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 – NON-FOREST LAND

CLUSTER EXTENT = 38.01.55 ha (10 Proposed + 7 Existing + 1 Expired Quarries)

A. NANDAKUMAR ROUGH STONE AND GRAVEL QUARRY

At
Chikkarampalayam Village, **Mettupalayam** Taluk, **Coimbatore** District

NAME OF PROJECT PROPONENT

Sl. No.	Proponent Name	Extent
1	**Thiru.A. Nandakumar** S/o.Arukutty Goundar, No.79D, Avinashi Road, Annur, Coimbatore District – 641 653 **Mobile:** +91 9842262448	**3.46.00 ha**

Obtained ToR

Lr.No. SEIAA-TN/F.No.9011/SEAC/ToR-1161/2022 Dated: 06.06.2022 for P1

Environmental Consultant	Laboratory
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 1,31 & 38 Certificate No : NABET/EIA/2225/RA 0276 Dated: 20.02.2023** Phone: 0427-2431989, Email: ifthiahmed@gmail.com, geothangam@gmail.com **Web: www.gemssalem.com**	**EHS 360 LABS PRIVATE LIMITED,** **10/2 Ground floor, 50th street, 7th Avenue, Ashok Nagar, Chennai – 600 083.** **ISO/IEC 17025:2017 Certified & MoEF Notified Laboratory**

Baseline Monitoring Period: December 2022 to February 2023

MAY 2023

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

CODE	Name of the Owner	Village	S.F. Nos	Extent in Ha	Status
PROPOSED QUARRY FOR PUBLIC HEARING
P1	Thiru.A. Nandakumar S/o.Arukutty Gounder No.79D, Avinashi road, Annur, Coimbatore	Chickkaram Palayam	78/1(P), 419&420	3.46.0	Lr.No.SEIAA-TN/F.No.9011/SEAC/ToR-1161/2022 Dated: 06.06.2022
	**TOTAL EXTENT**	**3.46.0**	
Near by Proposed Quarries
P2	Thiru.K. Sundararaj S/o. Karuppanna Gounder, Somayanur, Chinnathadagam, Coimbatore District.	Belladhi	393/1A (P)	2.11.5	Lr.No.SEIAA-TN/F.No.9087/SEAC/ToR-1176/2022 Dated: 14.06.2022
P3	Sri Blue Metal, Prop. S. Gnanasekaren, No. 2/241, Kannarpalayam, Karamadai, Mettupalayam Taluk, Coimbatore District – 641 104.	Belladhi	343 & 344/1	2.69.05	Lr.No.SEIAA-TN/F.No.9044/SEAC/ToR-1163/2022 Dated: 06.06.2022
P4	Thiru.R. Raju S/o. Rangasamy Naidu, No.108 Deepalaya, Valluvar Street, Sivananda Colony, Coimbatore-641012	Belladhi	391	2.93.0	Lr.No.SEIAA-TN/F.No.9221/SEAC/ToR-1193/2022 Dated: 14.07.2022
P5	Thiru. R.K. Palanisamy S/o. T. Karivaradha Gounder, No. 4/51, Ramampalayam, Jadayampalayam Post, Mettupalayam, Coimbatore District. Tamil Nadu State – 641 302.	Belladhi	340 (P) and 341/3 (P)	4.90.0	Lr.No.SEIAA-TN/F.No.9309/SEAC/ToR-1242/2022 Dated: 30.08.2022
P6	S. Palanisamy	Chikkarama palaym	435/2B2, 435/2C, 435/2D, 435/2B1 & 435/2E	1.55.0	Public hearing Conducted
P7	M/s. Palanivel Sri Blue Metals	Chikkarama palaym	428/1A, 60/1B & 61	1.75.5	Public hearing Conducted
P8	Tmt.M. Muthammal	Chikkarama palaym	77/2E (P), 77/2F (P), 79/1A (P)	1.82.0	Public hearing Conducted
P9	C.N. Mani	Chikkaram palayam	75	2.47.5	Public hearing Conducted
P10	M/s. Sri Blue Metal	Chickkaram palayam	77/1B, 421/2B (P)	3.11.0	Public hearing Conducted
	**TOTAL EXTENT**	**23.34.55**	
CODE	Name of the Owner	Village	S.F. Nos	Extent in Ha	Status

E1	Tmt.P. Bakiavathy	Chickkaram palayam	482/2429/ 1,429/2	1.81.5	17.10.2017 to 16.10.2022
E2	Thiru. S. Gnanasekaran	Chickkaram palayam	77/2D (P)	1.01.2	01.10.2018 to 30.09.2023
E3	Technomax Building Solution	Bellathi	345/3	1.48.8	26.10.2018 to 25.10.2023
E4	Tmt. R. Poorani	Chickkaram Palayam	80/1	1.27.0	22.12.2018 to 21.12.2023
E5	Tmt. T. Kaveriammal	Chickkaram Palayam	77/2B	0.99.0	24.12.2018 to 23.12.2023
E6	R.K. Selvakumar	Chickkaram Palayam	69 (Part)	2.19.0	17.10.2017 to 16.10.2022
E7	R.Ganesan	Chickkaram Palayam	460/2 & 462/1(P)	1.51.5	-
			TOTAL EXTENT	10.28.0	
CODE	**Name of the Owner**	**Village**	**S.F. Nos**	**Extent in Ha**	**Status**
EX-1	T. Rajendran	Bellathi	331/3	0.93.0	17.09.2016 to 16.09.2021
			TOTAL EXTENT	0.93.0	
		TOTAL CLUSTER EXTENT		38.01.55	

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

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TERMS OF REFERENCE (ToR) COMPLIANCE

P1 – Thiru.A.Nandakumar

"Lr.No.SEIAA-TN/F.No.9011/SEAC/ToR-1161/2022 Dated: 06.06.2022"

	SPECIFIC CONDITIONS	
1.	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 prepare and submit an "Action Plan for carrying out the realignment of the benches in the proposed quarry lease after it is approved by the concerned Asst. Director of Geology and Mining during the time of appraisal for obtaining the EC.	Noted and Agreed
2	The Proponent shall submit a conceptual 'Slope Stability Plan' for the proposed quarry during the appraisal while obtaining the EC, as the depth of the working is extended beyond 35 m below ground level.	Noted and Agreed
3	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, III Class mines manager appointed by the proponent.	Noted and agreed
4	The PP shall furnish the proposal for carrying out the controlled blasting techniques: involving the line drilling for each blast as well as along the boundary of the lease facing the village/habitations in the EIA report.	Ground Vibration Study is stated in Chapter- 4
5	The EIA Coordinates shall obtain and furnish the details of quarry /quarries operated by the PP in the past, either in the samr location or else where in the state with video and Photographic evidences.	Noted and agreed
6	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. a)What was the period of the operation and stoppage of the earlier mines with last work permit issued by the AD/DD mines? b) Quantity of minerals mined out. c) Highest production achieved in any one year d) Detail of approved depth of mining. e) Actual depth of the mining achieved earlier. f) Name of the person already mined in that leases area. g) If EC and CTO already obtained, the copy of the same shall be submitted. h) Whether the mining was carried out as per the approved mine plan (or EC if issued) with stipulated benches	The Applied Area is Existing Quarry – Fresh Lease Period- 02.06.2016 to 01.06.2021 The details of previous operations is enclosed as Annexure. With Existing Pit Dimension – | Pit	180 m (L)* 80 m (W)*20 m (D)
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7	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)	Discussed under Chapter 2 & Chapter 3.
8	The PP shall carry out Drone video survey covering the cluster, Green belt, fencing etc.	Noted and Agreed
9	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. 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 and periodical compliance with photographs will be submitted to SEIAA every 6 months.
10	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. Discussed under Chapter 2
11	The Project Proponent shall provide the Organization chart indicating the appointment of various statutory officials and other competent persons to be appointed as per the provisions of Mines Act 1952 and the MMR, 1961 for carrying out the quarrying operations scientifically and systematically in order to ensure safety and to protect the environment.	Noted and agreed. Detailed under Chapter 6.
12	contour map of the water table detailing the number of ground water The Project Proponent shall conduct the hydro-geological study considering the 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.	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.
13	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.	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 to assess the cumulative impact of the proposed project on the environment is prepared as a Draft EIA EMP and will be finalized after public consultation and will be submitted as Final EIA EMP Report.
14	The Proponent shall carry out the Cumulative impact study due to mining operations: carried out in the quarry specifically with reference to the specific environment in terms of air pollution, water pollution. & health impacts. Accordingly, the Environment Management plan should be prepared keeping the concerned quarry and the surrounding habitations in the mind.	The Cumulative impact study due to mining operations is explained in chapter - 7
15	Rain water harvesting management with recharging details along with water balance (both) monsoon & non-monsoon) be submitted.	The proposed project is Existing lease
16	Issues relating to Mine Safety, including slope geometry in case of Granite quarrying, blasting parameters etc. should be detailed. The proposed	Its is a Rough Stone Quarry

	safeguard measures in each case should also be provided.	
17	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 Cother 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.	It is a Patta Land
18	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.	It is Stored in Safety area 7.5m radius
19	Since non-saleable waste /OB/ intermediate waste etc. is huge in the granite quarry, the Proponent shall provide the details pertaining to management of the above material with year wise utilization and average moving inventory be submitted.	It is a Rough Stone Quarry; no waste will be generated
20	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.	It is a Patta Land. Got Permission from AD Mines
21	Description of water conservation measures proposed to be adopted in the Project should be given. Details of rainwater harvesting proposed in the Project, if any, should be provided	Mine Closure in Chapter -2
22	Impact on local transport infrastructure due to the Project should be indicated.	Transportation details mentioned in Chapter -2
23	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.	Greenbelt details in Chapter-4. It is proposed to plant 1750 trees along boundary and panchayat roads.
24	A detailed mine closure plan for the proposed project shall be included in EIA/EMP report which should be site-specific.	Mine Closure in Chapter -2
25	Public Hearing points raised and commitments of the Project Proponent on the same along with time bound Action Plan with budgetary provisions to implement the same should be provided and also incorporated in the final EIA/EMP Report of the Project and to be submitted to SEIAA/SEAC with regard to the Office Memorandum of MoEF& CC accordingly.	Noted and Agreed
26	The Public hearing advertisement shall be published in one major National daily and one most circulated vernacular daily.	Noted and Agreed
27	The PP shall produce/display the EIA report, Executive summery and other related information with respect to public hearing in Tamil Language also.	Noted and Agreed
28	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
29	The recommendation for the issue of "Terms of Reference" is subjected to the outcome of the Hon'ble NCT, Principal Bench, New Delhi in O.A No. 186 of	Noted and Agreed

	2016 M.A.No.350/2016). and O.A. and O.A.No.580/2016 (M.A.No 1182/2016) and O.A.No.102 2017 and OA No.404/2016 (M.A.No. 758/2016, M.A.No 920/2016. MA.No.1122/2016,அனந்தகிரு SEIAA-TNM.A.No.12/2017 & M.A. No. 843/2017) and OA.No 405/2016 and O.A. No.520 of 2016 (M.A.No. 981/2016, MA No.982/2016 & M.A.No.384/2017)	
30	The purpose of Green belt around the project is to capture the fugitive emissions, carbon sequestration and to attenuate the noise generated, in addition to improving the aesthetics A wide range of indigenous plant species should be planted as given in the appendix-I in consultation with the DFO. State Agriculture University and local school/college authorities. The plant species with dense/moderate canopy of native origin should be chosen.Species of small/medium/tall trees alternating with shrubs should be planted in a mixed manner	Noted and Agreed
31	Taller/one year old Saplings raised in appropriate size of bags, preferably eco-friendly bags should be planted as per the advice of local forest authorities/botanist/Horticulturist with regard to site specific choices. The proponent shall earmark the greenbelt area with GPS coordinates all along the boundary of the project site with at least 3 meters wide and in between blocks in an organized manner	The proposed project is Existing lease .Around 1750 trees are proposed to plant
32	A Disaster management Plan shall be prepared and included in the EIA/EMP Report.	Disaster management Plan details in Chapter-7
33	A Risk Assessment and management Plan shall be prepared and included in the ELA/EMP Report.	A Risk Assessment and management Plan Chapter- 7
34	Occupational Health impacts of the Project should be anticipated and the proposed preventive measures spelt out in detail. Details of pre-placement medical examination and periodical medical examination schedules should be incorporated in the EMP. The project specific occupational health mitigation measures with required facilities proposed in the mining area may be detailed.	Occupational Health impacts chapter- 10
35	Public health implications of the Project and related activities for the population in the impact zone should be systematically evaluated and the proposed remedial measures should be detailed along with budgetary allocations.	It is explained in Chapter -3
36	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.	It is explained in Chapter -3
37	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 against the project
38	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
39	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	Noted & agreed.

	with the site photographs which shall duly be certified by MoEF&CC. Regional Office, Chennai (or) the concerned DEE/TNPCB.	
40	Concealing any factual information or submission of false/fabricated data and failure to comply with any of the conditions mentioned above may result in withdrawal of this Terms of Conditions besides attracting penal provisions in the Environment (Protection) Act, 1986.	Noted & agreed.
ADDITIONAL CONDITIONS		
1	Depth of mining shall be restricted to 34m and the corresponding production as per the approved mining plan.	Noted and agreed
2	The scientific studies shall be carried out for any proposed quarry over the existing pit/quarry by the reputed Government Scientific Research Academic Institutions such as Anna University, NITS, IT'S, NIRM, CISR laboratories where the depth of the proposed working (or) ultimate depth of working is extended beyond 40 m below ground level (BGL) in case of flat terrain and the excavation extends beyond 30 m above ground level (AGL) in case of outcrops/hilly terrains for evaluating the stability of slopes A copy of the report shall be submitted to the SEIAA, the concerned AD/DGM, the concerned DEF/INPCB and the Director of Mines Safety, Chennai.	The issues raised during public hearing will be addressed in Final EIA/EMP Report.
3	Detailed study shall be carried out regard to impact of mining around the proposed mine lease area on the nearby Villages, Water-badies/ Rivers, & any ecological fragile areas.	Noted and agreed
4	The project proponent shall furnish VAO certificate with reference to 300m radius regard to approved habitations, schools, Archaeological structures etc.	VAO certificate is Obtained
5	As per the MoEF& CC office memorandum F.No.22-65/2017-1A III dated: 30.09.2020 and 20.10.2020 the proponent shall address the concerns raised during the public consultation and all the activities proposed shall be part of the Environment Management Plan.	Noted and agreed
6	The Environmental Impact Assessment shall study in detail on 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 Detailed under Chapter 3.
7	The Environmental Impact Assessment should study the biodiversity, the natural ecosystem, the soil micro flora, fauna and soil seed banks and suggest measures to maintain the natural Ecosystem.	Noted and agreed Detailed under Chapter 3.
8	Action should specifically suggest for sustainable management of the area and restoration of ecosystem for flow of goods and services.	Noted & agreed. Detailed under Chapter 4.
9	The project proponent shall study impact on fish habitats and the food WEB/ food chain in the nearby water body and Reservoir.	Noted & agreed. Detailed under Chapter 3.
10	The Terms of Reference should specifically study impact on soil health, soil erosion, the soil physical, chemical components and microbial components.	Noted & agreed. Detailed under Chapter 3.
11	The Environmental Impact Assessment should study impact on forest, vegetation, endemic. vulnerable and endangered indigenous flora and fauna.	Noted & agreed. Detailed under Chapter 3.

12	The Environmental Impact Assessment should study impact on standing trees and the existing trees should be numbered and action suggested for protection.	Noted & agreed. Detailed under Chapter 3.
13	The Environmental Impact Assessment should study on wetlands, water bodies, rivers streams, lakes and farmer sites.	Noted & agreed. Detailed under Chapter 3.
14	The Environmental Impact Assessment should hold detailed study on EMP with budget for Green belt development and mine closure plan including disaster management plan.	Noted & agreed. Detailed under Chapter 10.
15	The Environmental Impact Assessment should study impact on climate change, temperature rise. pollution and above soil & below soil carbon stock.	Noted & agreed. Detailed under Chapter 3.
16	The Environmental Impact Assessment should study impact on protected areas, Reserve Forests, National Parks, Corridors and Wildlife pathways, near project site.	Noted & agreed. Detailed under Chapter 3.
17	The project proponent shall study and furnish the impact of project on plantations in adjoin patta lands, Horticulture, Agriculture and livestock.	Noted & agreed. Detailed under Chapter 3.
18	The project proponent shall study and furnish the details on potential fragmentation impact of natural environment, by the activities.	Noted & agreed. Detailed under Chapter 3.
19	Detailed Environment Management Plan along with adaptation, mitigation & remedial strategies covering the entire mine lease period as per precise aren communication order issued.	Noted & agreed. Detailed under Chapter 10.
20	The project proponent shall study and furnish the impact on aquatic plants and animals in water. The project proponent shall study and furnish the impact on aquatic plants and animals in water	Noted & agreed. Detailed under Chapter 3.
21	The project proponent shall study and furnish the possible pollution due to plastic and micro plastic on the environment. The ecological risks and impacts of plastic & micro plastic on aquatic environment and fresh water systems due to activities contemplated during mining may be investigated and reported.	Noted & agreed. Detailed under Chapter 3.
22	The project proponent shall study on impact of mining on Reserve forests free ranging wildlife.	Noted & agreed. Detailed under Chapter 3.
23	Detailed study shall be carried out in regard to impact of mining around the proposed mine lease area covering the entire mine lease period as per precise area communication order issued from reputed research institutions on the following	
	a) Soil health & bio-diversity.	
	b) Climate change leading to Droughts, Floods etc. SEIAA-TN	
	c) Pollution leading to release of Greenhouse gases (GHG), rise in Temperature, & Livelihood of the local people,	Noted and agreed
	d) Possibilities of water contamination and impact on aquatic ecosystem health.	
	e) Agriculture, Forestry & Traditional practices.	
	f) Hydrothermal/Geothermal effect due to destruction in the Environment.	
	g) Bio-geochemical processes and its foot prints including environmental stress.	
	h) Sediment geochemistry in the surface streams:	
24	Hydro-geological study considering the contour map of the water table detailing the number of ground water pumping & open wells, and surface water	Noted & agreed. Detailed under Chapter 3.

	bodies such as rivers, tanks, canals, ponds etc. within km (radius) so as to assess the impacts on the nearby water bodies 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.	
25	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.	Noted & agreed. Detailed under Chapter 7.
26	To furnish risk assessment and management plan including anticipated vulnerabilities during operational and post operational phases of Mining.	Noted & agreed. Detailed under Chapter 7
27	Detailed Mine Closure Plan covering the entire mine lease period as per precise area communication order issued.	Noted & agreed. Detailed under Chapter 2.
STANDARD TERMS OF REFERENCE		
1	Year-wise production details since 1994 should be given, clearly stating the highest production achieved in any one year prior to 1994. It may also be categorically informed whether there had been any increase in production after the EIA Notification 1994 came into force, w.r.t. the highest production achieved prior to 1994.	Not applicable. This is Not a violation category project. This proposal falls under B1 Category (Cluster Condition).
2	A copy of the document in support of the fact that the Proponent is the rightful lessee of the mine should be given.	The applied land for quarrying is a Patta Land. Document is enclosed along with Approved Mining Plan as Annexure Volume 1.
3	All documents including approved mine plan, EIA and Public Hearing should be compatible with one another in terms of the mine lease area, production levels, waste generation and its management, mining technology etc. and should be in the name of the lessee.	Noted & agreed.
4	All corner coordinates of the mine lease area, superimposed on a High-Resolution Imagery/ toposheet, topographic sheet, geomorphology and geology of the area should be provided. Such an Imagery of the proposed area should clearly show the land use and other ecological features of the study area (core and buffer zone).	Map showing – Project area is superimposed on Satellite imagery is enclosed in Figure No. 2.7 Project area boundary coordinates superimposed on Toposheet – Figure No. 1.3, Surface Features around the project area covering 10km radius – Figure No. 2.8, Geology map of the project area covering 10km radius - Figure No. 2.11 Geomorphology Map of the Study Area covering 10 km radius – Figure No. 2.12,
5	Information should be provided in Survey of India Toposheet in 1:50,000 scale indicating geological map of the area, geomorphology of land forms of the area, existing minerals and mining history of the area, important water bodies, streams and rivers and soil characteristics.	Map showing – Geology map of the project area covering 10km radius - Figure No. 2.11, Geomorphology Map of the Study Area covering 10 km radius – Figure No. 2.12,
6	Details about the land proposed for mining activities should be given with information as to whether mining conforms to the land use policy of the State; land diversion for mining should have approval from State land use board or the concerned authority.	The applied area was inspected by the officers of Department of Geology along with revenue officials and found that the land is fit for quarrying under the policy of State Government.
7	It should be clearly stated whether the proponent Company has a well laid down Environment Policy	The proponent has framed their Environmental Policy and the same is discussed in the Chapter No 10.1A,.

	approved by its Board of Directors? If so, it may be spelt out in the EIA Report with description of the prescribed operating process/procedures to bring into focus any infringement/deviation/ violation of the environmental or forest norms/conditions? The hierarchical system or administrative order of the Company to deal with the environmental issues and for ensuring compliance with the EC conditions may also be given. The system of reporting of non-compliances / violations of environmental norms to the Board of Directors of the Company and/or shareholders or stakeholders at large, may also be detailed in the EIA Report.	
8	Issues relating to Mine Safety, including subsidence study in case of underground mining and slope study in case of open cast mining, blasting study etc. should be detailed. The proposed safeguard measures in each case should also be provided.	It is an opencast quarrying operation proposed to operate in Mechanized method. The rough stone formation is a hard, compact and homogeneous body. The height and width of the bench will be maintained as 5m with 900 bench angles. Quarrying activities will be carried out under the supervision of Competent Persons like Mines Manager, Mines Foreman and Mining Mate. Necessary permissions will be obtained from DGMS after obtaining Environmental Clearance.
9	The study area will comprise of 10 km zone around the mine lease from lease periphery and the data contained in the EIA such as waste generation etc., should be for the life of the mine / lease period.	Noted & agreed. The study area considered for this study is 10 km radius and all data contained in the EIA report such as waste generation etc., is for the Life of the Mine / lease period.
10	Land use of the study area delineating forest area, agricultural land, grazing land, wildlife sanctuary, national park, migratory routes of fauna, water bodies, human settlements and other ecological features should be indicated. Land use plan of the mine lease area should be prepared to encompass preoperational, operational and post operational phases and submitted. Impact, if any, of change of land use should be given.	Land use and land cover of the study area is discussed in Chapter No. 3. Land use plan of the project area showing pre-operational, operational and post-operational phases are discussed in Chapter No. 2, Table No 2.4.
11	Details of the land for any Over Burden Dumps outside the mine lease, such as extent of land area, distance from mine lease, its land use, R&R issues, if any, should be given	Not Applicable. There is no waste anticipated during this quarry operation. The entire quarried out rough stone will be transported to the needy customers. No Dumps is proposed outside the lease area.
12	A Certificate from the Competent Authority in the State Forest Department should be provided, confirming the involvement of forest land, if any, in the project area. In the event of any contrary claim by the Project Proponent regarding the status of forests, the site may be inspected by the State Forest Department along with the Regional Office of the Ministry to ascertain the status of forests, based on which, the Certificate in this regard as mentioned above be issued. In all such cases, it would be desirable for representative of the State Forest Department to assist the Expert Appraisal Committees.	Not Applicable. There is no Forest Land involved in the proposed project area. The proposed project area is a patta land. Approved Mining Plan is enclosed as Annexure Volume 1.
13	Status of forestry clearance for the broken-up area and virgin forestland involved in the Project including deposition of net present value (NPV) and compensatory afforestation (CA) should be indicated. A copy of the forestry clearance should also be furnished.	Not Applicable. The proposed project area does not involve any Forest Land.

14	Implementation status of recognition of forest rights under the Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 should be indicated.	Not Applicable. The project doesn't attract Recognition of Forest Rights Act, 2006.
15	The vegetation in the RF / PF areas in the study area, with necessary details, should be given.	No Reserve Forest within the Study Area.
16	A study shall be got done to ascertain the impact of the Mining Project on wildlife of the study area and details furnished. Impact of the project on the wildlife in the surrounding and any other protected area and accordingly, detailed mitigative measures required, should be worked out with cost implications and submitted.	Not Applicable. There are No National Parks, Biosphere Reserves, Wildlife Corridors, and Tiger/Elephant Reserves within 10 km Radius from the periphery of the project area.
17	Location of National Parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, Ramsar site Tiger/ Elephant Reserves/(existing as well as proposed), if any, within 10 KM of the mine lease should be clearly indicated, supported by a location map duly authenticated by Chief Wildlife Warden. Necessary clearance, as may be applicable to such projects due to proximity of the ecologically sensitive areas as mentioned above, should be obtained from the Standing Committee of National Board of Wildlife and copy furnished	Not Applicable. There are No National Parks, Biosphere Reserves, Wildlife Corridors, and Tiger/Elephant Reserves within 10 km Radius from the periphery of the project area.
18	A detailed biological study of the study area [core zone and buffer zone (10 KM radius of the periphery of the mine lease)] shall be carried out. Details of flora and fauna, endangered, endemic and RET Species duly authenticated, separately for core and buffer zone should be furnished based on such primary field survey, clearly indicating the Schedule of the fauna present. In case of any scheduled-I fauna found in the study area, the necessary plan along with budgetary provisions for their conservation should be prepared in consultation with State Forest and Wildlife Department and details furnished. Necessary allocation of funds for implementing the same should be made as part of the project cost.	Detailed biological study of the study area [core zone and buffer zone (10 km radius of the periphery of the mine lease)] was carried out and discussed under Chapter No. 3, There is no schedule I species of animals observed within study area as per Wildlife Protection Act 1972 as well as no species is in vulnerable, endangered or threatened category as per IUCN. There is no endangered red list species found in the study area.
19	Proximity to Areas declared as 'Critically Polluted' or the Project areas likely to come under the 'Aravalli Range', (attracting court restrictions for mining operations), should also be indicated and where so required, clearance certifications from the prescribed Authorities, such as the SPCB or State Mining Department should be secured and furnished to the effect that the proposed mining activities could be considered.	Not Applicable. Project area / Study area is not declared in 'Critically Polluted' Area and does not come under 'Aravalli Range.
20	Similarly, for coastal Projects, A CRZ map duly authenticated by one of the authorized agencies demarcating LTL. HTL, CRZ area, location of the mine lease w.r.t CRZ, coastal features such as mangroves, if any, should be furnished. (Note: The Mining Projects falling under CRZ would also need to obtain approval of the concerned Coastal Zone Management Authority).	Not Applicable. The project doesn't attract The C. R. Z. Notification, 2018.
21	R&R Plan/compensation details for the Project Affected People (PAP) should be furnished. While preparing the R&R Plan, the relevant State/National Rehabilitation & Resettlement Policy should be kept in view. In respect of SCs /STs and other weaker sections of the society in the study area, a need-based sample survey, family-wise, should be undertaken to	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.

	assess their requirements, and action programmes prepared and submitted accordingly, integrating the sectoral programmes of line departments of the State Government. It may be clearly brought out whether the village(s) located in the mine lease area will be shifted or not. The issues relating to shifting of village(s) including their R&R and socio-economic aspects should be discussed in the Report.	
22	One season (non-monsoon) [i.e. March-May (Summer Season); October-December (post monsoon season) ; December-February (winter season)]primary baseline data on ambient air quality as per CPCB Notification of 2009, water quality, noise level, soil and flora and fauna shall be collected and the AAQ and other data so compiled presented date-wise in the EIA and EMP Report. Site-specific meteorological data should also be collected. The location of the monitoring stations should be such as to represent whole of the study area and justified keeping in view the pre-dominant downwind direction and location of sensitive receptors. There should be at least one monitoring station within 500 m of the mine lease in the pre-dominant downwind direction. The mineralogical composition of PM10, particularly for free silica, should be given.	Baseline Data were collected for One Season (Post Monsoon) December 2022– February 2023 as per CPCB Notification and MoEF & CC Guidelines. Details in Chapter No. 3, Page No. 47 – 118.
23	Air quality modelling should be carried out for prediction of impact of the project on the air quality of the area. It should also take into account the impact of movement of vehicles for transportation of mineral. The details of the model used and input parameters used for modelling should be provided. The air quality contours may be shown on a location map clearly indicating the location of the site, location of sensitive receptors, if any, and the habitation. The wind roses showing pre-dominant wind direction may also be indicated on the map.	Air Quality Modelling for prediction of incremental GLC's of pollutant was carried out using AERMOD view 9.6.1 Model. Details in Chapter No. 4.
24	The water requirement for the Project, its availability and source should be furnished. A detailed water balance should also be provided. Fresh water requirement for the Project should be indicated.	Discussed under Chapter 2, Table No 2.15
25	Necessary clearance from the Competent Authority for drawl of requisite quantity of water for the Project should be provided.	Not Applicable. Water for dust suppression, greenbelt development and domestic use will be sourced from accumulated rainwater/seepage water in mine pits and purchased from local water vendors through water tankers on daily requirement basis. Drinking water will be sourced from the approved water vendors.
26	Description of water conservation measures proposed to be adopted in the Project should be given. Details of rainwater harvesting proposed in the Project, if any, should be provided.	Part of the working pit will be allowed to collect rain water during the spell of rain will be used for greenbelt development and dust suppression. The Mine Closure Plan is prepared for converting the excavated pit into rain water harvesting structure and serve as water reservoir for the project village during draught season.
27	Impact of the Project on the water quality, both surface and groundwater, should be assessed and necessary safeguard measures, if any required, should be provided.	Impact Studies and Mitigation Measures of Water Environment including Surface Water and Ground Water are discussed in Chapter 4,
28	Based on actual monitored data, it may clearly be shown whether working will intersect groundwater.	Not Applicable.

	Necessary data and documentation in this regard may be provided. In case the working will intersect groundwater table, a detailed Hydro Geological Study should be undertaken and Report furnished. The Report inter-alia, shall include details of the aquifers present and impact of mining activities on these aquifers. Necessary permission from Central Ground Water Authority for working below ground water and for pumping of ground water should also be obtained and copy furnished.	The ground water table inferred 60-70 m below ground level. The ultimate depth of quarry is 47 m bgl-P1 This proposal of 47m below ground level will not intersect the ground water table, which is inferred from the hydro-geological studies carried out at the project site. Discussed under Chapter 3
29	Details of any stream, seasonal or otherwise, passing through the lease area and modification / diversion proposed, if any, and the impact of the same on the hydrology should be brought out.	Not Applicable. There is no stream, seasonal or other water bodies passing within the project area. Therefore, no modification/ diversion of water bodies is anticipated.
30	Information on site elevation, working depth, groundwater table etc. Should be provided both in AMSL and Bgl. A schematic diagram may also be provided for the same.	Highest elevation of the project area is around 340m AMSL. The ultimate depth of quarry is 47 m bgl-P1 Water level of the area is 60-70 m BGL
31	A time bound Progressive Greenbelt Development Plan shall be prepared in a tabular form (indicating the linear and quantitative coverage, plant species and time frame) and submitted, keeping in mind, the same will have to be executed up front on commencement of the Project. Phase-wise plan of plantation and compensatory afforestation should be charted clearly indicating the area to be covered under plantation and the species to be planted. The details of plantation already done should be given. The plant species selected for green belt should have greater ecological value and should be of good utility value to the local population with emphasis on local and native species and the species which are tolerant to pollution.	Greenbelt Development Plan is discussed under Chapter 4,
32	Impact on local transport infrastructure due to the Project should be indicated. Projected increase in truck traffic as a result of the Project in the present road network (including those outside the Project area) should be worked out, indicating whether it is capable of handling the incremental load. Arrangement for improving the infrastructure, if contemplated (including action to be taken by other agencies such as State Government) should be covered. Project Proponent shall conduct Impact of Transportation study as per Indian Road Congress Guidelines.	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 significant impact due to the proposed transportation from the project area. Details in Chapter 2,
33	Details of the onsite shelter and facilities to be provided to the mine workers should be included in the EIA Report.	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 .
34	Conceptual post mining land use and Reclamation and Restoration of mined out areas (with plans and with adequate number of sections) should be given in the EIA report.	Discussed under Chapter 2, Mine Closure Plan is a part of Approved Mining Plan enclosed as Annexure Volume – 1.
35	Occupational Health impacts of the Project should be anticipated and the proposed preventive measures spelt out in detail. Details of pre-placement medical examination and periodical medical examination schedules should be incorporated in the EMP. The project specific occupational health mitigation measures with required facilities proposed in the mining area may be detailed.	Occupational Health Impacts of the project and preventive measures are detailed under Chapter 4,
36	Public health implications of the Project and related activities for the population in the impact zone should be systematically evaluated and the proposed	No Public Health Implications anticipated due to this project.

	remedial measures should be detailed along with budgetary allocations.	Details of CER and CSR are discussed under Chapter 8,
37	Measures of socio-economic significance and influence to the local community proposed to be provided by the Project Proponent should be indicated. As far as possible, quantitative dimensions may be given with time frames for implementation.	No Negative Impact on Socio Economic Environment on the Study Area is anticipated and this project shall benefit the Socio-Economic Environment by ways of employment for 38 people directly and 10 people indirectly. Details in Chapter 4,
38	Detailed environmental management plan (EMP) to mitigate the environmental impacts which, should inter-alia include the impacts of change of land use, loss of agricultural and grazing land, if any, occupational health impacts besides other impacts specific to the proposed Project.	Detailed Environment Management Plan for the project to mitigate the anticipated impacts described under Chapter 4 is discussed under Chapter 10,
39	Public Hearing points raised and commitment of the Project Proponent on the same along with time bound Action Plan with budgetary provisions to implement the same should be provided and also incorporated in the final EIA/EMP Report of the Project.	The outcome of public hearing will be updated in the final EIA/EMP report
40	Details of litigation pending against the project, if any, with direction /order passed by any Court of Law against the Project should be given.	No litigation is pending in any court against this project.
41	The cost of the Project (capital cost and recurring cost) as well as the cost towards implementation of EMP should be clearly spelt out.	Noted and agreed
42	A Disaster management Plan shall be prepared and included in the EIA/EMP Report.	Details in Chapter 7.3.
43	Benefits of the Project if the Project is implemented should be spelt out. The benefits of the Project shall clearly indicate environmental, social, economic, employment potential, etc.	Details in Chapter 8.
44	Besides the above, the below mentioned general points are also to be followed: -	
a	Executive Summary of the EIA/EMP Report	Enclosed as separate booklet.
b	All documents to be properly referenced with index and continuous page numbering.	All the documents are properly referenced with index and continuous page numbering.
c	Where data are presented in the Report especially in Tables, the period in which the data were collected and the sources should be indicated.	List of Tables and source of the data collected are indicated.
d	Project Proponent shall enclose all the analysis/testing reports of water, air, soil, noise etc. using the MoEF&CC/NABL accredited laboratories. All the original analysis/testing reports should be available during appraisal of the Project	Baseline monitoring reports are enclosed with This report in Chapter 3. Original Baseline monitoring reports will be submitted in the final EIA report during appraisal.
e	Where the documents provided are in a language other than English, an English translation should be provided.	Not Applicable.
f	The Questionnaire for environmental appraisal of mining projects as devised earlier by the Ministry shall also be filled and submitted.	Will be enclosed along with Final EIA/ EMP Report.
g	While preparing the EIA report, the instructions for the Proponents and instructions for the Consultants issued by MoEF&CC vide O.M. No. J-11013/41/2006-IA.II(I) Dated: 4th August, 2009, which are available on the website of this Ministry, should be followed.	Noted & Agreed. Instructions issued by MoEF & CC O.M. No. J-11013/41/2006-IA.II (I) Dated: 4th August, 2009 are followed.
h	Changes, if any made in the basic scope and project parameters (as submitted in Form-I and the PFR for securing the TOR) should be brought to the attention of MoEF&CC with reasons for such changes and permission should be sought, as the TOR may also have to be altered. Post Public Hearing changes in structure and content of the draft EIA/EMP (other than modifications arising out of the P.H. process)	Noted & Agreed.

	will entail conducting the PH again with the revised documentation	
i	As per the circular no. J-11011/618/2010-IA.II(I) Dated: 30.5.2012, certified report of the status of compliance of the conditions stipulated in the environment clearance for the existing operations of the project, should be obtained from the Regional Office of Ministry of Environment, Forest and Climate Change, as may be applicable.	Not Applicable.
j	The EIA report should also include (i) surface plan of the area indicating contours of main topographic features, drainage and mining area, (ii) geological maps and sections and (iii) sections of the mine pit and external dumps, if any, clearly showing the land features of the adjoining area.	Surface Plan – Figure No. 2.4 Working Plan – Figure No 2.13 Closure Plan – Figure No.2.16

1.   INTRODUCTION

1.0   PREAMBLE

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.

Rough Stone and Gravel are the major requirements for construction industry. This EIA report is prepared by considering Cumulative load of proposed & existing quarries of Chikkarampalayam Rough Stone and Gravel Cluster Quarries consisting of Ten Proposed and Seven Existing Quarries with total extent of Cluster of 38.01.55 Ha in Chikkarampalayam Village, Mettupalayam Taluk, Coimbatore District and Tamil Nadu State, cluster area calculated as per MoEF & CC Notification S.O. 2269(E) Dated 1st July 2016.

This EIA Draft is prepared in compliance with ToR obtained for the proposals enlisted for cluster classification. Among these proposed quarry projects, five projects mentioned in the cluster (ie, S. Palanisamy, M/s. Palanivel Sri Blue Metals, Tmt.M. Muthammal, C.N. Mani, C.N. Mani) has already underwent public hearing consultation held by the TNPCB, Coimbatore District.

This EIA Draft is prepared in compliance with ToR obtained vide:
- Lr.No. SEIAA-TN/F.No.9011/SEAC/ToR-1161/2022 Dated: 06.06.2022 for P1

The Baseline Monitoring study has been carried out during Post Moonsoon season (December 2022 to February 2023) and the Cumulative Environmental Impact Assessment study is undertaken, which is followed by preparation of a detailed Environmental Management Plan (EMP) individually to minimize those adverse impacts.

PURPOSE OF THE REPORT

The Ministry of Environment and Forests, Govt. of India, through its EIA notification S.O. 1533I of 14th September 2006 and its subsequent amendments   as per Gazette Notification S.O. 3977 I of 14thAugust 2018, Mining Projects are classified under two categories i.e. A (> 100 Ha) and B (≤ 100 Ha), and Schematic Presentation of Requirements on Environmental Clearance of Minor Minerals including cluster situation in Appendix–XI.

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

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

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

FIGURE 1.1 SATELLITE IMAGERY CLUSTER QUARRIES
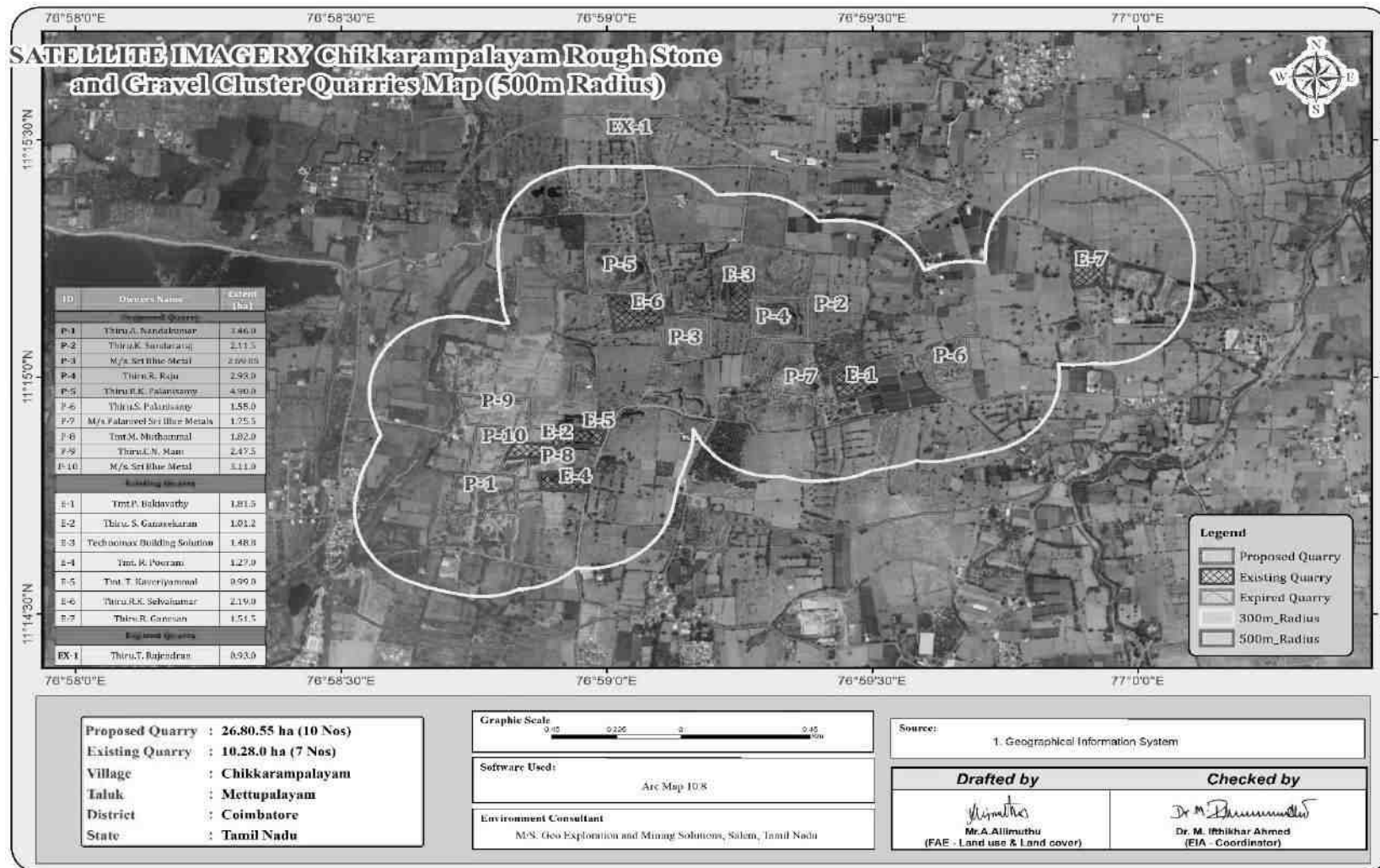
1.2   IDENTIFICATION OF PROJECT AND PROJECT PROPONENT

1.2.1   Identification of Project

TABLE 1.1: SALIENT FEATURES OF THE PROPOSED PROJECT

PROPOSAL – P1	
Name of the Project	Thiru. A. Nandhakumar Rough stone and Gravel quarry
S.F. No.	78/1(P), 419 & 420
Extent	3.46.0 ha
Land Type	Patta Land
Village Taluk and District	Chikkarampalayam Village, Mettupalayam Taluk, Coimbatore District

Source: Approved Mining Plan of Respective Proposals

1.2.2   Identification of Project Proponent

TABLE 1.2: DETAILS OF PROJECT PROPONENT

PROPOSAL – P1	
Name of the Project Proponent	Thiru.A. Nandakumar
Address	S/o.Arukutty Goundar, No.79D, Avinashi Road, Annur, Coimbatore District – 641 653
Mobile	+91 9842262448 +91 9585343636
Status	Individual

Source: Approved Mining Plan of Respective Proposal

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.

TABLE 1.3: BRIEF DESCRIPTION OF THE PROJECT – P1

Name of the Project	Thiru. A. Nandhakumar Rough Stone & Gravel Quarry	
Toposheet No	58-A/16	
Latitude between	$11^0 14'42.00''$ N to $11^0 14'47.83''$ N	
Longitude between	$76^0 58'41.37''$ E to $76^0 58'49.95''$ E	
Highest Elevation	350m AMSL	
Proposed Depth of Mining (As per ToR)	47 m bgl (2 m Gravel + 45 m Rough Stone)	
Geological Resources	Rough Stone in m^3	Gravel m^3
	13,49,900	39,684
Mineable Reserves	Rough Stone in m^3	Gravel m^3
	3,86,746	28,470
Yearwise Production	Rough Stone in m^3	Gravel m^3
	3,86,746	28,470
Environmental Clearance	Lr.No. SEIAA-TN/F.No.3822/EC/1(a)/2709/2015 Dated: 11.01.2016	
Consent to Operate (CTO) from TNPCB	Proceedings No. F.0702CBN/RS/DEE/TNPCB/CBN/A/2021 DATED 13.02.2021	
Ultimate Pit Dimension	180m (L) x 205m (W) x 47m(D) bgl	
Water Level in the surrounding areas	65 – 70 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 Southern side. The altitude of the area is 350 m (max) above mean sea level. The area is covered by 2 m thickness of Gravel Formation. Massive	

	Charnockite is found after 2 m (Gravel Formation) which is clearly inferred from the nearby existing quarrying pit.	
Machinery proposed	Jack Hammer	10 Nos
	Compressor	3 Nos
	Hydraulic Excavator	2 No
	Tippers	4 Nos
Blasting Method	Controlled Blasting Method by shot hole drilling and small dia of 25mm slurry explosive are proposed to be used for shattering and heaving effect for removal and winning of Rough Stone. No deep hole drilling is proposed.	
Proposed Manpower Deployment	38 Nos	
Project Cost	Rs. 79,45,000/-	
CER Cost	Rs. 5,00,000,/-	
Nearby Water Bodies	Canal	140m NW
	Belladhi Lake	820m NW
	Canal	1.90 km East
	Bhavani River	7.5km NE
Greenbelt Development Plan	As per Mining plan it is Proposed to plant 1750 trees in the 7.5 m Safety Zone, approach road and panchayat roads.	
Proposed Water Requirement	3.5 KLD	
Nearest Habitation	2.0 km North	

Source: Approved Mining Plan

1.3.2   Location of the Project

- All the proposed quarry projects fall in Chikkarampalayam Village, Mettupalayam Taluk and Coimbatore District.
- The project Projects is located about 26.0 km Northeastern of Coimbatore town and 8 km Southeastern of Mettupalayam and 2.0 km South East side of Belladihi Village.

