), dated 19.09.2006 and S.O. 50 (E) dated 11.01.2010 under the Environment(Protection) Act, 1986).

Ground Vibrations

Ground vibrations due to mining activities in the all the 6Mines within cluster are anticipated due to operation of Mining Machines like Excavators, drilling and blasting, transportation vehicles, etc. However, the major source of ground vibration from the all the 6 mines is blasting. The major impact of the ground vibrations is observed on the domestic houses located in the villages nearby the mine lease area. The kuchha houses are more prone to cracks and damage due to the vibrations induced by blasting whereas RCC framed structures can withstand more ground vibrations. Apart from this, the ground vibrations may develop a fear factor in the nearby settlements nearby the mining areas and may cause injury to persons or damage to the structures. Nearest Habitations from 6 mines respectively are as in below Table 7.17.

TABLE 7.17: NEAREST HABITATION FROM CLUSTER QUARRIES

Location ID	Distance & Direction
Habitation Near P1	640m-SW
Habitation Near P2	350m- SW
Habitation Near E1	365m-SW
Habitation Near E2	310m- SE
Habitation Near E3	1km-NE
Habitation Near E4	480m- S

Habitation Near E5	580m-W
Habitation Near E6	1km- NE
Habitation Near E7	800m- E
Habitation Near E8	480m-SE

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

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

Where –

V = peak particle velocity (mm/s)

K = site and rock factor constant

Q = maximum instantaneous charge (kg)

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

R = distance from charge (m)

TABLE 7.18: GROUND VIBRATIONS AT CLUSTER QUARRIES

Location ID	Maximum Charge in kgs	Nearest Habitation in m	PPV in m/ms
P1	20	640m-SW	0.178
P2	20	350m- SW	0.467
E1	12	365m-SW	0.290
E2	17	310m- SE	0.498
E3	28	1km-NE	0.114
E4	12	480m- S	0.187
E5	52	580m-W	0.447
E6	30	1km- NE	0.120
E7	36	800m- E	0.199
E8	11	480m-SE	0.175

Source: Blasting Calculations

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

Socio Economic Environment –

The 10 mines shall contribute towards CER and the community shall develop.

TABLE 7.19: SOCIO ECONOMIC BENEFITS FROM CLUSTER QUARRIES

Location ID	Project Cost	CER
P1	Rs. 1,90,83,000/-	Rs.5,00,000
P2	Rs. 74,01,000/-	Rs.5,00,000
E1	Rs. 57,66,825/-	Rs.5,00,000
E2	Rs. 45,39,000/-	Rs.5,00,000
E3	Rs. 37,18,100/-	Rs.5,00,000
E4	Rs.46,00,000/-	Rs.5,00,000
E5	Rs. 68,16,945	Rs.5,00,000
E6	Rs.52,52,000/-	Rs.5,00,000
E7	Rs.54,15,040/-	Rs.5,00,000
E8	Rs. 31,75,000/-	Rs.5,00,000
Total	**Rs.6,57,66,910/-**	**Rs.50,00,000**

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

- Proposed Projects shall fund towards **CER – Rs 10,00,000/-**
- Existing Projects shall fund towards **CER- Rs.40,00,000/-**

TABLE 7.20: EMPLOYMENT BENEFITS FROM CLUSTER QUARRIES

Description	Employment
P1	35
P2	28
Total	**63**
E1	12
E2	14
E3	20
E4	11
E5	20
E6	16
E7	18
E8	12
Total	**123**
Grand Total	**186**

A total of 35 people will get employment due to one proposed mines in cluster and 123 people are already employed at existing mines.

TABLE 7.21: GREENBELT DEVELOPMENT BENEFITS FROM CLUSTER QUARRIES

CODE	No of Trees proposed to be planted	Area Covered Sq.m	Name of the Species
P1	1,420	The safety zone along the boundary barrier has been identified to be utilized for Greenbelt development	Neem, Vilvam, Ashokha, Panai, etc.,
P2	1,610		
Total	**3,030**		
E1	405		
E2	910		
E3	610		
E4	835		
E5	940		
E6	605		
E7	760		
E8	700		
Total	**5,765**		
G. Total	**8,795**		

Based on the Proposed Mining Plans it's anticipated that there shall growth of native species of Neem, Vilvam, Ashokha, Panai etc., in the Cluster at a rate of 8795 Trees Planted over a period of 5 Years with Survival Rate of 80%.

7.5 PLASTIC WASTE MANAGEMENT PLAN

The project Proponent shall comply with Tamil Nadu Government Order (Ms) No. 84 Environment and Forest (EC.2) Department Dated: 25.06.2018 regarding ban on one time use and throw away plastics irrespective of thickness with effect from 01.01.2019 under Environment (Protection) Act, 1986.

Objective –

- To investigate the actual supply chain network of plastic waste.

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

TABLE 7.22: ACTION PLAN TO MANAGE PLASTIC WASTE

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

Source: Proposed by FAE's and EC

8. PROJECT BENEFITS

8.0 GENERAL

The Proposed Project for Quarrying Rough Stone and gravel at Ichipatti Village aims to produce about 4,38,060m^3 Rough Stone over a period of 10 Years and Gravel 44,520m^3 for period of Three years. This will enhance the socio-economic activities in the adjoining areas and will result in the following benefits.

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

8.1 EMPLOYMENT POTENTIAL

It is proposed to provide employment to about 35 persons for carrying out mining operations and give preference to the local people in providing employment in the one proposed quarry in the cluster. In addition, there will be opportunity for indirect employment to many people in the form of contractual jobs, business opportunities, service facilities etc. the economic status of the local people will be enhanced due to mining project.

8.2 SOCIO-ECONOMIC WELFARE MEASURES PROPOSED

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

8.3 IMPROVEMENT IN PHYSICAL INFRASTRUCTURE

The proposed quarry is located in Ichipatti Village, Palladam Taluk, Tiruppur District of Tamil Nadu and the area have communications, roads and other facilities already well established. The following physical infrastructure facilities will further improve due to proposed mine.

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

8.4 IMPROVEMENT IN SOCIAL INFRASTRUCTURE

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

8.5 OTHER TANGIBLE BENEFITS

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

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

CORPORATE SOCIAL RESPONSIBILITY

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

CSR Cost Estimation

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

CORPORATE ENVIRONMENT RESPONSIBILITY

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

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

TABLE 8.1 CER – ACTION PLAN

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

9. ENVIRONMENTAL COST BENEFIT ANALYSIS

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

10. ENVIRONMENTAL MANAGEMENT PLAN

10.0. GENERAL

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

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

10.1. ENVIRONMENTAL POLICY

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

The Proponent Thiru. T.Naveen Kiran will –

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

Description of the Administration and Technical Setup –

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

The said team will be responsible for:

- Monitoring of the water/ waste water quality, air quality and solid waste generated
- Analysis of the water and air samples collected through external laboratory
- Implementation and monitoring of the pollution control and protective measures/ devices which shall include financial estimation, ordering, installation of air pollution control equipment, waste water treatment plant, etc.
- Co-ordination of the environment related activities within the project as well as with outside agencies
- Collection of health statistics of the workers and population of the surrounding villages
- Green belt development
- Monitoring the progress of implementation of the environmental monitoring programme

- Compliance to statutory provisions, norms of State Pollution Control Board, Ministry of Environment and Forests and the conditions of the environmental clearance as well as the consents to establish and consents to operate.

10.2. LAND ENVIRONMENT MANAGEMENT –

Landscape of the area will be changed due to the quarrying operation, restoration of the land by converting the quarry pit into temporary reservoir and the remaining part of the area (un utilized areas, infrastructure, haul Roads) will be utilized for greenbelt development. There is no major vegetation in the project area during the course of quarrying operation and after completion of the quarrying operation thick plantation will be developed under greenbelt development programme.

TABLE 10.1. PROPOSED CONTROLS FOR LAND ENVIRONMENT

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

Source: Proposed by FAE's & EIA Coordinator

10.3. SOIL MANAGEMENT

There overburden in the form of Gravel which will directly loaded into tippers for the filling and levelling of low-lying areas.