FIGURE 1.2 KEY MAP SHOWING THE LOCATION OF THE CLUSTER SITE
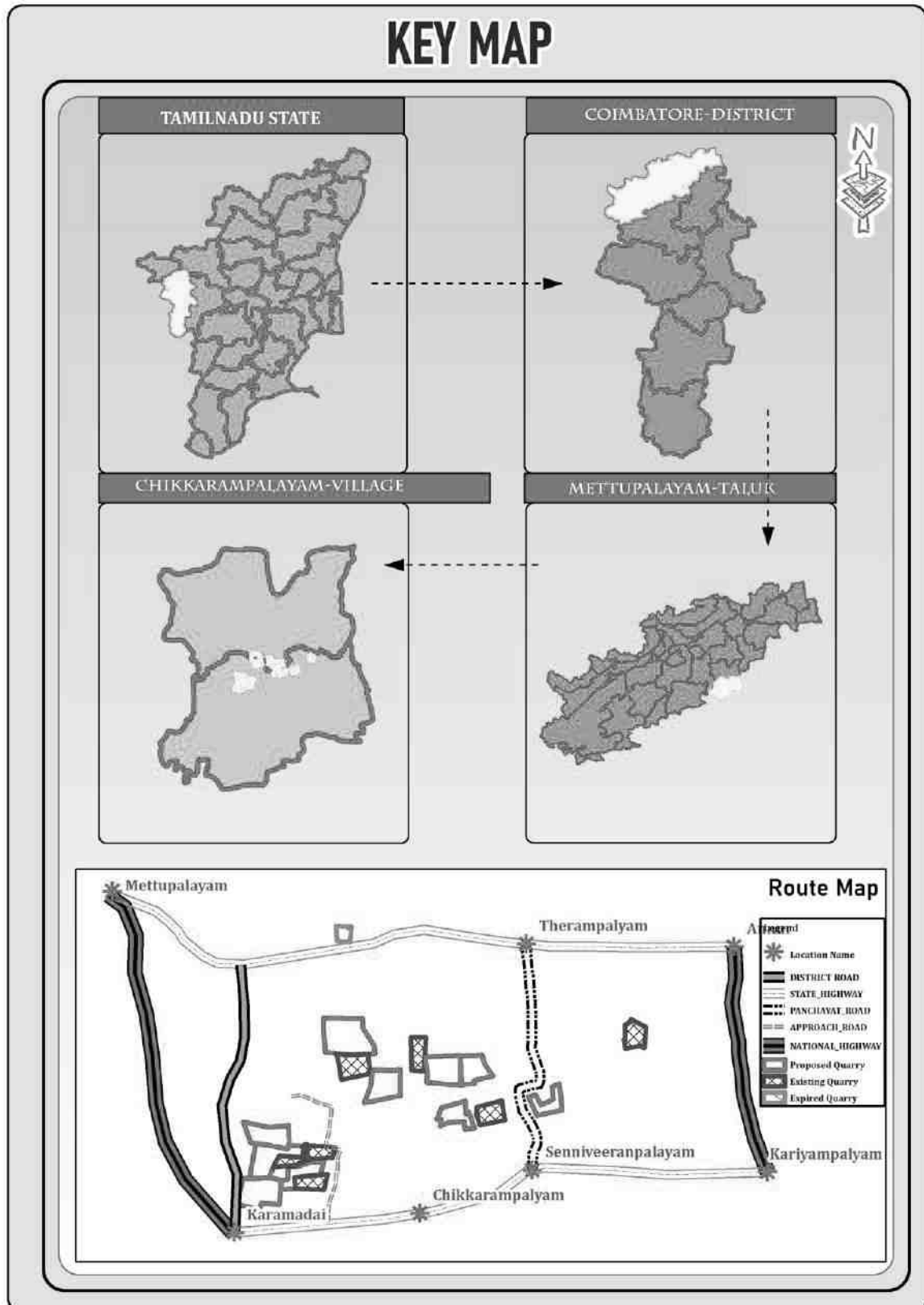
Source: Survey of India Toposheet 58-A/15 & 16

FIGURE 1.3: TOPOSHEET MAP OF THE STUDY AREA 10 KM RADIUS
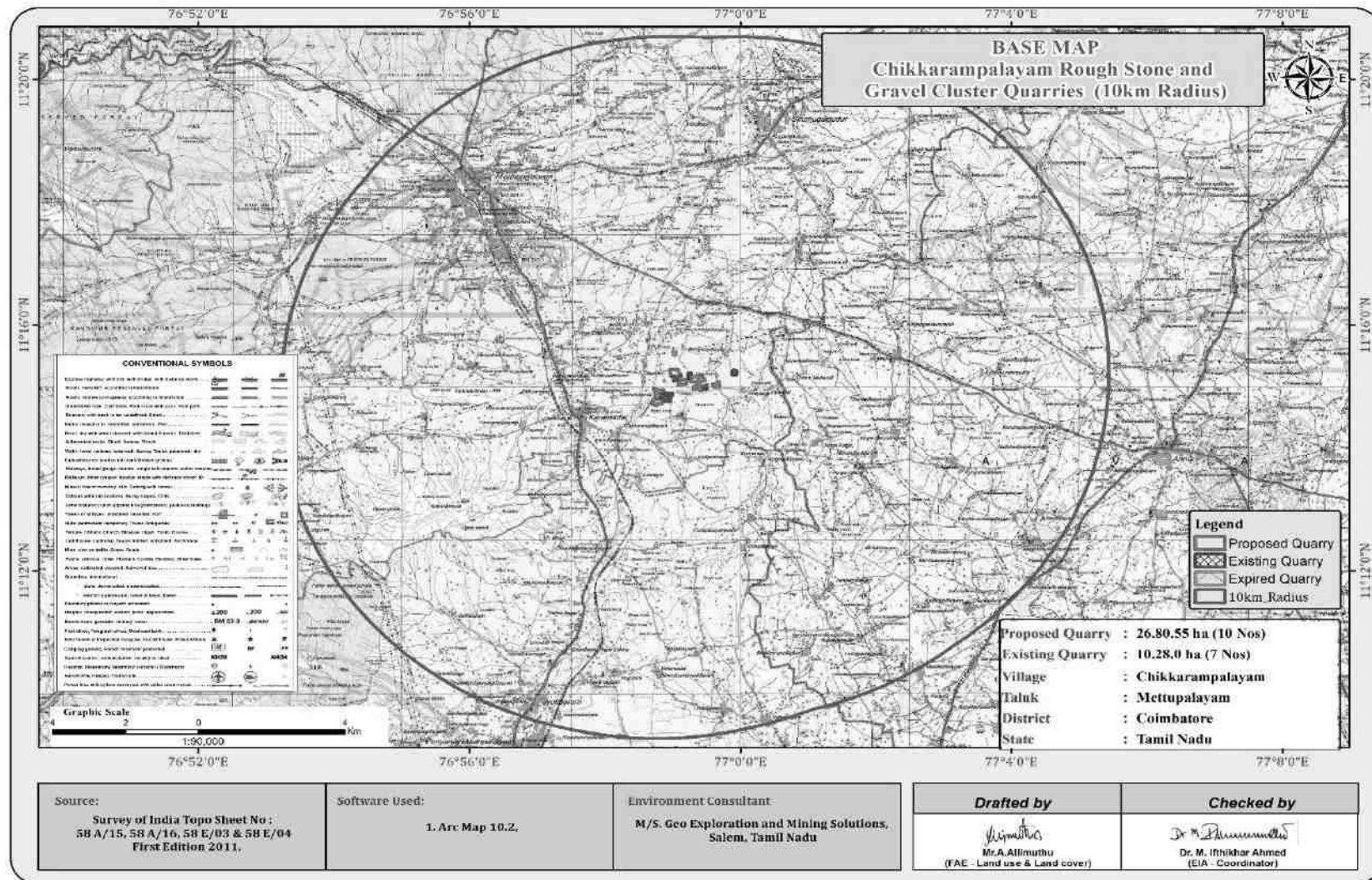
Source: Survey of India Toposheet 58-A/15 & 16

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 –

PROPOSAL – P1

- The proponent applied for Rough Stone and Gravel Quarry Lease Dated: 06.08.2021
- Precise Area Communication Letter was issued by the District Collector, Coimbatore Rc.No. 939/Mines/2021, Dated: 02.12.2021
- The Mining Plan was prepared by Recognized Qualified Person and approved by Assistant Director, Geology and Mining, Coimbatore District, vide Rc.No.939/Mines/2021, Dated: 31.12.2021.
- 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/ 72349/2022. dated: 17.02.2022

SCOOPING:

PROPOSAL – P1

- The proposal was placed in 273th SEAC meeting held on 14.05.2022 and the committee recommended for issue of ToR.
- The proposal was considered in 518th SEIAA meeting held on 06.06.2022 and issued ToR vide Lr.No.SEIAA-TN/F.NO.9011/SEAC/ToR-1161/2022 Dated:06.06.2022

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.
- The report has been prepared using the following references:
- Guidance Manual of Environmental Impact Assessment for Mining of Minerals, Ministry of Environment and Forests, 2010
- EIA Notification, 14th September, 2006
- ToR Lr.No. SEIAA-TN/F.No.9011/ ToR-1161/2022 Dated: 06.06.2022 – P1
- Approved Mining Plan of Respective Proposed Projects.

1.5   TERMS OF REFERENCE (ToR)

Compliance to ToR issued vide –

- ToR Lr.No. SEIAA-TN/F.No.9011/ ToR-1161/2022 Dated: 06.06.2022 – P1

(Detailed in above)

1.6   POST ENVIRONMENT CLEARANCE MONITORING

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

1.7   GENERIC STRUCTURE OF EIA DOCUMENT

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

1.8   THE SCOPE OF THE STUDY

The main scope of the EIA study is to quantify the cumulative impact in the study area due to cluster quarries and formulate the effective mitigation measures for individual leases. A detailed account of the emission sources, emissions control equipment, background Air quality levels, Meteorological measurements, Dispersion model and all other aspects of pollution like effluent discharge, Dust generation etc., have been discussed in this report. The baseline monitoring study has been carried out during the Post monsoon season (December 2022 to February 2023) 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.

<div align="center">TABLE 1.6: ENVIRONMENT ATTRIBUTES</div>

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 9 locations (2 Core & 7 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 5 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 Lr.No. SEIAA-TN/F.No.9011/ ToR-1161/2022 Dated: 06.06.2022 – P1

2. PROJECT DESCRIPTION

2.0 GENERAL

The Proposed Rough Stone Quarries requires Environmental Clearance. There are 1 proposed,9 Nearest Prposed Quarries and 7 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 38.01.55 ha.

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

2.1 DESCRIPTION OF THE PROJECT

The proposed projects are site specific and there is no additional area required for this project. There is no effluent generation/discharge from the proposed quarries.

Method of mining is common for all the quarries. Rough Stone is proposed to be excavated by opencast mechanized method involving splitting of rock mass of considerable volume from the parent rock mass by jackhammer drilling and blasting, hydraulic excavators are used for loading the Rough Stone from pithead to the needy crushers and rock breakers to avoid secondary blasting.

2.2 LOCATION OF THE PROJECT

- All the proposed quarry projects are located in Chikkarampalayam village, Mettupalayam taluk, Combat ore District.
- The Proposed projects is located about 26.0 km Northeastern of Coimbatore town and 8 km Southeastern of Mettupalayam and 2.0 km South East side of Belladihi Village.

The project does not fall within 10 km radius of any Eco – sensitive zone, National Park, Tiger Reserve, Elephant Corridor and Biosphere Reserves.

TABLE 2.1: SITE CONNECTIVITY

Nearest Roadway	The Nearest National Highway (NH-181) Coimbatore – Ooty is situated about 4km on the Southwestern side of the lease applied area. The State Highway (SH-168) Karamadai – Kariyampalayam is situated about 2km on the Southern side of the lease applied area.
Nearest Village	Chikkarampalayam – 1.0 Km South West
Nearest Town	Karamadai – 4.0 km – South West
Nearest Railway Station	Karamadai Railway station – 4.0Km – SW
Nearest Airport	Coimbatore –26.0 km – South West
Seaport	Kochi- 165 km – South West

Source: Survey of India Toposheet

TABLE 2.2: BOUNDARY CO-ORDINATES OF PROPOSED PROJECT

PROJECT – P1		
Corner Nos.	**Latitude**	**Longitude**
1	$11^0$14'43.20"N	$76^0$58'41.37"E
2	$11^0$14'44.96"N	$76^0$58'41.78"E
3	$11^0$14'45.07"N	$76^0$58'42.36"E
4	$11^0$14'47.61"N	$76^0$58'42.96"E
5	$11^0$14'47.50"N	$76^0$58'45.08"E
6	$11^0$14'47.83"N	$76^0$58'47.66"E
7	$11^0$14'47.26"N	$76^0$58'49.95"E
8	$11^0$14'42.88"N	$76^0$58'49.61"E
9	$11^0$14'43.08"N	$76^0$58'46.27"E
10	$11^0$14'42.00"N	$76^0$58'45.89"E
11	$11^0$14'42.32"N	$76^0$58'45.25"E
12	$11^0$14'42.68"N	$76^0$58'42.73"E

Source: Approved Mining Plans

FIGURE 2.1: GOOGLE IMAGE OF THE PROJECT AREA – P1

Source: Google Earth Imagery

FIGURE 2.6: QUARRY LEASE PLAN / SURFACE PLAN – P1
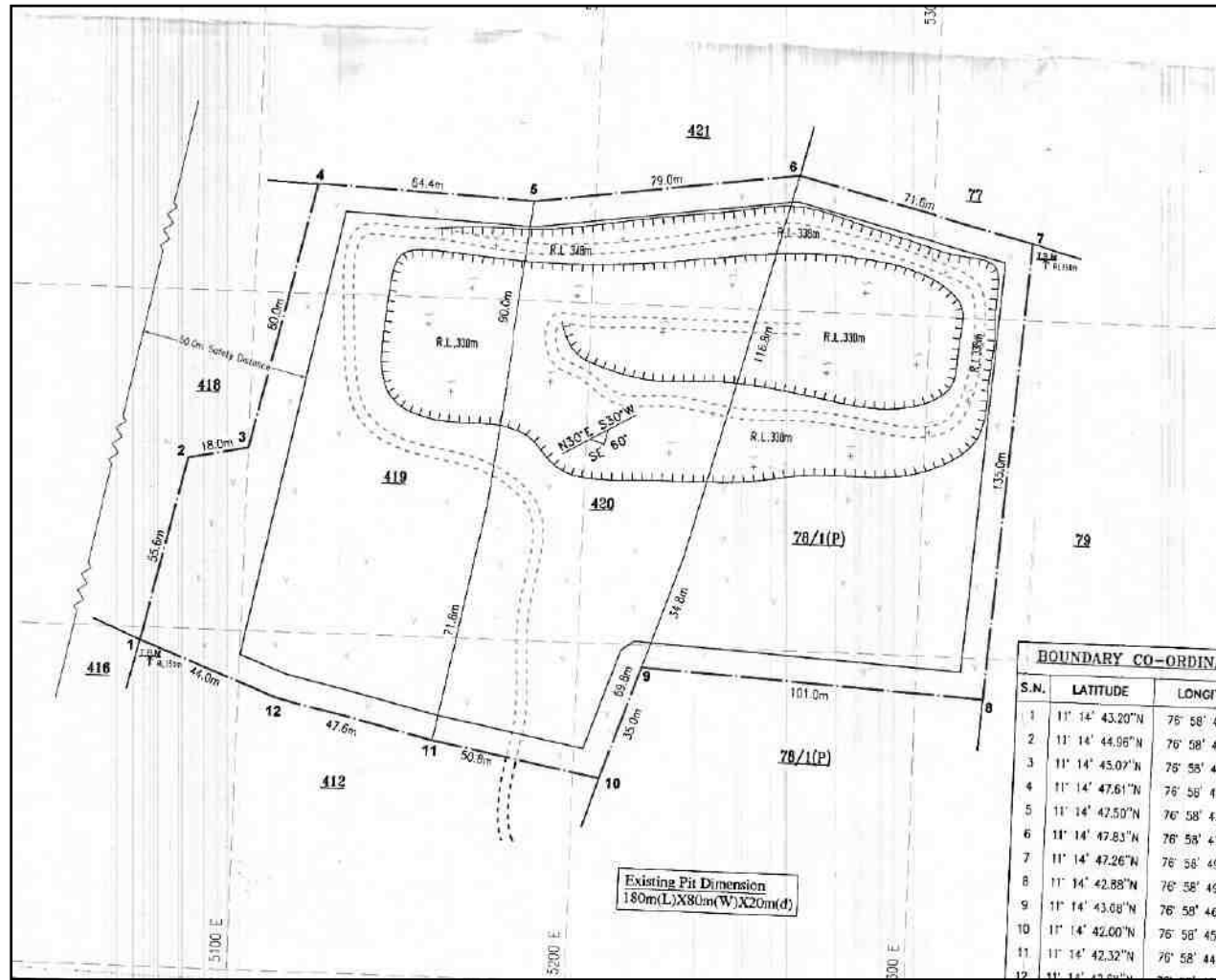
Source: Approved Mining Plan

FIGURE 2.11: VILLAGE MAP SUPERIMPOSED ON GOOGLE EARTH IMAGE
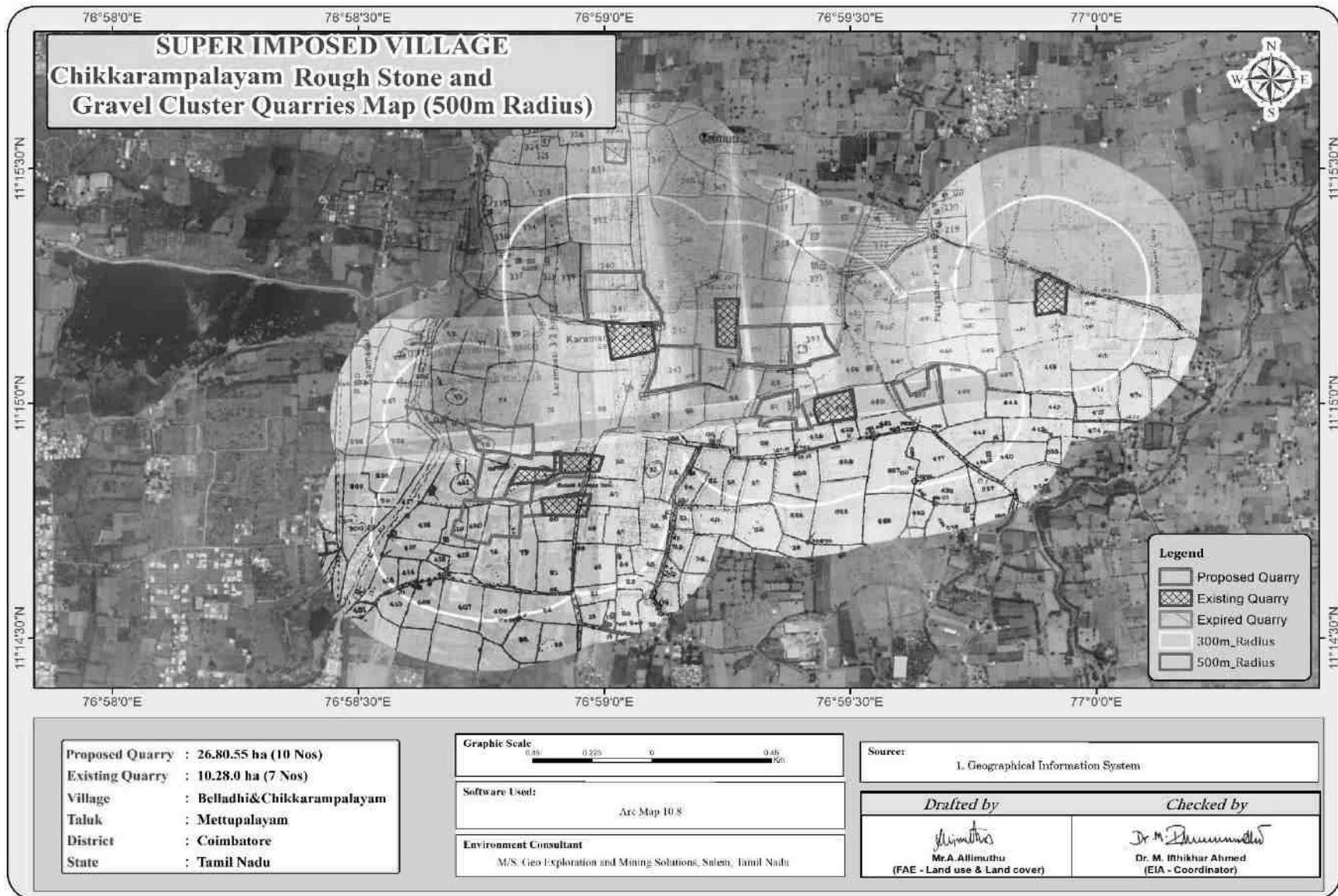
FIGURE 2.12: IMAGE SHOWING SURFACE FEATURES AROUND 10 KM RADIUS
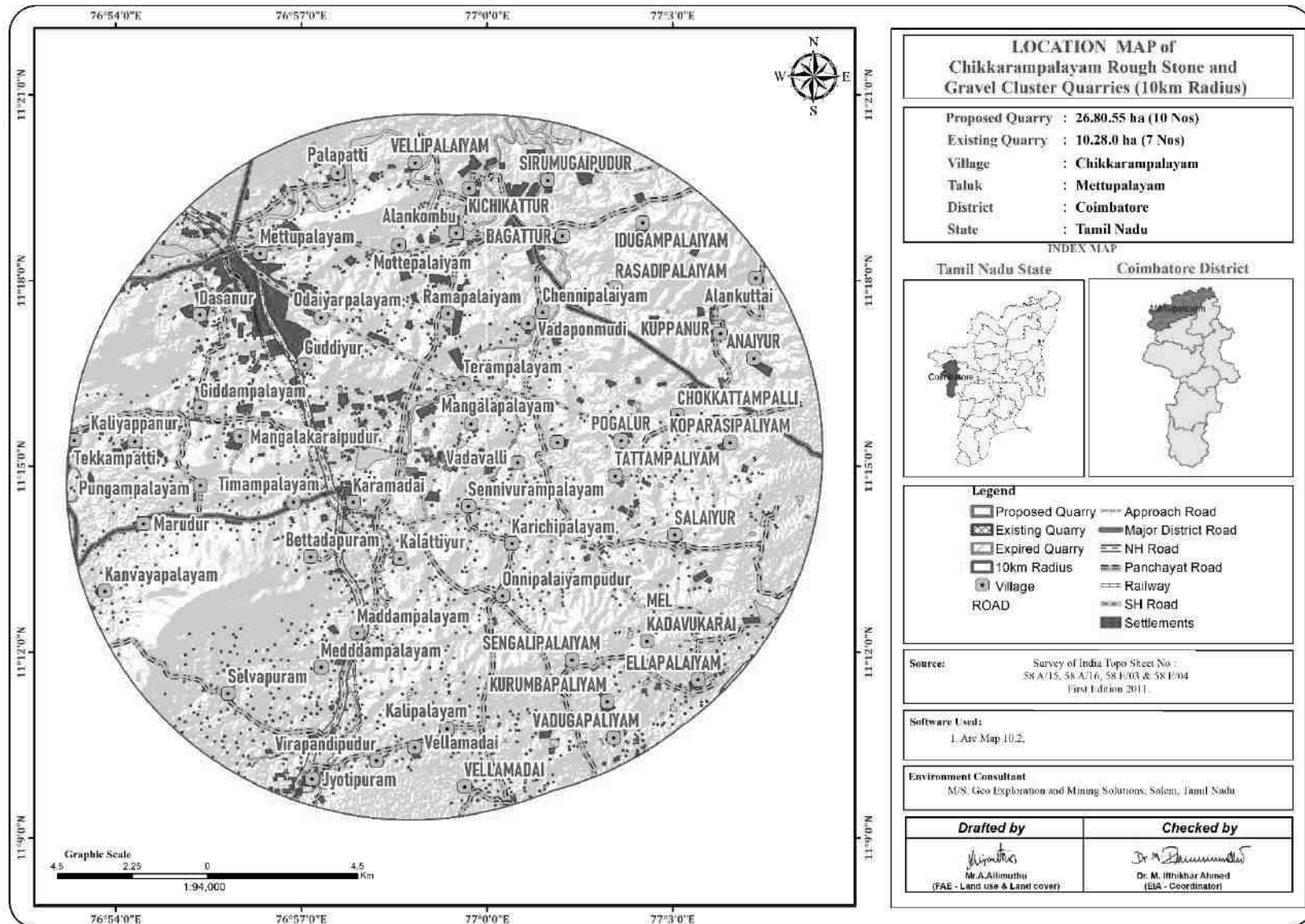
FIGURE 2.13: IMAGE SHOWING SURFACE FEATURES AROUND 5KM RADIUS
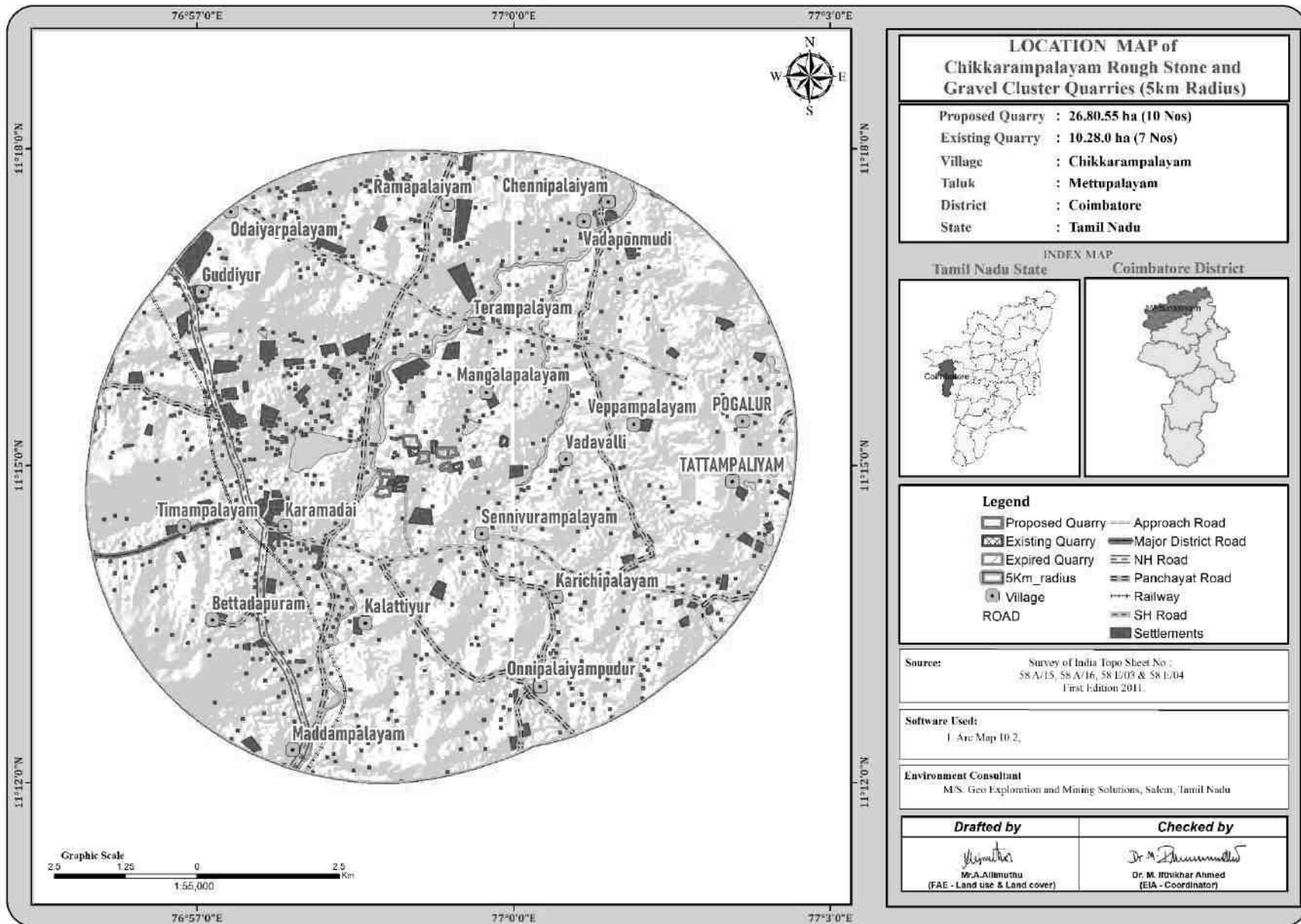
FIGURE 2.14: IMAGE SHOWING SURFACE FEATURES AROUND 1 KM RADIUS
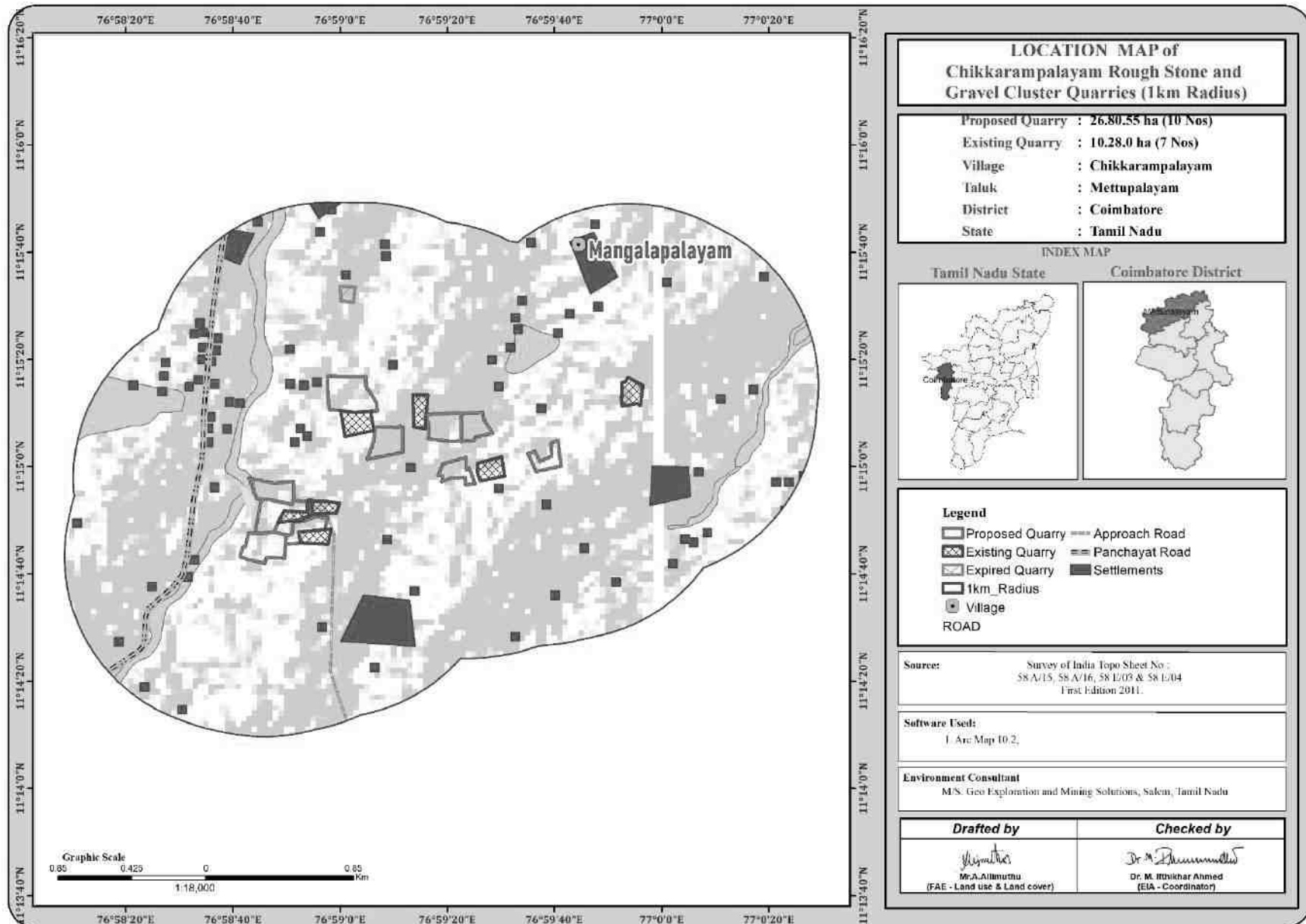
2.2.1   Project Area

- The Proposed Projects are site specific.
- There is no beneficiation or processing proposed inside all the project area.
- There is no forest land involved in the proposed project and is devoid of major vegetation and trees.

TABLE 2.3: LAND USE PATTERN OF THE PROPOSED PROJECT

PROJECT – P1		
Description	Present area in (ha)	Area at the end of life of quarry (Ha)
Area under quarry	1.22.7	2.79.1
Infrastructure	Nil	0.01.0
Roads	0.01.0	0.02.0
Green Belt	Nil	0.42.0
Un – utilized area	2.22.3	0.21.9
Grand Total	**3.46.0**	**3.46.0**

Source: Approved Mining Plans of Proposal

2.2.2   Size or Magnitude of Operation

TABLE 2.4: OPERATIONAL DETAILS FOR PROPOSED PROJECT

PROJECT – P1		
PARTICULARS	**DETAILS**	
	Rough Stone (5Year Plan period)	**Gravel in m³**
Geological Resources	13,49,900	39,684
Mineable Reserves	3,86,746	28,470
Production for five-year plan period	3,86,746	28470
Mining Plan Period / Lease Applied Period	5 Years	
Number of Working Days	300 Days	
Production per day	134	-
No of Lorry loads (6m³ per load)	22	6
Total Depth of Mining	47m bgl	

Source: mining plan

2.3   GEOLOGY

2.3.1   Regional Geology

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

i.   Charnockite Group represented by Charnockite, Pyroxene Granulite and Magnetite Quartzite
ii   Peninsular Gneissic Complex (II) comprising hornblende-biotite gneiss
iii   Peninsular Gneissic Complex (II) comprising hornblende-biotite gneiss
iv   Younger intrusive comprising, Nepheline-Syenite,Pink Granite, Pegmatite and Quartz veins and
v   Younger intrusive comprising, Nepheline-Syenite,Pink Granite, Pegmatite and Quartz veins and
vi   Quaternary sediments of Kankar and soil

Stratigraphy of the area –

Age	Group	Lithology
Holocene		Block cotton soil/clay±gypsum
Cenozoic		Kankar/calc-tufa

Neoproterozoic	Acid intrusives	Quartz veins Pegmatite Pink Granite
	Sivamalai syenite Complex	Nepheline-syenite
	Chalk Hills (Basic Intrusives)	Pyroxenite/Dunite
Archaean – Palaeoproterozoic	Peninsular Gneissic Complex (II) PGC (II)	Pink Granite Gneiss Hornblende Biotite gneiss
Archaean	Charnockite Group	Charnockite (Unclassified) Pyroxene Granulite Banded Magnetite Quartzite

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

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

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

Source: District Survey Report for Minor Minerals Coimbatore District – May 2019
(https://www.tnmines.tn.gov.in/pdf/dsr/9.pdf)

2.3.2   Local Geology: -

The study area follows the regional trend and mainly comprises of Hard Rock Formation as a homogeneous formation / Batholith formation of Charnockite. All the project areas are plain terrain, all the project areas are covered with gravel and weathered gravel formation of 1m-4m thickness (2m gravel & 2m Weathered gravel); Massive Charnockite formation is found after 1m-4m gravel and weathered gravel formation which is clearly inferred from the existing quarry pit.

2.3.3   Hydrogeology

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

Quaternary - Laterites, Sands and Clays

Tertiary - Sandstone, Gravels and Clays

Cretaceous - Limestone, Calcareous Sandstone and Clay unconformity.

Archaean - Charnockites, Gneisses, Granites, Dolerites and Pegmatite

- The major part of the area is covered by metamorphic crystalline rocks of charnockite, granitic gneiss of Archaean age intruded by dolerite dykes and pegmatite veins. These rocks are highly metamorphosed and have been subjected to very severe folding, crushing and faulting.
- Ground Water occurs under the phreatic condition and wherever there are deep seated fractures, it occurs under semi-confined to confined conditions.
- Occurrence of Ground Water in hard rock depends upon the intensity and depth of weathering, fractures and fissures present in the rocks.
- Granites and gneisses yield moderately compared to the yield in Charnockites.

- Depth of well in hard rock generally ranges between 8 and 15m below ground level.
- Generally yield in open wells ranges from 30 to 250m^3 /day and in bore well between 260 and 430m^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 Tirupur District. The alluvium consists of unconsolidated sands, gravelly sands, clays and clayey sands. The thickness of the sands ranges between 15 and 25 m in the alluvial formation which also form potential aquifers. In some areas, sand stone of tertiary formation are the potential groundwater reservoirs.

Aquifer Systems:

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

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

Alluvial Formations

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

Tertiary Cuddalore sandstone

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

Cretaceous Formations

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

Hard Rock Formations

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

Granitic Gneiss

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

Charnockite

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

Aquifer Parameters

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

TABLE 2.5: RANGE OF AQUIFER PARAMETERS

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

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

FIGURE 2.15: REGIONAL GEOLOGY MAP
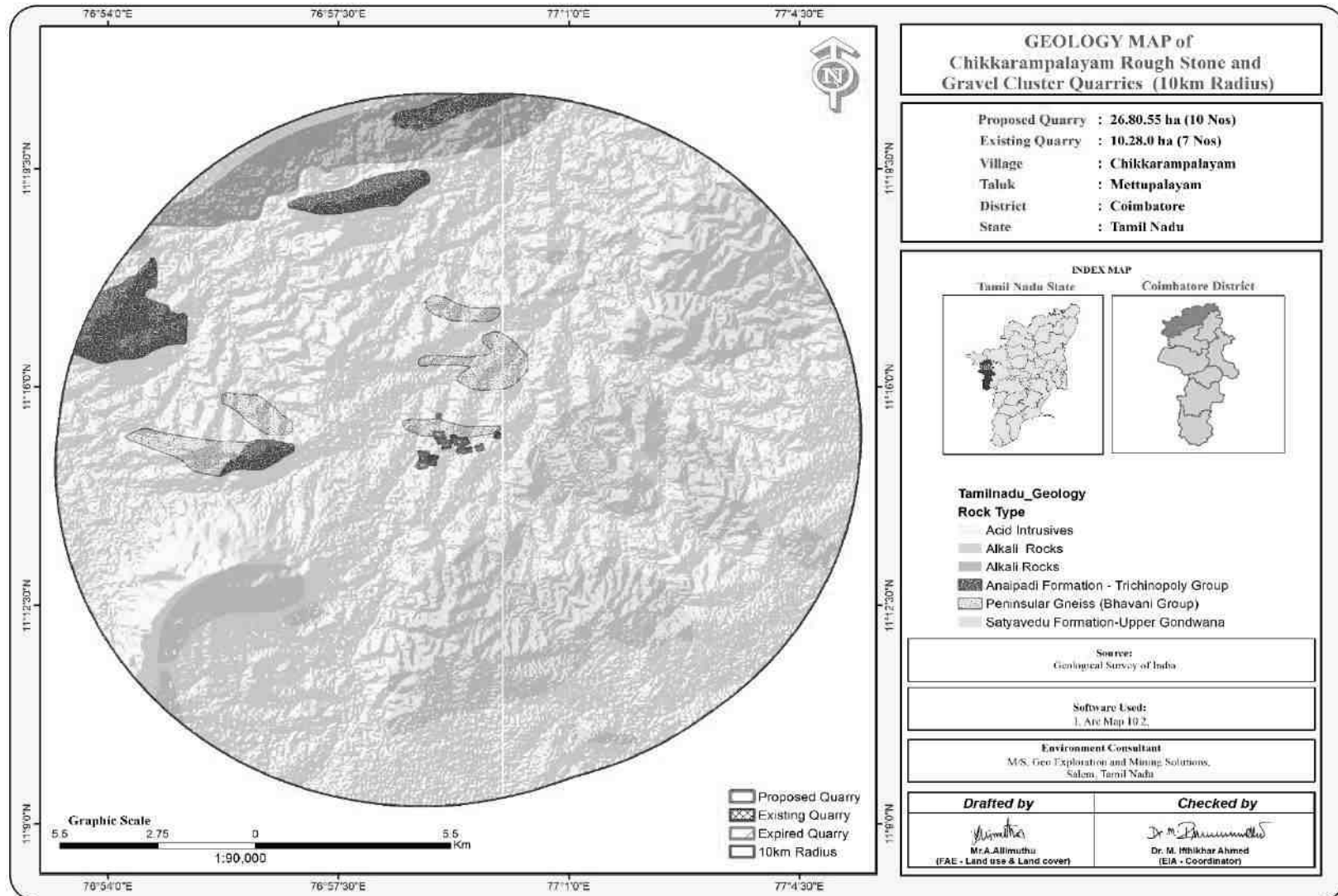
Source: From the above map it is inferred that the cluster quarries fall in the hard rock terrain (Peninsular Gneiss)

FIGURE 2.16: GEOMORPHOLOGY MAP
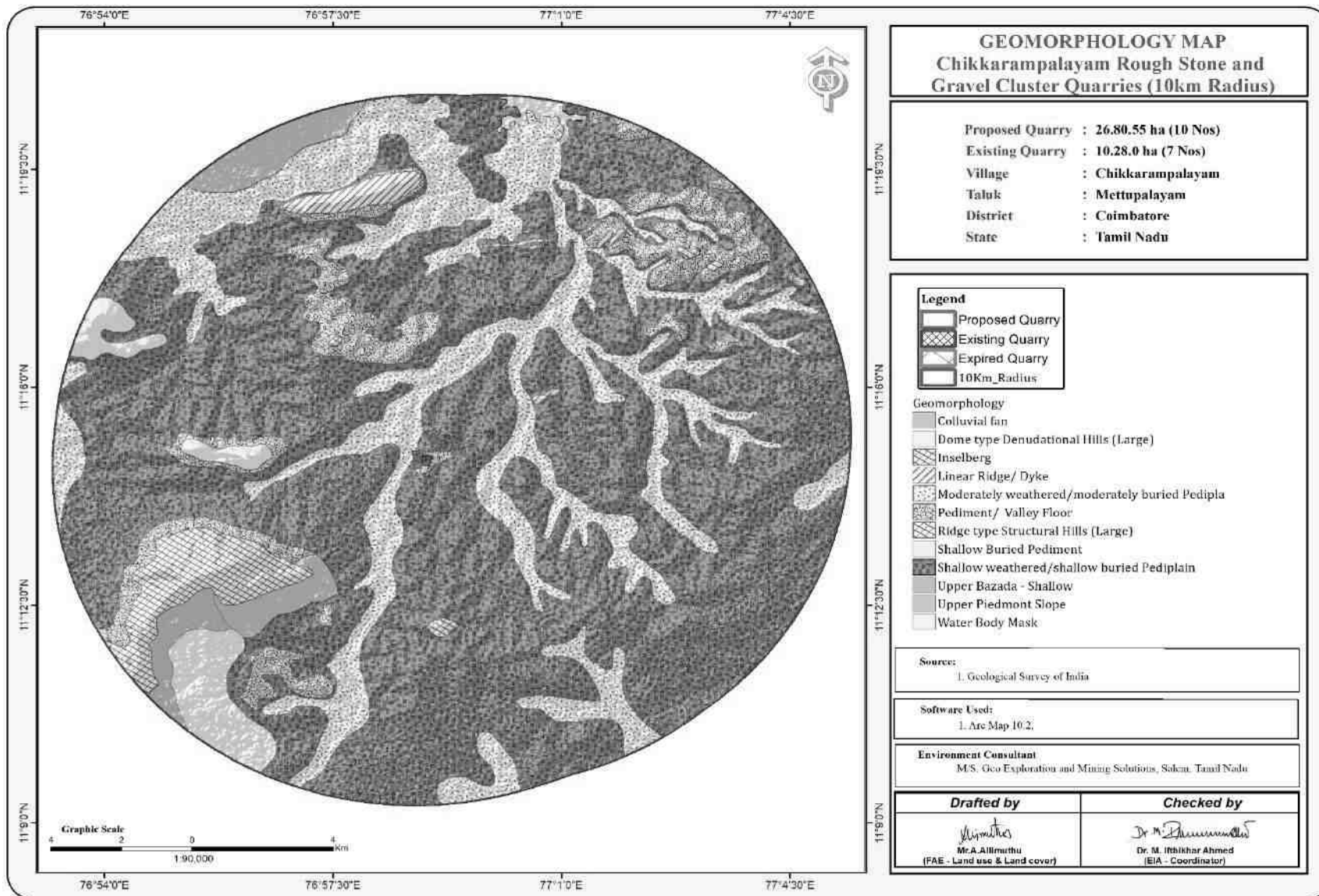
FIGURE 2.17: TOPOGRAPHY, GEOLOGICAL, YEAR-WISE DEVELOPMENT PRODUCTION PLAN AND SECTIONS – P1
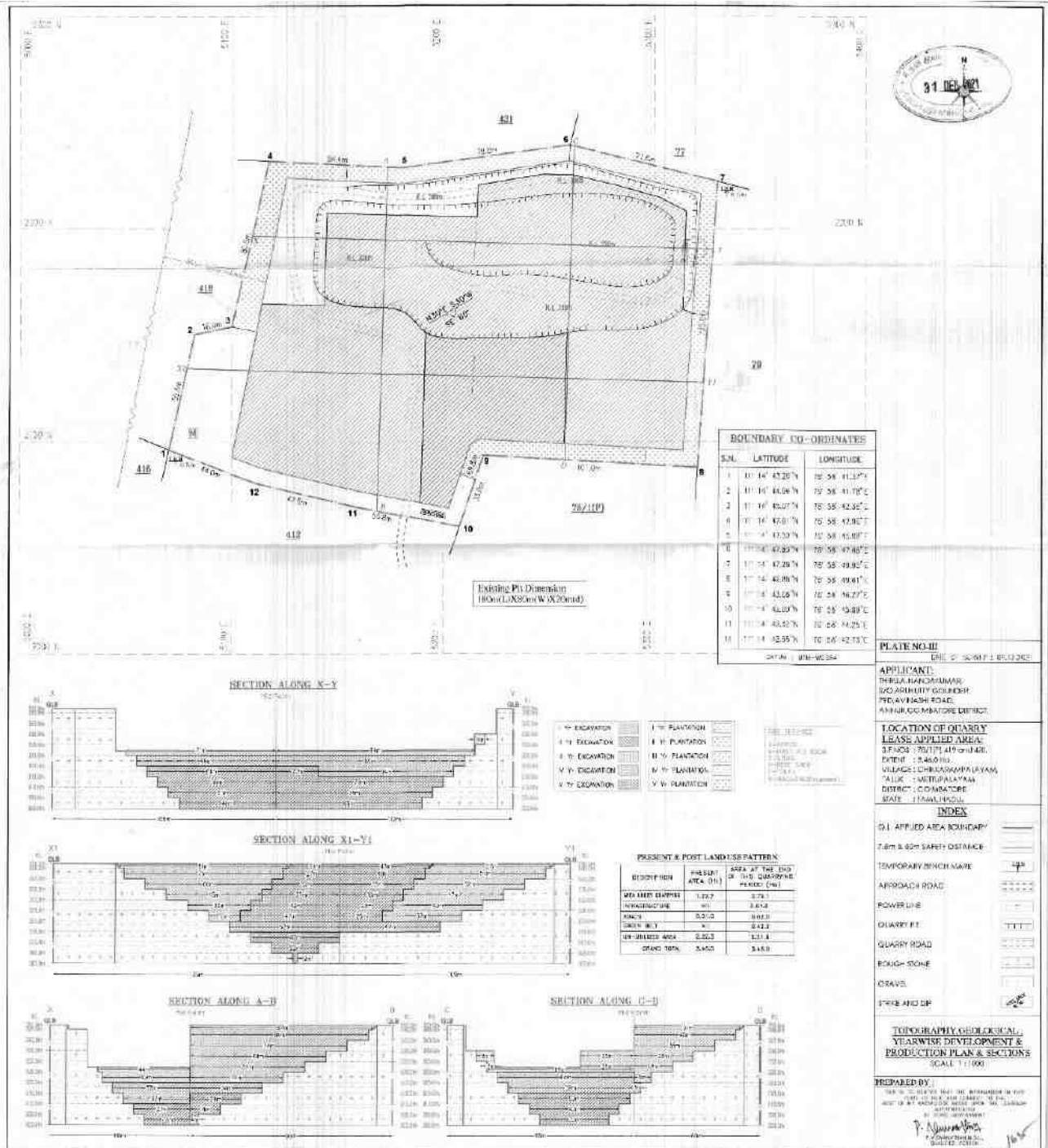
Source: Approved Mining Plan

FIGURE 2.22: CLOSURE PLAN AND SECTIONS – P1
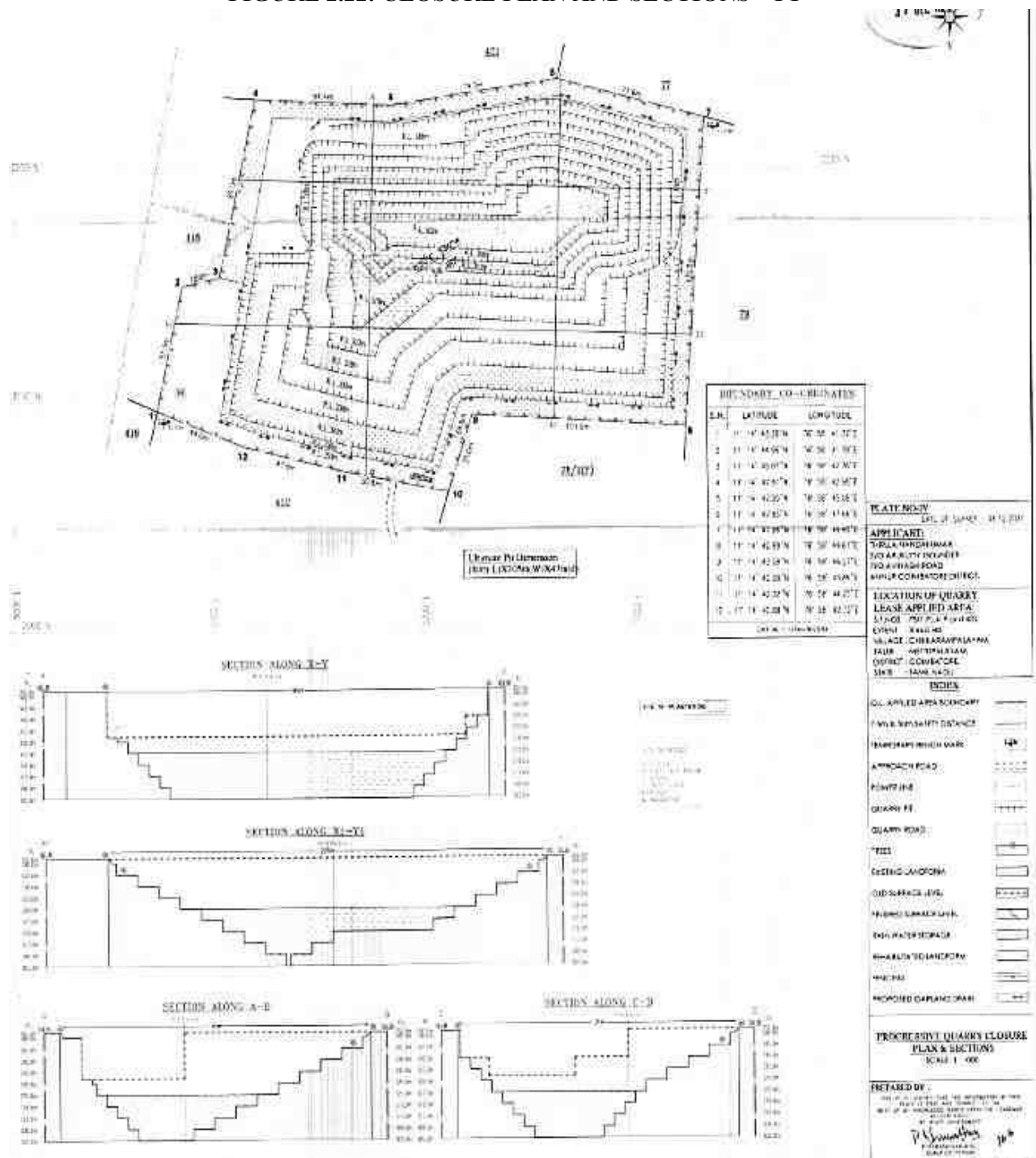
Source: Approved Mining Plan

2.4   RESOURCES AND RESERVES

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

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

TABLE 2.6: AVAILABLE GEOLOGICAL RESOURCES OF PROPOSED PROJECT

PROPOSAL – P1		
	Rough Stone	Gravel
Geological Resource in m^3	13,49,900	39,684
Mineable Resource in m^3	3,86,746	28,470

Source: Approved Mining Plan

TABLE 2.7: YEAR-WISE PRODUCTION PLAN

PROPOSAL – P1		
YEAR	ROUGH STONE (m^3)	GRAVEL (m^3)
I	79500	14094
II	80200	8562
III	77201	5814
IV	77150	-
V	72695	-
TOTAL	3,86,746	28470

Source: Approved Mining Plan

Disposal of Waste

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

Conceptual Mining Plan/ Final Mine Closure Plan

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

TABLE 2.8: ULTIMATE PIT DIMENSION

PROPOSAL – P1			
Pit	Length (Max) (m)	Width (Max) (m)	Depth (Max)
I	144	117	44m bgl

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.
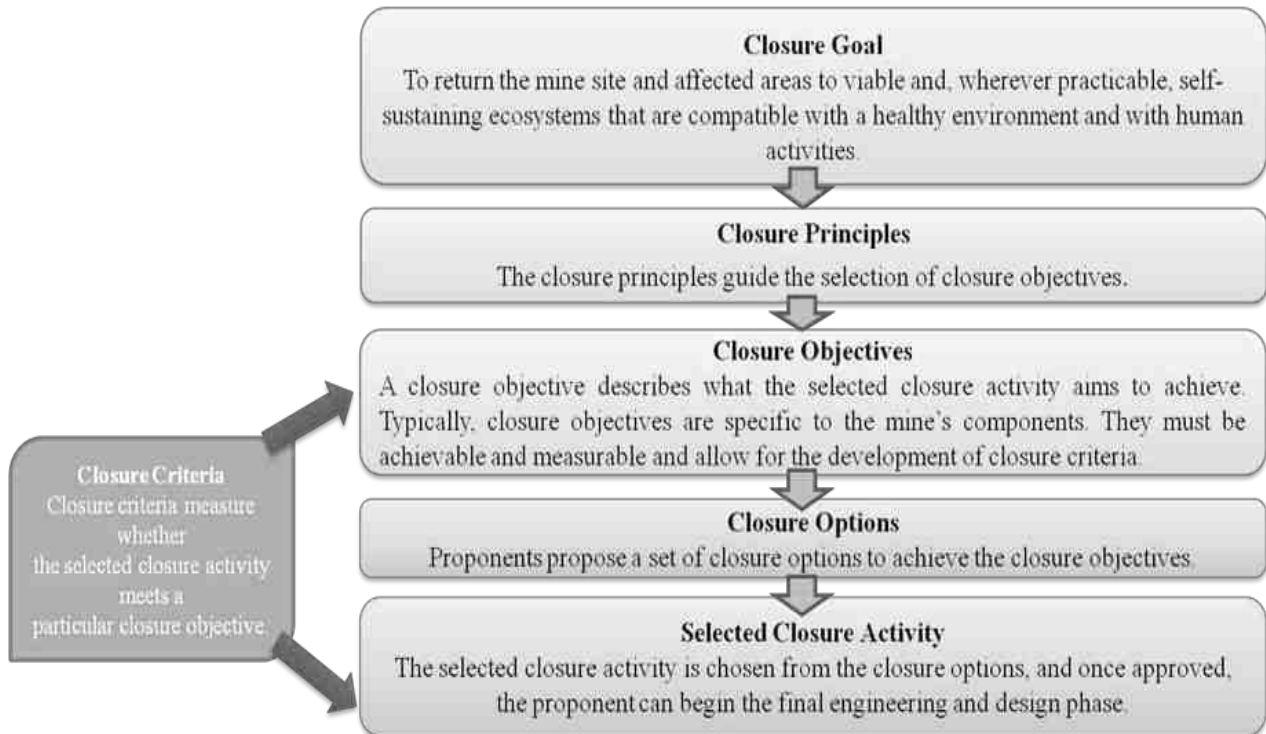
Closure Planning & Options Considerations in Mine Design –

- 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
- There is a canal on Western side of the cluster project area. The river canal will not be hindered by any of mine closure activities
- The project proponent as a part of social responsibilities assures to supply the stored mine pit water to the nearby villages after effective treatment process as per the standards of TNPCB & TWAD
- Native species will be planted in 3 row patterns on the boundary barriers and 1st bench, a full-time sentry will be appointed at the gate to prevent inherent entry of public & cattle.
- The access road to the quarry will be cut-off immediately after the closure

- The layout design shall be prepared and get approved from Department of Geology and Mining.
- The proponent is instructed to construct as per the layout approved
- Physical and chemical stability of structures left in place at the site, the natural rehabilitation of a biologically diverse, stable environment, the ultimate land use is optimized and is compatible with the surrounding area and the requirements of the local community, and taking the needs of the local community into account and minimizing the socio-economic impact of closure
- There will be a positive change in the environmental and ecology due to the mine closure.