TABLE 10.2. PROPOSED CONTROLS FOR SOIL MANAGEMENT

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

Source: Proposed by FAE's & EIA Coordinator

10.4. WATER MANAGEMENT

In the proposed quarrying project, no process is involved for the effluent generation, only oil & grease from the machinery wash is anticipated and domestic sewage from mines office. The quarrying operation is proposed up to

a depth of 45m BGL, the water table in the area is 58m – 62m below ground level, hence the proposed projects will not intersect the Ground water table during entire quarry period.

TABLE 10.3. PROPOSED CONTROLS FOR WATER ENVIRONMENT

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

Source: Proposed by FAE's & EIA Coordinator

10.5. AIR QUALITY MANAGEMENT

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

TABLE 10.4. PROPOSED CONTROLS FOR AIR ENVIRONMENT

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

Source: Proposed by FAE's & EIA Coordinator

10.6. NOISE POLLUTION CONTROL

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

TABLE 10.5.: PROPOSED CONTROLS FOR NOISE ENVIRONMENT

CONTROL	RESPONSIBILITY

Development of thick greenbelt all along the Buffer Zone (7.5 Meters) of the project area to attenuate the noise and the same will be maintained	Mines Manager
Preventive maintenance of mining machinery and replacement of worn-out accessories to control noise generation	Mines Foreman
Deployment of mining equipment with an inbuilt mechanism to reduce noise	Mines Manager
Provision of earmuff / ear plugs to workers working in noise prone zones in the mines	Mining Mate
Provision of effective silencers for mining machinery and transport vehicles	Mines Manager
Provision of sound proof AC operator cabins to HEMM	Mines Manager
Sharp drill bits are used to minimize noise from drilling	Mines Foreman
Controlled blasting technologies are adopted by using delay detonators to minimize noise from blasting	Mines Manager
Annual ambient noise level monitoring is carried out in the project area and in surrounding villages to access the impact due to the mining activities and the efficacy of the adopted noise control measures. Additional noise control measures will be adopted if required as per the observations during monitoring	Mines Manager
Reduce maximum instantaneous charge using delays while blasting	Mining Mate
Change the burden and spacing by altering the drilling pattern and/or delay layout, or altering the hole inclination	Mines Manager
Undertake noise or vibration monitoring	Mines Manager

Source: Proposed by FAE's & EIA Coordinator

10.7. GROUND VIBRATION AND FLY ROCK CONTROL

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

TABLE 10.6.: PROPOSED CONTROLS FOR GROUND VIBRATIONS & FLY ROCK

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

Source: Proposed by FAE's & EIA Coordinator

10.8. BIOLOGICAL ENVIRONMENT MANAGEMENT

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

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

- Greenbelt development all along the safety barrier of the project area
- It is also proposed to implement the greenbelt development programme and post plantation status will be regularly checked for every season.

- The main attributes that retard the survival of sapling is fugitive dust, this fugitive dust can be controlled by water sprinkling on the haul roads and installing a sprinkler unit near the newly planted area.
- Year wise greenbelt development will be recorded and monitored
    - Based on the area of plantation.
    - Period of plantation
    - Type of plantation
    - Spacing between the plants
    - Type of manuring and fertilizers and its periods
    - Lopping period, interval of watering
    - Survival rate
    - Density of plantation
- The ultimate reclamation planned leaves a congenial environment for development of flora & immigration of small fauna through green belt and water reservoir. The green belt and water reservoir developed within the Project at the end of mine life will attract the birds and animals towards the project area in the post mining period.

10.8.1. Green Belt Development Plan

About 1420 nos. of saplings is proposed to be planted for the Mining plan period in safety barrier of applied mine lease area with survival rate 80%. The greenbelt development plan has been prepared keeping in view the land use changes that will occur due to mining operation in the area.

TABLE 10.7: PROPOSED GREENBELT ACTIVITIES

No. of tress proposed to be planted	Area to be covered in m^2	Name of the species
1420	The safety zone along the boundary barrier has been identified to be utilized for Greenbelt development.	Neem, Vilvam, Panai, Ashokha, etc.,

Source: Approved Mining plan

The objectives of the greenbelt development plan are –

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

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

10.8.2. Species Recommended for Plantation

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

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

TABLE 10.8. RECOMMENDED SPECIES FOR THE PLANTSAITON

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

Source: Proposed by FAE's & EIA Coordinator

10.9. OCCUPATIONAL SAFETY & HEALTH MANAGEMENT

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

10.9.1. Medical Surveillance and Examinations –

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

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

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

TABLE 10.9. MEDICAL EXAMINATION SCHEDULE

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

10.9.2 Proposed Occupational Health and Safety Measures –

- The mine site will have adequate drinking water supply so that workers do not get dehydrated.
- Lightweight and loose-fitting clothes having light colours will be preferred to wear.

- Noise exposure measurements will be taken to determine the need for noise control strategies.
- The personal protective equipment will be provided for mine workers.
- At noisy working activity, exposure time will be minimized.
- Dust generating sources will be identified and proper control measure will be adopted.
- Periodic medical examinations will be provided for all workers.
- In respect of contract work, safety code for contractors and workers will be implemented. They will be allowed to work under strict supervision of statutory person/officials only after they will impart training at vocational training centres. All personal protective equipment's will be provided to them.
- A safety committee meeting every month will be organized to discuss the safety of the mines and the persons employed.
- Celebration of annual mines safety week and environmental week in order to develop safety awareness and harmony amongst employees and co quarry owners.

FIGURE 10.1.: PERSONAL PROTECTIVE EQUIPMENT TO THE MINE WORKERS

10.9.3: Health and Safety Training Programme

The Proponent will provide special induction program along with machinery manufacturers for the operators and co-operators to run and maintain the machinery effectively and efficiently. The training program for the supervisors and office staffs will be arranged in the Group Vocational Training Centres in the State and engage Environmental Consultants to provide periodical training to all the employees to carry out the mining operation in and eco-friendly manner as per Metalliferous Mines Regulation, 1961.

10.9.4.: Budgetary Provision for Environmental Management –

Adequate budgetary provision has been made by the Company for execution of Environmental Management Plan. The Table 10.10 gives overall investment on the environmental safeguards and recurring expenditure for successful monitoring and implementation of control measures.

TABLE 10.10: EMP BUDGET FOR PROPOSED PROJECT

Activities	Mitigation Measure	Provision for Implementation	Capital	Recurring
Air Environment	Compaction, gradation and drainage on both sides for Haulage Road	Rental Dozer & drainage construction on haul road @ Rs. 10,000/- per hectare; and yearly maintenance @ Rs. 10,000/- per hectare	28340	28340
	Fixed Water Sprinkling Arrangements + Water sprinkling by own water tankers	Fixed Sprinkler Installation and New Water Tanker Cost for Capital; and Water Sprinkling (thrice a day) Cost for recurring	800000	50000
	Muffle blasting – To control fly rocks during blasting	Blasting face will be covered with sand bags / steel mesh / old tyres / used conveyor belts	0	5000
	Wet drilling procedure / latest eco-friendly drill machine with separate dust extractor unit	Dust extractor @ Rs. 25,000/- per unit deployed as capital & @ Rs. 2500 per unit recurring cost for maintenance - 8 Units	200000	20000
	No overloading of trucks/tippers/tractors	Manual Monitoring through Security guard	0	5000
	Stone carrying trucks will be covered by tarpaulin	Monitoring if trucks will be covered by tarpaulin	0	10000
	Enforcing speed limits of 20 km/hr within ML area	Installation of Speed Governers @ Rs. 5000/- per Tipper/Dumper deployed - 3 Units	15000	750
	Regular monitoring of exhaust fumes as per RTO norms	Monitoring of Exhaust Fumes by Manual Labour	0	5000
	Regular sweeping and maintenance of approach roads for at least about 200 m from ML Area	Provision for 2 labours @ Rs.10,000/labour (Contractual) per Hectare	0	56680