Closure Goal
"To return the mine site and affected areas to viable and, wherever practicable, self-sustaining ecosystems that are compatible with a healthy environment and with human activities." Proponents can add to this goal (with stakeholder input), provided the reclamation standard expressed in this goal is maintained or improved.

Closure Principles
These principles guide the selection of closure objectives:
- Physical Stability
- Chemical Stability
- No Long-Term Active Care
- Future Use

Component-Specific Objectives
Objectives are developed for each mine component. Examples of components include:

| Open Pits | Waste Rock and Overburden Piles | Buildings and Equipment | Transportation Routes |

| Infrastructure | Landfills and Other Waste Disposal | Water Management Systems |

Post-Closure Monitoring –

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

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

TABLE 2.9: MINE CLOSURE BUDGET

Activity	Year					Cost	Total Cost
	I	II	III	IV	V		
Plantation in Nos	94	94	94	94	94	@ 100 Rs/ Saplings including maintenance	Rs 47,000
Plantation cost	9,400	9,400	9,400	9,400	9,400		
Renovation of Wire Fencing (770 meters)	2,31,000	-	-	-	-	@ 300Rs per meter	Rs2,31,000
Renovation of Garland Drain (700 meters)	2,10,000	-	-	-	-	@ 300Rs per meter	Rs 2,10,000
Cost for plantation in approach road and panchayat roads	4,000	4,000	4,000	4,000	4,000	@ 100 Rs/ Saplings including maintenance	Rs. 20,000
TOTAL							Rs 5,08,000

Source: Proposed by FAE's and EC

2.5   METHOD OF MINING

Proposed Method of Mining is common for all the Proposed Projects – The method of mining is Opencast Mechanized Mining Method is being proposed by formation of 5.0-meter height bench with a bench width not less than the bench height. However, as far as the quarrying of Rough Stone is concerned, observance of the provisions of Regulation 106 (2) (b) as above is seldom possible due to various inherent petro genetic factors coupled with mining difficulties. Hence it is proposed to obtain relaxation to the provisions of the above regulation from the Director of Mines Safety for which necessary provision is available with the Regulation 106 (2) (b) of MMR-1961, under Mine Act – 1952.

The Rough Stone is a batholith formation and the splitting of rock mass of considerable volume from the parent rock mass will be carried out by deploying jackhammer drilling and Slurry Explosives will be used for blasting. Hydraulic Excavators attached with Rock Breakers unit will be deployed for breaking large boulders to required fragmented sizes to avoid secondary blasting and hydraulic excavators attached with bucket unit will be deployed for loading the Rough Stone into the tippers and then the stone is transported from pithead to the nearby crushers.

2.5.1   Drilling & Blasting Parameters

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

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

Type of Explosives to be used –

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

Storage of Explosives –

No proposal for storage of explosives within the project area, the respective project proponents 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

PROPOSAL – P1				
S.NO.	TYPE	NOS	SIZE/CAPACITY	MOTIVE POWER
1	Jack hammers	10	1.2m to 2.0m	Compressed air
2	Compressor	3	400psi	Diesel Drive
3	Excavator with Bucket / Rock Breaker Unit 4	2	300 HP	Diesel Drive
4	Tippers / Dumpers	4	20 Tonnes	Diesel Drive

Source: Approved Mining Plans

2.6   GENERAL FEATURES

2.6.1   Existing Infrastructures

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

2.6.2   Drainage Pattern

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

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

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

2.6.3   Traffic Density

The traffic survey conducted based on the transportation route of material, the Rough Stone is proposed to be transported mainly through Senniveeranpalayam – Therampalayam Panchayat Road that connects to Karamadai - Kariyampalayam State Highway (SH-168) on South Eastern Side.

Traffic density measurements were performed at two locations
1.   Karamadai - Kariyampalayam State Highway (SH- 168)
2.   Senniveeranpalayam – Therampalayam –Panchayat Road.

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

TABLE.2.11: TRAFFIC SURVEY LOCATIONS

Station Code	Road Name	Distance and Direction	Type of Road
TS1	Karamadai - Kariyampalayam State Highway (SH- 168)	1.5 km-SE	Major District Road (Two Lane)
TS2	Senniveeranpalayam – Therampalayam – Panchayat Road	2 km-SE	Village road (Single Lane)

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	296	888	115	115	370	185	1188
TS2	122	366	28	28	118	59	453

Source: On-site monitoring by GEMS FAE & TM

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

TABLE 2.13: ROUGH STONE & GRAVEL HOURLY TRANSPORTATION REQUIREMENT

Transportation of Rough Stone & Gravel per day		
Capacity of trucks	No. of Trips per day Cumulatively	Volume in PCU
10 tonnes	60	60

Source: Data analysed from Approved Mining Plan

FIGURE.2.19: MINERAL TRANSPORTATION ROUTE MAP
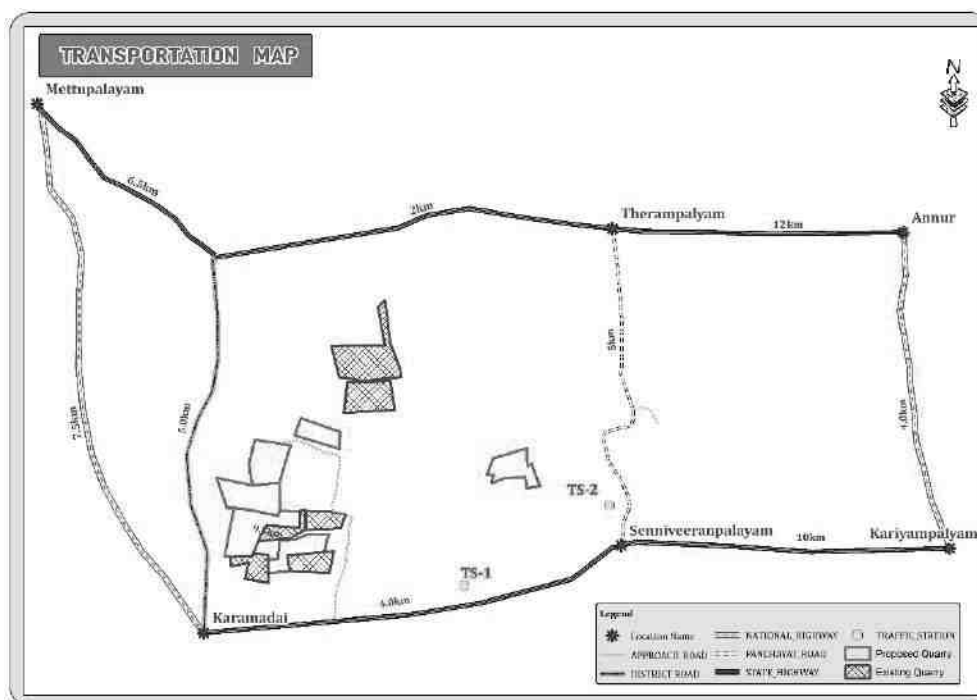
TABLE 2.14: SUMMARY OF TRAFFIC VOLUME

Route	Existing Traffic volume in PCU	Incremental traffic due to the project	Total traffic volume	Hourly Capacity in PCU as per IRC – 1960guidelines
Karamadai - Kariyampalayam State Highway (SH- 168)	1188	60	1248	1500
Senniveeranpalayam – Therampalayam –Panchayat Road	453	60	513	1200

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

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

2.6.4   Mineral Beneficiation and Processing

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

2.7 PROJECT REQUIREMENT

2.7.1 Water Source & Requirement

Detail of water requirements in KLD as given below:

TABLE 2.15: WATER REQUIREMENT FOR THE PROJECT

PROPOSAL – P1		
*Purpose	Quantity	Source
Dust Suppression	1.0 KLD	Rainwater accumulated in Mine Pit/ Water Tanker
Green Belt development	1.5 KLD	Rainwater accumulated in Mine Pit/ Water Tanker
Domestic purpose	1.0 KLD	Water Tankers
Total	**3.5 KLD**	

Source: Prefeasibility report

* Drinking water will be sourced from Approved Water Vendors

2.7.2 Power and Other Infrastructure Requirement

No proposed projects require power supply for the mining operations. 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 SEB by respective 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

High speed Diesel (HSD) will be used for mining machineries. Diesel will be brought from nearby Fuel Stations.
Average diesel consumption is around   =   500 Liters of HSD / day per proposed project.

2.7.4 Project Cost

TABLE 2.16: PROJECT COST OF PROPOSED PROJECTS

PROPOSAL – P1	
Project Cost	Rs.79,45,000/-

Source: Approved Mining Plan &Prefeasibility Report

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 mines regulations, 1961 for all the proposed projects.

TABLE 2.17: PROPOSED MANPOWER DEPLOYMENT

PROPOSAL – P1	
Mines Manager/Mines Foreman	1
Mate/Blaster	1
Jack hammer operator	8
Excavator Operator & Driver	3
Helper	3
Cleaner & Co-operator	3
Security	1
Total	**38**

Source: Approved Mining Plans of respective Project

2.9   PROJECT IMPLEMENTATION SCHEDULE

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

TABLE 2.18: 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						Production Start Period
Time line may vary; subjected to rules and regulations /& other unforeseen circumstances							

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

3.   DESCRIPTION OF ENVIRONMENT

3.0   GENERAL

This chapter presents a regional background to the baseline data at the very onset, which will help in better appreciation of micro-level field data, generated on several environmental and ecological attributes of the study area. The baseline status of the project environment is described section wise for better understanding of the broad-spectrum conditions. The baseline environment quality represents the background environmental scenario of various environmental components such as Land, Water, Air, Noise, Biological and Socio-economic status of the study area. Field monitoring studies to evaluate the base line status of the project site were carried out covering December 2022, January 2023 and February 2023 with CPCB guidelines. Environmental data has been collected with reference to cluster quarries by EHS 360 Labs Private Limited, – An accredited by ISO/IEC 17025:2017 (NABL) Laboratory for the below attributes –

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

Study Area

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

Study Period

The baseline study was conducted during the Winter season i.e., December 2022, January 2023 and February 2023

Study Methodology

- The project area was surveyed in detail with the help of Total Station and the boundary pillars were picked up with the help of GPS. The boundary coordinates were superimposed on the satellite imagery to understand the relief of the area, besides Land use pattern of the area was studied through the Bhuvan (ISRO)
- Soil samples were collected and analysed for relevant physio-chemical characteristics, exchangeable Cations, nutrients & micro nutrients etc., in order to assess the impact due to mining activities and to recommend saplings for Greenbelt development.
- Ground water samples were collected during the study period from the existing bore wells, while surface water was collected from ponds in the buffer zone. The samples were analysed for parameters necessary to determine water quality (based on IS: 10500:2012 criteria) and those which are relevant from the point of view of environmental impact of the proposed mines.
- An onsite meteorological station was setup in cluster area, to collect data about wind speed, wind direction, temperature, relative humidity, rainfall and general weather conditions were recorded throughout the study period.
- In order to assess the Ambient Air Quality (AAQ), samples of ambient air were collected by installation of Respiratory Dust Samplers (RDS) for Fugitive dust, 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's from census handbook 2011 and from the satellite imagery	Study Area	Satellite Imagery Primary Survey
*Soil	Physio-Chemical Characteristics	Once during the study period	5 (1 core & 4 buffer zone)	IS 2720 Agriculture Handbook - Indian Council of Agriculture Research, New Delhi
*Water Quality	Physical, Chemical and Bacteriological Parameters	Once during the study period	6 (2 surface water & 4 ground water)	IS 10500& CPCB Standards
Meteorology	Wind Speed Wind Direction Temperature Cloud cover Dry bulb temperature Rainfall	1 Hourly Continuous Mechanical/Automatic Weather Station	1	Site specific primary data& Secondary Data from IMD Station
*Ambient Air Quality	PM10 PM2.5 SO2 NOX Fugitive Dust	24 hourly twice a week (December 2022 – February 2023)	9 (2 core & 7 buffer)	IS 5182 Part 1-23 National Ambient Air Quality Standards, CPCB
*Noise Levels	Ambient Noise	Hourly observation for 24 Hours per location	7 (2 core & 5 buffer zone)	IS 9989 As per CPCB Guidelines
Ecology	Existing Flora and Fauna	Through field visit during the study period	Study Area	Primary Survey by Quadrate & Transect Study Secondary Data – Forest Working Plan
Socio Economic Aspects	Socio–Economic Characteristics, Population Statistics and Existing Infrastructure in the study area	Site Visit & Census Handbook, 2011	Study Area	Primary Survey, census handbook & need based assessments.

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

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

3.1 LAND ENVIRONMENT

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

3.1.1 Land Use/ Land Cover

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

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

S.No	Classification	Area ha	Area %
1	Builtup-Urban	1308.83	3.48
2	Decidious Forest	1226.9	3.26
3	Evergreen Forest	277.979	0.74
4	Scrub Land	2238.48	5.96
5	Scrub Forest	392.19	1.04
6	Mining Area	336.875	0.89
7	Crop Land	13905.3	37
8	Fallow Land	13099.1	34.8
9	Agricultural Land	2887.21	7.68
10	Builtup-Rural	1407.69	3.74
11	Water Bodies	178.5	0.47
12	River	287.005	0.76
Total		**37546.06**	**100**

Source: Survey of India Toposheet and Landsat Satellite Imagery

FIGURE 3.1: PIE DIAGRAM OF LAND USE AND LAND IN STUDY AREA
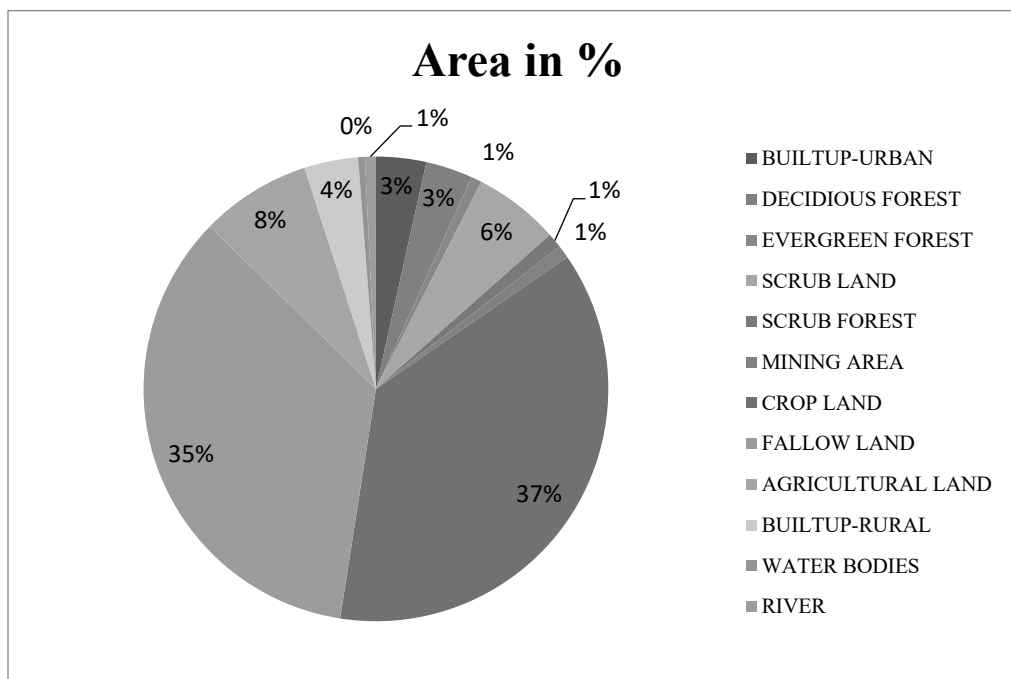
Source: Table 3.2

From the above table, pie diagram and land use map it is inferred that the majority of the land in the study area is Agriculture and fallow land (includes crop land) 79.48% followed by Built-up Lands - 7.22%, Scrub & Forest land – 11%, and Water bodies 1.23%.

The total mining area within the study area is 336.87.5 ha i.e., 0.89%. The cluster area of 38.01.55 ha contributes about 8.86% of the total mining area within the study area. This small percentage of Mining Activities shall not have any significant impact on the environment.

3.1.2   Topography

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

3.1.3   Drainage Pattern of the Area

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

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

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

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

3.1.4   Seismic Sensitivity

The proposed project site falls in the seismic Zone II, low damage risk zone as per BMTPC, Vulnerability Atlas of Seismic zone of India IS: 1893 – 2002. The project area falls in the hard rock terrain on the peninsular shield of south India which is highly stable.
(Source: https://moes.gov.in/writereaddata/files/LS_EN_20032020_385.pdf)

3.1.5   Environmental Features in the Study Area

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

FIGURE 3.2: LAND USE LAND COVER MAP 10KM RADIUS

LANDUSE-LANDCOVER MAP
Chikkarampalayam&Belladhi Rough Stone and
Gravel Cluster Quarries (10km Radius)

S.No	CLASSIFICATION	AREA_HA	AREA_%
	BUILTUP		
1	URBAN	1308.83	3.51
2	RURAL	1407.69	3.78
3	MINING	336.875	0.90
	AGRICULTURAL LAND		
4	CROP LAND	13920.3	37.36
5	PLANTATION	2887.21	7.75
6	FALLOW LAND	12799.1	34.35
	FOREST		
7	EVERGREEN/SEMI EVERGREEN	277.979	0.75
8	DECIDUOUS	1226.9	3.29
9	SCRUB FOREST	392.19	1.05
	BARREN/WASTE LANDS		
10	SCRUB LAND	2238.48	6.01
	WETLANDS/ WATER BODIES		
11	WATER BODIES/LAKE/RIVER	465	1.25
	TOTAL	37260.55	100.00

Legend
- Proposed Quarry
- Existing Quarry
- Expired Quarry
- 10Km_Radius

Proposed Quarry : 26.80.55 ha (10 Nos)
Existing Quarry : 10.28.0 ha (7 Nos)
Village : Belladhi&Chikkarampalayam
Taluk : Mettupalayam
District : Coimbatore
State : Tamil Nadu

Source:	Software Used:	Environment Consultant	Drafted by	Checked by
https://bhuvan-app3.nrsc.gov.in/ data/download/index.php	1. Arc Map 10.2,	M/S. Geo Exploration and Mining Solutions, Salem, Tamil Nadu	Mr.A.Allimuthu (FAE - Land use & Land cover)	Dr. M. Ifthikhar Ahmed (EIA - Coordinator)

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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	None	Nil within 10km Radius
2	Reserve Forest	Nellimalai R.F	7.3 Km North west
3	Tiger Reserve/ Elephant Reserve/ Biosphere Reserve	None	Nil within 10Km Radius
4	Critically Polluted Areas	None	Nil within 10km Radius
5	Mangroves	None	Nil within 10km Radius
6	Mountains/Hills	None	Nil within 10km Radius
7	Notified Archaeological Sites	None	Nil within 10km Radius
8	Industries/ Thermal Power Plants	None	Nil within 10km Radius
9	Defence Installation	None	Nil within 10km Radius

Source: Survey of India Toposheet

TABLE 3.4: NEARBY WATER BODIES FROM THE PROPOSED PROJECT SITE

PROPOSAL – P1		
Sl.No	NAME	DISTANCE & DIRECTION
1	Canal	Canal – 1.90Km – East side.
2	Belladhi Lake	820m – NW side
3	Bhavani River	7.5Km- NE side

Source: Village Cadastral Map and Field Survey

3.1.6 Soil Environment

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

The objective of the soil sampling is -

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

TABLE 3.5: SOIL SAMPLING LOCATIONS

S. No	Location Code	Monitoring Locations	Distance & Direction	Coordinates
1	S-1	Core Zone	Project Area	11°15'1.89"N 76°58'52.10"E
2	S-2	Bettadapuram	2.7Km South West	11°13'31.88"N 76°57'27.53"E
3	S-3	Therampalayam	1.8Km North East	11°16'17.93"N 76°59'56.46"E
4	S-4	Onnipalayam	4.2Km South East	11°12'26.51"N 77° 0'4.00"E
5	S-5	Pogalur	5Km North East	11°15'27.20"N 77° 2'23.84"E

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

Methodology –

For studying soil quality, sampling locations were selected to assess the existing soil conditions in and around the project site representing various land use conditions. The samples were collected by auger boring into the soil up to 90-cm depth. Five (5) 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 is presented below in Figure 3.4 and the physico-chemical characteristics of the soil & Test Results in Table 3.7.

FIGURE 3.3: SOIL SAMPLING LOCATIONS AROUND 10 KM RADIUS
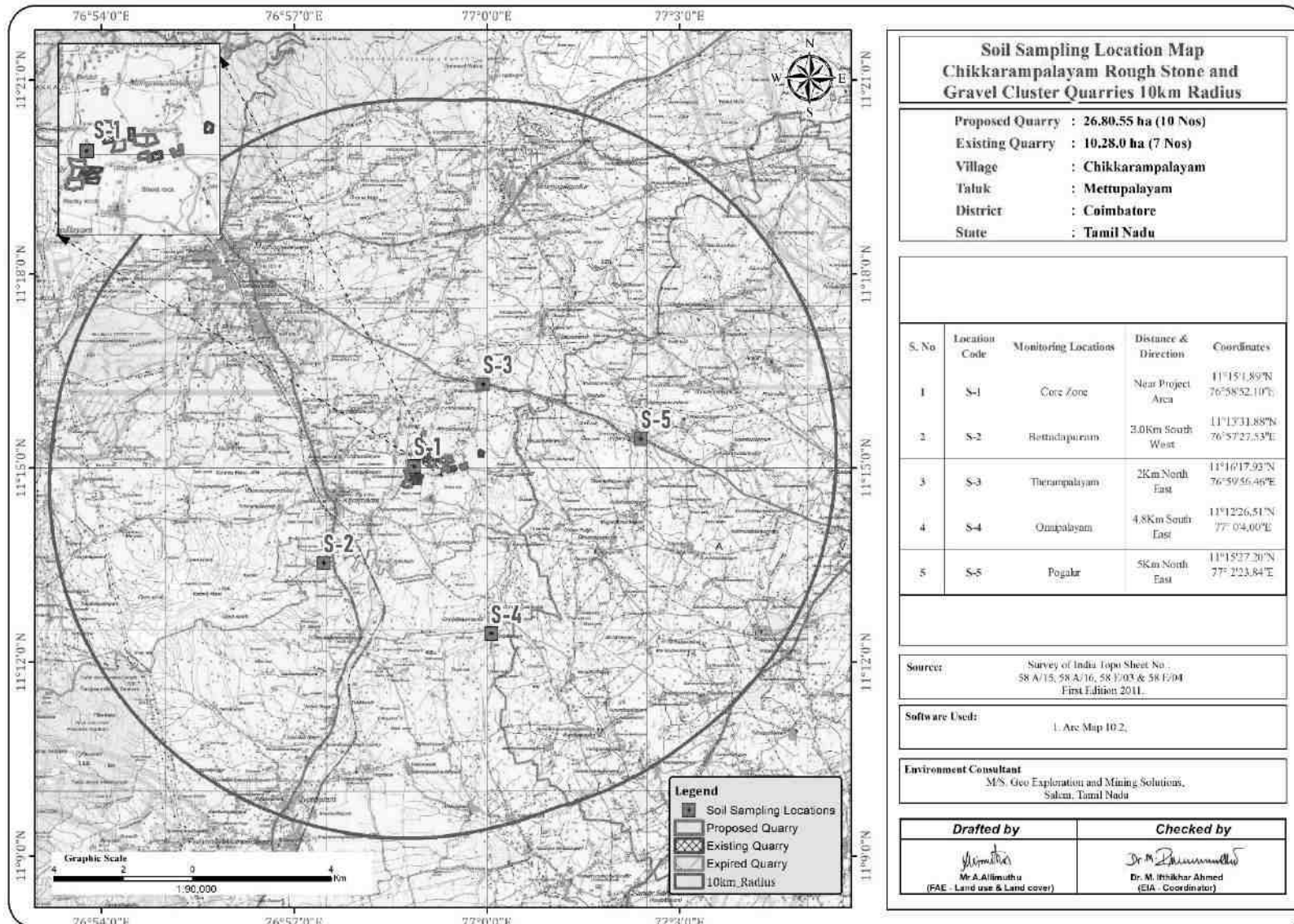
FIGURE 3.4: SOIL MAP
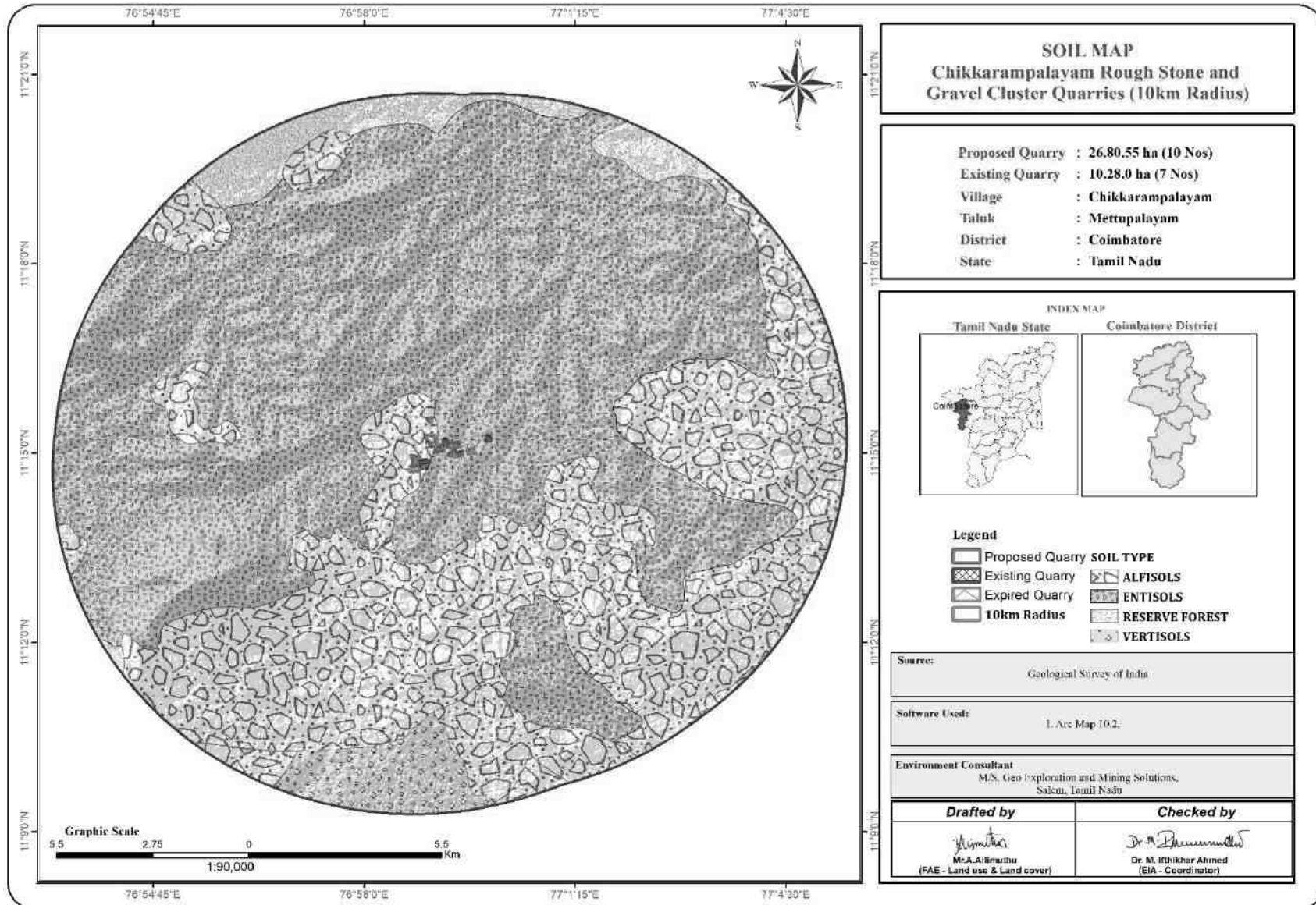
TABLE 3.7: SOIL QUALITY OF THE STUDY AREA

	Parameter	S-1 (Near Project Area)	S-2 (Bettadapuram)	S-3 (Therampalayam)	S-4 (Onnipalayam)	S-5 (Pogalur)
1	Colour	Brown	Dark Brown	Brown	Brown	Brown
2	pHat27°C	8.10	7.46	7.10	8.27	7.89
3	ElectricalConductivityat25°C	547	410	488	607	710
4	Water Activity	Medium	Medium	Medium	Medium	Medium
5	Texture	Sandy Clay	Sandy Loam	Clay	Clay	Sandy Loam
6	Sand	42.1	43.5	37.7	37.7	68.8
7	Slit	15.5	18.8	7.5	8.8	12.7
8	Clay	42.4	37.7	54.8	53.5	18.5
9	Water Holding Capacity	38.5	31.1	47.4	47.2	40.2
10	Bulk Density	1.02	1.03	1.37	1.26	1.02
11	Porosity	21.3	24.9	26.9	28.9	26.6
12	Exchangeable Calcium(asCa)	144.1	120	108.3	138	121.4
13	Exchangeable Magnesium(asMg)	20.5	17.7	25.5	28.8	27
14	Exchangeable Manganese(asMn)	27.3	25.5	31.9	41.1	38.7
15	Exchangeable Zinc as Zn	0.30	0.31	0.52	0.43	0.31
16	Available Boron (as B)	0.51	0.73	0.64	0.80	0.66
17	Soluble Chloride(as Cl)	142	132.7	154	146	161.2
18	Soluble Sulphate(as S04)	124.1	130	111	117	102
19	Available Potassium(as K)	40.1	28.8	30.0	41.3	37.6
20	Sodium Absorption Ratio	1.01	1.68	1.07	1.65	1.54
21	Available Phosphorous(as P)	42.5	30.1	37.7	41.4	37.5
22	Available Nitrogen(as N)	188	254.5	350.1	366.7	250.8
23	Cadmium (as Cd)	BDL (DL:0.003)				
24	Chromium (asCr)	BDL (DL:0.05)				
25	Copper(asCu)	BDL (DL:0.05)				
26	Lead (as Pb)	0.56	0.33	0.67	0.51	0.47
27	Total Iron	1.99	1.59	2.64	2.84	1.66
28	Organic Matter	1.27	1.88	2.10	2.74	1.05
29	Organic Carbon	0.74	1.09	1.22	1.59	0.61
30	CEC	40.1	34.7	37.5	42.2	33.0

Source: Sampling Results by EHS360 Labs Private Limited

Interpretation & Conclusion

Physical Characteristics –

The physical properties of the soil samples were examined for texture, bulk density, porosity and water holding capacity. The soil texture found in the study area is Clay to Sandy Loam Soil and Bulk Density of Soils in the study area varied between 1.02 – 1.37 g/cc. The Water Holding Capacity and Porosity of the soil samples is found to be medium i.e. ranging from 31.1 – 47.4 %. And 21.3-28.9 %.

Chemical Characteristics –

- The nature of soil is slightly alkaline to strongly alkaline with pH range 7.10 to 8.27
- The available Nitrogen content range between 188to 366 kg/ha
- The available Phosphorus content range between 30.1 to 42.5 kg/ha
- The available Potassium range between 28.8 to 41.3 mg/kg

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:

Bhavani 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.

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

3.2.3 Methodology

Reconnaissance survey was undertaken and monitoring locations were finalized based on;
- Drainage pattern;
- Location of Residential areas representing different activities/likely impact areas; and
- Likely areas, which can represent baseline conditions

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	COORDINATES
SURFACE WATER				
1	SW-1	Near Project Area	Near Project Area	11°14'59.66"N 76°58'39.99"E
2	SW-2	Belladhi Lake	750m North West	11°15'11.44"N 76°58'25.51"E
GROUND WATER				
3	WW-1	Therampalayam	3.5Km North East	11°16'19.25"N 76°59'58.78"E
4	WW-2	Bellaipalayam	6Km North East	11°17'44.73"N 77° 1'25.51"E
5	BW-1	Onnipalayam	5.2km South East	11°12'23.61"N 77° 00'8.58"E
6	BW-2	Pogalur	6Km North East	11°15'28.24"N 77° 2'23.04"E

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

FIGURE 3.5: WATER SAMPLING LOCATIONS AROUND 10 KM RADIUS
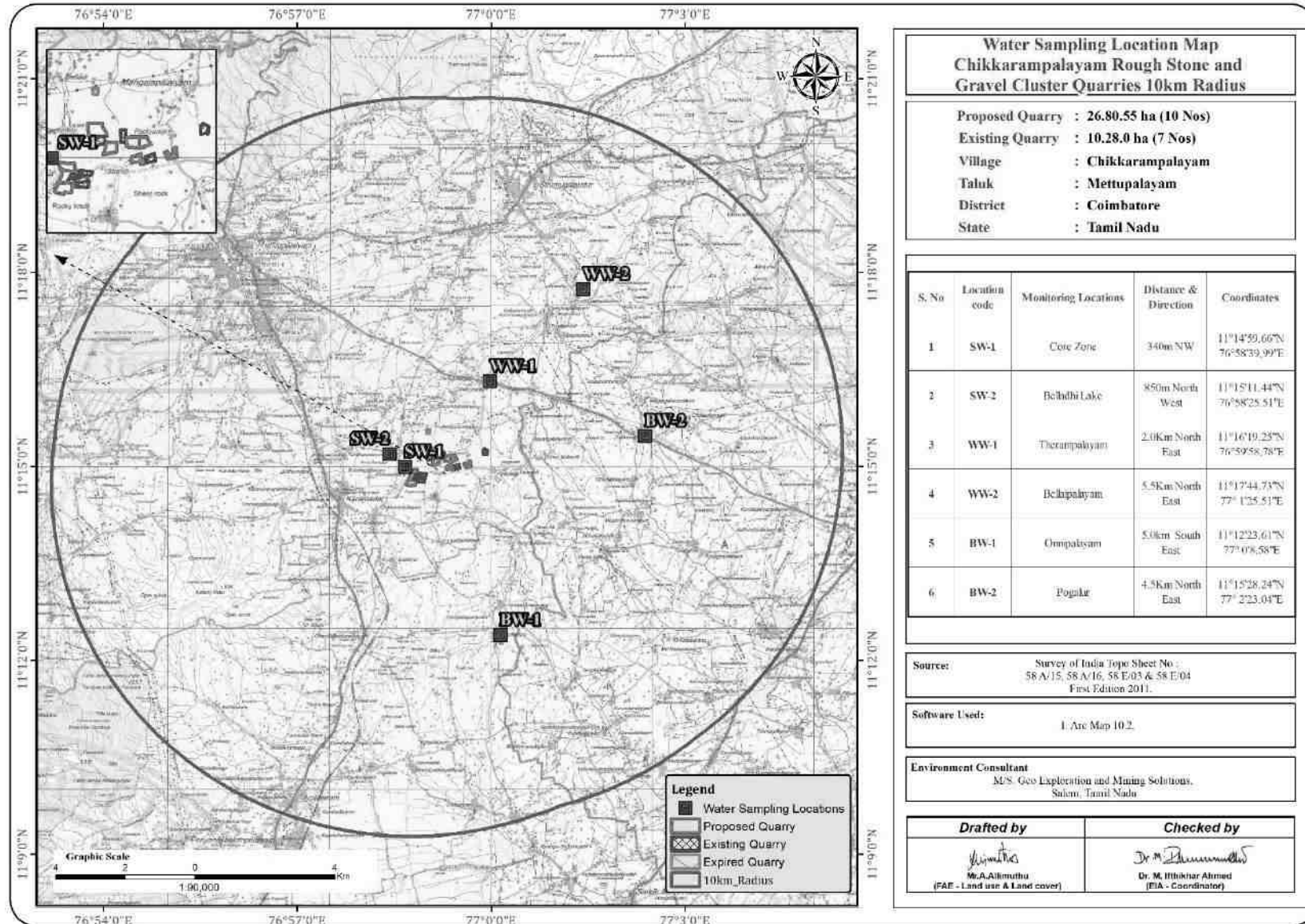
TABLE 3.9: GROUND WATER SAMPLING RESULTS

S.NO	Parameter	BW-1 (Onnipalayam)	BW-2 (Pogalur)	WW-1 (Therampalayam)	WW-2 (Bellaipalayam)
1	Color	< 5	< 5	< 5	< 5
2	Odour	Agreeable	Agreeable	Agreeable	Agreeable
3	pH@ 25°C	7.59	7.10	7.44	7.54
4	Electrical Conductivity @ 25°C	725	682	568	613
5	Turbidity	< 1	< 1	< 1	< 1
6	Total Dissolved Solids	428	402	335	362
7	Total Hardness as $CaCO_3$	213.62	259.14	192.88	172.59
8	Calcium as Ca	37.5	41.9	33.8	31.6
9	Magnesium as Mg	29.2	37.6	26.4	22.8
10	Total Alkalinity	164	177	135	142
11	Chloride as Cl^-	90.1	85.3	72.7	75.8
12	Sulphate as SO_4^-	29.2	28.3	25.7	26.7
13	Iron as Fe	0.22	0.17	BDL(DL:0.1)	BDL(DL:0.1)
14	Free Residual Chlorine	BDL(DL: 2.0)	BDL(DL: 2.0)	BDL(DL: 2.0)	BDL(DL: 2.0)
15	Fluoride as F	0.46	0.39	0.20	0.25
16	Nitrates as NO_3	11.9	9.5	8.3	7.6
17	Copper as Cu	BDL (DL:0.2)	BDL (DL:0.2)	BDL (DL:0.2)	BDL (DL:0.2)
18	Manganese as Mn	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)
19	Mercury as Hg	(BDL (DL: 0.0005)	(BDL (DL: 0.0005)	(BDL (DL: 0.0005)	(BDL (DL: 0.0005)
20	Cadmium as Cd	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)
21	Selenium as Se	BDL (DL: 0.05)	BDL (DL: 0.05)	BDL (DL: 0.05)	BDL (DL: 0.05)
22	Aluminium as Al	BDL (DL: 0.03)	BDL (DL: 0.03)	BDL (DL: 0.03)	BDL (DL: 0.03)
23	Lead as Pb	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)
24	Zinc as Zn	BDL (DL:0.02)	BDL (DL:0.02)	BDL (DL:0.02)	BDL (DL:0.02)
25	Total Chromium	BDL (DL: 0.05)	BDL (DL: 0.05)	BDL (DL: 0.05)	BDL (DL: 0.05)
26	Boron as B	BDL (DL:0.1)	BDL (DL:0.1)	BDL (DL:0.1)	BDL (DL:0.1)
27	Mineral Oil	BDL (DL:1.0)	BDL (DL:1.0)	BDL (DL:1.0)	BDL (DL:1.0)
28	Phenolic Compunds as C_6H_5OH	Absent	Absent	Absent	Absent
29	Anionic Detergents as	BDL (DL:0.1)	BDL (DL:0.1)	BDL (DL:0.1)	BDL (DL:0.1)
30	Cynaide as CN	Absent	Absent	Absent	Absent
31	Total Coliform	< 2	< 2	< 2	< 2
32	E-Coli	< 2	< 2	< 2	< 2
33	Barium as Ba	BDL (DL:0.5)	BDL (DL:0.5)	BDL (DL:0.5)	BDL (DL:0.5)
34	Ammonia (as Total	BDL (DL:0.1)	BDL (DL:0.1)	BDL (DL:0.1)	BDL (DL:0.1)
35	Sulphide as H_2S	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)
36	Molybdenum as Mo	BDL (DL:0.5)	BDL (DL:0.5)	BDL (DL:0.5)	BDL (DL:0.5)
37	Total Arsenic as As	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)
38	Total Suspended Solids	BDL(DL:2)	BDL(DL:2)	BDL(DL:2)	BDL(DL:2)

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

TABLE 3.10: SURFACE WATER SAMPLING RESULTS

Sl. No.	Parameter	Unit	RESULT		CPCB Designated Best Use
			SW1	SW2	
1	Colour	Hazen	10	5	300
2	Odour	-	Agreeable	Agreeable	Not specified
3	pH@ 25°C	-	7.40	7.83	6.5 – 8.5
4	Electrical Conductivity @ 25°C	µs/cm	539	758	
5	Turbidity	NTU	5.1	5.8	Not specified
6	Total Dissolved Solids	mg /l	318	440	1500
7	Total Hardness as $CaCO_3$	mg/l	197	145.9	Not specified
8	Calcium as Ca	mg/l	33.2	30	Not specified
9	Magnesium as Mg	mg/l	27.9	17.3	Not specified
10	Total Alkalinity as $CaCO_3$	mg/l	163	161.2	Not specified
11	Chloride as Cl^-	mg/l	69.5	101.2	600
12	Sulphate as SO_4^-	mg/l	24.1	32.2	400
13	Iron as Fe	mg/l	0.27	0.19	50
14	Free Residual Chlorine	mg/l	BDL(DL: 2.0)	BDL(DL: 2.0)	400
15	Fluoride as F	mg/l	0.34	0.12	1.5
16	Nitrates as NO_3	mg/l	12	5.1	50
17	Copper as Cu	mg/l	BDL (DL:0.2)	BDL (DL:0.2)	1.5
18	Manganese as Mn	mg/l	BDL (DL:0.05)	BDL (DL:0.05)	Not specified
19	Mercury as Hg	mg/l	(BDL (DL: 0.0005)	(BDL (DL: 0.0005)	Not specified
20	Cadmium as Cd	mg/l	BDL (DL:0.01)	BDL (DL:0.01)	0.01
21	Selenium as Se	mg/l	BDL (DL: 0.05)	BDL (DL: 0.05)	Not specified
22	Aluminium as Al	mg/l	BDL (DL: 0.03)	BDL (DL: 0.03)	Not specified
23	Lead as Pb	mg/l	BDL (DL:0.01)	BDL (DL:0.01)	0.1
24	Zinc as Zn	mg/l	BDL (DL:0.02)	BDL (DL:0.02)	15
25	Total Chromium	mg/l	BDL (DL: 0.05)	BDL (DL: 0.05)	0.05
26	Boron as B	mg/l	BDL (DL:0.1)	BDL (DL:0.1)	Not specified
27	Mineral Oil	mg/l	BDL (DL:1.0)	BDL (DL:1.0)	Not specified
28	Phenolic Compounds as C_6H_5OH	mg/l	Absent	Absent	0.005
29	Anionic Detergents as MBAS	mg/l	BDL (DL:0.1)	BDL (DL:0.1)	Not specified
30	Cyanide as CN	mg/l	Absent	Absent	0.05
31	Biological Oxygen Demand, 3 days @ 27°C		6.2	7.2	3
32	Chemical Oxygen Demand		24	32	Not specified
33	Dissolved Oxygen		7.5	6.1	4
34	Total Coliform	MPN/ 100ml	100	present	5000
35	E-Coli		20	present	Not specified
36	Barium as Ba	mg/l	BDL (DL:0.5)	BDL (DL:0.5)	300
37	Ammonia (as Total Ammonia-N)	mg/l	BDL (DL:0.1)	2.3	Not specified
38	Sulphide as H_2S	mg/l	BDL (DL:0.05)	BDL (DL:0.05)	Not specified
39	Molybdenum as Mo	mg/l	BDL (DL:0.5)	BDL (DL:0.5)	Not specified
40	Total Arsenic as As	mg/l	BDL (DL:0.01)	BDL (DL:0.01)	0.2
41	Total Suspended Solids	mg/l	5.7	6.6	-

3.2.4   Interpretation& Conclusion

Surface Water

   Ph:

The pH varied from 7.40 to 7.83while 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 318 to 440 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 69.5 – 101.2 mg/l. Nitrates varied from 5.1 to 12 mg/l, while sulphates varied from 24.1 to 32.2 mg/l.

Ground Water

The pH of the water samples collected ranged from 7.10 to 7.59 and within the acceptable limit of 6.5 to 8.5. pH, Sulphates and Chlorides of water samples from all the sources are within the limits as per the Standard. On Turbidity, the water samples meet the requirement. The Total Dissolved Solids were found in the range of 335 – 428 mg/l in all samples. The Total hardness varied between 172 – 259 mg/l for all samples.

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

3.2.5   Hydrology and Hydrogeological studies

The district is underlain by hard rock formation fissured and fractured crystalline rocks constitute the important aquifer systems in the district. Geophysical prospecting was carried out in that area by SSRMP-80 Instrument by qualified Geo physicist with the help of IGIS software and it was inferred that the low resistance encountered at the depth between 65-70m. The maximum depth proposed out of proposed projects is 31m to 47m BGL. Hence there is no possibilities of water table intersection during the entire mine life period besides it is also inferred topographically that there are no major water bodies intersecting the project area. There is no necessity of stream, channel diversion due to these proposed projects.

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

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

Station Code	Water Level in Meters bgl				Latitude	Longitude
	Dec 2022	Jan 2022	Feb 2023	Average		
OW1	7.2	9.2	11.2	9.2	11° 14' 47.18"N	76° 59' 10.14"E
OW2	7.3	9.3	11.3	9.3	11° 14' 38.26"N	76° 59' 20.99"E
OW3	7.6	9.6	11.6	9.6	11° 14' 40.53"N	76° 59' 46.02"E
OW5	8.8	10.8	12.8	10.8	11° 14' 50.23"N	76° 59' 36.33"E
OW4	9	11	13	11	11° 15' 16.79"N	76° 59' 30.78"E
OW6	8.4	10.4	12.4	10.4	11° 15' 12.07"N	76° 59' 45.71"E
OW7	7.9	9.9	11.9	9.9	11° 15' 22.86"N	76° 59' 08.97"E
OW8	8.4	10.4	12.4	10.4	11° 15' 44.75"N	76° 59' 09.68"E
OW9	8.2	10.2	12.2	10.2	11° 15' 41.58"N	76° 58' 47.27"E
OW10	8.8	10.8	12.8	10.8	11° 15' 16.48"N	77° 00' 16.93"E
OW11	8.6	10.6	12.6	10.6	11° 15' 27.36"N	76° 58' 33.27"E
OW12	8.2	10.2	12.2	10.2	11° 15' 00.71"N	76° 58' 27.81"E
OW13	8.7	10.7	12.7	10.7	11° 14' 34.87"N	76° 58' 18.34"E

Source: Onsite monitoring data

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

Station Code	Water Level in Meters bgl				Latitude	Longitude
	Dec 2022	Jan 2022	Feb 2023	Average		
BW1	58	60	62	60	11° 14' 47.84"N	76° 59' 48.18"E
BW2	60	62	64	62	11° 15' 11.15"N	76° 59' 37.63"E
BW3	65	67	69	67	11° 14' 29.87"N	76° 59' 11.37"E
BW4	60	62	64	62	11° 15' 30.22"N	76° 59' 40.93"E
BW5	61	63	65	63	11° 14' 23.52"N	76° 58' 37.51"E
BW6	59	61	63	61	11° 14' 59.97"N	76° 59' 58.85"E
BW7	62	64	66	64	11° 14' 50.09"N	76° 58' 24.64"E
BW8	65	67	69	67	11° 15' 26.07"N	76° 58' 35.89"E
BW9	65	67	69	67	11° 15' 12.64"N	77° 00' 25.64"E
BW10	64	66	68	66	11° 15' 45.79"N	76° 58' 54.88"E
BW11	60	62	64	62	11° 15' 34.56"N	77° 00' 09.11"E

Source: Onsite monitoring data

FIGURE 3.6: OPEN WELL CONTOUR MAP – DECEMBER 2022
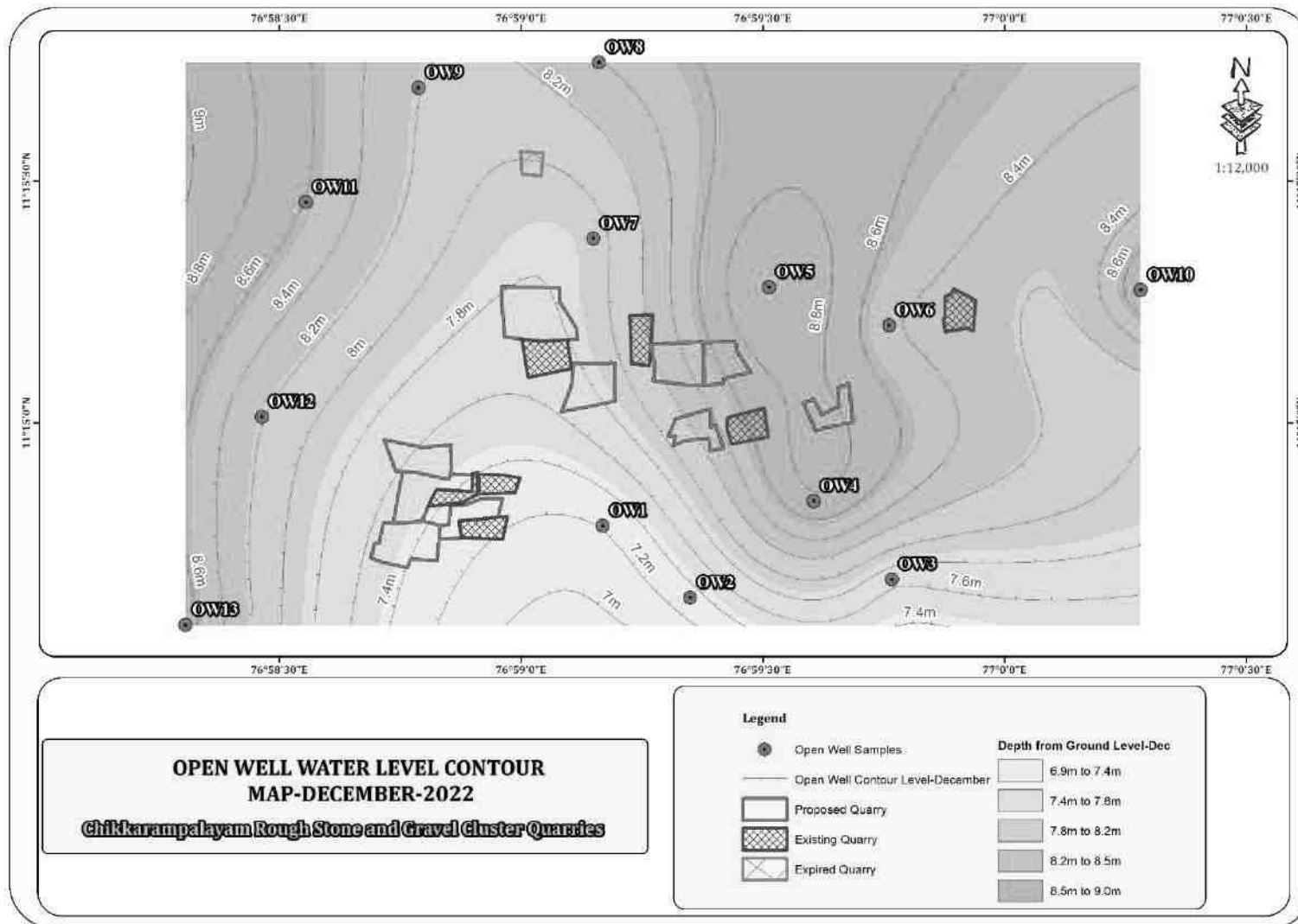
FIGURE 3.7: OPEN WELL CONTOUR MAP – JANUARY 2023
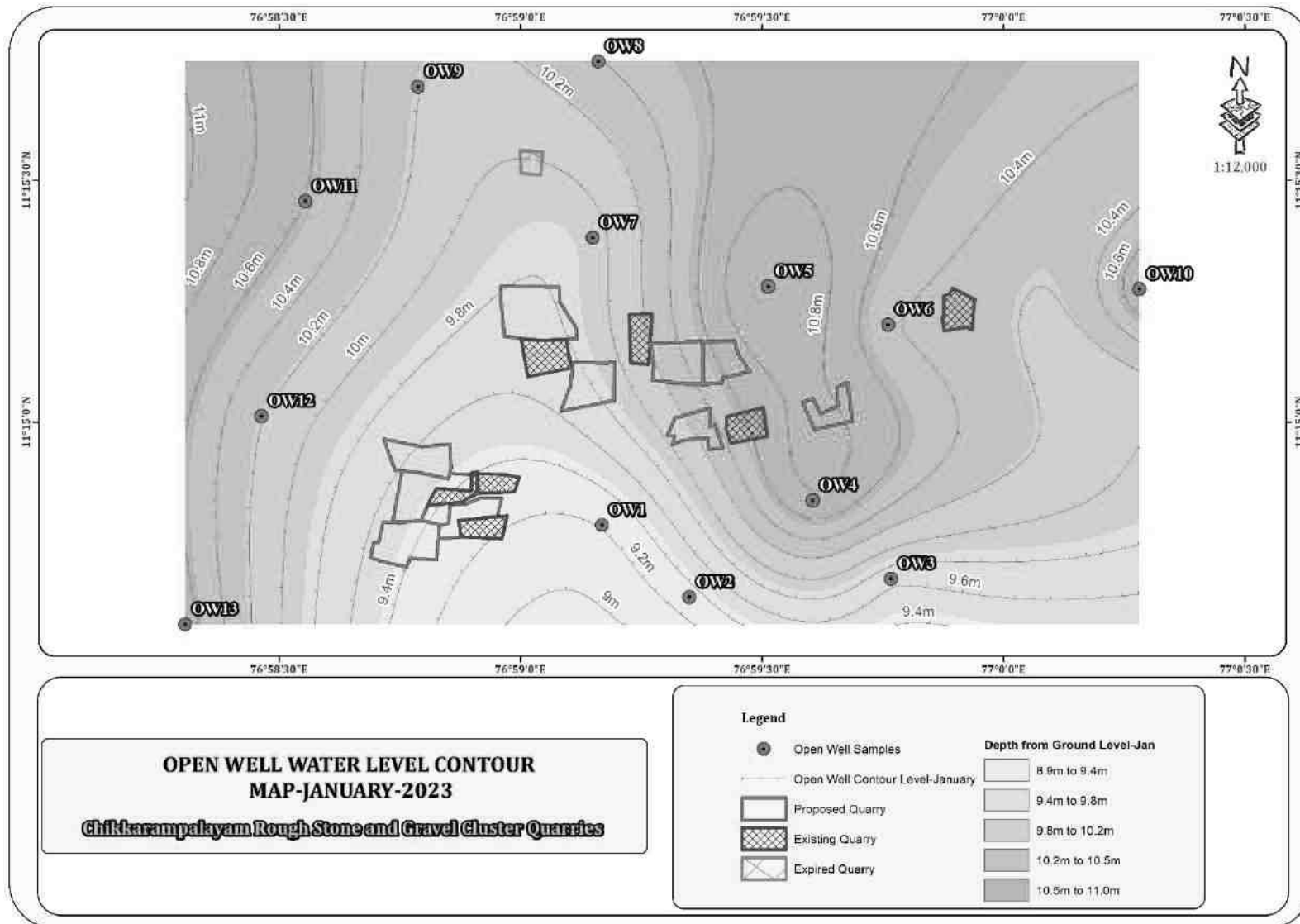
FIGURE 3.8: OPEN WELL CONTOUR MAP – FEBRUARY 2023
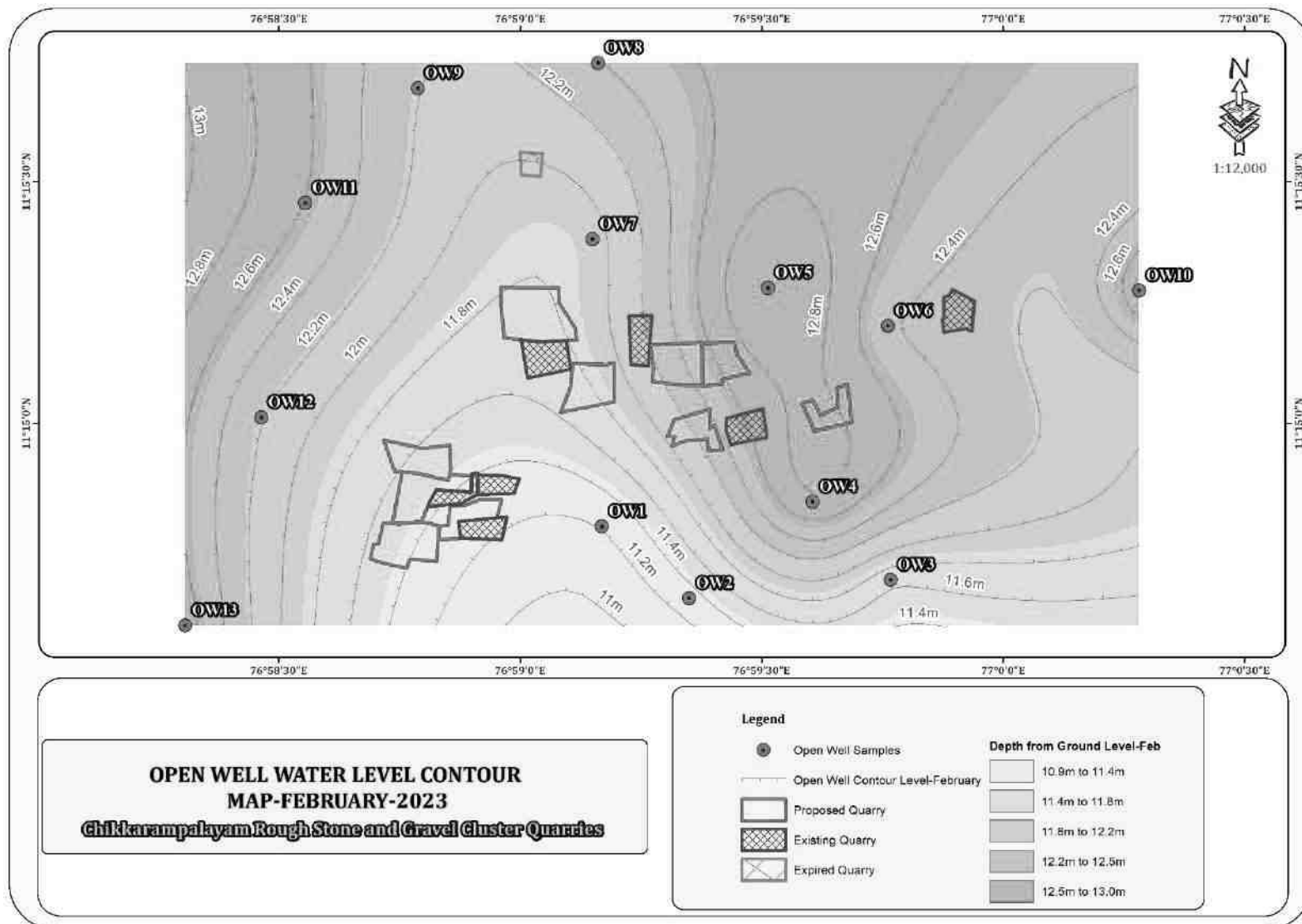
FIGURE 3.9: BOREWELL CONTOUR MAP – DECEMBER 2022
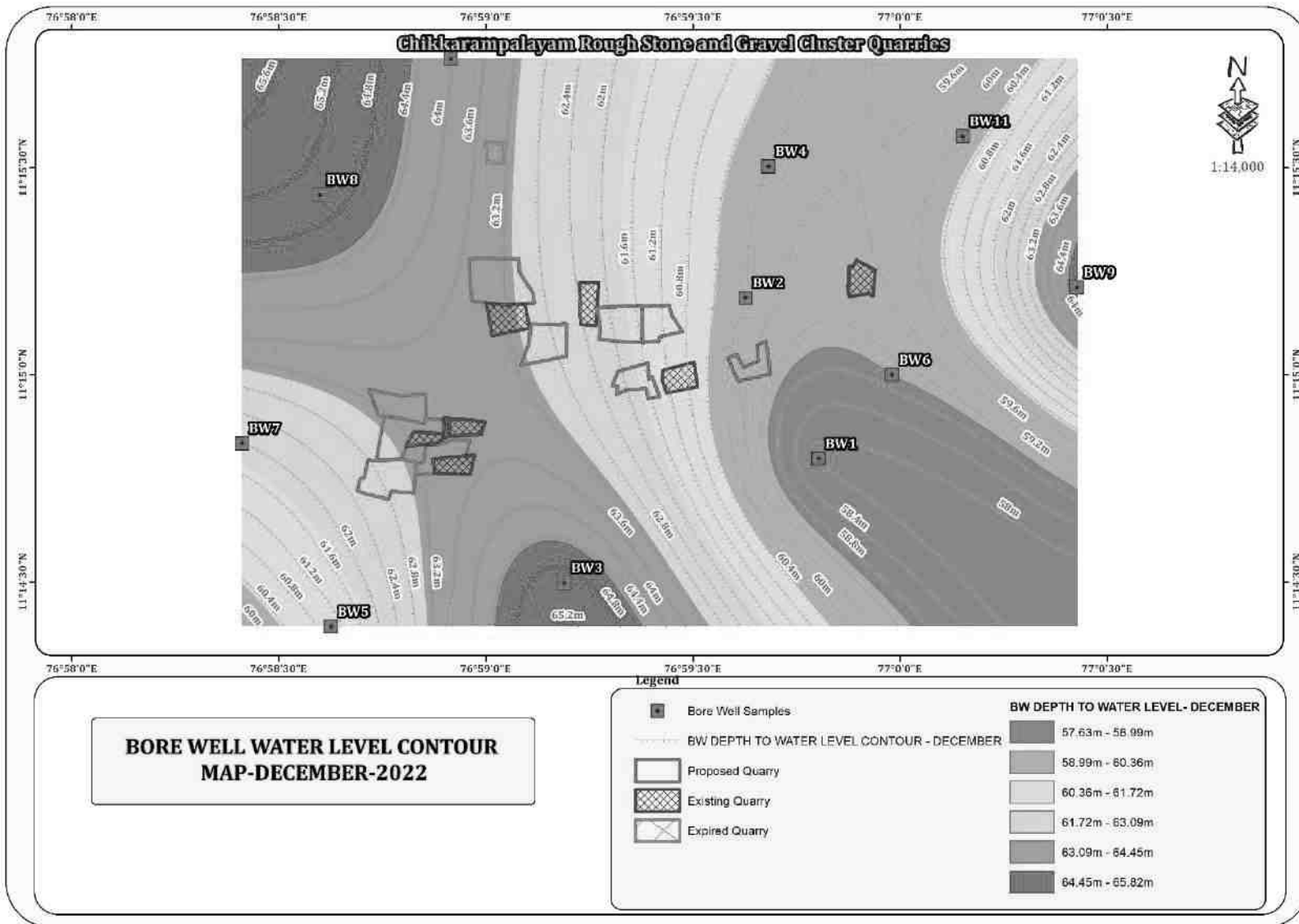
FIGURE 3.10: BOREWELL CONTOUR MAP – JANUARY 2023
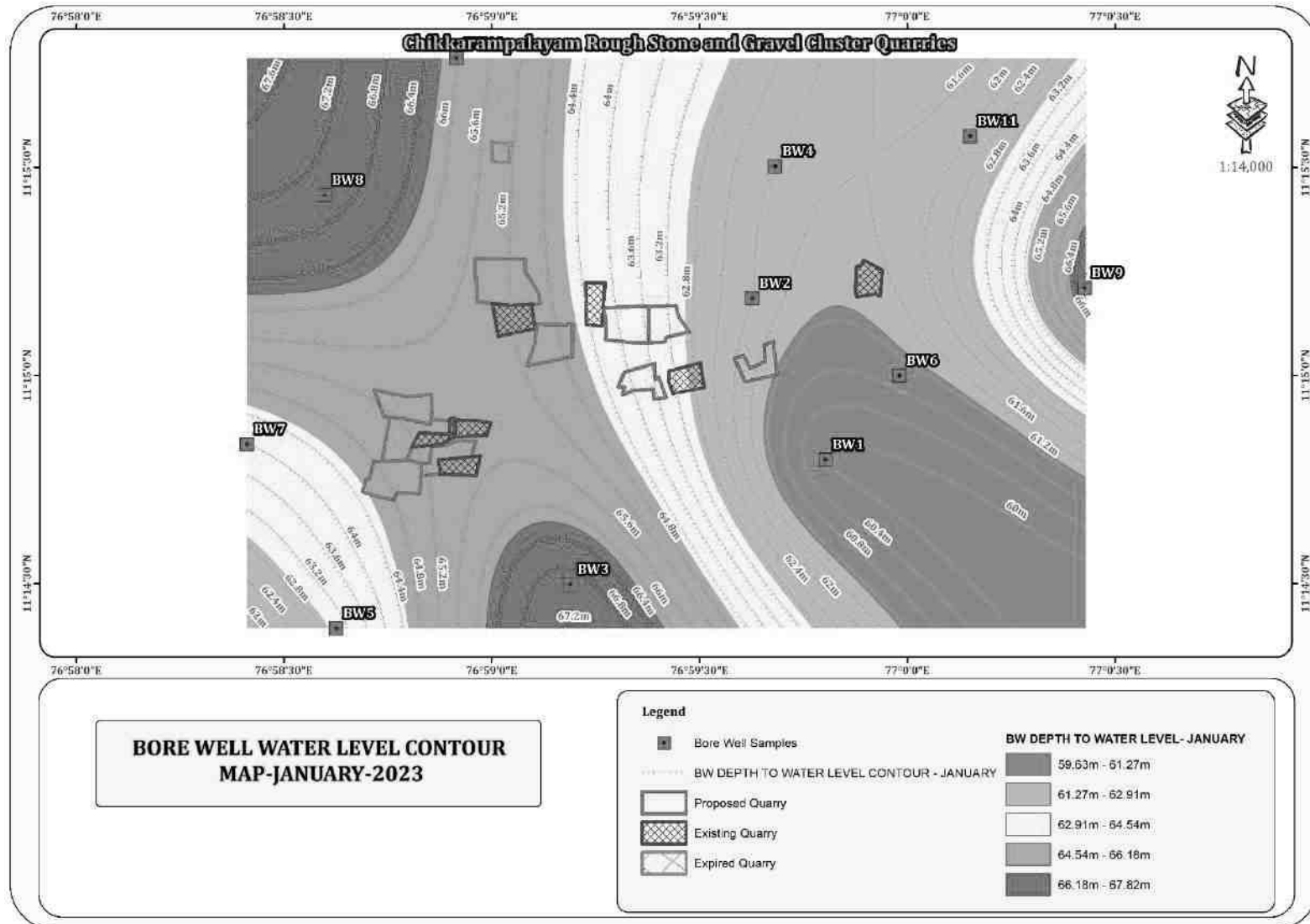
FIGURE 3.11: BOREWELL CONTOUR MAP – FEBRUARY 2023
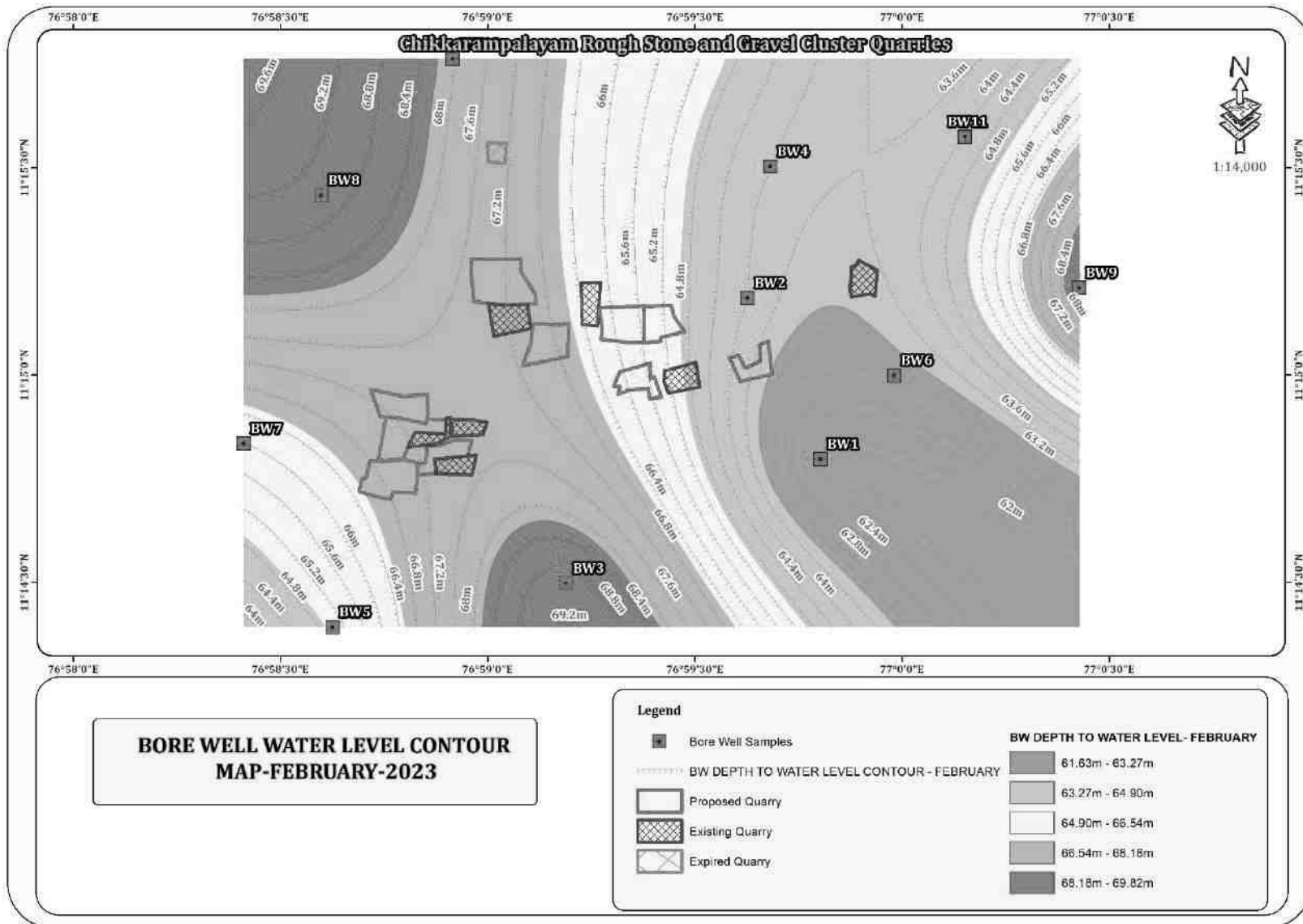
FIGURE 3.12: DRAINAGE MAP AROUND 10 KM RADIUS FROM PROJECT SITE
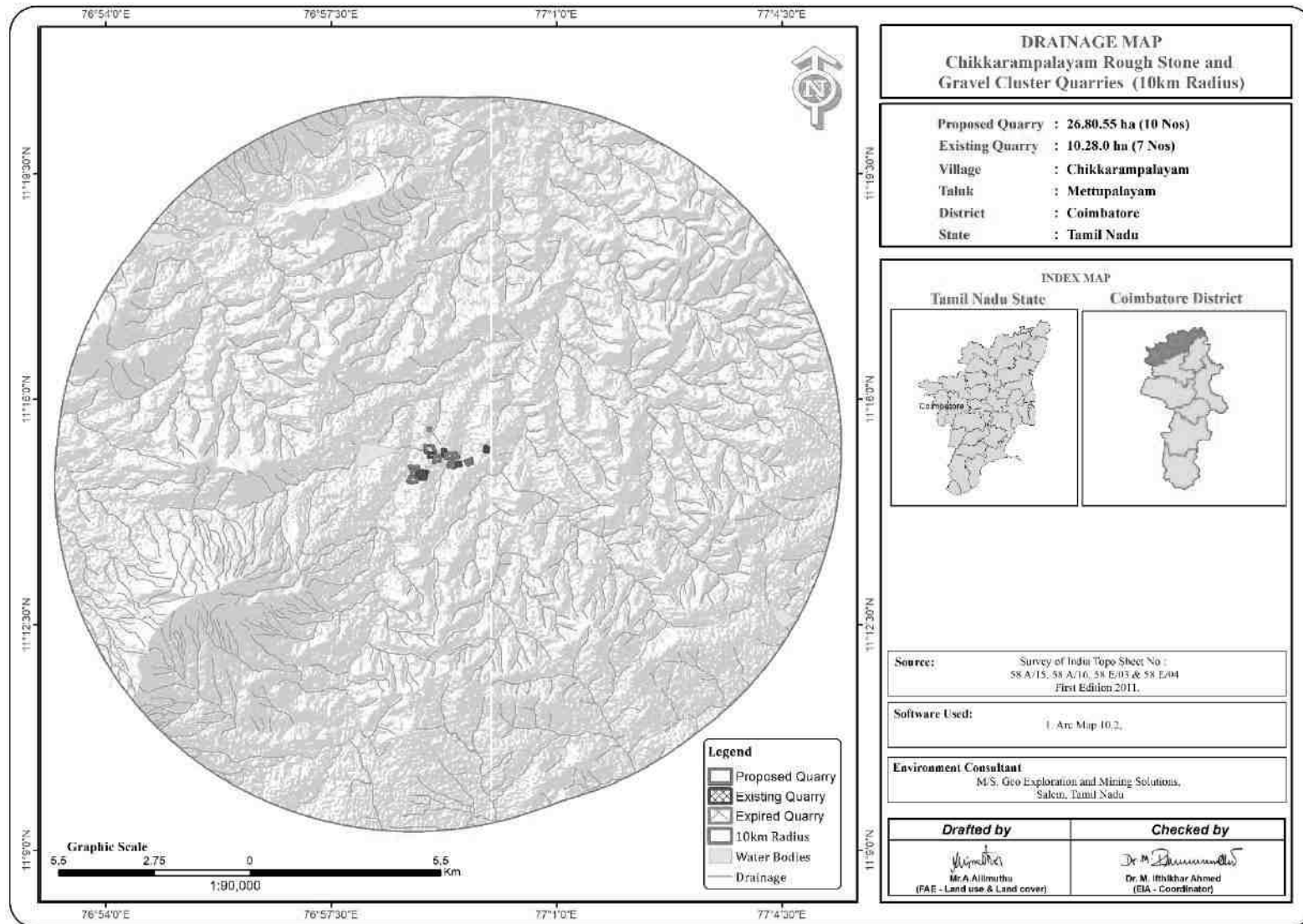
FIGURE 3.13: GROUND WATER PROSPECT MAP
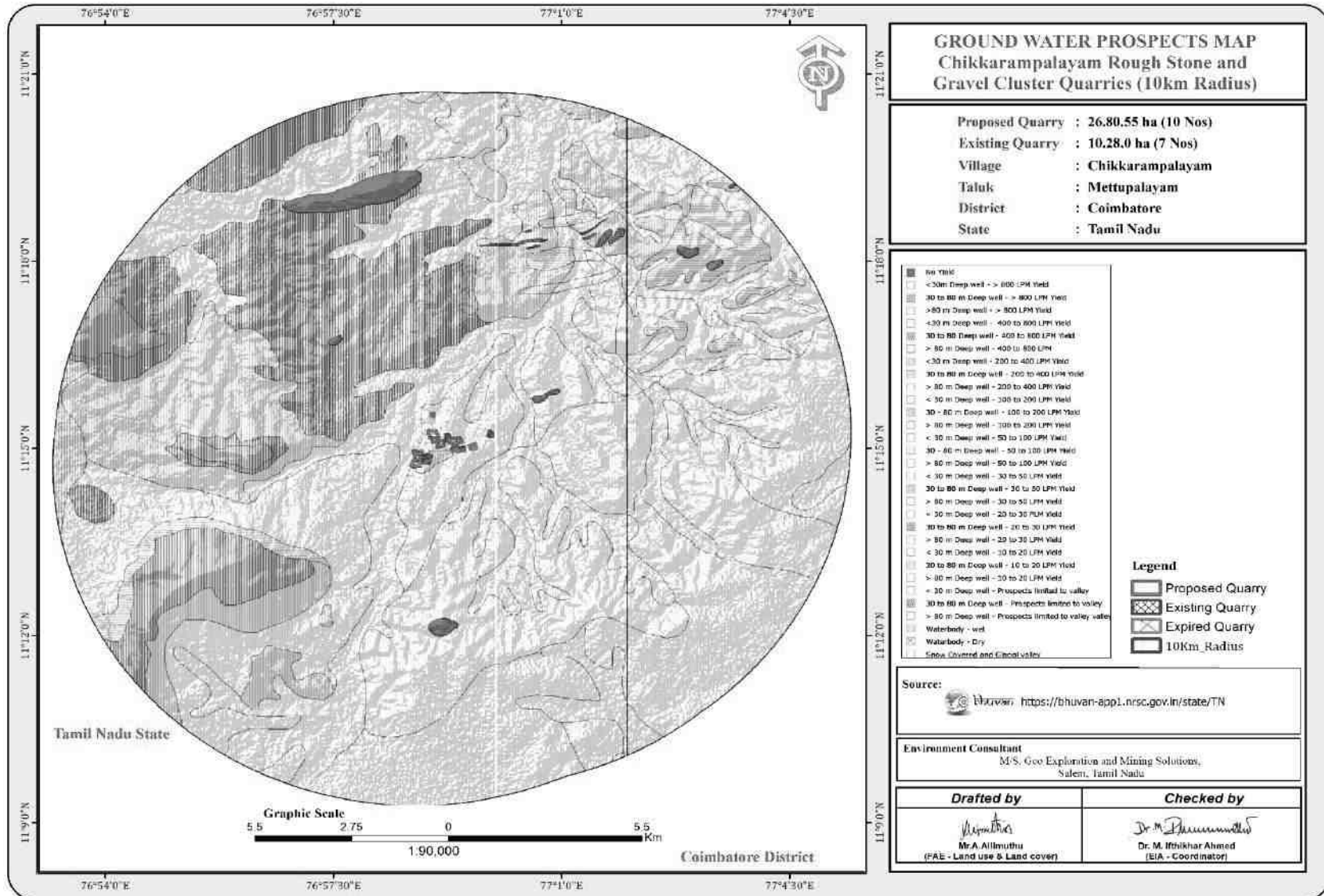
3.2.5.1 Methodology and Data Acquisition

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

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

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

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

ΔV = potential difference between receiving electrodes

G   = Geometric Factor.

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

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

ρr = Resistivity of Rocks

ρw = Resistivity of water in pores of rock

F   = Formation Factor

$\emptyset$ = Fractional pore volume

A   = Constants with values ranging from 0.5 to 2.5

3.2.5.2 Survey Layout

The layout for a resistivity survey depends on the choice of the current and potential electrode arrangement, which is called electrode array. Here the present study is considered with Schlumberger array. In which the distance may be used for current electrode separation while potential electrode separation is kept on third to one fifth of the same. One interesting aspect in VES is the principle of reciprocity, which permits interchange of the potential and current electrode without any effect on the measured apparent resistivity.

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

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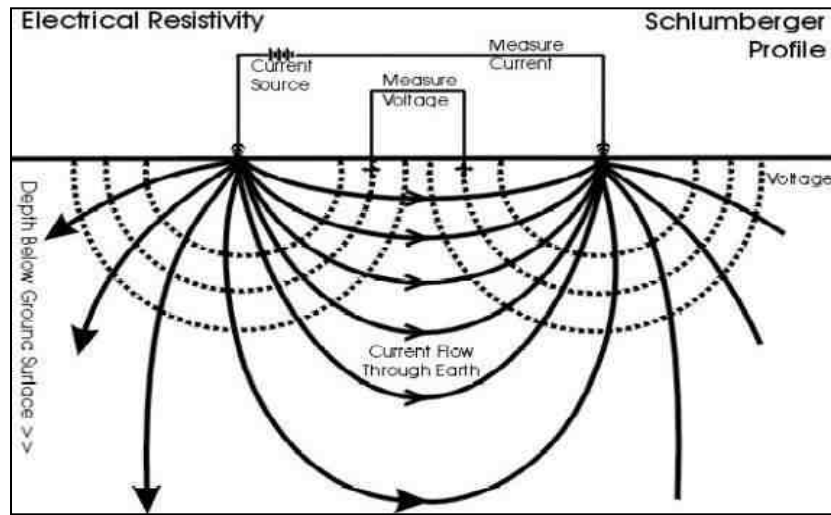
Measurements of ground Resistivity is essentially done by sending a current through two electrodes called current electrodes (C_1 & C_2) and measuring the resulting potential by two other electrodes called potential electrode (P_1 & P_2). The amount of current required to be sent into the ground depends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

3.2.5.3 Data Presentation

It was inferred that the low resistance encountered at the depth between 65-70m. The maximum depth proposed out of proposed projects is 37 m to 47m BGL. Hence there is no possibilities of water table intersection during the entire mine life period besides it is also inferred topographically that there are no major water bodies intersecting the project area.

3.2.5.4 Geophysical Data Interpretation

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

3.3   AIR ENVIRONMENT

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

The baseline studies on air environment include identification of specific air pollution parameters and their existing levels in ambient air. The ambient air quality with respect to the study zone of 10 km radius around the cluster forms the baseline information. The sources of air pollution in the region are mostly due to vehicular traffic, dust arising from unpaved village road and domestic & agricultural activities. The prime objective of the baseline air quality study was to establish the existing ambient air quality of the study area. These will also be useful for assessing the conformity to standards of the ambient air quality during the operation of proposed projects in cluster.

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

3.3.1   Meteorology & Climate

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

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

Climate –

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

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

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

Rainfall –

TABLE 3.13: RAINFALL DATA

Actual Rainfall in mm						Normal Rainfall in mm
2013	2014	2015	2016	2017	2018	
901.0	1221.7	992.9	505.5	873.4	1302.0	689.3

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

TABLE 3.14: METEOROLOGICAL DATA RECORDED AT SITE

S.No	Parameters		Dec - 2020	Jan - 2021	Feb - 2021
1	Temperature (⁰C)	Max	28.5	28.1	25.9
		Min	25.3	24.3	23.3
		Avg.	26.9	26.2	24.6
2	Relative Humidity (%)	Avg.	71.3	74.5	74.8
3	Wind Speed (m/s)	Max	8.750	3.681	3.125
		Min	1.459	0.833	0.000
		Avg.	5.104	2.257	1.562
4	Cloud Cover (OKTAS)		0-8	0-8	0-8
5	Wind direction		SSW,SW	NNE,NE	NE,NNE

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

Correlation between Secondary and Primary Data

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

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

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

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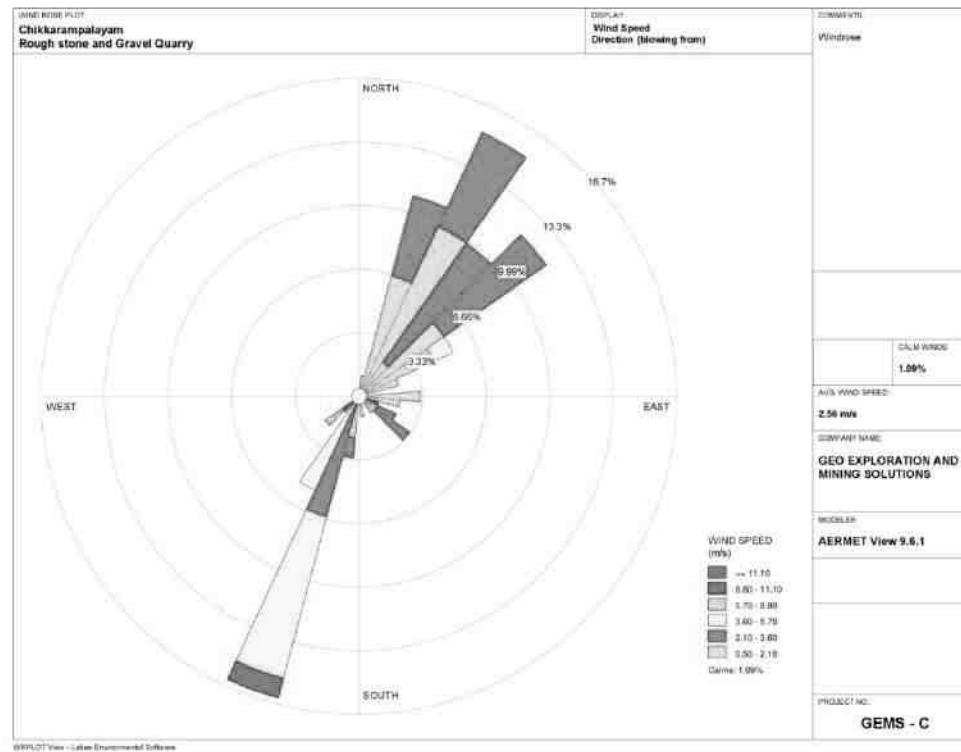
In the abstract of collected data wind rose were drawn on presented in figure No.3.14 during the monitoring period in the study area

1. Predominant winds were from NE- SW
2. Wind velocity readings were recorded between 0.50 to 11.10 m/s
3. Calm conditions prevail of about 1.09 % of the monitoring period
4. Temperature readings ranging from 23.3 to 28.5 °C
5. Relative humidity ranging from 71.3 to 74.8 %
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 modifiedmethod)	Respirable Dust Sampler with gaseous attachment
Free Silica	NIOSH – 7601	Visible Spectrophotometry

Source: Sampling Methodology followed by EHS360 Labs Private Limited & CPCB Notification

TABLE 3.16: NATIONAL AMBIENT AIR QUALITY STANDARDS

Sl.No.	Pollutant	Time Weighted Average	Concentration in ambient air	
			Industrial, Residential, Rural & other areas	Ecologically Sensitive area (Notified by Central Govt.)
1	Sulphur Dioxide (μg/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 December 2022 – February 2023. 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.

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

3.3.5   Ambient Air Quality Monitoring Stations

Nine (9) monitoring stations were set up in the study area as depicted in Figure 3.15 for assessment of the existing ambient air quality. Details of the sampling locations are as per given below.

TABLE 3.17: AMBIENT AIR QUALITY (AAQ) MONITORING LOCATIONS

S. No	Location Code	Monitoring Locations	Distance & Direction	Coordinates
1	AAQ1	Core Zone	Project Area	11°14'57.00"N 76°58'50.27"E
2	AAQ2	Core Zone	Near Existing Quarry	11°14'52.94"N 76°58'59.44"E
3	AAQ3	Therampalayam	1.8m North East	11°16'19.49"N 76°59'53.69"E
4	AAQ4	Karamadai	1.4 Km South West	11°14'22.79"N 76°57'45.77"E
5	AAQ5	Onnipalayam	4.2Km South East	11°12'25.30"N 77° 00'4.25"E
6	AAQ6	Bellaipalayam	5.5km North East	11°17'39.15"N 77° 1'17.60"E
7	AAQ7	Bodithimmampalayam	8.2km South East	11°15'19.84"N 76°57'15.75"E
8	AAQ8	Bettadapuram	2.7Km South West	11°13'31.86"N 76°57'27.03"E
9	AAQ9	Vadavalli	1.3km East	11°14'59.22"N 77° 0'23.93"E

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

FIGURE 3.15: AMBIENT AIR QUALITY LOCATIONS AROUND 10 KM RADIUS

TABLE 3.18 AMBIENT AIR QUALITY DATA LOCATION AAQ1-:

Period: December 2022 – February 2023   *Location: AAQ1- Project Area*   Sampling Time: 24-hourly

Monitoring		Particulates, $\mu g/m^3$			Gaseous Pollutants, $\mu g/m^3$					Other Pollutants (Particulate Phase) , $\mu g/m^3$				
Date	Period, hrs.	SPM	$PM_{2.5}$	PM_{10}	SO_2	NO_2	NH_3	O_3 (8-hly Avg.)	CO (8-hly Avg.)	Pb, $\mu g/m^3$	As, ng/m^3	Ni, ng/m^3	C_6H_6, ng/m^3	BaP, ng/m^3
NAAQ Norms*		80 (24 hrs)	60(24 hrs.)	100 (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)
05.12.2022	07.00-07.00	62.9	19.9	44.2	7.1	19.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
06.12.2022	07.15-07.15	62.7	19.7	44.5	6.9	18.9	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
12.12.2022	07.00-07.00	62.5	19.6	43.2	6.2	19.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
13.12.2022	07.15-07.15	64.7	19.4	43.8	6.4	19.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
19.12.2022	07.00-07.00	65.2	19.3	43.5	6.5	18.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
20.12.2022	07.15-07.15	65.1	19.9	43.2	6.9	19.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
26.12.2022	07.00-07.00	64.0	19.5	43.8	6.7	18.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
27.12.2022	07.15-07.15	64.3	19.2	43.5	6.0	19.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
02.01.2023	07.00-07.00	64.9	18.7	43.2	7.2	18.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
03.01.2023	07.15-07.15	64.2	18.3	42.9	7.6	18.9	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
09.01.2023	07.00-07.00	64.8	20.2	42.2	6.6	18.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
10.01.2023	07.15-07.15	63.7	19.5	43.2	7.5	19.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
16.01.2023	07.00-07.00	65.5	18.9	42.8	6.5	19.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
17.01.2023	07.15-07.15	64.8	19.1	43.5	6.1	19.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
23.01.2023	07.00-07.00	64.1	19.6	43.1	6.5	19.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
24.01.2023	07.15-07.15	62.9	19.7	44.8	6.3	20.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
30.01.2023	07.00-07.00	65.2	19.9	43.2	6.5	18.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
31.01.2023	07.15-07.15	65.4	19.5	45.6	6.9	19.9	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
06.02.2023	07.00-07.00	66.3	19.6	45.5	6.7	20.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
07.02.2023	07.15-07.15	64.9	19.3	45.1	6.4	18.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
13.02.2023	07.00-07.00	64.7	19.2	44.5	6.1	19.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
14.02.2023	07.15-07.15	65.2	19.3	44.0	6.5	19.9	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
20.02.2023	07.00-07.00	65.8	19.4	44.3	6.6	18.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
21.02.2023	07.15-07.15	64.3	19.6	43.6	6.2	19.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0

TABLE 3.19 AMBIENT AIR QUALITY DATA LOCATIO NAAQ2-:

Period: December 2022 – February 2023   *Location: AAQ2- Core zone*   Sampling Time: 24-hourly

Monitoring		Particulates, µg/m³			Gaseous Pollutants, µg/m³					Other Pollutants (Particulate Phase) , µg/m³				
Date	Period, hrs.	SPM	PM2.5	PM10	SO₂	NO₂	NH₃	O₃ (8-hly Avg.)	CO (8-hly Avg.)	Pb, µg/m³	As, ng/m³	Ni, ng/m³	C₆H₆, ng/m³	BaP, ng/m³
NAAQ Norms*		(24 hrs)	60(24 hrs.)	100 (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)
05.12.2022	07.15-07.15	57.3	19.8	39.3	7.3	21.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
06.12.2022	07.30-07:30	57.9	20.1	41.5	7.1	21.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
12.12.2022	07.15-07.15	58.3	20.3	39.6	7.6	21.9	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
13.12.2022	07.30-07:30	58.6	18.5	40.7	7.2	21.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
19.12.2022	07.15-07.15	58.1	18.8	41.3	7.5	22.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
20.12.2022	07.30-07:30	58.7	18.7	39.8	7.6	21.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
26.12.2022	07.15-07.15	57.4	18.2	38.9	7.3	21.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
27.12.2022	07.30-07:30	57.9	20.7	40.4	7.5	21.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
02.01.2023	07.15-07.15	57.3	20.0	42.6	7.6	21.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
03.01.2023	07.30-07:30	57.1	20.3	41.2	7.4	22.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
09.01.2023	07.15-07.15	58.7	19.9	40.2	7.8	21.9	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
10.01.2023	07.30-07:30	58.6	19.3	41.5	7.3	21.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
16.01.2023	07.15-07.15	58.4	19.5	42.2	7.2	21.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
17.01.2023	07.15-07.15	59.2	20.6	41.9	7.2	21.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
23.01.2023	07.00-07.00	56.6	20.5	41.3	7.4	22.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
24.01.2023	07.15-07.15	56.1	20.7	40.2	7.6	22.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
30.01.2023	07.00-07.00	56.7	19.2	40.5	7.7	21.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
31.01.2023	07.15-07.15	56.2	20.3	41.7	7.3	21.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
06.02.2023	07.00-07.00	56.1	21.9	41.3	7.5	21.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
07.02.2023	07.15-07.15	55.9	20.1	41.5	7.6	21.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
13.02.2023	07.00-07.00	55.7	20.7	41.5	7.9	21.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
14.02.2023	07.15-07.15	56.7	21.2	40.2	8.2	20.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
20.02.2023	07.00-07.00	56.2	20.3	40.3	7.7	20.9	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
21.02.2023	07.15-07.15	56.8	19.9	40.7	7.6	20.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0

TABLE 3.20 AMBIENT AIR QUALITY DATA LOCATION AAQ3-:

Period: December 2022 – February 2023   Location : *AAQ3- Therampalayam (NE)*   Sampling Time: 24-hourly

Monitoring		Particulates, $\mu g/m^3$			Gaseous Pollutants, $\mu g/m^3$					Other Pollutants (Particulate Phase) , $\mu g/m^3$				
Date	Period, hrs.	SPM	PM2.5	PM10	SO_2	NO_2	NH_3	O_3 (8-hly Avg.)	CO (8-hly Avg.)	Pb, $\mu g/m^3$	As, ng/m^3	Ni, ng/m^3	C_6H_6, ng/m^3	BaP, ng/m^3
NAAQ Norms*		(24 hrs.)	60 (24 hrs.)	100 (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)
05.12.2022	07.15-07.15	65.6	19.7	43.2	5.3	23.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
06.12.2022	07.30-07:30	65.5	19.6	41.8	5.7	23.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
12.12.2022	07.15-07.15	65.9	18.4	42.6	5.9	23.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
13.12.2022	07.30-07:30	65.1	21.6	43.5	6.3	23.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
19.12.2022	07.15-07.15	66.3	19.6	40.9	6.8	22.9	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
20.12.2022	07.30-07:30	66.7	20.4	41.6	6.4	22.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
26.12.2022	07.15-07.15	66.2	21.6	40.1	6.9	22.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
27.12.2022	07.30-07:30	67.1	18.6	41.7	6.8	23.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
02.01.2023	07.15-07.15	66.3	18.5	42.5	6.7	23.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
03.01.2023	07.30-07:30	66.2	19.7	41.8	6.2	23.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
09.01.2023	07.15-07.15	65.1	20.5	41.9	7.3	22.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
10.01.2023	07.30-07:30	66.7	21.6	42.4	7.5	22.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
16.01.2023	07.15-07.15	64.3	21.8	40.6	7.6	24.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
17.01.2023	07.15-07.15	64.7	19.6	40.3	7.9	24.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
23.01.2023	07.00-07.00	65.0	19.7	40.7	7.1	23.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
24.01.2023	07.15-07.15	63.6	21.5	41.8	6.6	23.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
30.01.2023	07.00-07.00	64.6	20.4	42.2	6.8	22.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
31.01.2023	07.15-07.15	64.2	18.8	42.4	6.9	22.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
06.02.2023	07.00-07.00	65.9	19.7	41.6	6.1	23.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
07.02.2023	07.15-07.15	66.1	21.5	41.8	6.7	23.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
13.02.2023	07.00-07.00	66.7	20.9	40.7	5.9	22.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
14.02.2023	07.15-07.15	66.3	22.1	43.3	6.8	23.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
20.02.2023	07.00-07.00	66.1	21.7	42.7	7.3	24.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
21.02.2023	07.15-07.15	65.8	20.8	40.8	7.5	24.9	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0

TABLE 3.21 AMBIENT AIR QUALITY DATA LOCATIO NAAQ4-:

Period: December 2022 – February 2023   Location: AAQ4 – Karamadai (SW)   Sampling Time: 24-hourly