	Installing wheel wash system near gate of quarry	Installation + Maintenance + Supervision	50000	20000
Noise Environment	Source of noise will be during operation of transportation vehicles, HEMM for this proper maintenance will be done at regular intervals.	Provision made in Operating Cost	0	0
	Oiling & greasing of Transport vehicles and HEMM at regular interval will be done	Provision made in Operating Cost	0	0
	Adequate silencers will be provided in all the diesel engines of vehicles.	Provision made in Operating Cost	0	0
	It will be ensured that all transportation vehicles carry a fitness certificate.	Provision made in Operating Cost	0	0
	Safety tools and implements that are required will be kept adequately near blasting site at the time of charging.	Provision made in OHS part	0	0
	Line Drilling all along the boundary to reduce the PPV from blasting activity and implementing controlled blasting.	Provision made in Operating Cost	0	0
	Proper warning system before blasting will be adopted and clearance of the area before blasting will be ensured.	Blowing Whistle by Mining Mate / Blaster / Compentent Person	0	0
	Provision for Portable blaster shed	Installation of Portable blasting shelter	50000	2000
	NONEL Blasting will be practiced to control Ground vibration and fly rocks	Rs. 30/- per 6 Tonnes of Blasted Material	0	1138956
Waste Management	Waste management (Spent Oil, Grease etc.,)	Provision for domestic waste collection and disposal through authorized agency	5000	20000
		Installation of dust bins	5000	2000

	Bio toilets will be made available outside mine lease on the land of owner itself	Provision made in Operating Cost	0	0
Mine Closure	1. Progressive Closure Activity - Surface Runoff managent	Provision for garland drain @ Rs. 10,000/- per Hectare with maintenance of Rs. 5,000/- per annum	28340	5000
	2. Progressive Closure Activity Barbed Wire Fencing to quarry area will be provisioned.	Per Hectare fencing Cost @ Rs. 2,00,000/- with Maintenance of Rs 10,000/- per annum	566800	10000
	3. Progressive Closure Activity Green belt development - 500 trees per one hectare - Proposal for 1420 Trees - 660 Inside Lease Area & 760 Outside Lease Area)	Site clearance, preparation of land, digging of pits / trenches, soil amendments, transplantation of saplings @ 200 per plant (capital) for plantation inside the lease area and @ 30 per plant maintenance (recurring)	132000	19800
		Avenue Plantation @ 300 per plant (capital) for plantation outside the lease area and @ 30 per plant maintenance (recurring)	228000	22800
	4. Implementation of Final Mine Closure Actity as per Approved Mining Plan on Last Year	Few activities already covered as progressive closure activities as greenbelt development, wire fencing, garland drain. *For Final Closure Activities 15% of the proposed closure cost will be spent during the final mine closure stage - Last Year	114750	0

	5. Contribution towards Green Fund. As per TNMMCR 1959, Rule 35 A	The Contribution towards Green Funds @ 10% of Seigniorage fee are indicated as part of EMP Budge and not necessarily implemented in the Project Site	3942540	0
Implementation of EC, Mining Plan & DGMS Condition	Size 6' X 5' with blue background and white letters as mentioned in MoM Appendix II by the SEAC TN	Fixed Display Board at the Quarry Entrance as permanent structure mentioning Environmental Conditions	10000	1000
	Air, Water, Noise and Soil Quality Sampling every 6 Months for Compliance Report of EC Conditions	Submission of 2 Half Yearly Compliance - Lab Monitoring Report as per CPCB norms	0	50000
	Workers will be provided with Personal Protective Equipment's	Provision of PPE @ Rs. 4000/- per employee with recurring based on wear and tear (say, @ Rs. 1000/- per employee) - 21 Employees	140000	35000
	Health check up for workers will be provisioned	IME & PME Health check up @ Rs. 1000/- per employee	0	35000
	First aid facility will be provided	Provision of 2 Kits per Hectare @ Rs. 2000/-	0	5668
	Mine will have safety precaution signages, boards.	Provision for signages and boards made	10000	2000
	No parking will be provided on the transport routes. Separate provision on the south side of the hill will be made for vehicles /HEMMs. Flaggers will be deployed for traffic management	Parking area with shelter and flags @ Rs. 50,000/- per hectare project and Rs. 10,000/- as maintenance cost	141700	10000
	Installation of CCTV cameras in the mines and mine entrance	Camera 4 Nos, DVR, Monitor with internet facility	30000	5000

	Implementation as per Mining Plan and ensure safe quarry working	Mines Manager (1st Class / 2nd Class / Mine Foreman) under regulation 34 / 34 (6) of MMR, 1961 and Mining Mate under regulation 116 of MMR,1961 @ 40,000/- for Manager & @ 25,000/- for Foreman / Mate	0	780000
CER	As per MoEF &CC OM 22-65/2017-IA.III Dated 25.02.2021	Detailed Description in following slides and Budget allocation is included as per MoeEF & CC OM	500000	0
TOTAL			**2940180**	**2344994**

*Marked cost is already discussed in the mining plan hence that is not included in the total Environmental Management plan cost Total Cost for the Ten years. The EMP has been prepared for the entire **lease period of 10 years** for the peak production capacity of **4,38,060m^3 of Rough stone**.

Year	Total Cost	Year	Total Cost
1st	₹ 52,85,174	**6th**	₹ 44,62,962
2nd	₹ 24,62,244	**7th**	₹ 32,16,020
3rd	₹ 25,85,356	**8th**	₹ 33,76,821
4th	₹ 27,14,624	**9th**	₹ 35,45,662
5th	₹ 28,50,355	**10th**	₹ 38,37,696
Total	**₹343 Lakhs**		

Cost inflation 5% per annum

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

10.10.: CONCLUSION –

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

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11. SUMMARY AND CONCLUSION

This EIA & EMP report prepared for the proposed Rough stone and Gravel quarry project located in S.F. No 207/2A, Ichipatti Village, Palladam Taluk, Tiruppur District belongs to Thiru. T. Naveen Kiran the Project falls in the Cluster category consist of 2 Proposed, 8 Existing Quarries falls under "B" category as per MoEF & CC Notification S.O. 3977 (E).

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

The proposed project is categorized under category "B1" Activity 1(a) (mining lease area in cluster situation) and will be considered at SEIAA – TN after conducting Public Hearing and Submission of EIA/EMP Report for Grant of Environmental Clearance. **"**Draft EIA report prepared on the basis of ToR issued for carrying out public hearing for the grant of Environmental Clearance from SEIAA, Tamil Nadu".

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

The main scope of the EIA study is to quantify the cumulative impact in the study area due to cluster quarries and formulate the effective mitigation measures for each individual leases. A detailed account of the emission sources, emissions control equipment, background Air quality levels, Meteorological measurements, Dispersion model and all other aspects of pollution like effluent discharge, Dust generation etc., have been discussed in this report. The baseline monitoring study has been carried out during the months Oct- Dec 2024 for various environmental components so as to assess the anticipated impacts of the cluster quarry projects on the environment and suitable mitigation measures for likely adverse impacts due to the proposed project is suggested individually for the respective proposed project under Chapter 10.

The project proponent ensures to obtain necessary clearances and quarrying will be carried out as per rules and regulations. The Mining Activity will be carried out in a phased manner as per the approved mining plan after obtaining EC, CTO from TNPCB, execution of lease deed and obtaining DGMS Permission and working will be carried out under the supervision of Competent Persons employed. Overall, the EIA report has predicted that the project will comply with all environment standards and legislation after commencement of the project and operational stage mitigation measures are implemented.

Mining operations has positive impact on environment and socio economy such as landscape improvement, water as by-product, economy development and better public services, providing and supply of Rough Stone as per market demand. Sustainable and modern mining leads us to see positive impact of mining operation and providing consistent employment for nearly 35 people directly in the proposed projects and indirectly around 80 people.

As discussed, it is safe to say that the proposed quarries are not likely to cause any significant impact to the ecology of the area, as adequate preventive measures will be adopted to keep the various pollutants within the permissible limits. Green belt development around the area will also be taken up as an effective pollution mitigate technique, as well as to serve as biological indicators for the pollutants released from the Thiru. T. Naveen Kumar Rough stone and Gravel quarry (Extent – 2.83.40 ha).

12. DISCLOSURE OF CONSULTANT

M/s Geo Exploration and Mining Solutions, an Accredited Organization under Quality Council of India – National Accreditation Board for Education & Training, New Delhi, for carrying out the EIA Study as per the ToR Issued for the proposed project.