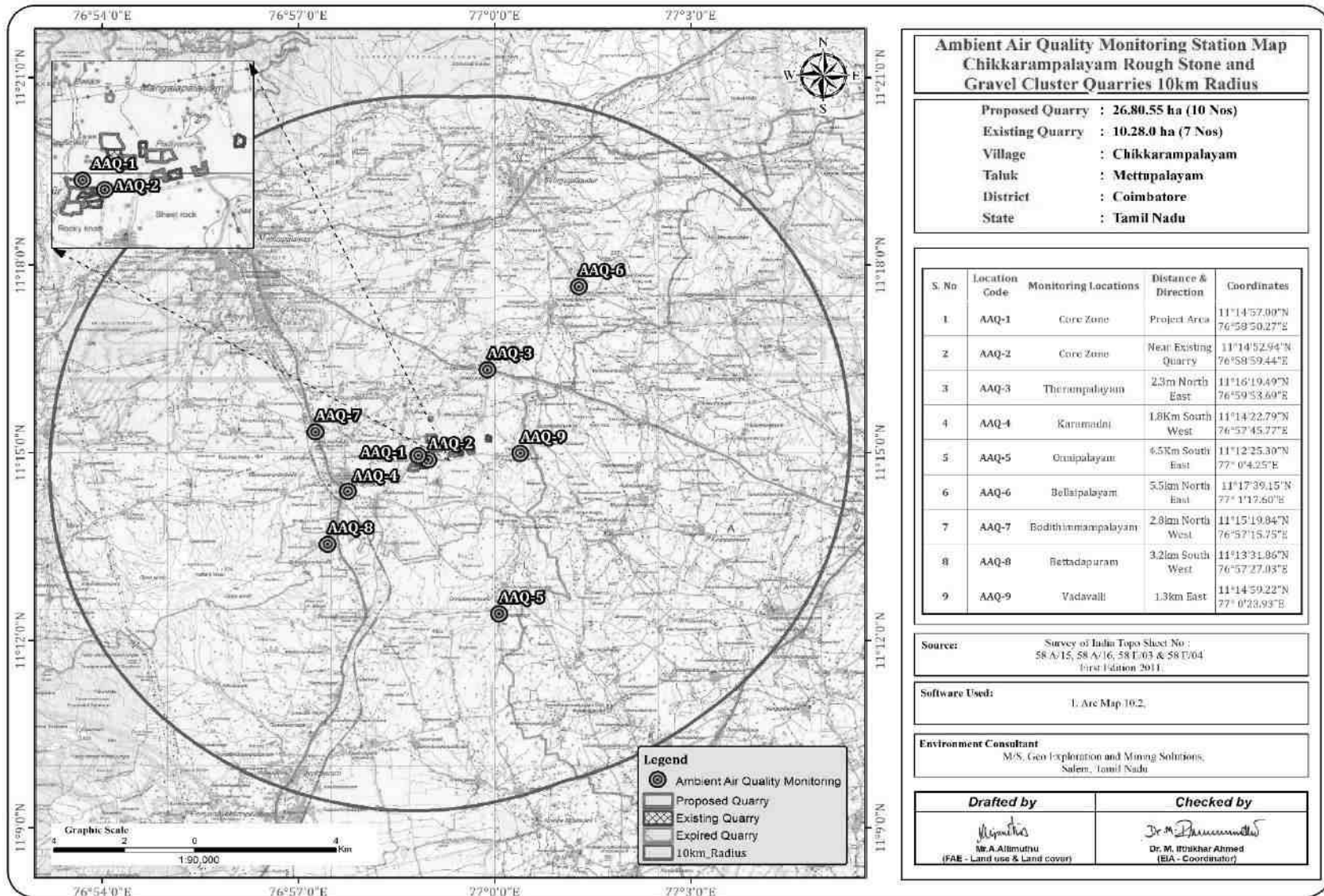| Monitoring		Particulates, µg/m³			Gaseous Pollutants, µg/m³					Other Pollutants (Particulate Phase) , µg/m³				
Date	Period, hrs.	SPM	PM2.5	PM10	SO₂	NO₂	NH₃	O₃ (8-hly Avg.)	CO (8-hly Avg.)	Pb, µg/m³	As, ng/m³	Ni, ng/m³	C₆H₆, ng/m³	BaP, ng/m³
NAAQ Norms*		(24 hrs.)	60(24 hrs.)	100 (24 hrs.)	80 (24 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)
05.12.2022	07.00-07.00	62.3	19.6	40.5	5.3	21.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
06.12.2022	07.15-07:15	62.6	18.9	39.2	5.5	21.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
12.12.2022	07.00-07.00	62.4	18.5	40.6	5.6	21.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
13.12.2022	07.15-07:15	62.7	18.2	41.0	5.8	21.9	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
19.12.2022	07.00-07.00	62.9	18.1	40.8	5.1	22.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
20.12.2022	07.15-07:15	63.6	18.9	41.5	5.9	22.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
26.12.2022	07.00-07.00	63.7	19.1	40.1	5.3	22.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
27.12.2022	07.15-07:15	63.8	19.5	41.7	5.2	23.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
02.01.2023	07.00-07.00	63.6	19.8	40.0	5.2	23.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
03.01.2023	07.15-07:15	63.4	19.5	40.1	5.8	22.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
09.01.2023	07.00-07.00	62.8	18.3	40.9	5.2	21.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
10.01.2023	07.15-07:15	62.7	18.8	40.4	5.4	21.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
16.01.2023	07.00-07.00	62.1	19.6	40.6	5.6	21.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
17.01.2023	07.15-07.15	62.5	18.1	40.9	5.4	20.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
23.01.2023	07.00-07.00	61.3	19.9	40.2	5.3	20.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
24.01.2023	07.15-07.15	61.7	18.5	41.7	5.1	20.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
30.01.2023	07.00-07.00	61.9	18.3	40.1	5.8	22.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
31.01.2023	07.15-07.15	64.3	18.8	41.6	5.6	22.9	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
06.02.2023	07.00-07.00	64.6	19.2	41.5	5.1	22.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
07.02.2023	07.15-07.15	64.1	18.5	40.8	5.5	23.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
13.02.2023	07.00-07.00	63.2	19.8	41.1	5.6	21.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
14.02.2023	07.15-07.15	63.9	19.6	41.5	5.4	23.9	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
20.02.2023	07.00-07.00	63.4	19.2	40.3	5.2	23.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
21.02.2023	07.15-07.15	63.7	18.6	40.9	5.7	24.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0

TABLE 3.22 AMBIENT AIR QUALITY DATA LOCATIO NAAQ5-:

Period: December 2022 – February 2023   Location*: AAQ5- Onnipalayam (SE)*   Sampling Time: 24-hourly

Monitoring		Particulates, µg/m³			Gaseous Pollutants, µg/m³					Other Pollutants (Particulate Phase) , µg/m³				
Date	Period, hrs.	SPM	PM2.5	PM10	SO₂	NO₂	NH₃	O₃ (8-hly Avg.)	CO (8-hly Avg.)	Pb, µg/m³	As, ng/m³	Ni, ng/m³	C₆H₆, ng/m³	BaP, ng/m³
NAAQ Norms*		(24 hrs.)	60(24 hrs.)	100 (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)
05.12.2022	07:30-07:30	66.3	20.7	41.3	8.3	23.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
06.12.2022	07:45-07:45	66.4	20.4	42.4	8.5	22.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
12.12.2022	07:30-07:30	65.2	21.5	41.8	8.7	23.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
13.12.2022	07:45-07:45	65.8	20.9	42.4	8.1	24.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
19.12.2022	07:30-07:30	63.2	20.5	44.3	8.6	24.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
20.12.2022	07:45-07:45	63.7	21.9	43.7	8.7	22.9	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
26.12.2022	07:30-07:30	64.6	21.7	40.6	7.3	23.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
27.12.2022	07:45-07:45	64.8	21.5	42.5	8.5	24.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
02.01.2023	07:30-07:30	64.2	20.6	43.6	7.2	23.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
03.01.2023	07:45-07:45	64.3	20.8	42.7	7.1	24.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
09.01.2023	07:30-07:30	64.7	20.4	41.6	7.6	23.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
10.01.2023	07:45-07:45	63.2	21.3	42.9	7.8	22.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
16.01.2023	07:30-07:30	63.8	20.8	43.8	7.1	24.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
17.01.2023	07.15-07.15	64.6	21.7	42.5	7.8	23.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
23.01.2023	07.00-07.00	64.8	21.6	41.9	6.6	24.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
24.01.2023	07.15-07.15	64.1	22.8	41.3	6.3	25.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
30.01.2023	07.00-07.00	63.2	21.2	42.7	6.1	23.9	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
31.01.2023	07.15-07.15	63.7	21.3	41.3	6.5	24.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
06.02.2023	07.00-07.00	63.1	20.5	43.6	6.8	23.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
07.02.2023	07.15-07.15	64.3	20.3	42.5	6.5	24.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
13.02.2023	07.00-07.00	64.8	21.7	44.8	7.6	23.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
14.02.2023	07.15-07.15	63.7	21.3	42.5	7.1	23.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
20.02.2023	07.00-07.00	63.1	20.8	41.3	7.8	22.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
21.02.2023	07.15-07.15	65.5	21.5	42.7	7.1	24.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0

TABLE 3.23 AMBIENT AIR QUALITY DATA LOCATIO NAAQ6-:

Period: December 2022 – February 2023   *Location: AAQ6 –Bellaipalayam (NE)*   Sampling Time: 24-hourly

Monitoring		Particulates, µg/m³			Gaseous Pollutants, µg/m³					Other Pollutants (Particulate Phase), µg/m³				
Date	Period, hrs.	SP/m	PM2.5	PM10	SO₂	NO₂	NH₃	O₃ (8-hly Avg.)	CO (8-hly Avg.)	Pb, µg/m³	As, ng/m³	Ni, ng/m³	C₆H₆, ng/m³	BaP, ng/m³
NAAQ Norms*		(24 hrs.)	60(24 hrs.)	100 (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)
05.12.2022	08:00-08:00	65.3	18.3	39.5	6.2	22.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
06.12.2022	08:15-08:15	65.7	18.8	39.2	6.5	23.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
12.12.2022	08:00-08:00	65.6	19.4	38.5	6.4	22.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
13.12.2022	08:15-08:15	65.7	18.9	38.8	6.8	23.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
19.12.2022	08:00-08:00	66.1	18.3	38.6	6.8	24.9	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
20.12.2022	08:15-08:15	66.2	19.7	38.7	7.2	21.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
26.12.2022	08:00-08:00	66.7	19.7	39.6	7.5	21.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
27.12.2022	08:15-08:15	66.2	18.2	39.8	7.4	22.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
02.01.2023	08:00-08:00	66.5	19.8	38.6	7.5	23.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
03.01.2023	08:15-08:15	65.8	20.3	38.1	7.7	22.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
09.01.2023	08:00-08:00	65.9	19.3	38.5	7.4	22.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
10.01.2023	08:15-08:15	65.7	20.1	38.4	7.1	23.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
16.01.2023	08:00-08:00	66.8	20.2	39.2	6.8	21.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
17.01.2023	07.15-07.15	66.9	20.4	39.3	6.5	22.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
23.01.2023	07.00-07.00	67.5	20.9	39.2	6.6	21.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
24.01.2023	07.15-07.15	67.3	20.3	39.6	7.2	24.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
30.01.2023	07.00-07.00	67.8	19.5	39.7	7.6	23.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
31.01.2023	07.15-07.15	66.5	19.7	38.2	7.9	22.9	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
06.02.2023	07.00-07.00	66.7	19.4	39.5	7.2	23.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
07.02.2023	07.15-07.15	66.8	19.5	38.3	7.1	22.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
13.02.2023	07.00-07.00	67.3	20.3	38.5	6.2	23.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
14.02.2023	07.15-07.15	67.9	20.7	39.5	6.5	22.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
20.02.2023	07.00-07.00	67.1	20.2	39.3	6.5	21.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
21.02.2023	07.15-07.15	67.5	18.3	40.5	6.8	23.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0

Legend: **PM2.5**-Particulate Matter size less than 2.5 µm; **PM10**-Respirable Particulate Matter size less than 10 µm; **SO₂**-Sulphur dioxide; **NOx**-Oxides of Nitrogen**;NH₃**-Ammonia; **O₃**-Ozone; **CO**-Carbon monoxide; **Pb**-Particulate Lead; **As**-Particulate Arsenic; **Ni**-Particulate Nickel; **C₆H₆**-Benzene &**BaP**- Benzo (a) pyrene inparticulate phase **NAAQ Norms**-National Ambient Air Quality Norms-**Revised as per GSR 826(E) dated 16.11.2009** for Industrial, Residential, Rural and other Area.

TABLE 3.24 AMBIENT AIR QUALITY DATA LOCATIO NAAQ7-:

Period: December 2022 – February 2023 | *Location: AAQ7 – Bodithimmampalayam (S)* | Sampling Time: 24-hourly

Monitoring		Particulates, µg/m³			Gaseous Pollutants, µg/m³					Other Pollutants (Particulate Phase) , µg/m³				
Date	Period, hrs.	SPM	PM2.5	PM10	SO₂	NO₂	NH₃	O₃ (8-hly Avg.)	CO (8-hly Avg.)	Pb, µg/m³	As, ng/m³	Ni, ng/m³	C₆H₆, ng/m³	BaP, ng/m³
NAAQ Norms*		(24 hrs.)	60(24 hrs.)	100 (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)
05.12.2022	08:00-08:00	60.9	20.4	41.7	6.9	20.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
06.12.2022	08:15-08:15	60.7	20.9	40.9	6.4	20.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
12.12.2022	08:00-08:00	61.3	20.3	40.3	6.3	20.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
13.12.2022	08:15-08:15	61.7	20.5	41.7	6.8	21.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
19.12.2022	08:00-08:00	61.6	20.7	42.3	6.6	21.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
20.12.2022	08:15-08:15	61.2	20.6	41.7	7.2	21.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
26.12.2022	08:00-08:00	60.7	21.3	40.2	7.7	21.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
27.12.2022	08:15-08:15	68.6	21.4	42.6	7.5	21.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
02.01.2023	08:00-08:00	69.2	21.8	40.5	7.8	21.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
03.01.2023	08:15-08:15	69.7	21.5	41.3	7.5	20.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
09.01.2023	08:00-08:00	69.2	21.9	41.7	7.8	20.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
10.01.2023	08:15-08:15	69.3	21.3	42.3	6.3	20.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
16.01.2023	08:00-08:00	69.1	20.9	41.3	6.8	20.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
17.01.2023	07.15-07.15	60.2	20.1	42.7	6.7	21.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
23.01.2023	07.00-07.00	60.7	22.5	42.9	6.9	21.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
24.01.2023	07.15-07.15	61.2	21.9	41.6	7.9	21.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
30.01.2023	07.00-07.00	61.7	23.3	43.5	7.3	21.9	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
31.01.2023	07.15-07.15	61.3	24.6	42.3	7.2	21.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
06.02.2023	07.00-07.00	61.7	22.8	41.9	6.8	20.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
07.02.2023	07.15-07.15	62.2	21.8	43.3	7.5	21.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
13.02.2023	07.00-07.00	62.8	25.3	42.5	7.6	20.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
14.02.2023	07.15-07.15	62.7	23.9	44.7	7.7	21.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
20.02.2023	07.00-07.00	62.9	23.4	43.6	7.8	20.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
21.02.2023	07.15-07.15	61.1	21.6	42.8	7.9	21.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0

TABLE 3.25 AMBIENT AIR QUALITY DATA LOCATIO NAAQ8-:

Period: December 2022 – February 2023   Location: AAQ8 – Bettadapuram (SW)   Sampling Time: 24-hourly

Monitoring		Particulates, µg/m³			Gaseous Pollutants, µg/m³					Other Pollutants (Particulate Phase) , µg/m³				
Date	Period, hrs.	SPM	PM2.5	PM10	SO₂	NO₂	NH₃	O₃ (8-hly Avg.)	CO (8-hly Avg.)	Pb, µg/m³	As, ng/m³	Ni, ng/m³	C₆H₆, ng/m³	BaP, ng/m³
NAAQ Norms*		(24 hrs.)	60(24 hrs.)	100 (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)
05.12.2022	08:00-08:00	59.3	18.7	40.3	6.3	25.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
06.12.2022	08:15-08:15	58.6	19.6	39.6	6.4	25.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
12.12.2022	08:00-08:00	57.3	19.7	39.7	6.5	25.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
13.12.2022	08:15-08:15	57.8	19.5	39.5	6.1	25.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
19.12.2022	08:00-08:00	57.3	19.2	38.3	6.7	25.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
20.12.2022	08:15-08:15	57.2	19.3	38.4	6.8	25.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
26.12.2022	08:00-08:00	57.4	19.1	38.2	6.7	25.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
27.12.2022	08:15-08:15	57.1	18.6	38.1	5.3	26.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
02.01.2023	08:00-08:00	57.3	18.7	40.6	5.8	26.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
03.01.2023	08:15-08:15	57.9	18.3	40.5	5.9	26.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
09.01.2023	08:00-08:00	58.3	20.7	40.7	5.7	26.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
10.01.2023	08:15-08:15	58.6	20.7	40.5	5.6	26.9	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
16.01.2023	08:00-08:00	56.8	19.3	40.6	5.1	26.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
17.01.2023	07.15-07.15	56.2	19.7	40.8	6.2	26.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
23.01.2023	07.00-07.00	56.7	19.6	39.7	6.7	25.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
24.01.2023	07.15-07.15	56.9	19.8	39.5	6.8	24.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
30.01.2023	07.00-07.00	58.9	20.3	39.1	6.5	24.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
31.01.2023	07.15-07.15	58.4	20.4	40.2	6.6	24.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
06.02.2023	07.00-07.00	57.3	20.9	40.3	6.1	24.9	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
07.02.2023	07.15-07.15	57.6	19.6	40.7	5.7	25.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
13.02.2023	07.00-07.00	57.1	19.8	40.5	5.3	25.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
14.02.2023	07.15-07.15	56.8	18.3	41.6	5.8	25.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
20.02.2023	07.00-07.00	56.2	18.2	41.7	5.9	25.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
21.02.2023	07.15-07.15	56.8	18.7	41.3	5.1	25.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0

Legend: **PM2.5**-Particulate Matter size less than 2.5 µm; **PM10**-Respirable Particulate Matter size less than 10 µm; **SO₂**-Sulphur dioxide; **NOx**-Oxides of Nitrogen**;NH₃**-Ammonia; **O₃**-Ozone; **CO**-Carbon monoxide; **Pb**-Particulate Lead; **As**-Particulate Arsenic; **Ni**-Particulate Nickel; **C₆H₆**-Benzene &**BaP**- Benzo (a) pyrene inparticulate phase **NAAQ Norms**-National Ambient Air Quality Norms-**Revised as per GSR 826(E) dated 16.11.2009** for Industrial, Residential, Rural and other Area.

TABLE 3.26 AMBIENT AIR QUALITY DATA LOCATIO NAAQ9-:

Period: December 2022 – February 2023   *Location: AAQ9 – Vadavalli*   Sampling Time: 24-hourly

Monitoring		Particulates, µg/m³			Gaseous Pollutants, µg/m³					Other Pollutants (Particulate Phase), µg/m³				
Date	Period, hrs.	SPM	PM2.5	PM10	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*		(24 hrs.)	60(24 hrs.)	100 (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)
05.12.2022	08:00-08:00	65.9	23.8	48.2	7.6	24.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
06.12.2022	08:15-08:15	66.7	24.6	47.6	7.4	24.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
12.12.2022	08:00-08:00	62.9	25.7	45.7	7.5	25.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
13.12.2022	08:15-08:15	62.4	23.6	45.5	6.8	25.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
19.12.2022	08:00-08:00	63.5	23.1	42.8	7.2	23.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
20.12.2022	08:15-08:15	63.6	24.7	44.9	7.1	24.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
26.12.2022	08:00-08:00	62.4	25.9	46.5	8.2	24.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
27.12.2022	08:15-08:15	63.8	23.9	44.4	8.8	24.9	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
02.01.2023	08:00-08:00	66.4	24.3	45.7	7.6	23.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
03.01.2023	08:15-08:15	65.8	25.1	43.6	7.7	24.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
09.01.2023	08:00-08:00	65.5	25.3	42.8	7.2	23.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
10.01.2023	08:15-08:15	64.9	24.7	45.4	7.1	22.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
16.01.2023	08:00-08:00	63.7	23.2	46.7	7.9	24.9	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
17.01.2023	07.15-07.15	64.8	25.8	46.9	6.6	24.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
23.01.2023	07.00-07.00	62.8	23.6	45.7	6.4	24.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
24.01.2023	07.15-07.15	63.5	24.9	45.9	6.2	25.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
30.01.2023	07.00-07.00	64.7	22.8	42.7	6.3	25.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
31.01.2023	07.15-07.15	65.2	23.7	43.6	6.9	25.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
06.02.2023	07.00-07.00	65.9	21.6	43.5	6.6	25.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
07.02.2023	07.15-07.15	64.4	22.5	43.6	7.7	24.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
13.02.2023	07.00-07.00	63.2	23.6	42.5	6.6	25.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
14.02.2023	07.15-07.15	65.8	25.4	44.6	7.1	23.9	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
20.02.2023	07.00-07.00	65.2	25.8	46.8	7.0	25.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
21.02.2023	07.15-07.15	63.4	22.9	46.7	7.5	24.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0

TABLE 3.27: SUMMARY OF AAQ – 1 to AAQ – 9

PM2.5	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8	AAQ9
Arithmetic Mean	19.8	19.9	20.3	19.1	21.1	21.0	21.0	18.7	23.35
Minimum	19.6	19.8	19.7	18.6	20.7	20.4	20.4	18.7	24.6
Maximum	19.9	19.9	20.8	19.6	21.5	21.6	21.6	18.7	23.8
NAAQ Norms	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60

PM10	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8	AAQ9
Arithmetic Mean	43.9	40.0	20.3	40.7	42.0	40.0	42.3	40.8	47.45
Minimum	43.6	39.3	40.8	40.5	41.3	39.5	41.7	40.3	46.7
Maximum	44.2	40.7	43.2	40.9	42.7	40.5	42.8	41.3	48.2
NAAQ Norms	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100

SO$_2$	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8	AAQ9
Arithmetic Mean	6.7	7.5	6.4	5.5	7.7	6.5	7.4	5.7	7.55
Minimum	6.2	6.2	5.3	5.3	7.1	6.2	6.9	5.1	7.5
Maximum	7.1	7.6	7.5	5.7	8.3	6.8	7.9	6.3	7.6
NAAQ Norms	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	100

NO$_2$	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8	AAQ9
Arithmetic Mean	19.1	20.7	24.3	22.7	23.9	23.2	21.1	25.1	24.25
Minimum	19.1	20.1	23.6	21.3	23.7	22.6	20.3	25.1	24.2
Maximum	19.1	21.3	24.9	24.1	24.1	23.7	21.8	25.1	24.3
NAAQ Norms	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	100

TABLE 3.28: ABSTRACT OF AMBIENT AIR QUALITY DATA

1	Parameter	PM2.5	PM10	SO$_2$	NO$_2$
2	No. of Observations	260	260	260	260
3	10th Percentile Value	18.6	39.3	5.6	19.9
4	20th Percentile Value	19.2	40.1	6.1	21.1
5	30th Percentile Value	19.5	40.5	6.4	21.5
6	40th Percentile Value	19.7	41.0	6.6	22.1
7	50th Percentile Value	20.3	41.6	6.8	22.8

8	60th Percentile Value	20.6	41.9	7.1	23.5
9	70th Percentile Value	21.1	42.6	7.3	23.9
10	80th Percentile Value	21.7	43.3	7.6	24.7
11	90th Percentile Value	23.6	44.7	7.8	25.3
12	95th Percentile Value	24.8	45.7	8.1	25.7
13	98th Percentile Value	25.8	46.9	8.7	26.7
14	Arithmetic Mean	21.4	42.5	7.1	23.4
15	Geometric Mean	21.2	42.4	7.0	23.3
16	Standard Deviation	2.4	2.4	0.9	2.1
17	Minimum	18.6	39.3	5.6	19.9
18	Maximum	25.8	46.9	8.7	26.7
19	**NAAQ Norms***	**100.0**	**60.0**	**80.0**	**80.0**
	% Values exceeding Norms*	0.0	0.0	0.0	0.0

FIGURE 3.16: BAR DIAGRAM OF SUMMARY OF AAQ 1 – AAQ 9

Summary of Ambient Air Quality Data (AAQ 1 - AAQ9)

	PM10	PM2.5	SO2	NO2
■ 98th Percentile Value	25.8	46.9	8.7	26.7
■ Arithmetic Mean	21.4	42.5	7.1	23.4
▣ Minimum	18.6	39.3	5.6	19.9
■ Maximum	25.8	46.9	8.7	26.7
▣ NAAQ Norms*	60.0	100.0	80.0	80.0
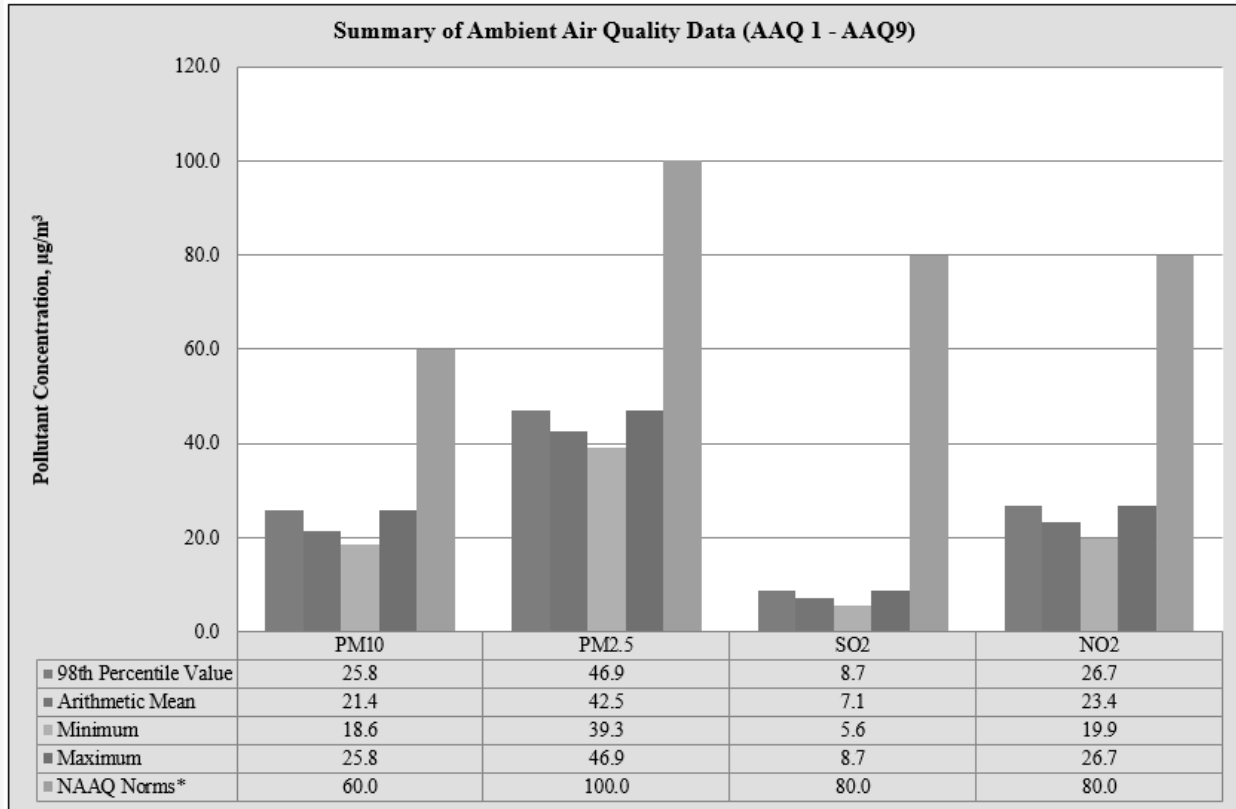
Source: Table 3.17 to 3.27

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

Particulate Matter (PM$_{2.5}$, µg/m^3)

	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8
Arithmetic Mean	19.8	19.9	20.3	19.1	21.1	21.0	21.0	18.7
Minimum	19.6	19.8	19.7	18.6	20.7	20.4	20.4	18.7
Maximum	19.9	19.9	20.8	19.6	21.5	21.6	21.6	18.7
NAAQ Norms	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0
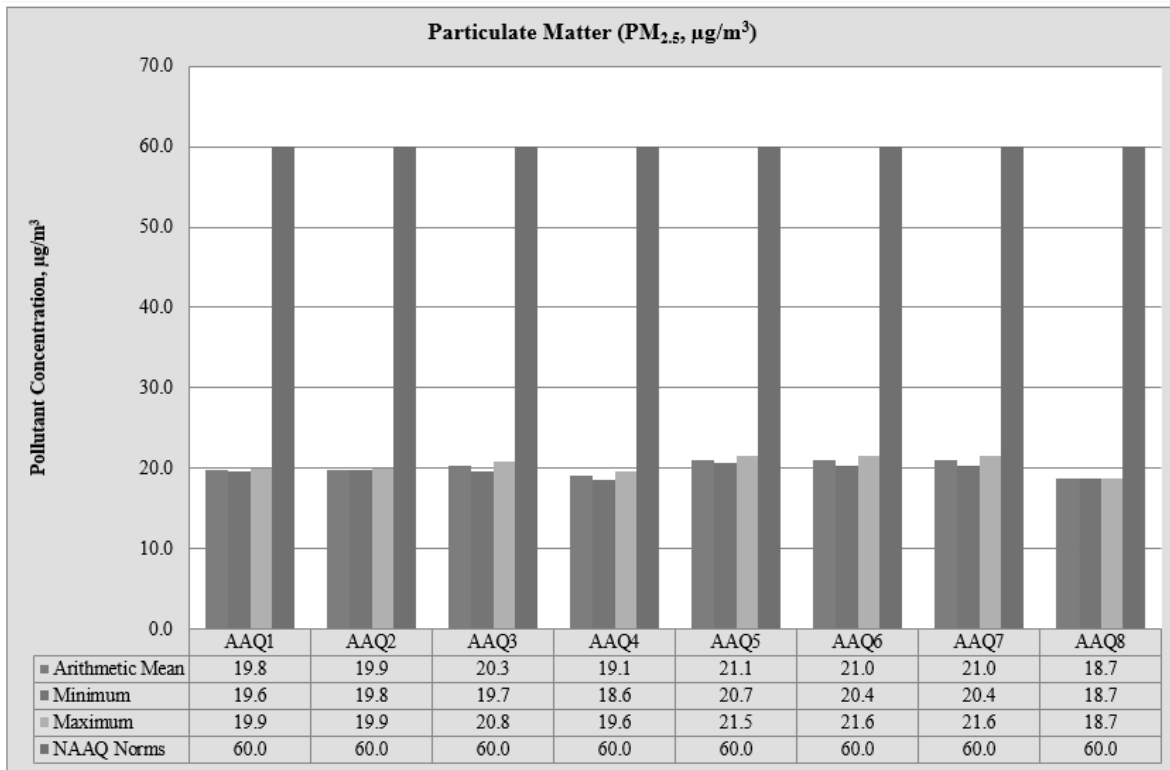
Source: Table 3.17 to 3.27

FIGURE 3.18: BAR DIAGRAM OF PARTICULATE MATTER PM$_{10}$

Particulate Matter (PM$_{10}$, µg/m^3)

	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8	AAQ9
Arithmetic Mean	43.9	40.0	20.3	40.7	42.0	40.0	42.3	40.8	47.45
Minimum	43.6	39.3	40.8	40.5	41.3	39.5	41.7	40.3	46.7
Maximum	44.2	40.7	43.2	40.9	42.7	40.5	42.8	41.3	48.2
NAAQ Norms	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100
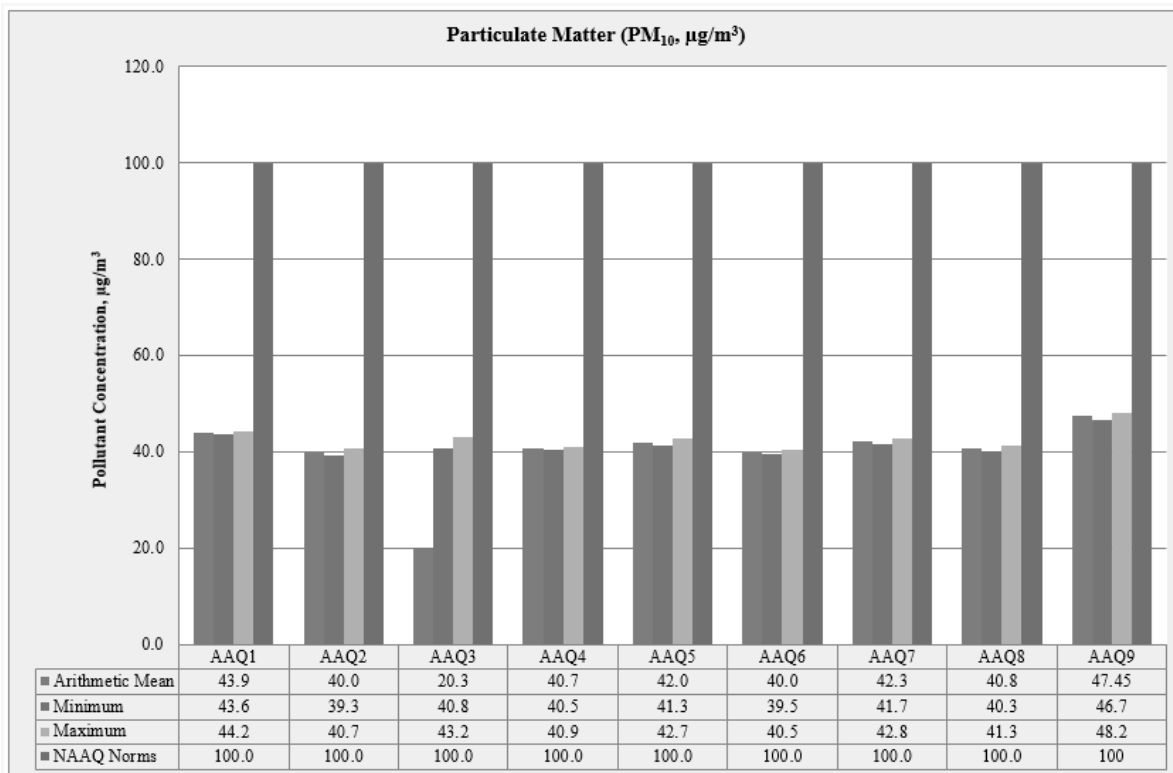
Source: Table 3.17 to 3.27

3.3.6   Interpretations & Conclusion

As per monitoring data, PM_{10} ranges from 38.1 µg/m³ to 48.2 µg/m³, $PM_{2.5}$ data ranges from 18.2 µg/m³ to 25.9 µg/m³, SO_2 ranges from 5.1µg/m³ to 8.8 µg/m³ and NO_2 data ranges from 18.2 µg/m³ to 26.9 µg/m³. The concentration levels of the above criteria pollutants were observed to be well within the limits of NAAQS prescribed by CPCB.

3.3.7   FUGITIVE DUST EMISSION –

Fugitive dust was recorded at 9AAQ monitoring stations for 30 days average during the study period.

TABLE 3.29: AVERAGE FUGITIVE DUST SAMPLE VALUES

AAQ Locations	Avg SPM (µg/m³)
AAQ 1	61.92
AAQ 2	55.06
AAQ 3	63.04
AAQ 4	60.53
AAQ 5	61.80
AAQ 6	63.90
AAQ7	60.87
AAQ 8	55.19
AAQ9	61.86

Source: Onsite monitoring/ sampling by EHS360 Labs Private Limited

FIGURE 3.21: LINE DIAGRAM OF AVERAGE SPM VALUES

	AAQ 1	AAQ 2	AAQ 3	AAQ 4	AAQ 5	AAQ 6	AAQ 7	AAQ 8	AAQ 9
Avg SPM (µg/m3)	61.92	55.06	63.04	60.53	61.80	63.90	60.87	55.19	61.86
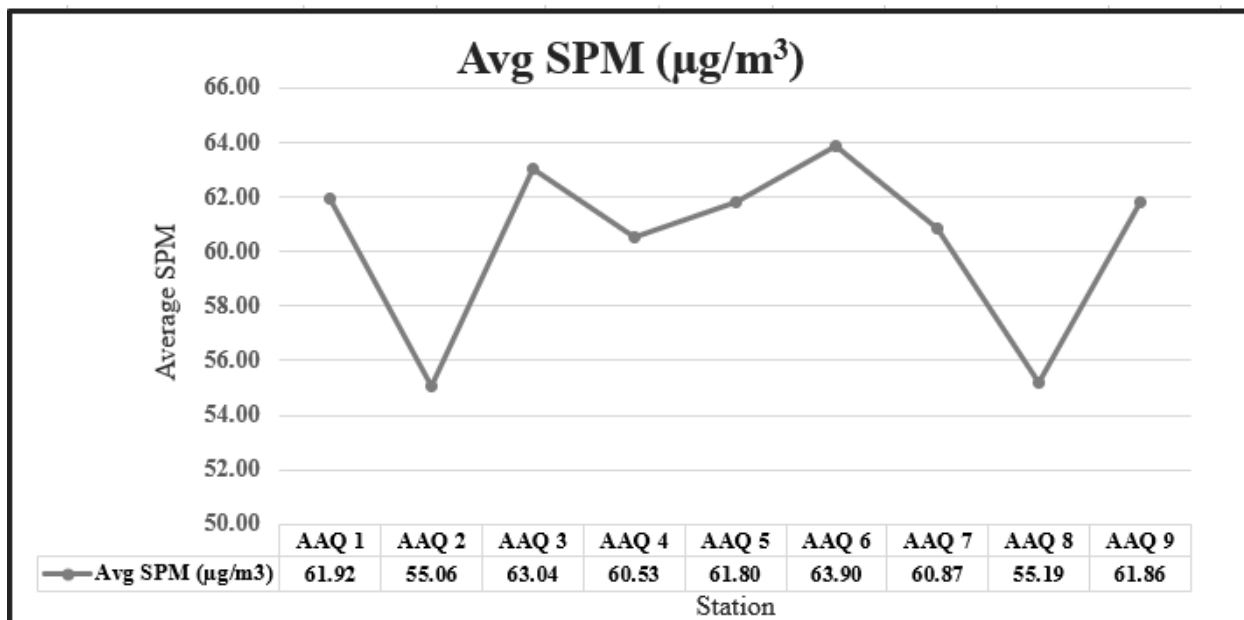
Source: Table 3.28

TABLE 3.30: FUGITIVE DUST SAMPLE VALUES IN µg/m³

SPM (µg/m³)	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8	AAQ9
Average	61.92	55.06	63.04	60.53	61.80	63.90	60.87	55.19	61.86
Min	66.3	58.6	66.7	64.6	66.4	67.8	69.3	59.3	66.7
Max	62.5	56.1	64.2	61.3	63.1	65.7	60.2	57.1	62.4

Source: Calculations from Lab Analysis Reports

FIGURE 3.22: BAR DIAGRAM OF SPM VALUES
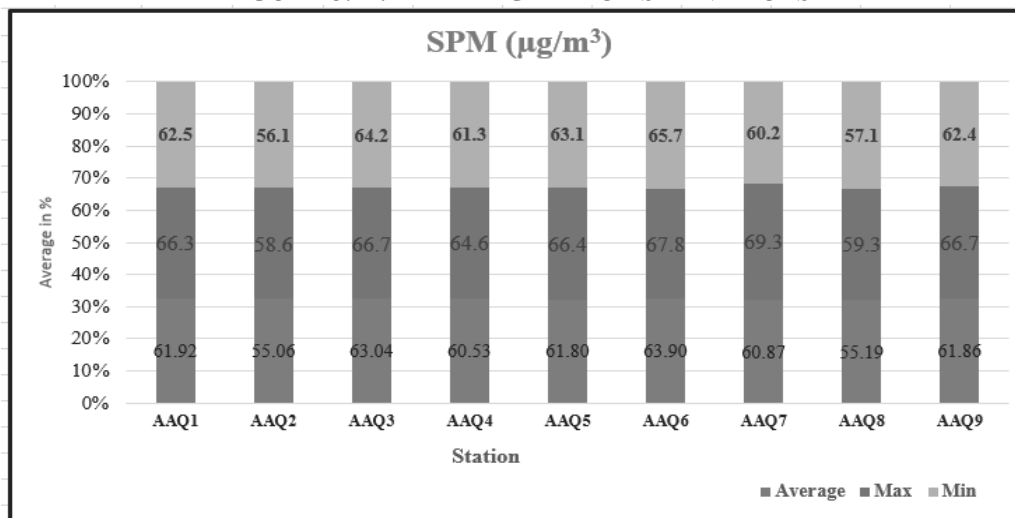
Source: Table 3.29

3.4   NOISE ENVIRONMENT

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

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

3.4.1   Identification of Sampling Locations

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

TABLE 3.31: DETAILS OF SURFACE NOISE MONITORING LOCATIONS

S. No	Location Code	Monitoring Locations	Distance & Direction	Coordinates
1	N1	Core Zone	Project Area	11°14'57.66"N 76°58'50.32"E
2	N2	Core Zone	Project Area	11°15'1.10"N 76°58'51.63"E
3	N3	Core Zone	Near Existing Quarry	11°14'58.87"N 76°59'26.06"E
4	N4	Therampalayam	1.8Km North East	11°16'19.72"N 76°59'53.59"E
5	N5	Bellaipalayam	5.5Km North East	11°17'38.96"N 77° 1'18.44"E
6	N6	Karamadai	1.3Km South West	11°14'21.33"N 76°57'47.97"E
7	N7	Onnipalayam	4.2Km South East	11°12'25.21"N 77°00'04.15"E

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

3.4.2   Method of Monitoring

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

be obtained from variable sound pressure level, 'L', over a time period by using following equation. The equivalent noise level is defined mathematically as,

$L_{eq} = 10 \log L / T \sum (10^{Ln/10})$

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

T = Time interval of observation

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

FIGURE 3.23: NOISE MONITORING STATIONS AROUND 10 KM RADIUS

Noise Monitoring Station Map
Chikkarampalayam Rough Stone and
Gravel Cluster Quarries 10km Radius

Proposed Quarry	: 26.80.55 ha (10 Nos)
Existing Quarry	: 10.28.0 ha (7 Nos)
Village	: Chikkarampalayam
Taluk	: Mettupalayam
District	: Coimbatore
State	: Tamil Nadu

S. No	Location code	Monitoring Locations	Distance & Direction	Coordinates
1	N-1	Core Zone	Project Area	11°14'57.66"N 76°59'50.32"E
2	N-2	Core Zone	Project Area	11°15'1.10"N 76°58'51.63"E
3	N-3	Core Zone	Near Existing Quarry	11°14'58.87"N 76°59'26.06"E
4	N-4	Therampalayam	2.4Km North East	11°16'19.72"N 76°59'53.59"E
5	N-5	Bellalpalayam	5.0Km North East	11°17'38.96"N 77°1'18.44"E
6	N-6	Karamadai	1.7Km South West	11°14'21.33"N 76°57'47.97"E
7	N-7	Onnipalayam	4.7Km South East	11°12'25.21"N 77°00'04.15"E

Source: Survey of India Topo Sheet No : 58 A/15, 58 A/16, 58 E/03 & 58 E/04 First Edition 2011.

Software Used: 1: Arc Map 10.2.

Environment Consultant: M/S. Geo Exploration and Mining Solutions, Salem, Tamil Nadu

Drafted by	Checked by
Mr.A.Alilmuthu (FAE - Land use & Land cover)	Dr. M. Iftikhar Ahmed (EIA - Coordinator)

Legend
- Noise Monitoring Stations
- Proposed Quarry
- Existing Quarry
- Expired Quarry
- 10km_Radius

Graphic Scale
1:90,000

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 3.32: AMBIENT NOISE QUALITY RESULT

S. No	Locations	Noise level (dB (A) Leq)		Ambient Noise Standards
		Day Time	Night Time	
1	Project Area	41.8	37.1	**Industrial** **Day Time- 75 dB (A)** **Night Time- 70 dB (A)**
2	Project Area (NE)	39.2	37.9	
3	Near Existing Quarry (E)	39.5	35.3	
4	Therampalayam (NE)	37.6	35.7	
5	Bellaipalayam (NE)	38.6	35.2	**Residential** **Day Time– 55 dB (A)** **Night Time- 45 dB (A)**
6	Karamadai (SW)	39.4	39.2	
7	Onnipalayam (SE)	39.4	35.4	

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

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

	N1	N2	N3	N4	N5	N6	N7
Day Time (dB (A) Leq)	47.8	46.8	47.3	48.1	47.6	45.3	40.9
Standards	75	70	70	70	70	70	70
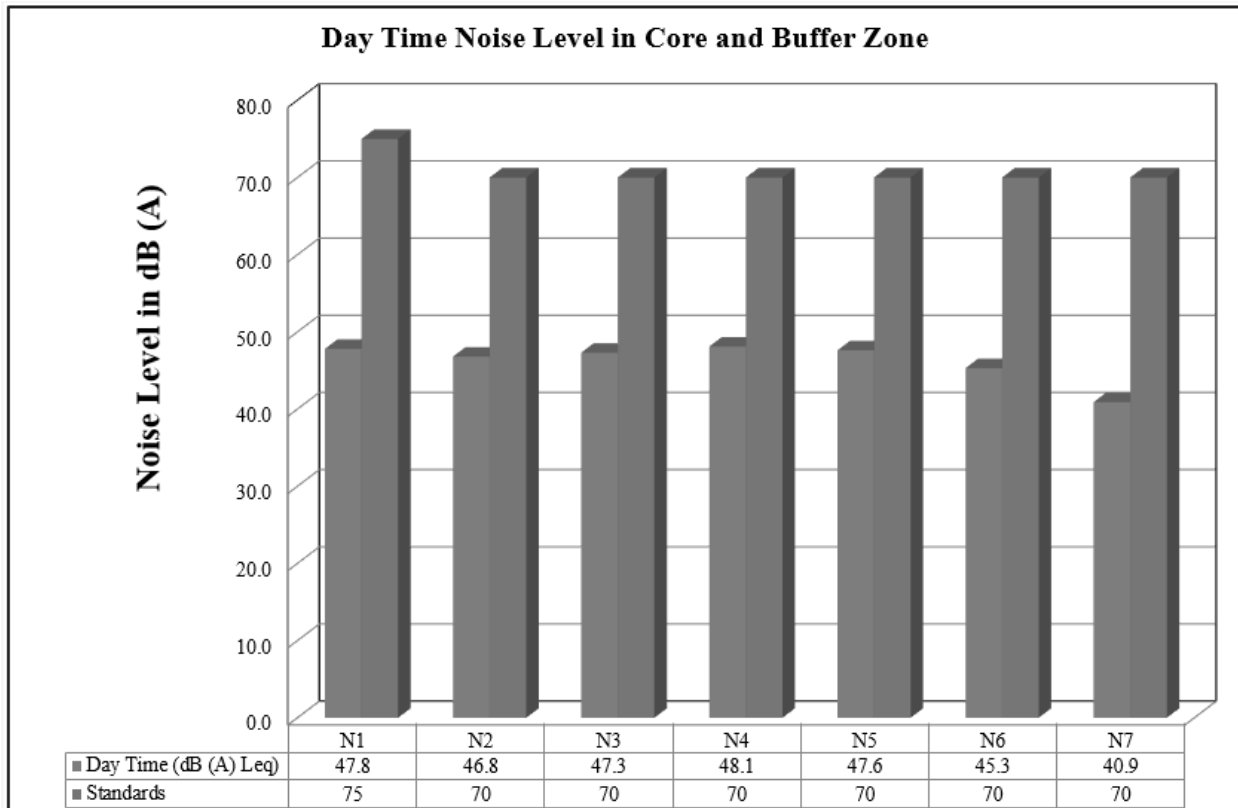
FIGURE 3.25: NIGHT TIME NOISE LEVELS IN CORE AND BUFFER ZONE

Night Time Noise Level in Core and Buffer Zone

	N1	N2	N3	N4	N5	N6	N7
Night Time (dB (A) Leq)	37.6	39.4	37.8	38.2	40.7	37.7	37.3
Standards	70	45	45	45	45	45	45
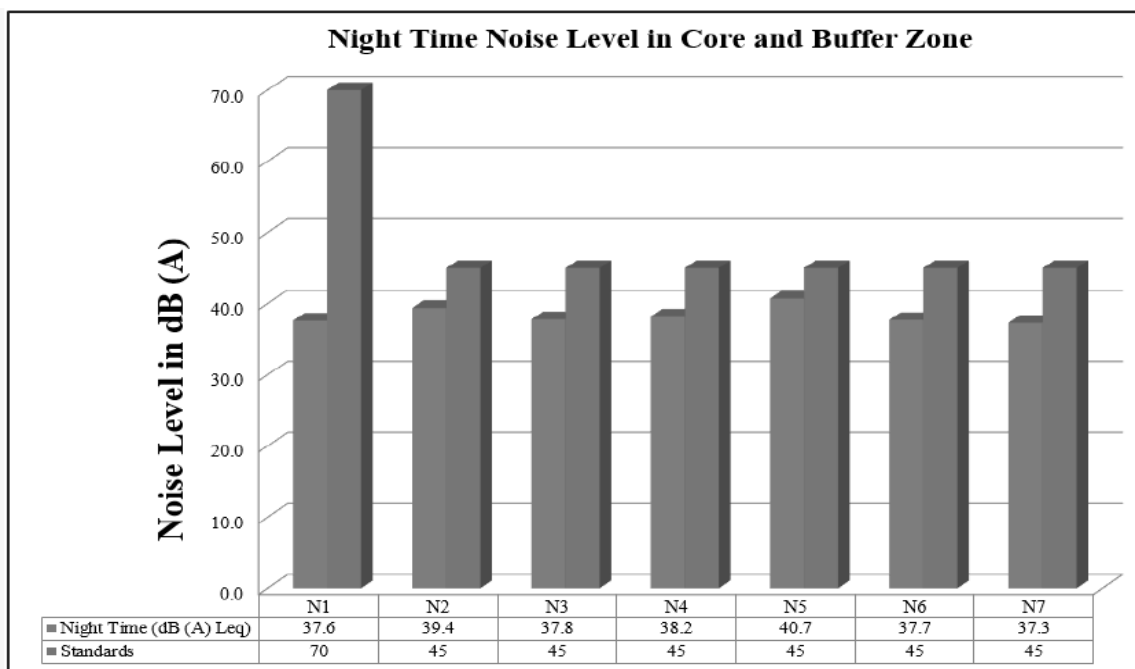
3.4.4   Interpretation & Conclusion:

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 46.8 to 47.8 dB (A) Leq and during night time were from 37.6 to 39.4 dB (A) Leq. Noise levels recorded in buffer zone during day time were from 40.9 to 48.1 dB (A) Leq and during night time were from 37.3 to 40.7 dB (A) Leq.

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

3.5   ECOLOGICAL ENVIRONMENT

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

3.5.1   Scope of Work

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

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

3.5.2   Objectives of Biological Studies

The present study was undertaken with the following objectives:

1. To study the likely impact of the proposed mining project on the local biodiversity and to suggest mitigation measure, if required, for vulnerable biota.
2. To assess the nature and distribution of vegetation (Terrestrial and Aquatic) in and around the mining activity.
3. Detail of flora and fauna, Endemic, Rare, Endangered and Threatened (RET Species) separately for core and buffer area based on such primary field survey and clearly indicating the Schedule of fauna present. In case of any schedule- I fauna found in the study area, the necessary plan along with budgetary provisions for their conservation should be prepared in consultation with State Forest and Wildlife Department and details furnished.
4. Devise management & conservation measures for biodiversity.

3.5.3   Methodology of Sampling

The present study was carried out in given steps
1. Field survey was conducted by visual encounter survey for flora present within the 10 km radius study area of all the proposed mine site.
2. After surveying the core and buffer areas, a detailed floral inventory has been compiled. List of all plants of the study area was prepared and their habitats were recorded.
3. Verification of Rare, Endangered and Threatened Flora species from IUCN Red Data Book.
4. Plants and Animals communities were noted.

Site selection criteria: The core study area is located at Village: Chikkirampalayam, Taluk: Mettupalayam, District: Coimbatore, Tamil Nadu. The buffer study area comprises of 10 km radius from all the proposed Rough stone quarry area.

Selection of sampling locations was made with reference to topography, land use, vegetation pattern, etc. The observations were taken on natural vegetation, roadside plantation and non-forest area (agricultural field, in plain areas, village wasteland, etc.) for quantitative representation of different species.

A methodology of Sampling Flora and fauna studies were carried out to assess the list of terrestrial plant and animal species that occur in the core area and the buffer area up to 10 km radius from the project site. No damage is created to flora and fauna during the sampling.

In order to provide representative ecological status for the study area, the 10-km buffer zone has been divided into four quartiles for biodiversity sampling, i.e., NE (Quartile-1), NW (Quartile-2) SW (Quartile-3) and SE (Quartile-4) is given in Fig. 3.26. Each of the quartiles have been examined for representative flora on randomly sampled quadrats for trees (25x25-m), shrubs (10x10-m) and herbs (2x2-m) depending upon prevailing geographical conditions and bio-diversity aspects of study area.

Phyto-sociological Survey method

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

Quadrats method

Quadrats of 25 × 25-m were laid down randomly within core and 5-km buffer area; each quadrat was laid to assess the trees (>5 cm GBH) and one, 10 × 10-m sub-quadrat nested within the quadrat for shrubs. The quadrats were laid randomly to cover the area to maximize the sampling efforts and minimize the species homogeneity, such as small stream area, trees in agricultural bunds, tank bunds, farm forestry plantations, wildlife areas, natural forest area, avenue plantations, house backyards, etc. In each quadrat individuals belonging to tree (25 × 25-m) and shrub (10 × 10-m) were recorded separately and have been identified on the field. Quadrates sampling methods is given in Fig no.3.26.

FIGURE 3.26: A SCHEMATIC DIAGRAM FOR FLORAL RANDOM SAMPLING
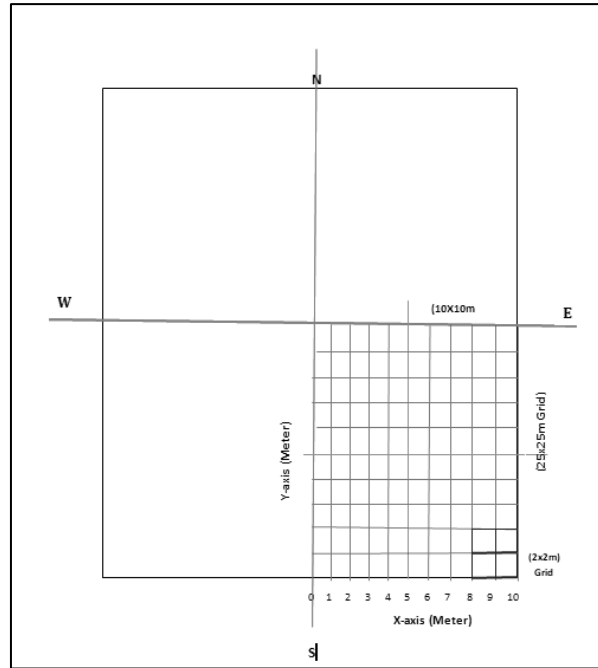
FLORA IN CORE ZONE

Taxonomically a total of 27 species belonging to 20 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 Trees 9 (33%) followed by Herb 8 (30%), Shrub 6 (22%) and Climbers 4 (15%). Details of flora with the scientific name were mentioned in Table No. 3.33. The result of core zone of flora studies shows that Fabaceae and Lamiaceae, Amaranthaceae are the main dominating species in the study area it mentioned in Table No.3.33 and the details of diversity of flora family's pattern are given in Fig No.3.27. No species found as threatened category (Table No. 3.33).

FLORA IN BUFFER ZONE

Similar type of environment also in buffer area but with more flora diversity compare than core zone area because nearby agriculture land was found to dominate mostly in all the directions. Majority of the flat landscape around project unit is occupied by agriculture fields. It contains a total of 76 species belonging to 38 families have been recorded from the buffer zone. The floral (76) varieties among them Thirty-five Trees 35 (46%) Twelve Shrubs 12 (16%) and Seventy Herbs 17 (22%) and Climbers Twelve 12 (16%) were identified. The result of buffer zone of flora studies shows that Fabaceae and Cucurbitaceae, Solanaceae are the main dominating species in the study area it mentioned in Table No.3.34.

There is no Rare, Endangered and Threatened Flora species in mining area and their surrounding area. Details of flora with the scientific name were mentioned in Table No.3.34. The diversity of flora families is given in Fig No.3.28.

TABLE 3.33: FLORA IN CORE ZONE

SI.No	English Name	Vernacular Name	Scientific Name	Family Name
		TREES		
1	Acacia Nilotica	Karuvelam maram	*Vachellia nilotica*	Fabaceae
2	Noni	Nuna maram	*Morinda citrifolia*	Rubiaceae
3	Mango	Manga	*Mangifera indica*	Anacardiaceae
4	Tamarind	Puliyamaram	*Tamarindus indica*	Legumes
5	Neem	Vembu	*Azadirachta indica*	Meliaceae
6	Asian Palmyra plam	Panai maram	*Borassus flabellifer*	Arecaceae
7	Millettia pinnata	Pongam oiltree	*Pongamia pinnata*	Fabaceae
8	Mesquite	Velikathan maram	*Prosopis juliflora*	Fabaceae
9	Coconut	Thennai maram	*Cocos nucifera*	Arecaceae
		SHRUBS		
10	Touch-me-not	Thottalchinungi	*Mimosa pudica*	Mimosaceae
11	Indian mallow	Thuththi	*Abutilon indicum*	Malvaceae
12	Wild sage	Unichedi	*Lantana camara*	Verbenaceae
13	Sarphonka	Katu-kolingi	*Tephrosia purpurea*	Fabaceae
14	Avaram	Avarai	*Senna auriculata*	Fabaceae
15	Milk Weed	Erukku	*Calotropis gigantea*	Apocynaceae
		HERBS		
16	Common leucas	Thumbai	*Leucas aspera*	Lamiaceae
17	Devil's thorn	Nerunji	*Tribulus terrestris*	Zygophyllales
18	Yellow-fruit Nightshade	Kantang kathrikai	*Solanum virginianum*	Solanaceae
19	Mountain knotgrass	Poolai poondu	*Aerva lanata*	Amaranthaceae
20	Common nut sedge	Korai	*Cyperus rotundus*	Cyperaceae
21	Indian doab	Arugampul	*Cynodon dactylon*	Poaceae
22	Prickly chaff flower	Nayuruv	*Achyranthes aspera*	Amaranthaceae
23	Basil	Karunthulasi	*Ocimum basilicum*	Lamiaceae
		CLIMBER		
24	Slender dwarf morning-glory	Vishnukrandi	*Evolvulus alsinoides*	Convolvulaceae
25	wild water lemon	Sirupunaikkali	*Passiflora foetida*	Passifloraceae
26	stemmed vine	Perandai	*Cissus quadrangularis*	Vitaceae
27	Wild bitter	Pavarkai	*Momordica charantia*	Cucurbitaceae

TABLE 3.34: FLORA IN BUFFER ZONE

SI.No	English Name	Vernacular Name	Scientific Name	Family Name	Resource use type
			TREES		
1	Neem or Indian lilac	Vembu	*Azadirachta indica*	Meliaceae	M
2	Millettia pinnata	Pongam oiltree	*Pongamia pinnata*	Fabaceae	E
3	Bitter Albizia	Arappu	*Albizia amara*	Fabaceae	M
4	Coconut	Thennai maram	*Cocos nucifera*	Arecaceae	EM
5	Rosewood trees	Eeti	*Dalbergia latifolia*	Fabaceae	E
6	Mango	Manga	*Mangifera indica*	Anacardiaceae	E
7	Sesban	Chitthakathi	*Sesbania sesban*	Fabaceae	M
8	Tamarind	Puliyamaram	*Tamarindus indica*	Legumes	EM
9	Creamy Peacock Flower	Vadanarayani	*Delonix elata*	Fabaceae	M
10	Beauty leaf	Punnai	*Calophyllu inophyllum*	Calophyllaceae	M
11	Indian fig tree	Athi	*Ficus recemosa*	Moraceae	EM
12	Gum arabic tree	Karuvelam	*Acacia nilotica*	Mimosaceae	NE
13	Indian fir tree	Nettilinkam	*Polylathia longifolia*	Annonaceae	E
14	Asian Palmyra plam	Panai maram	*Borassus flabellifer*	Arecaceae	E
15	Castor oil plant	Amanakku	*Ricinus communis*	Euphorbiaceae	M
16	Manilkara zapota	Sapota	*Manilkara zapota*	Sapotaceae	E
17	Black plum	Navalmaram	*Sygygium cumini*	Myrtaceae	EM
18	Lemon	Ezhumuchaipalam	*Citrus lemon*	Rutaceae	EM
19	Banyan tree	Alamaram	*Ficus benghalensis*	Moraceae	E
20	Banana tree	Vazhaimaram	*Musa*	Musaceae	EM
21	Teak	Thekku	*Tectona grandis*	Verbenaceae	E
22	Indian gooseberry	Nelli	*Emblica officinalis*	Phyllanthaceae	EM
23	Eucalyptus	Eucalyptus	*Eucalyptus globules*	Myrtaceae	EM
24	Jack fruit	Palamaram	*Artocarpus heterophyllus*	Moraceae	E
25	Henna	Marudaani	*Lawsonia inermis*	Lythraceae	EM
26	Five leaf chastera	Nochi	*Vitex negundo*	Lamiaceae	M
27	Papaya	Pappali maram	*Carica papaya L*	Caricaceae	EM
28	Acacia Nilotica	Karuvelam maram	*Vachellia nilotica*	Fabaceae	M
29	Chinese chaste tree	Nochi	*Vitex negundo*	Verbenaceae	E
30	Peepal	Arasanmaram	*Ficus religiosa*	Moraceae	M
31	Noni	Nuna maram	*Morinda citrifolia*	Rubiaceae	M
32	Guava	Koyya	*Psidium guajava*	Myrtaceae	EM
33	Custard apple	Seethapazham	*Annona reticulata*	Annonaceae	E
34	Curry tree	Velipparuthi	*Murraya koenigii*	Asclepiadaceae	EM

35	Bamboo	Moonghil	*Bambusa bambo*	Poaceae	E
SHRUBS					
36	Avaram	Avarai	*Senna auriculata*	Fabaceae	M
37	Indian Oleander	Arali	*Nerium indicum*	Apocynaceae	M
38	Thorn apple	Oomathai	*Datura stramonium*	Solanaceae	E
39	Flame of the Woods	Idlipoo	*xoracoc cinea*	Rubiaceae	M
40	Puriging nut	Kattamanakku	*Jatropha curcas*	Euphorbiaceae	EM
41	Night shade plan	Sundaika	*Solanum torvum*	Solanaceae	EM
42	Indian mallow	Thuthi	*Abutilon indicum*	Meliaceae	M
43	Shoe flower	Chemparuthi	*Hibiscu rosa-sinensis*	Malvaceae	EM
44	Rosary pea	Kundumani	*Abrus precatorius*	Fabaceae	M
45	Milk Weed	Erukku	*Calotropis gigantea*	Apocynaceae	M
46	Ceylon Date Palm	Icham	*Phoenix pusilla*	Arecaceae	EM
47	Touch-me-not	Thottalchinungi	*Mimosa pudica*	Mimosaceae	M
HERBS					
48	Prickly chaff flower	Nayuruv	*Achyranthes aspera*	Amaranthaceae	M
49	Tridax daisy	Veetukaayapoondu	*Tridax procumbens*	Asteraceae	M
50	Hibiscus hispidissimus	Kaattu piral	*Hibiscus hispidissimus*	Malvaceae	M
51	Indian Copperleaf	Kuppaimeni	*Acalypha indica*	Euphorbiaceae	M
52	False daisy	Karisilanganni	*Eclipta prostata*	Asteraceae	EM
53	Common nut sedge	Korai	*Cyperus rotundus*	Cyperaceae	NE
54	Node Flower	Kumattikkirai	*Allmania nodiflora*	Amaranthaceae	M
55	Poor land flatsedg	Kunnakora	*Cyperus compressus*	Cyperaceae	NE
56	Gale of the wind	Keelaneeli	*Phyllanthus niruri*	Phyllanthaceae	EM
57	Benghal dayflower	Kanamvazha	*Commelina benghalensis*	Commelinaceae	M
58	Common leucas	Thumbai	*Leucas aspera*	Lamiaceae	M
59	Carrot grass	Parttiniyam	*Parthenium hysterophorus*	Asteraceae	NE
60	Creeping wood sorrel	Pulliyari	*Oxalis corniculata*	Oxalidaceae	M
61	Red Hogweed	Mukurattai	*Boerhavia diffusa*	Nyctaginaceae	M
62	Holy basil	Thulasi	*Ocimum tenuiflorum*	Lamiaceae	M
63	Indian doab	Arugampul	*Cynodon dactylon*	Poaceae	E
64	European black nightshade	Manathakkali	*Solanumnigrum*	Solanaceae	EM
CLIMBER					
65	Ivy gourd	Kovai	*Coccinia grandis*	Cucurbitaceae	M
66	Stemmed vine	Perandai	*Cissus quadrangularis*	Vitaceae	M
67	Balloon vine	Mudakkotan	*Cardiospermum helicacabum*	Sapindaceae	M
68	Betel	Vetrilai	*Piper betle*	Piperaceae	EM
69	Butterfly pea	Karkakartum	*Clitoria ternatea*	Fabaceae	M

70	Wild bitter	Pavarkai	*Momordica charantia*	Cucurbitaceae	EM
71	Purple fruited pea eggplant	Thuthuvelai	*Solanum trilobatum*	Solanaceae	EM
72	Indian sarsparilla	Nannari	*Hemidesmus indicus*	Asclepiadaceae	M
73	Pointed gourd	Kovakkai	*Trichosanthes dioica*	Cucurbitaceae	EM
74	Butterfly-pea	Sangupoo	*Clitoriaternatia*	Fabaceae	M
75	Wild jasmine	Malli	*Jasminum augustifolium*	Oleaceae	EM
76	Bottle Guard	Sorakkai	*Lagenaria siceraria*	Cucurbitaceae	EM

*E- Economical, M- Medicinal, EM- Both Economical and Medicinal, NE- Not evaluated

AQUATIC VEGETATION

The field survey for assessing the aquatic vegetation was also undertaken during the study period. The list of aquatic plants observed in the study area is given in Table 3.35.

TABLE 3.35: AQUATIC VEGETATION

Sl.No	Scientific name	Common Name	Tamil Name	IUCN List
1	*Eichornia crassipe*	Water hyacinth	Agayatamarai	NA
2	*Aponogetonnatans*	Floating laceplant	Kottikizhnagu	NA
3	*Nymphaea nouchali*	Blue waterlily	Nellambal	LC

*LC- Least Concern, NA-Not yet assessed

FAUNA

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

FAUNA METHODOLOGY

The study of fauna takes substantial amount of time to understand the specific faunal characteristics of the area. The assessment of fauna has been done on the bases of primary data collected from the lease sites. The presence was also confirmed from the local inhabitants depending on the animal sightings and the frequency of their visits in the project area. In addition, officials, local peoples were another source of information for studying the fauna of the area. Field activities are physical/active search, covering rocks, burrows, hollow inspection and location of nesting sites and habitat assessment etc. Taxonomical identification was done by the field guide book and wildlife envis data base (wiienvis.nic.in/Database/Schedule Species Database) and Zoological Survey of India (ZSI). Detailed faunas are mentioned in the Table No. 3.36 and 3.37.

Survey and Monitoring of Mammals

Intensive survey has been done by line transect methods (Walking and in vehicle) for all major habitats for surveying of mammals by direct and indirect evidence. Indirect methods such as faecal matter (i.e., scat) and pug mark by establishing 10 × 100-m linear transects depending on the habitat (i.e., existing wildlife game routes/forest trails used).

Direct observation technique has been used for surveying large and medium sized mammals. But this technique is perfectly suitable for surveying of diurnal mammals; however, good photographs were also taken for species identification.

Survey and Monitoring of Birds

Birds are sampled by using point count methods, and opportunistic bird sightings. By this bird vocal sounds and photographs, the species were identified in consultation with village local people.

Point count: in these methods, the observer will stand in a randomly chosen point and birds seen or heard in 50m radius are recorded for 5-min. this observation is repeated in another point at least 30m from the first point. We have enumerated 20 point – counts in each quartile, which constitute a total of 80 points-count (20 x 4) within 10 km radius area.

Opportunistic bird sightings: while traveling in study area, many bird species will be detected in survey time. Such species are recoded by their appearance or by their call.

Survey and Monitoring of reptiles

Several survey techniques such as standard walk transect visual encounter survey methods were used to sampling reptiles in each and every habitat of the study area. While doing this survey, photographs were taken for identification of species. Species identification was done by using standard field guides in consultation with village people expert.

The butterfly was enumerated by 2 linear transects of 10 × 100 m were laid within each quartile at minimum interval of 1 km. Further, amphibians and fishes documented in existing literature and secondary information in consultation with local people and wildlife experts.

FAUNA IN CORE ZONE

A total of 23 varieties of species observed in the Core zone of Chikkarampalayam Village, Rough stone and gravel quarry (Table No.3.36) among them numbers of Insects 7 (30%), Reptiles 5 (22%), Mammals 3 (13%) and Avian 8 (35%). A total of 23 species belonging to 18 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 7 species are under schedule IV according to Indian wild life Act 1972. A total eight species of bird were sighted in the mining lease area.

Dominant species are mostly birds and insects and three amphibians were observed during the extensive field visit (Hoplobatrachus tigerinus), (Rana hexadactyla), (Bufo melonosticatus). 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. 3.36.

TABLE 3.36: FAUNA IN CORE ZONE

SI. No	English Name	Family Name	Scientific Name	WPA Schedule	IUCN List
			INSECTS		
1	Grasshopper	Acrididae	*Hieroglyphus sp*	NL	LC
2	Striped tiger	Nymphalidae	*Danaus plexippus*	Schedule IV	LC
3	Common Tiger	Nymphalidae	*Danaus genutia*	NL	NL
4	Mottled emigrant	Peridae	*Catopsilia pyranthe*	NL	LC
5	Praying mantis	Mantidae	*mantis religiosa*	NL	NL
6	Red-veined darter	Libellulidae	*Sympetrum fonscolombii*	NL	LC
7	Stick insect	Lonchodidae	*carausius morosus*	NL	LC
			REPTILES		
8	Garden lizard	Agamidae	*Calotes versicolor*	NL	LC
9	Brahminy skink	Scincidae	*Eutropis carinata*	NL	LC
10	Common skink	Scincidae	*Mabuya carinatus*	NL	LC
11	Common house gecko	Gekkonidae	*Hemidactylus frenatus*	NL	LC
12	Fan-Throated Lizard	Agamidae	*Sitanaponticeriana*	NL	LC
			MAMMALS		
13	Indian Field Mouse	Muridae	*Mus booduga*	Schedule IV	NL
14	Asian Small Mongoose	Herpestidae	*Herpestes javanicus*	Schedule II	LC
15	Common rat	Muridae	*Rattus rattus*	Schedule IV	LC
			AVES		
16	Asian green bee-eater	Meropidae	*Meropsorientalis*	NL	LC
17	Two-tailed Sparrow	Dicruridae	*Dicrurus macrocercus*	Schedule IV	LC
18	Common myna	Sturnidae	*Acridotheres tristis*	NL	LC
19	common quail	Phasianidae	*Coturnix coturnix*	Schedule IV	LC
20	House crow	Corvidae	*Corvussplendens*	NL	LC
21	Cattle egret	Ardeidae	*Bubulcus ibis*	NL	LC
22	Koel	Cucalidae	*Eudynamys*	Schedule IV	LC
23	Indian pond heron	Ardeidae	*Ardeola grayii*	Schedule IV	LC

*NE- Not evaluated; LC- Least Concern, NT –Near Threatened, T-Threatened

FAUNA IN BUFFER ZONE

Taxonomically a total of 44 species belonging to 32 families have been recorded from the buffer zone area. Based on habitat classification the majority of species were Birds 17 (38%), followed by Insects 14 (32%), Reptiles 7 (16%), Mammals 3 (7%) and amphibians 3 (7.5%). There are three Schedule II species and twenty four species are under schedule IV according to Indian wild life Act 1972. A total 17 species of bird were sighted in the study area. There are no critically endangered, endangered, vulnerable and endemic species were observed.

The result of core & Buffer zone of fauna studies shows that Nymphalidae and *Scincidae, Agamidae* are the main dominating species in the study area; it is mentioned in Table No.3.37. There is no schedule I Species in study area. A detail of fauna diversity of family's pattern is given in Fig No.3.30. There are no critically endangered, endangered, vulnerable and endemic species were observed. Details of faunal diversity in buffer zone are given in Table No.3.37.

TABLE 3.37: FAUNA IN BUFFER ZONE

SI.No	Common name/English Name	Family Name	Scientific Name	Schedule list wildlife Protection act 1972	IUCN Red List data
			INSECTS		
1	Blue tiger	Nymphalidae	*Tirumala limniace*	Schedule IV	LC
2	Praying mantis	Mantidae	*mantis religiosa*	NL	NL
3	Striped tiger	Nymphalidae	*Danaus plexippus*	Schedule IV	LC
4	Tawny coster	Nymphalidae	*Danaus chrysippus*	Schedule IV	LC
5	Common Tiger	Nymphalidae	*Danaus genutia*	Schedule IV	LC
6	Common Indian crow	Nymphalidae	*Euploea core*	Schedule IV	LC
7	Red-veined darter	Libellulidae	*Sympetrum fonscolombii*	NL	LC
8	Ant	Formicidae	*Camponotus Vicinus*	NL	NL
9	Dragonfly	Gomphidae	*Ceratogomphus pictus*	Schedule IV	
10	Milkweed butterfly	Nymphalidae	*Danainae*	NL	LC
11	Indian honey bee	Apidae	*Apis cerana*	Schedule IV	LC
12	Grasshopper	Acrididae	*Hieroglyphus sp*	NL	LC
13	Lesser grass blue	Lycaenidae	*Zizina Otis indica*	Schedule IV	LC
14	Jewel beetle	Buprestidae	*Eurythyrea austriaca*	Schedule IV	NA
			REPTILES		
15	Garden lizard	Agamidae	*Calotes versicolor*	NL	LC
16	Rat snake	Colubridae	*Ptyas mucosa*	Sch II (Part II)	LC
17	Olive keelback water snake	Natricidae	*Atretium schistosum*	Sch II (Part II)	
18	Brahminy skink	Scincidae	*Eutropis carinata*	NL	LC
19	Common house gecko	Gekkonidae	*Hemidactylus frenatus*	NL	LC
20	Fan-Throated Lizard	Agamidae	*Sitanaponticeriana*	NL	LC
21	Common skink	Scincidae	*Mabuya carinatus*	NL	LC
			MAMMALS		
22	Indian palm squirrel	Sciuridae	*Funambulus palmarum*	Schedule IV	LC
23	Indian Field Mouse	Muridae	*Mus booduga*	Schedule IV	LC
24	Asian Small Mongoose	Herpestidae	*Herpestes javanicus*	Schedule (Part II)	LC
			AVES		
25	Indian pond heron	Ardeidae	*Ardeola grayii*	Schedule IV	LC
26	Common Quail	Phasianidae	*Coturnix coturnix*	Schedule IV	LC
27	Common myna	Sturnidae	*Acridotheres tristis*	NL	LC
28	Shikra	Accipitridae	*Accipiter badius*	NL	LC
29	Koel	Cucalidae	*Eudynamys*	Schedule IV	LC
30	Asian green bee-eater	Meropidae	*Meropsorientalis*	NL	LC
31	Red-vented Bulbul	Pycnonotidae	*Pycnonotuscafer*	Schedule IV	LC
32	Indian golden oriole	Oriolidae	*Oriolus kundoo*	Schedule IV	LC
33	Rose-ringed parkeet	Psittaculidae	*Psittacula krameri*	NL	LC
34	Cattle egret	Ardeidae	*Bubulcus ibis*	NL	LC
35	Common quail	Phasianidae	*Coturnix coturnix*	Schedule IV	LC
36	Black drongo	Dicruridae	*Dicrurus macrocercus*	Schedule IV	LC
37	Two-tailed Sparrow	Dicruridae	*Dicrurus macrocercus*	Schedule IV	LC
38	Grey Francolin	Phasianidae	*Francolinus pondicerianus*	Schedule IV	LC
39	White-breasted waterhen	Rallidae	*Amaurornis phoenicurus*	NL	LC
40	Common Coot	Rallidae	*Fulica atra*	Schedule IV	LC
41	House crow	Corvidae	*Corvussplendens*	NL	LC
			AMPHIBIANS		
42	Indian Burrowing frog	Dicroglossidae	*Sphaerotheca breviceps*	Schedule IV	LC
43	Green Pond Frog	Ranidae	*Rana hexadactyla*	Schedule IV	LC
44	Tiger Frog	Chordata	*Hoplobatrachus tigerinus (Rana tigerina)*	Schedule IV	LC

*NL- Not listed, LC- Least concern, NT- Near threatened

FIGURE 3.27: FLORAL DIVERSITY IN CORE ZONE
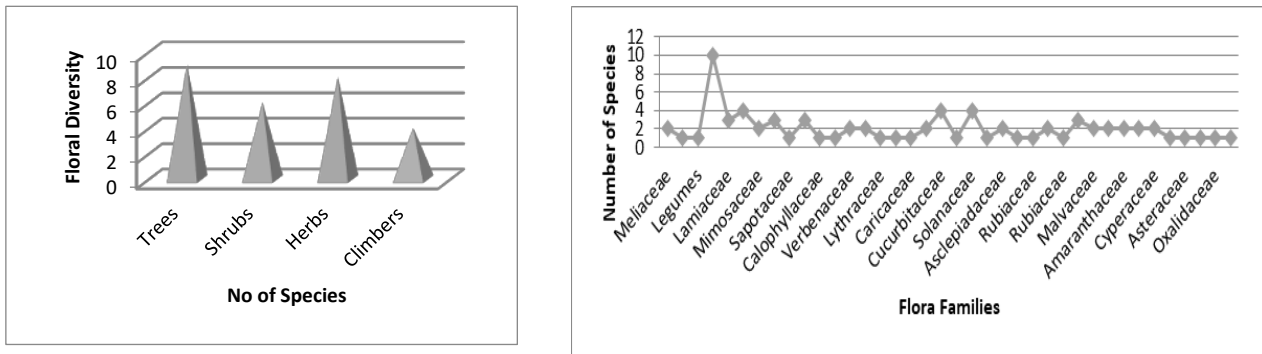
FIGURE 3.28: FLORAL DIVERSITY IN BUFFER ZONE
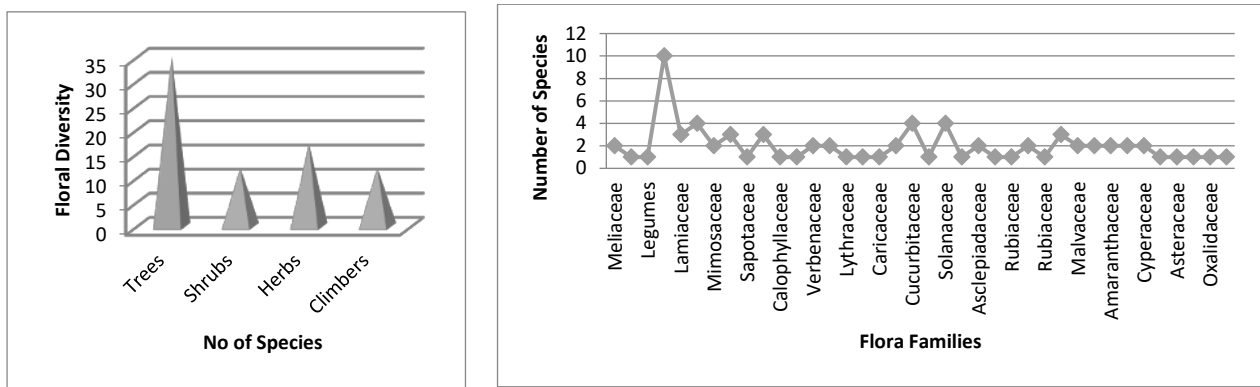
FIGURE 3.29: FAUNA DIVERSITY IN CORE ZONE
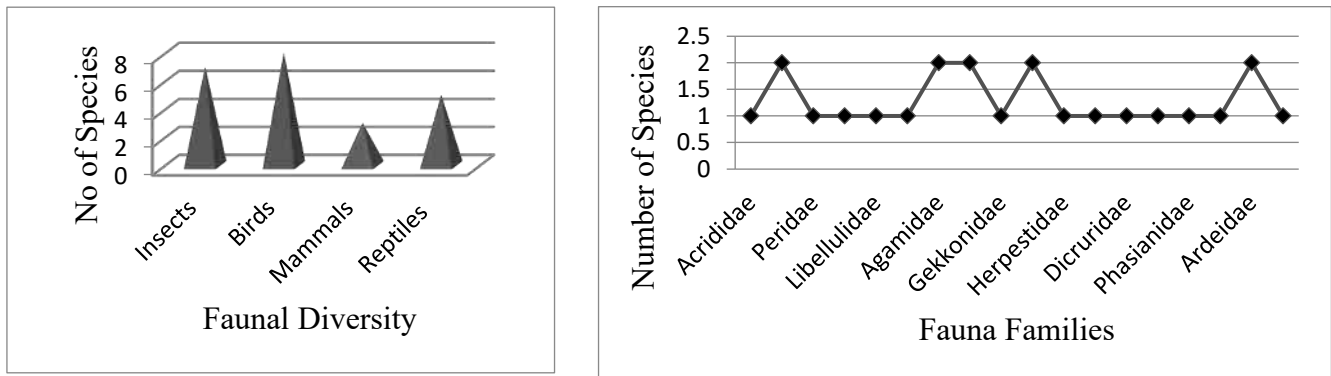
FIGURE 3.30: FAUNA DIVERSITY IN BUFFER ZONE
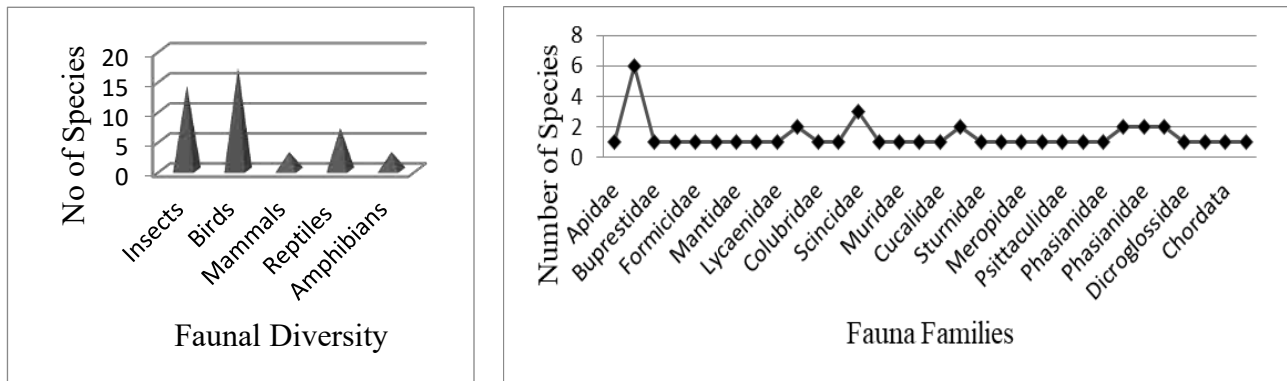
3.5.4   Interpretation& Conclusion:

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. Hence this small mining operation over short period of time will not have any significant impact on the surrounding flora and fauna.

3.6   SOCIO ECONOMIC ENVIRONMENT

Socio-economic study is an essential part of environmental study. It includes demographic structure of the area, provision of basic amenities viz., housing, education, health and medical services, occupation, water supply, sanitation, communication, transportation, prevailing diseases pattern as well as feature like temples, historical monuments etc., at the baseline level. This will help in visualizing and predicting the possible impact depending upon the nature and magnitude of the project.

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

3.6.1   Objectives of the Study

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

3.6.2   Scope of Work

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

3.6.3   District Profile

Coimbatore is the third largest city of Tamilnadu, Coimbatore, is one of the most industrialized cities in Tamil Nadu, known as the textile capital of South India or the Manchester of the South, the city is situated on the banks of the river Noyyal, Coimbatore existed even prior to the 2nd or 3rd century AD by Karikalan, the first of the early Cholas. Among its other great rulers were Rashtrakutas, Chalukyas, Pandyas, Hoysalas and the Vijayanagara kings.

There are more than 25,000 small, medium, large sale industries and textile mill. Coimbatore is also famous for the manufacture of motor pump sets and varied engineering goods. The development of Hydro electricity from the Pykara Falls in the 1930 led to a cotton boom in Coimbatore.

Coimbatore serves as an entry and exit point to neighbouring Kerala and the ever-popular hill station of Udhagamandalam (Ooty). It is the disembarking point for those who want to take the Mountain train that runs from Mettupalayam, just 35 kms from Coimbatore. There are also regular bus services from Coimbatore to Ooty.

3.6.4   Study area:

CHIKKIRAMPALAYAM VILLAGE

Chikkarampalayam village is situated in Teshil Mettupalayam, District Coimbatore and in State of Tamil Nadu India. Village has population of 10242 as per census data of 2011, in which male population is 5059 and female population is 5183. Total geographical area of Chikkarampalayam village is 1456.29 Hectares. Population density of Chikkarampalayam is 7 persons per Hectares. Total number of house hold in village is 2957.

As per the Census Data 2011 there are 1025 Femals per 1000 males out of 10242 total population of village. There are 1005 females per 1000 males under 6 years of age in the village.

In Chikkarampalayam village population of children with age 0-6 is 874 which makes up 8.53 % of total population of village. Average Sex Ratio of Chikkarampalayam village is 1025 which is higher than Tamil Nadu state average of 996. Child Sex Ratio for the Chikkarampalayam as per census is 1005, higher than Tamil Nadu average of 943.

TABLE 3.38: CHIKKIRAMPALAYAM VILLAGE POPULATION FACTS

Number of Households	2957
Population	10,242
Male Population	5,059
Female Population	5,183
Children Population	874
Sex-ratio	1025 females per 1000 males
Literacy	78.81%
Male Literacy	84.99%
Female Literacy	72.79%
Scheduled Tribes (ST) %	9
Scheduled Caste (SC) %	2,045

Source:https://www.census2011.co.in/data/village/644356-chikkarampalayam-tamil-nadu.html

Gram Panchayat name of the Chikkarampalayam village is Chikkarampalayam . CD Block name is Karamadai and Teshil/Taluk or sub-district is Mettupalayam. Data Reference year is 2009 of Census 2011. Sub District HQ Name is METTUPALAYAM and Sub District HQ Distance is 10 Km from the village. District Head Quarter name is COIMBATORE and it's distance from the village is 35Km. Nearest Town of the Chikkarampalayam village is KARAMADAI and nearest town distance is 1 km. Pincode of Chikkarampalayam village is 641104. As per census 2011 village code of village Chikkarampalayam is 644356.

TABLE 3.39: DEMOGRAPHICS POPULATION OF VILLAGE CHIKKIRAMPALAYAM

Total Population	Male Population	Female Population
10242	5059	5183

Source: https://etrace.in/census/village/chikkarampalayam-mettupalayam-district-coimbatore-tamil-nadu-644356

Sex Ratio of Chikkirampalayam Village -Census 2011

As per the Census Data 2011 there are 1025 Females per 1000 males out of 10,242 total population of village. There are 1005 girls per 1000 boys under 6 years of age in the village.

Literacy of Chikkirampalayam Village

Out of total population total 7383 people in Chikkarampalayam Village are literate, among them 3929 are male and 3454 are female in the village. Total literacy rate of Chikkarampalayam is 78.81%, for male literacy is 84.99% and for female literacy rate is 72.79%.

Worker's profile of Chikkirampalayam Village

Total working population of Chikkarampalayam is 4694 which are either main or marginal workers. Total workers in the village are 4694 out of which 3220 are male and 1474 are female. Total main workers are 4269 out of which female main workers are 3004 and male main workers are 1265. Total marginal workers of village are 425.

TABLE 3.42: POPULATION DATA OF STUDY AREA

SI.No.	Village Name	No of House Holds	Total Population	Male	Female	Total Literate Population	Male Literate	Female Literate	Total Illiterate Population	Male Illiterate	Female Illiterate
1	Belladhi	2155	7637	3863	3774	5293	2987	2306	2344	876	1468
2	Bellapalayam	2703	9131	4606	4525	6392	3517	2875	2739	1089	1650
3	Bilichi	3076	10412	5188	5224	7231	3884	3347	3181	1304	1877
4	Chickadasampalayam	5276	19049	9546	9503	13818	7370	6448	5231	2176	3055
5	Chikkarampalayam	2957	10242	5059	5183	7383	3929	3454	2859	1130	1729
6	Illuppanatham	2665	9255	4569	4686	6225	3387	2838	3030	1182	1848
7	Jadayampalayam	2935	10049	5030	5019	7240	3910	3330	2809	1120	1689
8	Karegoundenpalayam	2084	7531	3796	3735	5101	2802	2299	2430	994	1436
9	Kariampalayam	1232	4498	2264	2234	2839	1595	1244	1659	669	990
10	Kattampatti	1664	5859	2919	2940	4237	2270	1967	1622	649	973
11	Kuppanur	1225	4130	2113	2017	2477	1406	1071	1653	707	946
12	Kuppepalayam	779	2784	1424	1360	1642	936	706	1142	488	654
13	Marudur	2737	9491	4756	4735	6156	3392	2764	3335	1364	1971
14	Odanthurai	1529	5399	2686	2713	3454	1883	1571	1945	803	1142
15	Odderpalayam	2051	7403	3626	3777	5054	2684	2370	2349	942	1407
16	Pogalur	1321	4671	2332	2339	2874	1599	1275	1797	733	1064
17	Thekkampatti	3619	12414	6189	6225	7988	4477	3511	4426	1712	2714
18	Vadakkalur	1567	5640	2784	2856	3703	2092	1611	1937	692	1245
19	Vadavalli	1105	3859	1902	1957	2496	1359	1137	1363	543	820
20	Veerapandi	2105	7528	3792	3736	4788	2694	2094	2740	1098	1642
21	Vellamadai	1975	6874	3458	3416	4003	2263	1740	2871	1195	1676

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

TABLE 3.43: WORKERS PROFILE OF STUDY AREA

SI.No.	Village Name	Total Workers Population	Male Workers	Female Workers	Total Main Workers	Main Workers Male	Main Workers Female	Main Cultivation Workers	Main Agriculture Workers	Main Other Workers	Non-Worker Population
1	Belladhi	3526	2508	1018	3331	2405	926	476	1039	1773	4111
2	Bellapalayam	4626	3035	1591	4047	2738	1309	418	568	1986	4505
3	Bilichi	5390	3472	1918	4717	3129	1588	652	1048	2951	5022
4	Chickadasampalayam	8539	5860	2679	7450	5371	2079	620	1367	5289	10510
5	Chikkarampalayam	4694	3220	1474	4269	3004	1265	344	662	3151	5548
6	Illuppanatham	4474	2958	1516	3279	2385	894	571	400	1834	4781
7	Jadayampalayam	4904	3250	1654	4627	3098	1529	689	1078	2119	5145
8	Karegoundenpalayam	4001	2513	1488	3667	2325	1342	610	1389	1562	3530
9	Kariampalayam	2263	1498	765	1939	1350	589	172	359	1052	2235
10	Kattampatti	2753	1891	862	2529	1817	712	222	524	1736	3106
11	Kuppanur	2657	1496	1161	2385	1383	1002	674	773	871	1473
12	Kuppepalayam	1476	945	531	1423	922	501	379	360	679	1308
13	Marudur	4782	3088	1694	4311	2928	1383	856	1275	2090	4709
14	Odanthurai	2709	1690	1019	2514	1616	898	77	958	1396	2690
15	Odderpalayam	3295	2281	1014	3045	2178	867	464	496	1957	4108
16	Pogalur	2524	1552	972	2315	1483	832	410	655	1216	2147
17	Thekkampatti	6595	4091	2504	5531	3504	2027	896	2058	2392	5819
18	Vadakkalur	3234	1932	1302	3047	1840	1207	524	655	1296	2406
19	Vadavalli	2519	1395	1124	2420	1357	1063	1029	641	660	1340
20	Veerapandi	4271	2495	1776	3724	2224	1500	439	231	3011	3257
21	Vellamadai	3964	2344	1620	3085	1922	1163	638	836	1515	2910

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

TABLE 3.44: COMMUNICATION & TRANSPORT FACILITIES IN THE STUDY AREA

Sl.No	Village Name	PO	SPO	PTO	T	PCO	MP	IC / CSC	PCF	BS	PBS	RS	NH	SH	MDR	BTR	GR	NWR	FP
1	Belladhi	2	1	2	1	1	1	2	2	1	1	2	2	1	1	1	1	2	1
2	Bellapalayam	2	1	2	1	1	1	2	2	1	1	2	2	1	1	1	1	2	1
3	Bilichi	2	1	2	1	1	1	2	2	1	1	2	1	1	1	1	1	2	1
4	Chickadasampalayam	2	1	2	1	1	1	2	2	2	1	2	2	1	1	1	1	2	1
5	Chikkarampalayam	2	1	2	1	1	1	2	2	2	1	2	2	1	1	1	1	2	1
6	Illuppanatham	2	1	2	1	1	1	2	2	1	1	2	2	1	1	1	1	2	1
7	Jadayampalayam	2	1	2	1	1	1	2	2	1	1	2	2	1	1	1	1	2	1
8	Karegoundenpalayam	2	1	2	1	1	1	2	2	1	1	2	1	1	1	1	1	2	1
9	Kariampalayam	2	1	2	1	1	1	2	2	1	1	2	1	1	1	1	1	2	1
10	Kattampatti	2	1	2	1	1	1	1	2	1	1	2	1	2	1	1	1	2	1
11	Kuppanur	2	1	2	1	1	1	2	2	1	1	2	2	2	2	1	1	2	1
12	Kuppepalayam	2	1	2	1	1	1	2	2	1	1	2	2	2	2	1	1	2	1
13	Marudur	2	1	2	1	1	1	2	2	1	1	2	2	1	1	1	1	2	1
14	Odanthurai	2	1	2	1	1	1	2	2	1	1	2	1	2	1	1	1	2	1
15	Odderpalayam	2	1	2	1	2	1	2	2	1	1	2	2	2	1	1	1	2	1
16	Pogalur	2	1	2	1	1	1	2	2	1	1	2	2	2	2	1	1	2	1
17	Thekkampatti	2	1	2	1	1	1	2	2	1	1	2	2	2	2	1	1	2	1
18	Vadakkalur	2	1	2	1	1	1	2	2	1	1	2	2	2	2	1	1	2	1
19	Vadavalli	2	1	2	1	1	1	2	2	1	1	2	2	2	2	1	1	2	1
20	Veerapandi	2	1	2	1	1	1	2	1	1	1	2	1	2	1	1	1	2	1
21	Vellamadai	2	1	2	1	1	1	2	1	1	1	2	2	1	1	1	1	2	1

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

TABLE 3.45: WATER & DRAINAGE FACILITIES IN THE STUDY AREA

Sl.No	Village Name	TP	CW	UCW	HP	TW/BH	S	R/C	T/P/L	CD	OD	CT
1	Belladhi	1	1	1	2	1	1	2	2	1	1	1
2	Bellapalayam	1	1	1	1	1	2	2	2	1	1	2
3	Bilichi	1	1	1	1	1	2	2	2	1	1	2
4	Chickadasampalayam	1	1	1	1	1	2	1	2	1	1	1
5	Chikkarampalayam	1	1	1	2	1	2	2	2	1	1	2
6	Illuppanatham	1	1	1	1	1	2	2	2	1	1	2
7	Jadayampalayam	1	1	1	2	1	2	1	2	1	1	1
8	Karegoundenpalayam	1	1	1	1	1	2	2	2	1	1	2
9	Kariampalayam	1	2	1	2	1	2	2	2	1	1	2
10	Kattampatti	1	1	1	2	1	2	2	2	1	1	2
11	Kuppanur	1	1	1	2	1	1	2	2	1	1	2
12	Kuppepalayam	1	1	1	1	1	2	2	2	1	1	2
13	Marudur	1	1	1	1	1	1	1	2	1	1	1
14	Odanthurai	1	1	1	2	1	2	1	1	1	1	2
15	Odderpalayam	1	1	1	1	1	1	2	2	1	1	2
16	Pogalur	1	1	1	1	1	2	1	2	1	1	2
17	Thekkampatti	1	1	1	1	1	2	2	2	1	1	2
18	Vadakkalur	1	1	1	1	1	1	2	2	1	1	1
19	Vadavalli	1	1	1	1	1	2	2	2	1	1	2
20	Veerapandi	1	1	1	2	1	1	2	2	1	1	2
21	Vellamadai	1	1	1	1	1	2	2	2	1	1	2

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

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

TABLE 3.46: OTHER FACILITIES IN THE STUDY AREA

SI.No	Village Name	ATM	CB	COB	ACS	SHG	PDS	RM	AMS	NC	NC-AC	CC	SF	PL	NPS	APS	BDRO	PS
1	Belladhi	2	1	1	2	1	1	1	2	1	1	1	1	1		1	1	1
2	Bellapalayam	2	2	1	1	1	1	2	1	1	1	1	2	2		1	1	1
3	Bilichi	2	2	1	1	1	1	2	2	1	1	2	1	1		1	1	1
4	Chickadasampalayam	2	2	1	1	1	1	2	1	1	1	1	1	2		1	1	1
5	Chikkarampalayam	2	2	2	1	1	1	2	2	1	1	1	2	1		1	1	1
6	Illuppanatham	2	2	1	1	1	1	2	2	1	1	1	1	2		1	1	1
7	Jadayampalayam	1	2	1	1	1	1	1	2	1	1	1	1	1		1	1	1
8	Karegoundenpalayam	2	2	1	1	1	1	2	2	1	1	1	1	1		1	1	1
9	Kariampalayam	2	2	2	1	1	1	2	2	1	1	1	1	1		1	1	1
10	Kattampatti	1	1	2	1	1	1	2	2	1	1	2	1	1		1	1	1
11	Kuppanur	2	2	1	1	1	1	2	2	1	1	2	2	1		1	1	1
12	Kuppepalayam	2	2	2	1	1	1	2	2	1	1	2	1	1		1	1	1
13	Marudur	2	2	2	2	1	1	2	2	1	1	1	1	1		1	1	1
14	Odanthurai	2	2	2	2	1	1	2	2	1	1	2	2	1		1	1	1
15	Odderpalayam	2	2	2	2	1	1	2	2	1	1	1	1	2		1	1	1
16	Pogalur	2	2	2	1	1	1	2	2	1	1	2	2	1		1	1	1
17	Thekkampatti	2	2	1	1	1	1	2	2	1	1	1	1	1		1	1	1
18	Vadakkalur	2	1	2	1	1	1	1	2	1	1	2	2	1		1	1	1
19	Vadavalli	2	2	2	1	1	1	2	2	1	1	1	1	1		1	1	1
20	Veerapandi	2	2	2	2	1	1	2	2	1	1	1	1	1		1	1	1
21	Vellamadai	2	2	1	1	1	1	2	2	1	1	1	1	1		1	1	1
22	Belladhi	2	1	1	2	1	1	1	2	1	1	1	1	1		1	1	1
23	Bellapalayam	2	2	1	1	1	1	2	1	1	1	1	2	2		1	1	1

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

TABLE 3.47: EDUCATIONAL FACILITIES IN THE STUDY AREA

SI.No	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	Belladhi	1	2	1	2	1	2	2	2	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2
2	Bellapalayam	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2
3	Bilichi	1	2	1	2	1	2	2	2	2	2	2	2	2	1	2	2	2	2	2	2	2	2	2	2
4	Chickadasampalayam	1	1	1	2	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	1	2	1	2	2
5	Chikkarampalayam	1	1	1	1	1	1	1	1	2	1	2	2	2	1	2	2	2	2	2	2	2	2	2	2
6	Illuppanatham	1	2	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
7	Jadayampalayam	1	1	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
8	Karegoundenpalayam	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	Kariampalayam	1	1	1	2	1	2	2	2	2	2	2	2	2	1	2	2	2	1	2	2	2	2	2	2
10	Kattampatti	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
11	Kuppanur	1	2	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
12	Kuppepalayam	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2	2	2	2
13	Marudur	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	Odanthurai	1	2	1	1	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
15	Odderpalayam	1	2	1	1	1	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2
16	Pogalur	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
17	Thekkampatti	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
18	Vadakkalur	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
19	Vadavalli	1	2	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
20	Veerapandi	1	1	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
21	Vellamadai	1	2	1	2	1	2	1	2	1	2	2	2	2	2	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

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TABLE 3.48: MEDICAL FACILITIES IN THE STUDY AREA

Sl.No	Village Name	CHC	PHC	PHSC	MCW	TBC	HA	HAM	D	VH	MHC	FWC	NGM-I/O
1	-	0	0	1	0	0	0	0	0	1	0	0	a
2	Bellapalayam	0	1	1	1	1	0	0	1	0	0	1	
3	Bilichi	0	1	1	1	1	0	0	1	1	0	1	
4	Chickadasampalayam	0	3	8	2	3	0	0	3	0	0	3	
5	Chikkarampalayam	0	1	1	1	1	0	0	1	1	0	1	
6	Illuppanatham	0	0	1	0	0	0	0	0	0	0	0	b
7	Jadayampalayam	0	1	1	1	1	0	0	1	0	0	1	
8	Karegoundenpalayam	0	0	1	1	1	0	0	0	0	0	0	b
9	Kariampalayam	0	0	1	0	0	0	0	0	0	0	0	c
10	Kattampatti	0	0	1	0	0	0	0	0	1	0	0	a
11	Kuppanur	0	0	1	0	0	0	0	0	0	0	0	b
12	Kuppepalayam	0	0	0	0	0	0	0	0	0	0	0	b
13	Marudur	0	0	1	0	0	0	0	0	0	0	0	b
14	Odanthurai	0	0	3	0	0	0	0	0	0	0	0	a
15	Odderpalayam	0	0	1	1	0	0	0	0	0	0	0	a
16	Pogalur	1	1	1	1	1	0	0	1	1	0	1	
17	Thekkampatti	0	2	1	2	2	0	0	2	1	0	2	
18	Vadakkalur	0	0	1	1	0	0	0	0	0	0	0	b
19	Vadavalli	0	0	1	1	0	0	0	0	0	0	0	b
20	Veerapandi	0	1	1	1	1	0	0	1	0	0	1	
21	Vellamadai	0	0	1	1	0	0	0	0	1	0	0	b

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 – Tamil Nadu Census of India – 2011

3.6.6 Recommendation and Suggestion

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

3.6.7 Summary & Conclusion

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

4. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

4.0   GENERAL

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

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

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

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

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

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

4.1   LAND ENVIRONMENT:

4.1.2 Anticipated Impact from Proposed Project

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

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

4.1.2 Common Mitigation Measures for Proposed Project

- The mining activity will be gradual confined in blocks and excavation will be undertaken progressively along with other mitigative measures like phase wise development of greenbelt etc.
- Construction of garland drains all around the quarry pits and construction of check dam at strategic location in lower elevations to prevent erosion due to surface runoff during rainfall and also to collect the storm water for various uses within the proposed area.
- Green belt development along the boundary within safety zone. The small quantity of water stored in the mined-out pit will be used for greenbelt.
- Thick plantation will be carried out on unutilized area, top benches of mined out pits, on safety barrier, etc.,
- At conceptual stage, the land use pattern of the quarry will be changed into Greenbelt area and temporary reservoir
- In terms of aesthetics, natural vegetation surrounding the quarry will be retained (such as in a buffer area i.e., 7.5 m safety barrier and other safety provided) so as to help minimise dust emissions.
- Proper fencing will be carried out at the conceptual stage, Security will be posted round the clock, to prevent inherent entry of the public and cattle.