Name and address of the consultancy:

GEO EXPLORATION AND MINING SOLUTIONS
No 17, Advaitha Ashram Road,
Alagapuram, Salem – 636 004
Tamil Nadu, India
Email:infogeoexploration@gmail.com
Web: www.gemssalem.com
Phone: 0427 2431989.

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

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

Abbreviations

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

DECLARATION BY EXPERTS CONTRIBUTING TO THE EIA/EMP

This EIA/EMP for Thiru. T. Naveen Kiran Rough stone and Gravel quarry over an Extent of 2.83.4 ha in Ichipatti Village, Palladam Taluk, Tiruppur District of Tamil Nadu is prepared as per the Generic Structure of EIA Guidelines manual. It is also certified that information furnished in the above EIA study are true and correct to the best of our knowledge.

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

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

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

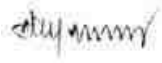
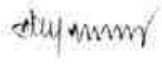
Date & Signature: 

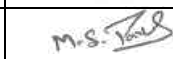
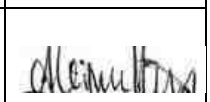
Period of Involvement: **June 2024 to till date**

Associated Team Member with EIA Coordinator:

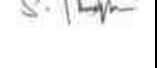
1. **Mr. S. Nagamani**
2. **Mr.P. Viswanathan**
3. **Mr. M. Santhoshkumar**
4. **Mr. S. Ilavarasan**

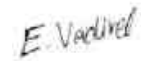
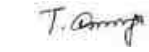
FUNCTIONAL AREA EXPERTS ENGAGED IN THE PROJECT

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

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

LIST OF TEAM MEMBERS ENGAGED IN THIS PROJECT

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

4	Mr. Umamahesvaran	GEO	▪ Site Visit with FAE ▪ Provide inputs on Geological Aspects ▪ Assist in Resources & Reserve Calculation and preparation of Production Plan & Conceptual Plan	
5	Mr. A. Allimuthu	SE	▪ Site Visit with FAE ▪ Assist FAE with collection of data's ▪ Provide inputs by analysing primary and secondary data	
6	Mr. S. Ilavarasan	LU; SC	▪ Site Visit with FAE ▪ Assisting FAE in preparation of land use maps ▪ Provide inputs & Assisting FAE with soil conservation methods and identifying impacts	
7	Mr. E. Vadivel	HG	▪ Site Visit with FAE ▪ Assist FAE & provide inputs on aquifer characteristics, ground water level/table ▪ Assist with methods of ground water recharge and conduct pump test, flow rate	
8	Mr. D. Dinesh	NV	▪ Site Visit with FAE ▪ Assist FAE and provide inputs on impacts due to proposed mine activity and suggest mitigation measures ▪ Assist FAE with prediction modelling	
9	Mr. Panneer Selvam	EB	▪ Site Visit with FAE ▪ Assist FAE with collection of baseline data ▪ Provide inputs and assist with labelling of Flora and Fauna	
10	Mrs. Nathiya	EB	▪ Site Visit with FAE ▪ Assist FAE with collection of baseline data ▪ Provide inputs and assist with labelling of Flora and Fauna	

DECLARATION BY THE HEAD OF THE ACCREDITED CONSULTANT ORGANIZATION

I, Dr. M. Ifthikhar Ahmed, Managing Partner, Geo Exploration and Mining Solutions, hereby, confirm that the above-mentioned Functional Area Experts and Team Members prepared the Cluster EIA/EMP for Thiru. T. Naveen Kiran Rough stone and Gravel quarry over an Extent of 2.83.40 ha in Ichipatti Village, Palladam Taluk, Tiruppur District of Tamil Nadu. It is also certified that information furnished in the EIA study are true and correct to the best of our knowledge.

Signature& Date:

Name:	**Dr. M. Ifthikhar Ahmed**
Designation:	**Managing Partner**
Name of the EIA Consultant Organization:	**M/s. Geo Exploration and Mining Solutions**
NABET Certificate No & Issue Date:	**NABET/EIA/2225/RA 0276 Dated: 20-2-2023**
Validity:	**Valid till 06.08.2025**