4.1.3 Soil Environment

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

4.1.4 Impact on Soil Environment from Proposed Project

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

4.1.5 Common Mitigation Measures for Proposed Project

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

4.1.6 Waste Dump Management

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

4.2   WATER ENVIRONMENT
4.2.1 Anticipated Impact from Proposed Project

- The major sources of water pollution normally associated due to mining and allied operations are:
    - Generation of waste water from vehicle washing.
    - Washouts from surface exposure or working areas
    - Domestic sewage
    - Disturbance to drainage course in the project area
    - Mine Pit water discharge
- Increase in sediment load during monsoon in downstream of lease area

- This being a mining project, there will be no process effluent. Waste from washing of machinery may result in discharge of Oil & grease, suspended solids.
- The sewage from soak pit may percolate to the ground water table and contaminate it.
- Surface drainage may be affected due to Mining
- Abstraction of water may lead to depletion of water table

Detail of water requirements in KLD as given below:

TABLE 4.1: WATER REQUIREMENT

PROPOSAL – P1		
*Purpose	Quantity	Source
Dust Suppression	1.2 KLD	Rainwater accumulated in Mine Pit/ Water Tanker
Green Belt development	1.3 KLD	Rainwater accumulated in Mine Pit/ Water Tanker
Domestic purpose	0.5 KLD	Water Tankers
Total	**3.0 KLD**	

* Water for drinking purpose will be brought from approved water vendors
Source: Approved Mining Plan Pre-Feasibility Report

4.2.2 Common Mitigation Measures for Proposed Project

- Garland drain, settling tank will be constructed along the proposed mining lease area. The Garland drain will be connected to settling tank and sediments will be trapped in the settling traps and only clear water will be discharged out to the natural drainage
- Rainwater will be collected in sump in the mining pits and will be allowed to store and pumped out to surface setting tank of 15 m x 10m x 3m to remove suspended solids if any. This collected water will be judiciously used for dust suppression and such sites where dust likely to be generated and for developing green belt. The proponent will collect and judicially utilize the rainwater as part of rainwater harvesting system.
- Providing benches with inner slopes and through a system of drains and channels, allowing rain water to descent into surrounding drains, so as to minimize the effects of erosion & water logging arising out of uncontrolled descent of water.
- Reuse the water collected during storm for dust suppression and greenbelt development within the mines
- Installing interceptor traps/oil separators to remove oils and greases. Water from the tipper wash-down facility and machinery maintenance yard will pass through interceptor traps/oil separators prior to its reuse;
- Using flocculating or coagulating agents to assist in the settling of suspended solids during monsoon seasons;
- Periodic (every 6 month once) analysis of quarry pit water and ground water quality in nearby villages.
- Domestic sewage from site office & urinals/latrines provided in ML is discharged in septic tank followed by soak pits.
- Waste water discharge from mine will be treated in settling tanks before using for dust suppression and tree plantation purposes.
- De-silting will be carried out before and immediately after the monsoon season.
- Regular monitoring (every 6 month once) and analysing the quality of water in open well, bore wells and surface water

4.3   AIR ENVIRONMENT

4.3.1. Anticipated Impact from Proposed Project

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

- Simultaneously, the air-borne dust may travel to longer distances and settle in the villages located near the mine lease area.

4.3.1.1. Modelling of Incremental Concentration from Proposed Project

Wind erosion of the exposed areas and the air borne particulate matter generated by quarrying operation, and transportation are mainly 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.

The impact on Air Environment is due to the mining and allied activities during Land Development phase, Mining process and Transportation. The emissions of Sulphur dioxide (SO_2), Oxides of Nitrogen (NOx) due to excavation/loading equipment and vehicles plying on haul roads are marginal. Loading - unloading and transportation of Rough Stone, wind erosion of the exposed area and movement of light vehicles will be the main polluting source in the mining activities releasing Particulate Matter (PM_{10}) affecting Ambient Air of the area. Prediction of impacts on air environment has been carried out taking into consideration cumulative production three proposed quarries. Air environment and net increase in emissions by Open pit source modelling in AERMOD Software.

4.3.2.1 Emission Estimation

An emissions factor is a representative value that attempts to relate the quantity of a pollutant released to the atmosphere with an activity associated with the release of that pollutant.
The general equation for emissions estimation is:

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

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

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

4.3.2 Frame work of Computation & Model details

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

Impact was predicted over the distance of 10 km around the source to assess the impact at each receptor separately at the various locations and maximum incremental GLC value at the project site. Maximum impact of PM10

was observed close to the source due to low to moderate wind speeds. Incremental value of PM10 was superimposed on the base line data monitored at the proposed site to predict total GLC of PM10 due to combined impacts

TABLE 4.2: ESTIMATED EMISSION RATE FOR PM_{10}

Activity	Source type	Value	Unit
		P1	
Drilling	Point Source	0.078564385	g/s
Blasting	Point Source	0.000724007	g/s
Mineral Loading	Point Source	0.040511056	g/s
Haul Road	Line Source	0.002488386	g/s/m
Overall Mine	Area Source	0.056026982	g/s

TABLE 4.3: ESTIMATED EMISSION RATE FOR SO_2

Activity	Source type	Value	Unit
		P1	
Overall Mine	Area Source	0.000447229	g/s

TABLE 4.4: ESTIMATED EMISSION RATE FOR NO_X

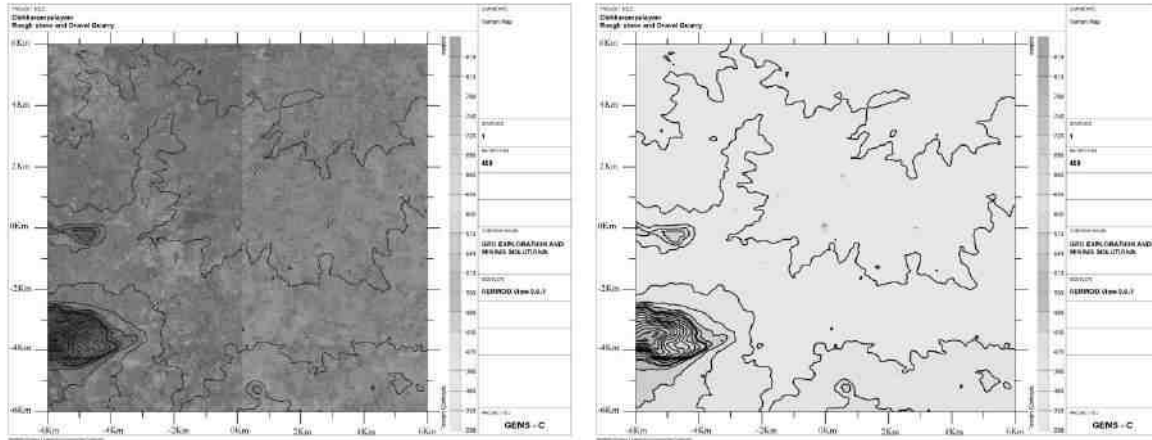| Activity	Source type	Value	Unit
		P1	
Overall Mine	Area Source	0.000024444	g/s

FIGURE 4.1: AERMOD TERRAIN MAP
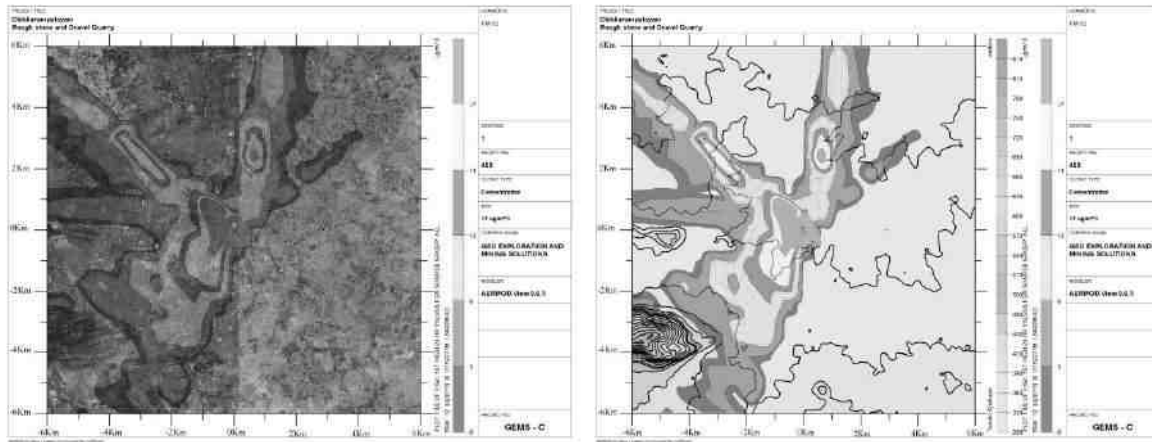

FIGURE 4.2: PREDICTED INCREMENTAL CONCENTRATION OF PM$_{10}$

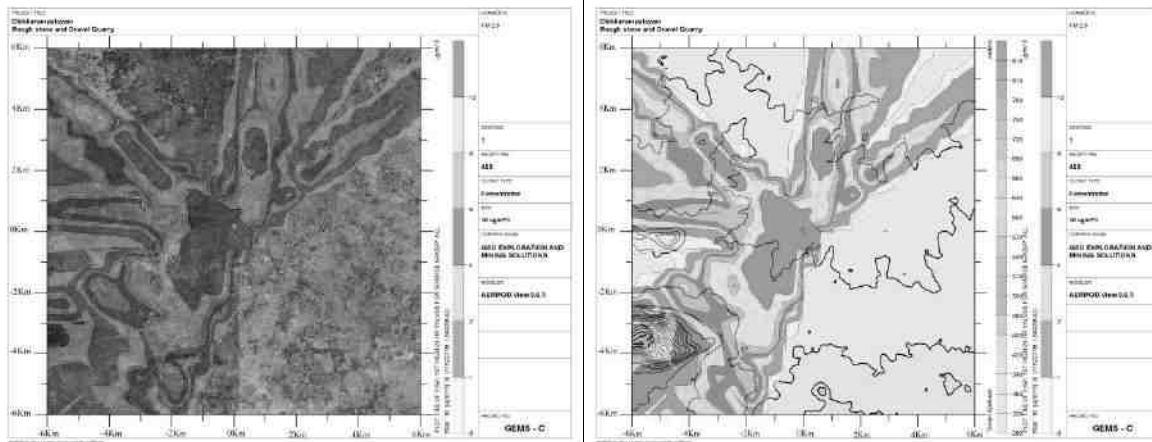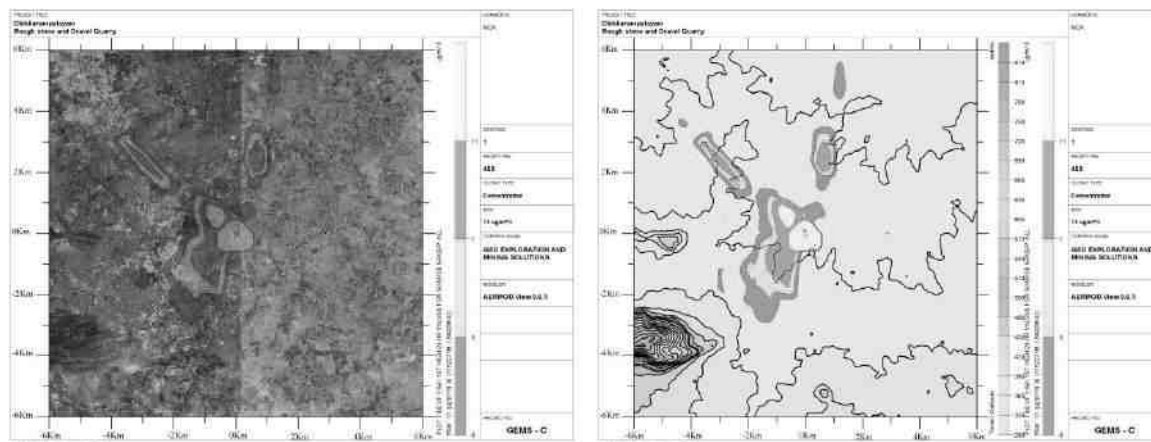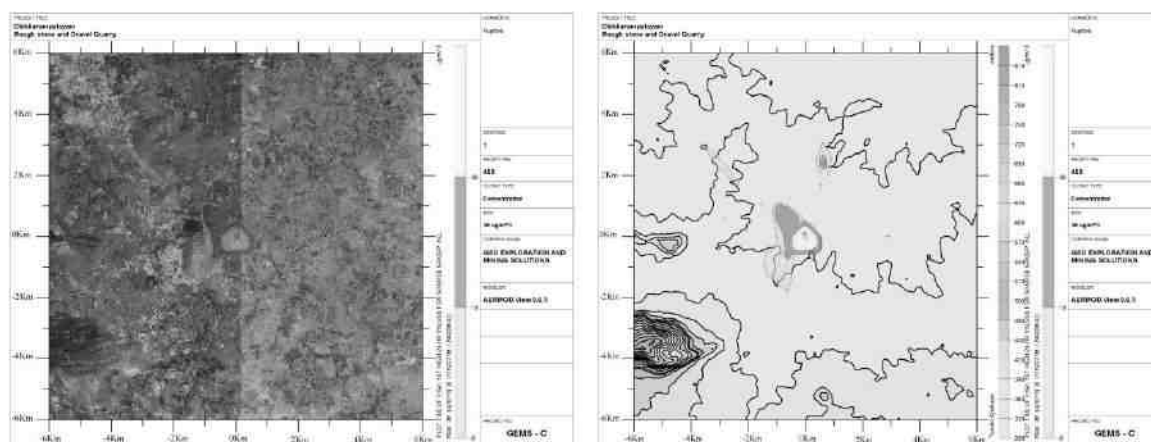**FIGURE 4.3: PREDICTED INCREMENTAL CONCENTRATION OF SO$_2$**

FIGURE 4.4: PREDICTED INCREMENTAL CONCENTRATION OF NO$_X$

FIGURE 4.5: PREDICTED INCREMENTAL CONCENTRATION OF FUGITIVE DUST

4.3.2.1 Model Results

The post project Resultant Concentrations of PM10, PM2.5, SO2& NOX (GLC) is given in Table below:

TABLE 4.5: INCREMENTAL & RESULTANT GLC OF PM$_{10}$

Station Code	Location	X Coordinate (m)	Y Coordinate (m)	Average Baseline PM$_{10}$ (µg/m³)	Incremental value of PM$_{10}$ due to mining (µg/m³)	Total PM$_{10}$ (µg/m³)
AAQ1	11°14'57.00"N 76°58'50.27"E	17	-20	24.2	17.72	41.92
AAQ2	11°15'33.80"N 76°57'59.66"E	-1530	1055	23.6	9.54	33.14
AAQ3	11°15'54.66"N 76°59'7.44"E	541	1693	23.4	7.65	31.05
AAQ4	11°14'22.79"N 76°57'45.77"E	-1954	-1143	22.7	12.01	34.71
AAQ5	11°12'25.30"N 77° 0'4.25"E	2278	-4781	20.2	0	20.2
AAQ6	11°16'19.13"N 77° 0'29.50"E	3049	2461	21.6	3.15	24.75
AAQ7	11°15'19.84"N 76°57'15.75"E	-2871	619	21.4	5.37	26.77
AAQ8	11°13'31.86"N 76°57'27.03"E	-2529	-2709	21.7	1.58	23.28
AAQ9	11°14'59.22"N 77° 0'23.93"E	2881	-83	22.4	0	22.4

TABLE 4.6: INCREMENTAL & RESULTANT GLC OF PM$_{2.5}$

Station Code	Location	X Coordinate (m)	Y Coordinate (m)	Average Baseline PM$_{2.5}$ ($\mu g/m^3$)	Incremental value of PM$_{2.5}$ due to mining ($\mu g/m^3$)	Total PM$_{2.5}$ ($\mu g/m^3$)
AAQ1	11°14'57.00"N 76°58'50.27"E	17	-20	43.4	10.95	54.35
AAQ2	11°15'33.80"N 76°57'59.66"E	-1530	1055	42.6	10.12	52.72
AAQ3	11°15'54.66"N 76°59'7.44"E	541	1693	42.7	8.69	51.39
AAQ4	11°14'22.79"N 76°57'45.77"E	-1954	-1143	42.6	10.38	52.98
AAQ5	11°12'25.30"N 77° 0'4.25"E	2278	-4781	42.3	0	42.3
AAQ6	11°16'19.13"N 77° 0'29.50"E	3049	2461	41.6	4.88	46.48
AAQ7	11°15'19.84"N 76°57'15.75"E	-2871	619	41.7	7.23	48.93
AAQ8	11°13'31.86"N 76°57'27.03"E	-2529	-2709	42.1	2.16	44.26
AAQ9	11°14'59.22"N 77° 0'23.93"E	2881	-83	42.5	0	42.5

TABLE 4.7: 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°14'57.00"N 76°58'50.27"E	17	-20	19.8	3.59	23.39
AAQ2	11°15'33.80"N 76°57'59.66"E	-1530	1055	15.3	3.32	18.62
AAQ3	11°15'54.66"N 76°59'7.44"E	541	1693	16.2	2.47	18.67
AAQ4	11°14'22.79"N 76°57'45.77"E	-1954	-1143	10.8	3.50	14.3
AAQ5	11°12'25.30"N 77° 0'4.25"E	2278	-4781	10.6	0	10.6
AAQ6	11°16'19.13"N 77° 0'29.50"E	3049	2461	10.1	0	10.1
AAQ7	11°15'19.84"N 76°57'15.75"E	-2871	619	9.6	1.03	10.63
AAQ8	11°13'31.86"N 76°57'27.03"E	-2529	-2709	10.7	0	10.7
AAQ9	11°14'59.22"N 77° 0'23.93"E	2881	-83	9.5	0	9.5

TABLE 4.8: INCREMENTAL & RESULTANT GLC OF NOX

Station Code	Location	X Coordinate (m)	Y Coordinate (m)	Average Baseline NOx ($\mu g/m^3$)	Incremental value due to mining ($\mu g/m^3$)	Total NOx ($\mu g/m^3$)
AAQ1	11°14'57.00"N 76°58'50.27"E	17	-20	23.4	11.85	35.25
AAQ2	11°15'33.80"N 76°57'59.66"E	-1530	1055	22.6	2.83	25.43
AAQ3	11°15'54.66"N 76°59'7.44"E	541	1693	22.4	1.18	23.58
AAQ4	11°14'22.79"N 76°57'45.77"E	-1954	-1143	15.8	5.99	21.79
AAQ5	11°12'25.30"N 77° 0'4.25"E	2278	-4781	15.6	0	15.6
AAQ6	11°16'19.13"N 77° 0'29.50"E	3049	2461	13.1	0	13.1
AAQ7	11°15'19.84"N 76°57'15.75"E	-2871	619	12.1	0	12.1
AAQ8	11°13'31.86"N 76°57'27.03"E	-2529	-2709	13.4	0	13.4
AAQ9	11°14'59.22"N 77° 0'23.93"E	2881	-83	14.1	0	14.1

TABLE 4.9: INCREMENTAL & RESULTANT GLC OF FUGITIVE DUST

Station Code	Location	X Coordinate (m)	Y Coordinate (m)	Average Baseline Fugitive ($\mu g/m^3$)	Incremental value due to mining ($\mu g/m^3$)	Total Fugitive Dust ($\mu g/m^3$)
AAQ1	11°14'57.00"N 76°58'50.27"E	17	-20	63.9	36.15	100.05
AAQ2	11°15'33.80"N 76°57'59.66"E	-1530	1055	63.5	0	63.5
AAQ3	11°15'54.66"N 76°59'7.44"E	541	1693	63.0	0	63.0
AAQ4	11°14'22.79"N 76°57'45.77"E	-1954	-1143	60.6	0	60.6
AAQ5	11°12'25.30"N 77° 0'4.25"E	2278	-4781	61.0	0	61.0
AAQ6	11°16'19.13"N 77° 0'29.50"E	3049	2461	61.2	0	61.2
AAQ7	11°15'19.84"N 76°57'15.75"E	-2871	619	60.9	0	60.9
AAQ8	11°13'31.86"N 76°57'27.03"E	-2529	-2709	61.7	0	61.7
AAQ9	11°14'59.22"N 77° 0'23.93"E	2881	-83	60.8	0	60.8

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. Common Mitigation Measures for Respective Individual Proposed Projects

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 –

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

Occupational Health –

- Dust mask will be provided to the workers and their use will be strictly monitored
- Annual medical checkups, trainings and campaigns will be arranged to ensure awareness about importance of wearing dust masks among all mine workers & tipper drivers

- Ambient Air Quality Monitoring will be conducted six months once to assess effectiveness of mitigation measures proposed

4.4 NOISE ENVIRONMENT

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

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

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

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

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

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.

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

4.4.1 Anticipated Impact from all Proposed Projects

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 4.10: ACTIVITY AND NOISE LEVEL PRODUCED BY MACHINERY

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

*50 feet from source = 15.24 meters

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

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

TABLE 4.11: PREDICTED NOISE INCREMENTAL VALUES

Location ID	N1	N2	N3	N4	N5	N6	N7
Maximum Monitored Value (Day) dB(A)	42.3	41.8	42.8	40.2	39.1	39.9	39.2
Incremental Value dB(A)	70.6	63.2	50.6	29.2	24.5	32.1	26.1

Total Predicted Noise level dB(A)	70.6	63.2	51.2	40.5	39.2	40.6	39.4

The incremental noise level is found within the range of 63.2 –70.6 dB (A) in Core Zone and 24.5 – 50.6 dB (A) in Buffer zone. The noise level at different receptors in buffer zone is lower due to the distance involved and other topographical features adding to the noise attenuation. The resultant Noise level due to monitored values and calculated values at the receptors are based on the mathematical formula considering attenuation due to Green Belt as 4.9 dB (A) the barrier effect. From the above table, it can be seen that the ambient noise levels at all the locations are within permissible limits of Industrial area (core zone) & Residential area (buffer zone) as per THE NOISE POLLUTION (REGULATION AND CONTROL) RULES, 2000 (The Principal Rules were published in the Gazette of India, vide S.O. 123(E), dated 14.2.2000 and subsequently amended vide S.O. 1046(E), dated 22.11.2000, S.O. 1088(E), dated 11.10.2002, S.O. 1569 (E), dated 19.09.2006 and S.O. 50 (E) dated 11.01.2010 under the Environment (Protection) Act, 1986.).

4.4.2 Common Mitigation Measures for Respective Individual Proposed Projects

The following noise mitigation measures are proposed for control of Noise

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

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

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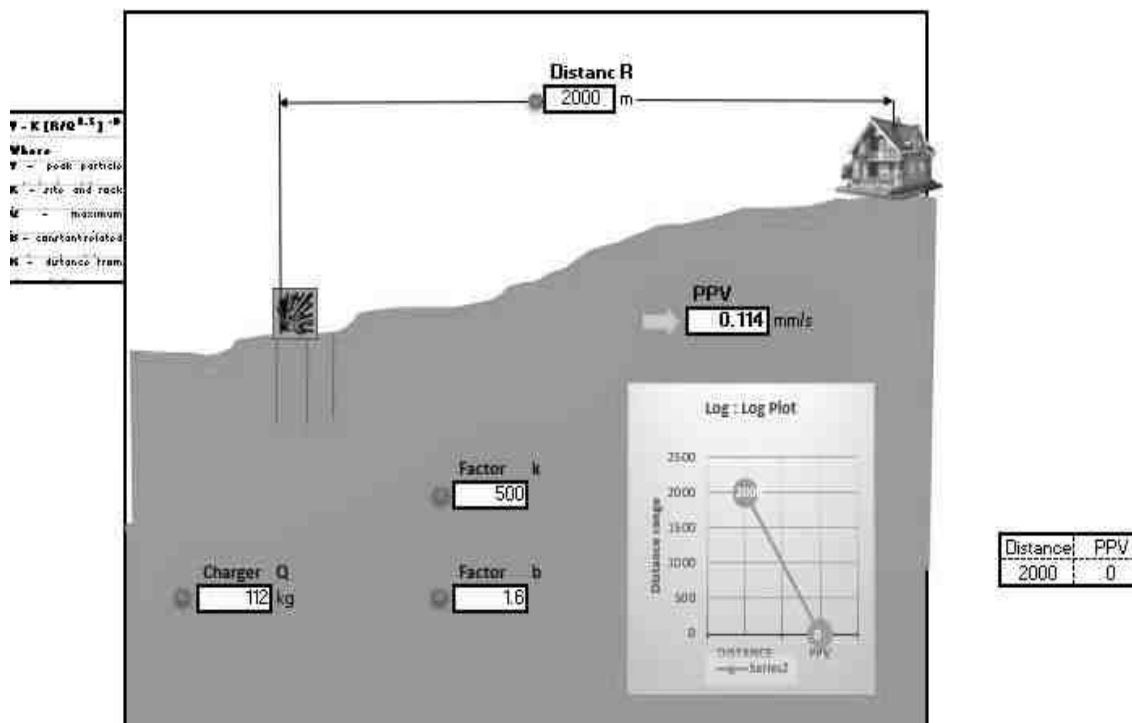Q = maximum instantaneous charge (kg)
B = constant related to the rock and site (usually 1.6)

R = distance from charge (m)

TABLE 4.12: PREDICTED PPV VALUES DUE TO BLASTING

Location ID	Maximum Charge in kgs	Nearest Habitation in m	PPV in m/ms
P1	112	2.0km	0.144

FIGURE 4.6: GROUND VIBRATION PREDICTION

From the above graph, the charge per blast of 112kg is well below the Peak Particle Velocity of 8 mm/s as per Directorate General of Mines Safety for safe level criteria through Circular No. 7 dated 29/8/1997. But the all the project proponents ensure that the charge per blast shall be less than 85 kg and carry out blasting twice or thrice a day based on the onsite conditions under the supervision of competent person employed. However, as per statutory requirement control measures will be adopted to avoid the impacts due to ground vibrations and fly rocks due to blasting**.**

4.4.3.1 Common Mitigation Measures for Respective Individual Proposed Projects

- The blasting operations in the cluster quarries are carried out without deep hole drilling and blasting using delay detonators, which reduces the ground vibrations;
- Proper quantity of explosive, suitable stemming materials and appropriate delay system will be adopted to avoid overcharging and for safe blasting;
- Adequate safe distance from blasting will be maintained as per DGMS guidelines;
- Blasting shelter will be provided as per DGMS guidelines;
- Blasting operations will be carried out only during day time;

- The charge per delay will be minimized and preferably a greater number of delays will be used per blasts;
- During blasting, other activities in the immediate vicinity will be temporarily stopped;
- Drilling parameters like depth, diameter and spacing will be properly designed to give proper blast;
- A fully trained explosives blast man (Mining Mate, Mines Foreman, 2nd Class Mines Manager/ 1st Class Mines Manager) will be appointed.
- A set of shot firing rules will be drawn up and blasting shall commence outlining the detailed operating procedures that will be followed to ensure that shot firing operations on site take place without endangering the workforce or public.
- Sufficient angular stemming material will be used to confine the explosive force and minimise environmental disturbance caused by venting / misfire.
- The detonators will be connected in a predetermined sequence to ensure that only one charge is detonated at any one time and a NONEL or similar type initiation system will be used.
- The detonation delay sequence shall be designed so as to ensure that firing of the holes is in the direction of free faces so as to minimise vibration effects.
- Appropriate blasting techniques shall be adopted such that the predicted peak particle velocity shall not exceed 8 mm/s.
- Vibration monitoring will be carried out every 6 months to check the efficacy of blasting practices

4.5 ECOLOGY AND BIODIVERSITY

4.5.1 Impact on Ecology and Biodiversity

The impact on biodiversity is difficult to quantify because of its diverse and dynamic characteristics, mining activities generally result in the deforestation, land degradation, water, air and noise pollution which directly or indirectly affect the faunal and floral status of the project area. However, occurrence and magnitude of these impacts are entirely dependent upon the project location, mode of operation and technology involved. Impact prediction is the main footstep in impact evaluation and identifies project actions that are likely to bring significant changes in the project environment. The present study was carried out to predict the likely impacts of the proposed project at chikkarampalayam village and the surrounding environment with special reference to biological attributes covering habitats/ecosystems and associated biodiversity.

The proposed mining activities include removal of some scattered bushes and other thorny species. Although impacts on key habitat elements will occur on a local scale, but on a regional scale they would not be critical for the life cycle needs of the species observed or expected. Moreover, during conceptual stage, the mined-out areas on the top bench will be re-vegetated by planting local /native species and lower benches will be converted into rainwater harvesting structure following completion of mining activities, which will replace habitat resources for fauna species in this locality over a longer time. Existing roads will be used; new roads will not be constructed to reduce impact on flora.

Wild life is not commonly found in the project area and its immediate environs because of lack of vegetal cover and surface water. Except few domestic animals, reptiles, hares and some common birds are observed in the study area.

I. None of the plants will be cut during operational phase of the mine.
II. There shall be negligible air emissions or effluents from the project site. During loading the truck, dust generation will be likely. This shall be a temporary effect and not anticipated to affect the surrounding vegetation significantly.
III. Most of the land in the buffer area is undulating terrain with crop lands, grass patches and small shrubs. Hence, there will be no effect on flora of the region

4.5.2 Common Mitigation Measures for Proposed Project

Keeping all this in mind the mitigations have been suggested under environmental management plan. With the understanding of the role of plant species as bio-filter to control air pollution, appropriate plant species (mainly tree species) have been suggested conceding the area/site requirements and needed performance of specific species. The details of year wise proposed plantation program are given in Table 4.13.

The main objective of the green belt is to provide a barrier between the source of pollution and the surrounding areas. In order to compensate the loss of vegetation cover, it is suggested to carry out afforestation program mainly in proposed areas falls in the cluster earmarked for plantation program as per Approved Mining Plan in different phases. This habitat improvement program would ensure the faunal species to re-colonize and improve the abundance status in the core zone.

The objectives of the green belt cover will cover the following:

- Noise abatement
- Ecological restoration
- Aesthetic, biological and visual improvement of area due to improved vegetative and plantations cover.

4.5.2.2.1. Species Recommendation for Plantation granted in the district

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

- Natural growth of existing species and survival rate of various species.
- Suitability of a particular plant species for a particular type of area.
- Creating of biodiversity.
- Fast growing, thick canopy copy, perennial and evergreen large leaf area.
- Efficient in absorbing pollutants without major effects of natural growth.
- The following species may be considering primary for plantation best suited for the prevailing climate condition in the area.

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, and Casuarina will be planted along the Lease boundary and avenue plantation will be carried out in respective proposed projects. The rate of survival expected to be 80% in this area. Afforestation Plan is given in Table No.4.13 and budget of green belt development plan are given in Table No.4.14.

TABLE 4.14: GREENBELT DEVELOPMENT PLAN

PROPOSAL – P1					
Year	No. of tress proposed to be planted	Area to be covered in m2	Name of the species	Survival rate expected in %	No. of trees expected to be grown
I	1750	Plantation along 7.5m safety distance, along approach road.	Neem, Pongamia Pinnata, Casuarina etc.,	80	1400

TABLE 4.15: BUDGET FOR GREENBELT DEVELOPMENT PLAN

PROPOSAL – P1							
Activity	Year					Cost	Total Cost
	I	II	III	IV	V		
Plantation in Nos	94	94	94	94	94	@ 100 Rs/ Saplings including maintenance	Rs 47,000
Plantation cost	9,400	9,400	9,400	9,400	9,400		

Renovation of Wire Fencing (770 meters)	2,31,000	-	-	-	-	@ 300Rs per meter	Rs2,31,000
Renovation of Garland Drain (700 meters)	2,10,000	-	-	-	-	@ 300Rs per meter	Rs 2,10,000
Cost for plantation in approach road and panchayat roads	4,000	4,000	4,000	4,000	4,000	@ 100 Rs/ Saplings including maintenance	Rs. 20,000
TOTAL							**Rs 5,08,000**

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

4.5.3. Anticipated Impact on Fauna

- There is no Wildlife Sanctuary and Biosphere Reserve within 10 km radius of the project site.
- No rare, endemic & endangered species are reported in the buffer zone. However, during the course of mining, the management will practice scientific method of mining with proper Environmental Management Plan including pollution control measures especially for air and noise, to avoid any adverse impact on the surrounding wildlife.
- Fencing around all the proposed mine lease areas will be constructed to restrict the entry of stray animals
- Green belt development will be carried out which will help in minimizing adverse impact on the flora found in the area.

4.5.3.1. Measures for protection and conservation of wildlife species

- Undertaking mitigative measures for conducive environment to the flora and fauna in consultation with Forest Department.
- Dust suppression system will be installed within mine and periphery of mine for all proposed projects
- Plantation around mine area will help in creating habitats for small faunal species and to create better environment for various fauna. Creating and developing awareness for nature and wildlife in the adjoining villages.

4.5.3.2. Mitigation Measures

- All the preventive measures will be taken for growth & development of fauna.
- Creating and development awareness for nature and wildlife in the adjoin villages.
- The workers shall be trained to not harm any wildlife, should it come near the project site. No work shall be carried out after 6.00 pm.

4.5.4. Impact on Aquatic Biodiversity

Mining activities will not disturb the existing aquatic ecology as there is no effluent discharge proposed from the Rough stone quarry. There is no natural perennial surface water body within the mine lease area. Hence, aquatic biodiversity is not observed in the mine lease area.

4.5.5. Impact Assessment on Biological Environment

A detail of impact and assessments was mentioned in Table No 4.16.

TABLE 4.16: ECOLOGICAL IMPACT ASSESSMENTS

SI.No	Attributes	Assessment
1	Proximity to national park/wildlife sanctuary/reserve forest /mangroves/ coastline/estuary/sea	Nellimalai R.F 7.3 Km North West
2	Proposed mining project impact surface water quality that also provide water to wildlife	'NO 'scheduled or threatened wildlife animal sighted regularly core in core area.
3	Located near an area populated by rare or endangered species	NO endangered, critically endangered, vulnerable species sighted in core mining lease area.
4	Proposed project restricts access to waterholes for wildlife	'NO'
5	Project likely to affect migration routes	'NO 'migration route observed during monitoring period.
6	Proposed mining project increase siltation that would affect nearby biodiversity area.	Surface runoff management such as garland drains is proposed to be constructed, so there will be no siltation nearby mining area.
7	Risk of fall/slip or cause death to wild animals due to project activities	'NO'
8	Activities of the project affects the breeding/nesting sites of birds and animals	No breeding and nesting site was identified in mining lease site. The fauna sighted mostly migrated from buffer area.
9	Mining project effect the forest-based livelihood/ any specific forest product on which local livelihood depended	'NO '
10	The project release effluents into a water body that also supplies water to a wildlife	No water body near to core zone so chances of water become polluted is low.
11	The project likely to affect wetlands, Fish breeding grounds, marine ecology	'NO'. Wetland was not present in near core Mining lease area. No breeding and nesting ground present in core mining area.
12	Project likely to affect flora of an area, which have medicinal value	'NO'
13	Forestland is to be diverted, has carbon high sequestration	'NO 'There was no forest land diverted.

TABLE 4.17: ANTICIPATED IMPACT OF ECOLOGY AND BIODIVERSITY

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

		-Loss of Habitat (Direct impact)	Site does not form Unique / critical habitat structure for unique flora or fauna.		
		Mining phase			
2	Excavation of mineral using machine and labours, Transportation activities will generate noise.	Site-specific disturbance to normal faunal movements at the site due to noise.(Partial impact)	Site does not form unique / critical habitat structure for unique flora or fauna.	Less severe	Mining activity should not be operated after 5PM. Excavation of dump and transportation work should stop before 7PM.
3	Vehicular Movement for transportation of materials will result in generation of dust (SPM) due to haul roads and emission of SO2,NO2,CO etc.	Impact on surrounding agriculture and associated fauna due to deposition of dust and Emission of CO. (Indirect impact)	Impact is less as the agricultural land far from core area.	Less severe	All vehicles will be certified for appropriate Emission levels. More plantation have been suggested Upgrade the vehicles with alternative fuel such biodiesel, methanol and biofuel around the mining area.

4.6 SOCIO ECONOMIC

4.6.1 Anticipated Impact from Proposed Project

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

4.6.2 Common Mitigation Measures for Proposed Project

- Good maintenance practices will be adopted for all machinery and equipment, which will help to avert potential noise problems.
- Green belt will be developed in and around the project site as per Central Pollution Control Board (CPCB) guidelines.
- Air pollution control measure will be taken to minimize the environmental impact within the core zone.
- For the safety of workers, personal protective appliances like hand gloves, helmets, safety shoes, goggles, aprons, nose masks and ear protecting devices will be provided as per mines act and rules.
- Benefit to the State and the Central governments through financial revenues by way of royalty, tax, duties, etc.., from this project directly and indirectly.
- From above details, the quarry operations will have highly beneficial positive impact in the area

4.7 OCCUPATIONAL HEALTH AND SAFETY

Occupational health and safety hazards occur during the operational phase of mining and primarily include the following:
- Respiratory hazards
- Noise
- Physical hazards
- Explosive storage and handling

4.7.1 Respiratory Hazards

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

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

4.7.2 Noise

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

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

4.7.3 Physical Hazards

The following measures are proposed for control of physical hazards

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

4.7.4 Occupational Health Survey

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

- General physical tests
- Audiometric tests
- Full chest, X-ray, Lung function tests, 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 from any of the proposed quarries.

4.9   MINE CLOSURE

Mine closure plan is the most important environmental requirement in mining projects. The mine closure plan should cover technical, environmental, social, legal and financial aspects dealing with progressive and post closure activities. The closure operation is a continuous series of activities starting from the decommissioning of the project. Therefore, progressive mine closure plan should be specifically dealt with in the mining plan and is to be reviewed along with mining plan. As progressive mine closure is a continuous series of activities, it is obvious that the proposals of scientific mining have included most of the activities to be included in the closure plan. While formulating the closure objectives for the site, it is important to consider the existing or the pre-mining land use of the site; and how the operation will affect this activity.

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

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

4.9.1 Mine Closure Criteria

The criteria involved in mine closure are discussed below:

4.9.1.1 Physical Stability

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

4.9.1.2 Chemical Stability

The solid wastes on the mine site should be chemically stable. This means that the consequences of chemical changes or conditions leading to leaching of metals, salts or organic compounds should not endanger public health and safety nor result in the deterioration of environmental attributes. If the pollutant 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

Chikkirampalayam Rough Stone Quarry Project at Chikkirampalayam Village is a mining project for excavation of Rough Stone, which is site specific. All 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

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

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

5.4 ANALYSIS OF ALTERNATIVE TECHNOLOGY

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

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

6.1 METHODOLOGY OF MONITORING MECHANISM

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

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

The responsibilities of this cell will be:

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

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

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

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

FIGURE 6.1: PROPOSED ENVIRONMENTAL MONITORING CELL P1
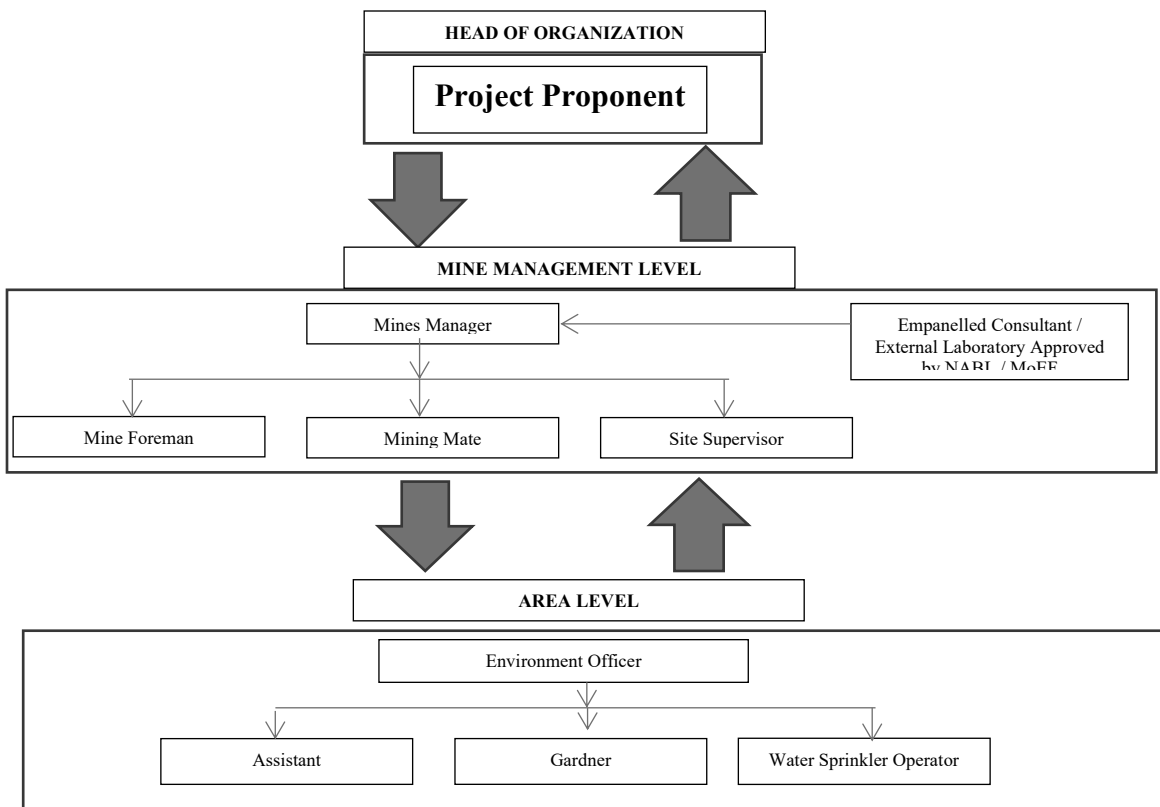
* The Environmental Monitoring Cell will be formed in all the proposed projects

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 FOR ALL PROPOSED PROJECTS

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

6.3   MONITORING SCHEDULE AND FREQUENCY

Monitoring shall confirm that commitments are being met. This may take the form of direct measurement and recording of quantitative information, such as amounts and concentrations of discharges, emissions and wastes,

for measurement against statutory standards. Monitoring may include socio-economic interaction, through local liaison activities or even assessment of complaints.

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

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

The details of monitoring are detailed in Table 6.2

TABLE 6.2: PROPOSED MONITORING SCHEDULE POST EC FOR P1

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

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

6.4   BUDGETARY PROVISION FOR EMP

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

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

TABLE 6.3 ENVIRONMENT MONITORING BUDGET

PROPOSAL – P1			
Sl.No.	Parameter	Capital Cost	Recurring Cost per annum
1	Air Quality	Rs. 76,000/-	Rs. 76,000/-
2	Meteorology		
3	Water Quality		
4	Hydrology		
5	Soil Quality		
6	Noise Quality		
7	Vibration Study		
Total		**Rs 76,000/-**	**Rs 76,000/-**

Source: Approved Mining Plan

6.5   REPORTING SCHEDULES OF MONITORED DATA

The monitored data on air quality, water quality, noise levels and other environmental attributes will be periodically examined by the 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
- Post-COVID Health Management Plan

7.1.   PUBLIC CONSULTATION FOR P1

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 FOR P1

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 FOR P1

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 FOR P1

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 FOR P1
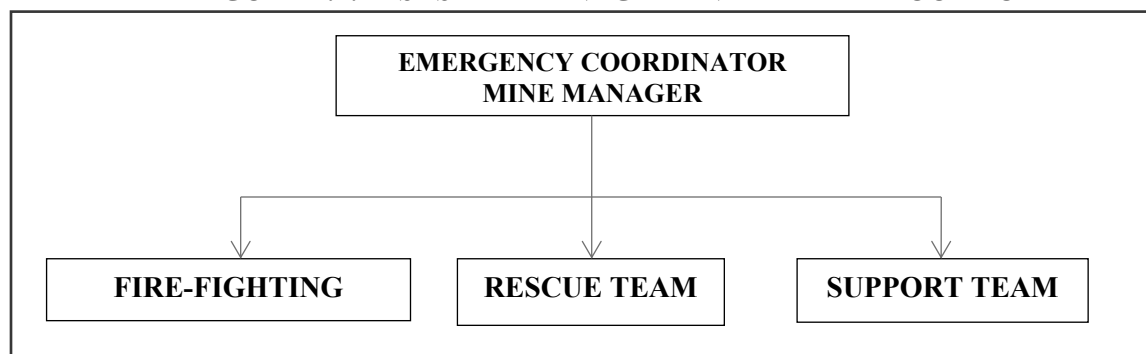
The emergency organization shall be headed by emergency coordinator who will be qualified competent mine manager. In his absence senior most people available at the mine shall be emergency coordinator till arrival of mine manager. There would be three teams for taking care of emergency situations – Fire-Fighting Team, Rescue Team and Support Team. The proposed composition of the teams is given in Table 7.2.

TABLE 7.2: PROPOSED TEAMS TO DEAL WITH EMERGENCY SITUATION

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

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

Roles and responsibilities of emergency team –

(a) Emergency coordinator (EC)

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

(b) Incident controller (IC)

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

(c) Communication and advisory team

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

(d) Roll call coordinator

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

(e) Search and rescue team

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

(f) Emergency security controller

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

Emergency control procedure –

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

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

Proposed fire extinguishers at different locations –

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

TABLE 7.3: PROPOSED FIRE EXTINGUISHERS AT DIFFERENT LOCATIONS IN P1

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

Alarm system to be followed during disaster –

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

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

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

7.4   CUMULATIVE IMPACT STUDY

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

TABLE 7.4: LIST OF QUARRIES WITHIN 500 METER RADIUS

CODE	Name of the Owner	Village	S.F. Nos	Extent in Ha	Status
PROPOSED QUARRY FOR PUBLIC HEARING				
P1	Thiru.A. Nandakumar S/o.Arukutty Gounder No.79D, Avinashi road, Annur, Coimbatore	Chickkaram Palayam	78/1(P), 419&420	3.46.0	Lr.No.SEIAA-TN/F.No.9011/SEAC/ToR-1161/2022 Dated: 06.06.2022
TOTAL EXTENT				**3.46.0**	
Near by Proposed Quarries				
P2	Thiru.K. Sundararaj S/o. Karuppanna Gounder, Somayanur,	Belladhi	393/1A (P)	2.11.5	Lr.No.SEIAA-TN/F.No.9087/SEAC/ToR-1176/2022 Dated: 14.06.2022

CODE	Name of the Owner	Village	S.F. Nos	Extent in Ha	Status
	Chinnathadagam, Coimbatore District.				
P3	Sri Blue Metal, Prop. S. Gnanasekaren, No. 2/241, Kannarpalayam, Karamadai, Mettupalayam Taluk, Coimbatore District – 641 104.	Belladhi	343 & 344/1	2.69.05	Lr.No.SEIAA-TN/F.No.9044/SEAC/ToR-1163/2022 Dated: 06.06.2022
P4	Thiru.R. Raju S/o. Rangasamy Naidu, No.108 Deepalaya, Valluvar Street, Sivananda Colony, Coimbatore-641012	Belladhi	391	2.93.0	Lr.No.SEIAA-TN/F.No.9221/SEAC/ToR-1193/2022 Dated: 14.07.2022
P5	Thiru. R.K. Palanisamy S/o. T. Karivaradha Gounder, No. 4/51, Ramampalayam, Jadayampalayam Post, Mettupalayam, Coimbatore District. Tamil Nadu State – 641 302.	Belladhi	340 (P) and 341/3 (P)	4.90.0	Lr.No.SEIAA-TN/F.No.9309/SEAC/ToR-1242/2022 Dated: 30.08.2022
P6	S. Palanisamy	Chikkarama palaym	435/2B2, 435/2C, 435/2D, 435/2B1 & 435/2E	1.55.0	Public hearing Conducted
P7	M/s. Palanivel Sri Blue Metals	Chikkarama palaym	428/1A, 60/1B & 61	1.75.5	Public hearing Conducted
P8	Tmt.M. Muthammal	Chikkarama palaym	77/2E (P), 77/2F (P), 79/1A (P)	1.82.0	Public hearing Conducted
P9	C.N. Mani	Chikkaram palayam	75	2.47.5	Public hearing Conducted
P10	M/s. Sri Blue Metal	Chickkaram palayam	77/1B, 421/2B (P)	3.11.0	Public hearing Conducted
	TOTAL EXTENT			23.34.55	
CODE	Name of the Owner	Village	S.F. Nos	Extent in Ha	Status
E1	Tmt.P. Bakiavathy	Chickkaram palayam	482/2429/1,429/2	1.81.5	17.10.2017 to 16.10.2022
E2	Thiru. S. Gnanasekaran	Chickkaram palayam	77/2D (P)	1.01.2	01.10.2018 to 30.09.2023
E3	Technomax Building Solution	Bellathi	345/3	1.48.8	26.10.2018 to 25.10.2023
E4	Tmt. R. Poorani	Chickkaram Palayam	80/1	1.27.0	22.12.2018 to 21.12.2023
E5	Tmt. T. Kaveriammal	Chickkaram Palayam	77/2B	0.99.0	24.12.2018 to 23.12.2023
E6	R.K. Selvakumar	Chickkaram Palayam	69 (Part)	2.19.0	17.10.2017 to 16.10.2022

E7	R.Ganesan	Chickkaram Palayam	460/2 & 462/1(P)	1.51.5	-
		TOTAL EXTENT		**10.28.0**	
CODE	**Name of the Owner**	**Village**	**S.F. Nos**	**Extent in Ha**	**Status**
EX-1	T. Rajendran	Bellathi	331/3	0.93.0	17.09.2016 to 16.09.2021
		TOTAL EXTENT		**0.93.0**	
	TOTAL CLUSTER EXTENT			**38.01.55**	

- **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. A. Nandhakumar** Rough Stone & Gravel Quarry	
Toposheet No	58-A/16	
Latitude between	$11^0 14'42.00''$N to $11^0 14'47.83''$N	
Longitude between	$76^0 58'41.37''$E to $76^0 58'49.95''$E	
Highest Elevation	350m AMSL	
Proposed Depth of Mining (As per ToR)	47 m bgl (2 m Gravel + 45 m Rough Stone)	
Geological Resources	Rough Stone in m^3	Gravel m^3
	13,49,900	39,684
Mineable Reserves	Rough Stone in m^3	Gravel m^3
	3,86,746	28,470
Yearwise Production	Rough Stone in m^3	Gravel m^3
	3,86,746	28,470
Environmental Clearance	Lr.No.SEIAA-TN/F.No.3822/EC/1(a)/2709/2015 Dated: 11.01.2016	
Consent to Operate (CTO) from TNPCB	Proceedings No. F.0702CBN/RS/DEE/TNPCB/CBN/A/2021 DATED 13.02.2021	
Ultimate Pit Dimension	180m (L) x 205m (W) x 47m(D) bgl	
Water Level in the surrounding areas	65 – 70 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 Southern side. The altitude of the area is 350 m (max) above mean sea level. The area is covered by 2 m thickness of Gravel Formation. Massive Charnockite is found after 2 m (Gravel Formation) which is clearly inferred from the nearby existing quarrying pit.	
Machinery proposed	Jack Hammer	10 Nos
	Compressor	3 Nos
	Hydraulic Excavator	2 No
	Tippers	4 Nos
Blasting Method	Controlled Blasting Method by shot hole drilling and small dia of 25mm slurry explosive are proposed to be used for shattering and heaving effect for removal and winning of Rough Stone. No deep hole drilling is proposed.	
Proposed Manpower Deployment	38 Nos	
Project Cost	Rs. 79,45,000/-	
CER Cost	Rs. 5,00,000/-	
Nearby Water Bodies	Canal	140m NW
	Belladhi Lake	820m NW
	Canal	1.90 km East
	Bhavani River	7.5km NE
Greenbelt Development Plan	As per Mining plan it is Proposed to plant 1750 trees in the 7.5 m Safety Zone,approach road & panchayat roads.	
Proposed Water Requirement	3.5 KLD	

Nearest Habitation	2.0 km North

Source: Approved Mining Plan

TABLE 7.6: SALIENT FEATURES OF PROPOSAL "P2"

Name of the Project	Thiru. K. Sundararaj Rough stone and Gravel quarry		
Toposheet No	58-A/15		
Latitude between	$11^0 15'04.60''$ N to $11^0 15'10.07''$ N		
Longitude between	$76^0 59'22.63''$ E to $76^0 59'28.51''$ E		
Highest Elevation	348m AMSL		
Proposed Depth of Mining (As per ToR)	34 m bgl (2 m Gravel + 2 m Wheathered Formation + 30m Rough Stone)		
Geological Resources	Rough Stone in m^3	Weathered Formation m^3	Gravel m^3
	8,45,880	42,294	42,294
Mineable Reserves	Rough Stone in m^3	Weathered Formation m^3	Gravel m^3
	2,92,600	29,648	32,660
Yearwise production recommended in ToR	Rough Stone in m^3	Weathered Formation m^3	Gravel m^3
	2,65,550	29,648	32,600
Existing pit Dimension	NIL		
Environmental Clearance	It is a fresh quarry		
Consent to Operate (CTO) from TNPCB	It is a fresh quarry		
Ultimate Pit Dimension	144m (L) x 117m (W) x 44m (D)		
Water Level measured in the surrounding area	65-70m 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 Southeastern side. The altitude of the area is 348m (max) above mean sea level. The area is covered by 2m thickness of Gravel and 2m of Weathered formation. Massive Charnockite is found after 4m (2m Gravel + 2m Weathered formation) which is clearly inferred from the nearby existing quarrying pit.		
Machinery proposed	Jack Hammer	7 Nos	
	Compressor	2 No	
	Hydraulic Excavator	2 No	
	Tippers	4 No	
Blasting method and type of Explosives proposed	Controlled Blasting Method by shot hole drilling (35-32mm dia hole) and small dia of 25mm slurry explosive are proposed to use for winning of Rough Stone. No deep hole drilling is proposed.		
Proposed Manpower Deployment	35 Nos		
Project Cost	Rs.56,71,000/-		
CER Cost	Rs.5,00,000/-		
Nearby Water Bodies	Canal	950 m SE	
	Canal	1.1km NW	
	Belladhi lake	1.6km West	
	Bhavani River	6.6km North	
Greenbelt Development Plan	As per Mining plan it is Proposed to plant 1000 trees in the 7.5 m Safety Zone,approach road & panchayat roads.		
Proposed Water Requirement	2.0 KLD		
Nearest Habitation	Sikkarampalayam – 2.0Km- East		

Source: Approved Mining Plan

TABLE 7.7: SALIENT FEATURES OF PROPOSAL "P3"

Name of the Quarry	Tvl. Sri Blue Metals Rough Stone and Gravel Quarry	
Toposheet No	58-A/15	
Latitude between	$11^0 15'01.36''N$ to $11^0 15'07.48''N$	
Longitude between	$76^0 59'05.05''E$ to $76^0 59'11.68''E$	
Highest Elevation	352m AMSL	
Proposed Depth of Mining	47 m bgl (2 m Gravel + 45 m Rough Stone)	
Geological Resources	Rough Stone in m^3	Gravel in m^3
	12,09,600	53,760
Mineable Reserves	Rough Stone in m^3	Gravel in m^3
	4,83,960	42,900
Yearwise Production	Rough Stone in m^3	Gravel in m^3
	4,83,960	42,900
Existing pit dimension	-	
Environmental Clearance	-	
Consent to Operate (CTO) from TNPCB	-	
Ultimate Pit Dimension	150m (L) x 143m (W) x 47m (D) bgl	
Water Level in the surrounds area	65-70 m bgl	
Method of Mining	Opencast Mechanized Mining Method involving drilling and blasting	
Topography	The lease applied area is exhibits plain topography. The area has gentle sloping towards Northeastern side. The altitude of the area is 352 m (max) above mean sea level. The area is covered by 2 m thickness of Gravel formation. Massive Charnockite is found after 2 m Gravel formation which is clearly inferred from the nearby existing pit	
Machinery proposed	Jack Hammer	10 Nos
	Compressor	3 Nos
	Hydraulic Excavator	2 No
	Tippers	5Nos
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	41 Nos	
Project Cost	Rs. 79,58,000/-	
CER Cost	Rs. 5,00,000/-	
Nearby Water Bodies	Canal	680m NW
	Odai	120m N
	Belladhi Lake	1.45 km West
	Odai	6.65 km NE
	Bhavani River	6.8km N
Greenbelt Development Plan	As per Mining plan it is Proposed to plant 1300 trees in the 7.5 m Safety Zone,approach road & panchayat roads.	
Proposed Water Requirement	2.6 KLD	
Nearest Habitation	800m South	
Source: Approved Mining Plan		

TABLE 7.8: BRIEF DESCRIPTION OF THE PROJECT – P4

Name of the Quarry	Thiru.R. Raju Rough Stone and Gravel Quarry		
Toposheet No	58-A/15		
Latitude between	11°15'04.79"N to 11°15'10.11"N		
Longitude between	76°59'16.16"E to 76°59'22.73"E		
Highest Elevation	348m AMSL		
Proposed Depth of Mining	39m bgl (2 m Gravel +2m Weathered Gravel+ 35 m Rough Stone)		
Geological Resources	Rough Stone in m³	Gravel in m³	Weathered Gravel in m³
	6,01,908	378	378
Mineable Reserves	Rough Stone in m³	Gravel in m³	Weathered Gravel in m³
	1,48,565	378	378
Proposed Production	Rough Stone in m³	Gravel in m³	Weathered Gravel in m³
	1,21,590	-	-
Existing pit dimension	166m (L) x 147m (W) x 25m (D) bgl		
Environmental Clearance	-		
Consent to Operate (CTO) from TNPCB	-		
Ultimate Pit Dimension	166m (L) x 147m (W) x 44m (D) bgl		
Water Level in the surrounds area	60-65 m bgl		
Method of Mining	Opencast Mechanized Mining Method involving drilling and blasting		
Topography	The lease applied area is exhibits plain topography. The area has gentle sloping towards Northeastern side. The altitude of the area is 348 m (max) above mean sea level. The area is covered by 2 m thickness of Gravel formation. Massive Charnockite is found after 2 m Gravel formation which is clearly inferred from the nearby existing pit		
Machinery proposed	Jack Hammer	4 Nos	
	Compressor	1 Nos	
	Hydraulic Excavator	1 No	
	Tippers	2Nos	
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	20 Nos		
Project Cost	Rs. 41,11,000/-		
CER Cost	Rs. 5,00,000/-		
Nearby Water Bodies	Canal	1 km NW	
	Belladhi Lake	1.45 km West	
	Odai	6.65 km NE	
Greenbelt Development Plan	As per Mining plan it is Proposed to plant 1500 trees in the 7.5 m Safety Zone,approach road & panchayat roads.		
Proposed Water Requirement	3.0 KLD		
Nearest Habitation	430m NE		

TABLE 7.9: BRIEF DESCRIPTION OF THE PROJECT – P5

Name of the Quarry	Thiru.R.K. Palanisamy Rough Stone and Gravel Quarry
Toposheet No	58-A/15
Latitude between	11°15'04.00"N to 11°15'10.68"N
Longitude between	76°58'58.06"E to 76°59'07.10"E
Highest Elevation	352m AMSL
Proposed Depth of Mining	37m bgl (2 m Gravel + 35 m Rough Stone)

Geological Resources	Rough Stone in m^3	Gravel in m^3
	11,32,713	40,136
Mineable Reserves	Rough Stone in m^3	Gravel in m^3
	3,42,504	22,512
Proposed Production	Rough Stone in m^3	Gravel in m^3
	2,63,254	22,512
Existing pit dimension	196m (L) x 125m (W) x 35m (D) bgl	
Environmental Clearance	Lr.No.SEIAA-TN/F.No.4254/EC/1(a)/2897/2015 Dated: 15.02.2016	
Consent to Operate (CTO) from TNPCB	Proceedings No. F.0831CBN/RS/DEE/TNPCB/CBN/W/2017 DATED 17.11.2017	
Ultimate Pit Dimension	207m (L) x 186m (W) x 42m (D) bgl	
Water Level in the surrounds area	56-61 m bgl	
Method of Mining	Opencast Mechanized Mining Method involving drilling and blasting	
Topography	The lease applied area is exhibits plain topography. The area has gentle sloping towards Northwestern side. The altitude of the area is 352 m (max) above mean sea level. The area is covered by 2 m thickness of Gravel formation. Massive Charnockite is found after 2 m Gravel formation which is clearly inferred from the nearby existing pit	
Machinery proposed	Jack Hammer	8 Nos
	Compressor	2 Nos
	Hydraulic Excavator	2 No
	Tippers	4 Nos
Blasting Method	Controlled Blasting Method by shot hole drilling and small dia of 25mm slurry explosive are proposed to be used for shattering and heaving effect for removal and winning of Rough Stone. No deep hole drilling is proposed.	
Proposed Manpower Deployment	33 Nos	
Project Cost	Rs. 79,96,000/-	
CER Cost	Rs. 5,00,000/-	
Nearby Water Bodies	Canal	360 m West
	Belladhi Lake	850 m West
	Odai	1.5 km SE
Greenbelt Development Plan	As per Mining plan it is Proposed to plant 2500 trees in the 7.5 m Safety Zone, approach road & panchayat roads.	
Proposed Water Requirement	3.0 KLD	
Nearest Habitation	1.0 km NW	

TABLE 7.10: SALIENT FEATURES OF PROPOSAL "E1"

Name of the Quarry	Tmt. P.Bhagyavathy Rough Stone and Gravel Quarry	
Toposheet No	58-A/15	
Latitude between	11^{0}14'57"N to 11^{0}15'02"N	
Longitude between	76^{0}59'25"E to 76^{0}59'31"E	
Geological Resources	Rough Stone in m^3	Gravel m^3
	3,62,960	36,296
Mineable Reserves	Rough Stone in m^3	Gravel m^3
	60,940	10,064
Existing pit dimension	143m (L) x 63m (W) x 22m (D)	
Ultimate Pit Dimension	150m (L) x 103m (W) x 22m (D)	
Method of Mining	Opencast Mechanized Mining Method involving drilling and blasting	
Machinery proposed	Jack Hammer	1 Nos
	Compressor	1 Nos
	Hydraulic Excavator	1 Nos
	Tippers	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	12 Nos
Project Cost	Rs. 31,51,000 /-
CER Cost @ 2% of Project Cost	Rs. 63,020 /-

Source: Approved Mining Plan

TABLE 7.11: SALIENT FEATURES OF PROPOSAL "E2"

Name of the Quarry	Thiru. S.Gnanasekaran Roughstone and gravel quarry	
Toposheet No	58-A/15	
Latitude between	$11^0 14'49.77"$N to $11^0 14'53.70"$N	
Longitude between	$76^0 58'48.20"$E to $76^0 58'54.52"$E	
Geological Resources	Rough Stone in m^3	Gravel m^3
	3,03,600	20,240
Mineable Reserves	Rough Stone in m^3	Gravel m^3
	34,130	1,104
Existing pit dimension	128m(L) x 44m(W) x12m(D)	
Ultimate Pit Dimension	Pit-1: 129m(L) x 44m(W) x 32m(D) Pit-2: 64m(L) x 12m(W) x 7m(D)	
Method of Mining	Opencast Mechanized Mining Method involving drilling and blasting	
Machinery proposed	Jack Hammer	1 Nos
	Compressor	1 Nos
	Hydraulic Excavator	1 Nos
	Tippers	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	11 Nos	
Project Cost	Rs. 42,12,400/-	
CER Cost @ 2% of Project Cost	Rs.84,248/-	

Source: Approved Mining Plan

TABLE 7.12: SALIENT FEATURES OF PROPOSAL "E3"

Name of the Quarry	Tvl.Technomax Building Solution India Pvt. Ltd - Rough Stone and Gravel Quarry	
Toposheet No	58-A/15	
Latitude between	$11^0 15'07"$N to $11^0 15'13"$N	
Longitude between	$76^0 59'14"$E to $76^0 59'17"$E	
Geological Resources	Rough Stone and Gravel in m^3	
	8,62,200	
Mineable Reserves	Rough Stone in m^3	Gravel m^3
	1,06,085	19,060
Excavated pit Dimension	84m (L) x 7.5m (W) x 5m (D)	
Ultimate Pit Dimension	177m (L) x 61m (W) x 32m (D)	
Method of Mining	Opencast Mechanized Mining Method involving drilling and blasting	
Machinery proposed	Jack Hammer	1 Nos
	Compressor	1 Nos
	Hydraulic Excavator	1 Nos
	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	14 Nos
Project Cost	Rs. 29,58,000 /-
CER Cost @ 2% of Project Cost	Rs. 59,160 /-

Source: Approved Mining Plan

TABLE 7.13: SALIENT FEATURES OF PROPOSAL "E4"

Name of the Quarry	Tmt.R.Poorani Rough Stone & Gravel Quarry	
Toposheet No	58-A/15	
Latitude between	$11^0 14'45.54"$N to $11^0 14'48.39"$N	
Longitude between	$76^0 58'52.31"$E to $76^0 58'58.33"$E	
Geological Resources	Rough Stone in m^3	Gravel m^3
	5,09,080	25,454
Mineable Reserves	Rough Stone in m^3	Gravel m^3
	77,355	7,068
Existing pit dimension	60m(L) x 50m(W) x 20m(D)	
Ultimate Pit Dimension	118m(L) x 58m(W) x 42m (D)	
Method of Mining	Opencast Mechanized Mining Method involving drilling and blasting	
Machinery proposed	Jack Hammer	3 Nos
	Compressor	1 Nos
	Hydraulic Excavator	1 Nos
	Tippers	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	18 Nos	
Project Cost	Rs. 36,28,550 /-	
CER Cost @ 2% of Project Cost	Rs. 73,000 /-	

Source: Approved Mining Plan

TABLE 7.14: SALIENT FEATURES OF PROPOSAL "E5"

Name of the Quarry	Tmt.Kaveriammal Rough Stone & Gravel Quarry	
Toposheet No	58-A/15	
Latitude between	$11^0 14'51.16"$N to $11^0 14'53.59"$N	
Longitude between	$76^0 58'54.62"$E to $76^0 58'59.82"$E	
Geological Resources	Rough Stone in m^3	Gravel m^3
	3,60,270	24,018
Mineable Reserves	Rough Stone in m^3	Gravel m^3
	46,576	-
Existing pit dimension	85m (L) x 60m(W) x 19m(D)	
Ultimate Pit Dimension	85m(L) x 60m(W) x 42m (D)	
Method of Mining	Opencast Mechanized Mining Method involving drilling and blasting	
Machinery proposed	Jack Hammer	3 Nos
	Compressor	1 Nos
	Hydraulic Excavator	1 Nos
	Tippers	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	18 Nos	
Project Cost	Rs. 32,64,085/-	
CER Cost @ 2% of Project Cost	Rs. 67,000 /-	

Source: Approved Mining Plan

TABLE 7.15: SALIENT FEATURES OF PROPOSAL "E6"

Name of the Quarry	Thiru.R.K.Selvakumar Roughstone and Gravel quarry

Toposheet No	58-A/15	
Latitude between	$11^0 15'05.65''$ N to $11^0 15'10.63''$ N	
Longitude between	$76^0 59'00.09''$ E to $76^0 59'06.30''$ E	
Geological Resources	Rough Stone in m^3	Gravel m^3
	2,19,000	43,800
Mineable Reserves	Rough Stone in m^3	Gravel m^3
	1,27,480	6,360
Existing pit dimension	115m (L) x 108m (W) x 7m (D) bgl	
Ultimate Pit Dimension	152m (L) x 117m (W) x 7m (D) bgl	
Method of Mining	Opencast Mechanized Mining Method involving drilling and blasting	
Machinery proposed	Jack Hammer	2 Nos
	Compressor	1 Nos
	Hydraulic Excavator	- Nos
	Tippers	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.34,98,000/-	
CER Cost @ 2% of Project Cost	Rs. 59,488/-	

TABLE 7.16: SALIENT FEATURES OF PROPOSAL "E7"

Name of the Quarry	Thiru.R.Ganesan Roughstone and Gravel quarry	
Toposheet No	58-A/15	
Latitude between	$11^0 15'11.28''$ N to $11^0 15'16.63''$ N	
Longitude between	$76^0 59'52.42''$ E to $76^0 59'56.41''$ E	
Production for five years	Rough Stone in m^3	Gravel m^3
	1,89,650	22,990
Ultimate Pit Dimension	123m (L) x 95m (W) x 42m (D) bgl	
Method of Mining	Opencast Mechanized Mining Method involving drilling and blasting	
Machinery proposed	Jack Hammer	5 Nos
	Compressor	2 Nos
	Hydraulic Excavator	1 Nos
	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	23 Nos	
Project Cost	Rs.41,08,000/-	
CER Cost @ 2% of Project Cost	Rs. 83,000/-	

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 7.17: 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	3,86,746	77,349	258	43
P2	2,92,600	58,520	195	33
P3	4,83,960	96,792	322	54
P4	1,21,590	24,318	81	27
P5	2,63,254	52,650	175	30

P6	81,738	16,348	54	9
P7	1,29,689	25,938	86	14
P8	63,384	12,677	42	7
P9	2,00,603	40,121	134	22
P10	2,75,864	55,173	184	31
Total	**22,99,428**	**4,59,886**	**1,531**	**270**
E1	60,940	12,188	40	7
E2	34,130	6,826	22	4
E3	1,06,085	21,217	70	12
E4	77,355	15,471	51	9
E5	46,576	9,315	31	5
E6	1,27,480	25,496	85	14
E7	1,89,650	37,930	126	21
Total	**6,42,216**	**1,28,443**	**425**	**72**
Grand Total	**29,41,644**	**5,88,329**	**1,956**	**342**

TABLE 7.17: CUMULATIVE PRODUCTION LOAD OF GRAVEL

Quarry	Production for five year plan period	Per Year Production in m³	Per Day Production in m³	Number of Lorry Load Per Day
P1	28,470	9,490	31	5
P2	32,660	10,886	36	6
P3	42,900	14,300	48	8
P4	-	-	-	-
P5	22,512	7,504	25	4
P6	11,496	3,832	13	2
P7	7,038	2,346	8	1
P8	-	-	-	-
P9	-	-	-	-
P10	-	-	-	-
Total	**1,45,076**	**48,358**	**161**	**26**
E1	10,064	3,354	11	2
E2	1,104	1,104	4	1
E3	19,060	6,353	21	3
E4	7,068	2,356	8	1
E5	-	-	-	-
E6	6,360	2,120	7	1
E7	22,990	7,663	25	4
Total	**66,646**	**22,950**	**76**	**12**
Grand Total	**2,11,722**	**71,308**	**237**	**38**

On a cumulative basis considering the proposed quarries, it can be seen that the overall production of Rough Stone is 1,9561m³ per day and overall production of Gravel is 237 m³ per day with a capacity of 342 trips of Rough Stone per day and 38 Trips per day of Gravel from the cluster.

Note: Per day production of Rough Stone is calculated for 5 Years Lease Period and for Gravel production with 2 or 3 years of production period. And the load of existing quarries is covered under existing environment of the cluster.

Based on the above production quantities the emissions due to various activities in all the 17 mines includes various activities like ground preparation, excavation, handling and transport of ore. These activities have been analysed systematically basing on USEPA-Emission Estimation Technique Manual, for Mining AP-42, to arrive at possible emissions to the atmosphere and estimated emissions are given in Table 7.18.

TABLE 7.18: EMISSION ESTIMATION FROM QUARRIES WITHIN 500 METER RADIUS

EMISSION ESTIMATION FOR QUARRY "P1"				
	Activity	Source type	Value	Unit
Estimated Emission Rate for PM₁₀	Drilling	Point Source	0.078564385	g/s
	Blasting	Point Source	0.000724007	g/s

	Mineral Loading	Point Source	0.040511056	g/s
	Haul Road	Line Source	0.002488386	g/s/m
	Overall Mine	Area Source	0.056026982	g/s
Estimated Emission Rate for SO_2	Overall Mine	Area Source	0.000447229	g/s
Estimated Emission Rate for NOx	Overall Mine	Area Source	0.000024444	g/s
EMISSION ESTIMATION FOR QUARRY "P2"				
	Activity	**Source type**	**Value**	**Unit**
	Drilling	Point Source	0.055605678	g/s
Estimated Emission Rate for PM_{10}	Blasting	Point Source	0.000128591	g/s
	Mineral Loading	Point Source	0.036102563	g/s
	Haul Road	Line Source	0.002484127	g/s/m
	Overall Mine	Area Source	0.048715505	g/s
Estimated Emission Rate for SO_2	Overall Mine	Area Source	0.000138544	g/s
Estimated Emission Rate for NOx	Overall Mine	Area Source	0.000005679	g/s
EMISSION ESTIMATION FOR QUARRY "P3"				
	Activity	**Source type**	**Value**	**Unit**
	Drilling	Point Source	0.086443465	g/s
Estimated Emission Rate for PM_{10}	Blasting	Point Source	0.001167550	g/s
	Mineral Loading	Point Source	0.041822409	g/s
	Haul Road	Line Source	0.002490722	g/s/m
	Overall Mine	Area Source	0.061949643	g/s
Estimated Emission Rate for SO_2	Overall Mine	Area Source	0.000625478	g/s
Estimated Emission Rate for NOx	Overall Mine	Area Source	0.000042238	g/s
EMISSION ESTIMATION FOR QUARRY "P4"				
	Activity	**Source type**	**Value**	**Unit**
	Drilling	Point Source	0.072584325	g/s
Estimated Emission Rate for PM_{10}	Blasting	Point Source	0.000487336	g/s
	Mineral Loading	Point Source	0.039455959	g/s
	Haul Road	Line Source	0.002486942	g/s/m
Estimated Emission Rate for SO_2	Overall Mine	Area Source	0.000350638	g/s
Estimated Emission Rate for NOx	Overall Mine	Area Source	0.000022225	g/s
EMISSION ESTIMATION FOR QUARRY "P5"				
	Activity	**Source type**	**Value**	**Unit**
	Drilling	Point Source	0.096363812	g/s
Estimated Emission Rate for PM_{10}	Blasting	Point Source	0.002009946	g/s
	Mineral Loading	Point Source	0.043944459	g/s
	Haul Road	Line Source	0.002496205	g/s/m
Estimated Emission Rate for SO_2	Overall Mine	Area Source	0.001033536	g/s
Estimated Emission Rate for NOx	Overall Mine	Area Source	0.000106451	g/s
EMISSION ESTIMATION FOR QUARRY "P6"				
	Activity	**Source type**	**Value**	**Unit**
	Drilling	Point Source	0.060014139	g/s
Estimated Emission Rate for PM_{10}	Blasting	Point Source	0.000188314	g/s
	Mineral Loading	Point Source	0.037820608	g/s
	Haul Road	Line Source	0.002485291	g/s/m
Estimated Emission Rate for SO_2	Overall Mine	Area Source	0.045875596	g/s
Estimated Emission Rate for NOx	Overall Mine	Area Source	0.000208224	g/s
EMISSION ESTIMATION FOR QUARRY "P7"				
	Activity	**Source type**	**Value**	**Unit**
	Drilling	Point Source	0.068927914	g/s
Estimated Emission Rate for PM_{10}	Blasting	Point Source	0.000376348	g/s
	Mineral Loading	Point Source	0.039119245	g/s
	Haul Road	Line Source	0.002486549	g/s/m
Estimated Emission Rate for SO_2	Overall Mine	Area Source	0.048462644	g/s
Estimated Emission Rate for NOx	Overall Mine	Area Source	0.000301047	g/s

EMISSION ESTIMATION FOR QUARRY "P8"				
	Activity	**Source type**	**Value**	**Unit**
Estimated Emission Rate for PM_{10}	Drilling	Point Source	0.055605678	g/s
	Blasting	Point Source	0.000128591	g/s
	Mineral Loading	Point Source	0.036102563	g/s
	Haul Road	Line Source	0.002484127	g/s/m
Estimated Emission Rate for SO_2	Overall Mine	Area Source	0.048715505	g/s
Estimated Emission Rate for NOx	Overall Mine	Area Source	0.000138544	g/s
EMISSION ESTIMATION FOR QUARRY "P9"				
	Activity	**Source type**	**Value**	**Unit**
Estimated Emission Rate for PM_{10}	Drilling	Point Source	0.078564385	g/s
	Blasting	Point Source	0.000724007	g/s
	Mineral Loading	Point Source	0.040511056	g/s
	Haul Road	Line Source	0.002488386	g/s/m
Estimated Emission Rate for SO_2	Overall Mine	Area Source	0.056026982	g/s
Estimated Emission Rate for NOx	Overall Mine	Area Source	0.000447229	g/s
EMISSION ESTIMATION FOR QUARRY "P10"				
	Activity	**Source type**	**Value**	**Unit**
Estimated Emission Rate for PM_{10}	Drilling	Point Source	0.086443465	g/s
	Blasting	Point Source	0.001167550	g/s
	Mineral Loading	Point Source	0.041822409	g/s
	Haul Road	Line Source	0.002490722	g/s/m
Estimated Emission Rate for SO_2	Overall Mine	Area Source	0.061949643	g/s
Estimated Emission Rate for NOx	Overall Mine	Area Source	0.000625478	g/s
EMISSION ESTIMATION FOR QUARRY "E1"				
	Activity	**Source type**	**Value**	**Unit**
Estimated Emission Rate for PM_{10}	Drilling	Point Source	0.087649098	g/s
	Blasting	Point Source	0.001251272	g/s
	Mineral Loading	Point Source	0.042102401	g/s
	Haul Road	Line Source	0.002491313	g/s/m
	Overall Mine	Area Source	0.068795495	g/s
Estimated Emission Rate for SO_2	Overall Mine	Area Source	0.000682266	g/s
Estimated Emission Rate for NOx	Overall Mine	Area Source	0.000058127	g/s
EMISSION ESTIMATION FOR QUARRY "E2"				
	Activity	**Source type**	**Value**	**Unit**
Estimated Emission Rate for PM_{10}	Drilling	Point Source	0.059389863	g/s
	Blasting	Point Source	0.000178721	g/s
	Mineral Loading	Point Source	0.037368626	g/s
	Haul Road	Line Source	0.002484936	g/s/m
	Overall Mine	Area Source	0.040945162	g/s
Estimated Emission Rate for SO_2	Overall Mine	Area Source	0.000182352	g/s
Estimated Emission Rate for NOx	Overall Mine	Area Source	0.000005032	g/s
EMISSION ESTIMATION FOR QUARRY "E3"				
	Activity	**Source type**	**Value**	**Unit**
Estimated Emission Rate for PM_{10}	Drilling	Point Source	0.050959974	g/s
	Blasting	Point Source	0.000083131	g/s
	Mineral Loading	Point Source	0.036097148	g/s
	Haul Road	Line Source	0.002484124	g/s/m
	Overall Mine	Area Source	0.052437245	g/s
Estimated Emission Rate for SO_2	Overall Mine	Area Source	0.000133875	g/s
Estimated Emission Rate for NOx	Overall Mine	Area Source	0.000006481	g/s
EMISSION ESTIMATION FOR QUARRY "E4"				
	Activity	**Source type**	**Value**	**Unit**
Estimated Emission Rate for PM_{10}	Drilling	Point Source	0.046181079	g/s
	Blasting	Point Source	0.000050808	g/s

	Mineral Loading	Point Source	0.034447976	g/s
	Haul Road	Line Source	0.00248339	g/s/m
	Overall Mine	Area Source	0.038403514	g/s
Estimated Emission Rate for SO$_2$	Overall Mine	Area Source	7.96088E-05	g/s
Estimated Emission Rate for NOx	Overall Mine	Area Source	0.000001920	g/s
EMISSION ESTIMATION FOR QUARRY "E5"				
	Activity	**Source type**	**Value**	**Unit**
	Drilling	Point Source	0.059029582	g/s
	Blasting	Point Source	0.000173366	g/s
Estimated Emission Rate for PM$_{10}$	Mineral Loading	Point Source	0.038241054	g/s
	Haul Road	Line Source	0.002485657	g/s/m
	Overall Mine	Area Source	0.042406200	g/s
Estimated Emission Rate for SO$_2$	Overall Mine	Area Source	0.000221962	g/s
Estimated Emission Rate for NOx	Overall Mine	Area Source	0.000006604	g/s
EMISSION ESTIMATION FOR QUARRY "E6"				
	Activity	**Source type**	**Value**	**Unit**
	Drilling	Point Source	0.057549062	g/s
	Blasting	Point Source	0.000152688	g/s
Estimated Emission Rate for PM$_{10}$	Mineral Loading	Point Source	0.036518344	g/s
	Haul Road	Line Source	0.002484365	g/s/m
	Overall Mine	Area Source	0.038221411	g/s
Estimated Emission Rate for SO$_2$	Overall Mine	Area Source	0.000146086	g/s
Estimated Emission Rate for NOx	Overall Mine	Area Source	0.000003464	g/s
EMISSION ESTIMATION FOR QUARRY "E7"				
	Activity	**Source type**	**Value**	**Unit**
	Drilling	Point Source	0.047549062	g/s
	Blasting	Point Source	0.000132688	g/s
Estimated Emission Rate for PM$_{10}$	Mineral Loading	Point Source	0.027518344	g/s
	Haul Road	Line Source	0.002084365	g/s/m
	Overall Mine	Area Source	0.034221411	g/s
Estimated Emission Rate for SO$_2$	Overall Mine	Area Source	0.000134086	g/s
Estimated Emission Rate for NOx	Overall Mine	Area Source	0.000002764	g/s

Source: Emission Calculation

TABLE 7.19: INCREMENTAL & RESULTANT GLC WITHIN CLUSTER

PM$_{10}$ in µg/m^3	
Background	24.2
Incremental	17.72
Resultant	41.92
NAAQ Norms	**100 µg/m^3**
PM$_{2.5}$ in µg/m^3	
Background	43.4
Incremental	10.95
Resultant	54.35
NAAQ Norms	**60 µg/ m^3**
So2 in µg/m^3	
Background	19.8
Incremental	3.59
Resultant	23.39
NAAQ Norms	**80 µg/ m^3**
No2 in µg/m^3	
Background	23.4
Incremental	11.85

Resultant	35.25
NAAQ Norms	**80 µg/ m³**

Noise Environment –

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

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

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

Where:

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

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

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

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 7.20: PREDICTED NOISE INCREMENTAL VALUES FROM CLUSTER

Location ID	Background Value (Day) dB(A)	Incremental Value dB(A)	Total Predicted dB(A)	Residential Area Standards dB(A)
Habitation Near P1	47	48.1	50.6	
Habitation Near P2	41.4	46.1	47.4	
Habitation Near P3	42	49.2	50.0	
Habitation Near P4	38	43.4	46.8	
Habitation Near P5	41.7	45.3	49.4	
Habitation Near P6	46.3	45.8	49.2	
Habitation Near P7	38.86	40.1	42.5	
Habitation Near P8	41.4	46.1	47.4	
Habitation Near P9	47	48.1	50.6	55
Habitation Near P10	42	49.2	50.0	
Habitation Near E1	42.44	42.6	45.5	
Habitation Near E2	46.92	48.5	50.8	
Habitation Near E3	43.85	41.5	45.8	
Habitation Near E4	40.3	46.1	47.1	
Habitation Near E5	41.01	44.5	46.1	
Habitation Near E6	36.3	43.2	44.0	
Habitation Near E7	33.4	40.7	42.2	

Source: Lab Monitoring Data

The incremental noise level is found within the range of 40.1 – 50.8 dB (A) in Buffer zone. The noise level at different receptors in buffer zone is lower due to the distance involved and other topographical features adding to the noise attenuation. The resultant Noise level due to monitored values and calculated values at the receptors are based on the mathematical formula considering attenuation due to Green Belt as 4.9 dB (A)the barrier effect. From the above table, it can be seen that the ambient noise levels at all the locations near habitations are within permissible limits of Residential Area (buffer zone) as per THE NOISE POLLUTION (REGULATION AND CONTROL) RULES, 2000(The Principal Rules were published in the Gazette of India, vide S.O.123(E), dated 14.2.2000 and subsequently amended vide S.O. 1046(E),dated 22.11.2000, S.O. 1088(E), dated 11.10.2002, S.O. 1569 (E), dated 19.09.2006 and S.O. 50 (E) dated 11.01.2010 under the Environment(Protection) Act, 1986).

Ground Vibrations

Ground vibrations due to mining activities in the all the 17 Mines within cluster are anticipated due to operation of Mining Machines like Excavators, drilling and blasting, transportation vehicles, etc. However, the major source of ground vibration from the all the 17 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 12 mines respectively are as in below Table 7.21.

TABLE 7.21: NEAREST HABITATION FROM EACH MINE

Location ID	Distance & Direction
Habitation Near P1	2km North
Habitation Near P2	2km East
Habitation Near P3	800m South
Habitation Near P4	430m NE
Habitation Near P5	1.0 km NW
Habitation Near P6	550m SE
Habitation Near P7	1Km E
Habitation Near P8	600m SE
Habitation Near P9	470m SW
Habitation Near P10	380m SW
Habitation Near E1	750m NW
Habitation Near E2	380m West
Habitation Near E3	850m NW
Habitation Near E4	500m SW
Habitation Near E5	600m West
Habitation Near E6	700m SW
Habitation Near E7	660m SE

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

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

Where –

V = peak particle velocity (mm/s)

K = site and rock factor constant

Q = maximum instantaneous charge (kg)

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

R = distance from charge (m)

TABLE 7.22: GROUND VIBRATIONS AT 17 MINES

Location ID	Maximum Charge in kgs	Nearest Habitation in m	PPV in m/ms
P1	112	2km North	0.114
P2	85	2km East	0.091
P3	140	800m South	0.590
P4	35	430m NE	0.526
P5	76	1.0 km NW	0.486
P6	23	550m SE	0.253
P7	35	1Km E	0.136
P8	14	600m SE	0.181
P9	58	470m SW	0.683
P10	42	380m SW	1.241
E1	84	750m NW	0.435

E2	23	380m West	0.458
E3	14	850m NW	0.085
E4	10	500m SW	0.152
E5	23	600m West	0.220
E6	20	700m SW	0.154
E7	21	660m SE	0.132

Source: Blasting Calculations

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

Socio Economic Environment –

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

TABLE 7.23: SOCIO ECONOMIC BENEFITS FROM 17 MINES

Location ID	Project Cost	CER
P1	Rs.79,45,000	Rs.5,00,000
P2	Rs.56,71,000	Rs.5,00,000
P3	Rs.79,58,000	Rs.5,00,000
P4	Rs.41,11,000	Rs.5,00,000
P5	Rs.79,96,000	Rs.5,00,000
P6	Rs. 27,07,850	Rs.5,00,000
P7	Rs.29,13,070	Rs.5,00,000
P8	Rs.31,37,000	Rs.5,00,000
P9	Rs.44,85,000	Rs.5,00,000
P10	Rs.60,13,000	Rs.5,00,000
Total	**Rs. 5,29,36,920**	**Rs.50,00,000**
E1	Rs.31,26,000	Rs.25,000
E2	Rs.42,12,400	Rs. 1,05,000
E3	Rs.28,94,000	Rs. 64,000
E4	Rs.36,28,550	Rs.73,000
E5	Rs.32,64,085	Rs. 67,000
E6	Rs.34,98,000	Rs. 87,000
E7	Rs.61,55,000	Rs. 1,54,000
Total	**Rs.2,67,78,035**	**Rs.4,75,000**
Grand Total	**Rs. 7,97,14,955**	**Rs.54,75,000**

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 50,00,000/-**
- Existing Projects shall fund towards CER – **Rs.4,75,000/-**
- Projects in Cluster shall fund towards CER – **Rs 54,75,000/-**

TABLE 7.24: EMPLOYMENT BENEFITS FROM 17 MINES

Description	Employment
P1	38
P2	35
P3	41
P4	20
P5	33
P6	18
P7	21
P8	15
P9	25
P10	31
Total	**277**

Code	No of Trees
E1	12
E2	11
E3	14
E4	18
E5	18
E6	14
E7	10
Total	**97**
Grand Total	**374**

A total of 277 people will get employment due to 10 proposed mines in cluster and 97 people are already employed at existing mines.

TABLE 7.25: GREENBELT DEVELOPMENT BENEFITS FROM 17 MINES

Code	No of Trees proposed to be planted	Survival %	Area Covered	Name of the Species	No. of Trees expected to be grown
P1	1750	80%		Neem, Casuarina	1400
P2	1250	80%		Neem, Casuarina	1055
P3	1300	80%		Neem, Casuarina	1040
P4	1500	80%		Neem, Casuarina	1200
P5	2500	80%	Plantation is along safety distance, approach road	Neem, Casuarina	2000
P6	225	80%		Neem, Casuarina	180
P7	1,000	80%		Neem, Casuarina	800
P8	1,000	80%		Neem, Casuarina	800
P9	1,250	80%		Neem, Casuarina	1000
P10	1,500	80%		Neem, Casuarina	1250
Total	**13,275**	**80%**			**10,620**
E1	100	80%	1000	Neem, Casuarina	80
E2	120	80%	1500	Neem, Casuarina	96
E3	200	80%	1000	Neem, Casuarina	160
E4	400	80%	2000	Neem, Casuarina	320
E5	320	80%	2000	Neem, Casuarina	256
E6	150	80%	1000	Neem, Casuarina	120
E7	80	80%	2500	Neem, Casuarina	72
Total	**1,370**	**80%**	**11,000**	Neem, Casuarina	**1,104**

Based on the Proposed Mining Plans it's anticipated that there shall growth of native species of Neem, Casuarina, etc in the Cluster at a rate of 13,275 Trees Planted over a period of 5 Years with Survival Rate of 80% and expected growth is around 10,620Trees in Proposed Quarries.

7.5   PLASTIC WASTE MANAGEMENT PLAN FOR P1

All 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 7.26: 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 Projects for Quarrying Rough Stone and gravel at Chikkarampalayam Village aims to produce cumulatively 3,86,746 m³ Rough Stone over a period of 5 Years and Gravel 28,470 m³ for period of 3 years. This will enhance the socio-economic activities in the adjoining areas and will result in the following benefits

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

8.1 EMPLOYMENT POTENTIAL

It is proposed to provide employment to about 38 persons for carrying out mining operations and give preference to the local people in providing employment in the three proposed quarries in the cluster. In addition, there will be opportunity for indirect employment to many people in the form of contractual jobs, business opportunities, service facilities etc. the economic status of the local people will be enhanced due to mining project.

8.2 SOCIO-ECONOMIC WELFARE MEASURES PROPOSED

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

8.3 IMPROVEMENT IN PHYSICAL INFRASTRUCTURE

The proposed quarries are located in Chikkirampalayam Village, Mettupalayam Taluk and Coimbatore District of Tamil Nadu and the area have communications, roads and other facilities already well established. The following physical infrastructure facilities will further improve due to 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

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

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

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

CSR Cost Estimation

- CSR activities will be taken up in the Chikkirampalayam 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.
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.

For the proposed projects it is recommended to spent Rs 5,00,000/- towards CER Activities in the nearby Government School for Renovation or reconstruction of Existing Toilet, Provding Note books to the school library, Plantation in the school ground & any other recommendations by the School Head masters.

TABLE 8.1 CER – ACTION PLAN

Code	CER
P1	Rs 5,00,000/-

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

9.   ENVIRONMENTAL COST BENEFIT ANALYSIS

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

10   ENVIRONMENTAL MANAGEMENT PLAN – P1

10.0   GENERAL

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

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

10.1   ENVIRONMENTAL POLICY

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

The Proponent Thiru. A. Nandakumar will –

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

Description of the Administration and Technical Setup –

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

The said team will be responsible for:

- Monitoring of the water/ waste water quality, air quality and solid waste generated
- Analysis of the water and air samples collected through external laboratory
- Implementation and monitoring of the pollution control and protective measures/ devices which shall include financial estimation, ordering, installation of air pollution control equipment, waste water treatment plant, etc.
- Co-ordination of the environment related activities within the project as well as with outside agencies
- Collection of health statistics of the workers and population of the surrounding villages
- Green belt development
- Monitoring the progress of implementation of the environmental monitoring programme
- Compliance to statutory provisions, norms of State Pollution Control Board, Ministry of Environment and Forests and the conditions of the environmental clearance as well as the consents to establish and consents to operate.

10.2   LAND ENVIRONMENT MANAGEMENT –

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

TABLE 10.1: PROPOSED CONTROLS FOR LAND ENVIRONMENT – P1

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

Source: Proposed by FAE's & EIA Coordinator

10.3   SOIL MANAGEMENT

There is no overburden or waste anticipated from proposed project.

TABLE 10.2: PROPOSED CONTROLS FOR SOIL MANAGEMENT – P1

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

Source: Proposed by FAE's & EIA Coordinator

10.4   WATER MANAGEMENT

In the proposed quarrying project, no process is involved for the effluent generation, only oil & grease from the machinery wash is anticipated and domestic sewage from mine office. The quarrying operation is proposed upto a depth of 47 m BGL, the water table in the area is 65 m – 70 m below ground level, hence the proposed projects will not intersect the Ground water table during entire quarry period.

TABLE 10.3: PROPOSED CONTROLS FOR WATER ENVIRONMENT – P1

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 – P1

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 – P1

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

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

Source: Proposed by FAE's & EIA Coordinator

10.7.   GROUND VIBRATION AND FLY ROCK CONTROL

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

TABLE 10.6.: PROPOSED CONTROLS FOR GROUND VIBRATIONS & FLY ROCK – P1

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 1750 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 FOR5 YEAR PLAN PERIOD – P1

Year	No. of tress proposed to be planted	Area to be covered in m2	Name of the species	Survival rate expected in %	No. of trees expected to be grown
I	1750	Plantation along 7.5m safety distance,along approach road.	Neem, Pongamia Pinnata, Casuarina etc.,	80	1400

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

The objectives of the greenbelt development plan are –

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

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

10.8.2 Species Recommended for Plantation

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

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

TABLE 10.8: RECOMMENDED SPECIES TO PLANT IN THE GREENBELT – P1

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

Source: Proposed by FAE's & EIA Coordinator

10.9   OCCUPATIONAL SAFETY & HEALTH MANAGEMENT

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

10.9.1   Medical Surveillance and Examinations –

- Identifying workers with conditions that may be aggravated by exposure to dust & noise and establishing baseline measures for determining changes in health.

- Evaluating the effect of noise on workers

- Enabling corrective actions to be taken when necessary

- Providing health education

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

- General Physical Examination and Blood Pressure

- X-ray Chest and ECG

- Sputum test

- Detailed Routine Blood and Urine examination

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

TABLE 10.9: MEDICAL EXAMINATION SCHEDULE – P1

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)					

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

10.9.2   Proposed Occupational Health and Safety Measures –

- The mine site will have adequate drinking water supply so that workers do not get dehydrated.
- Lightweight and loose-fitting clothes having light colours will be preferred to wear.
- Noise exposure measurements will be taken to determine the need for noise control strategies.
- The personal protective equipment will be provided for mine workers.
- Supervisor will be instructed for reporting any problems with hearing protectors or noise control equipment.
- At noisy working activity, exposure time will be minimized.
- Dust generating sources will be identified and proper control measure will be adopted.
- Periodic medical examinations will be provided for all workers.

- Strict observance of the provisions of DGMS Acts, Rules and Regulations in respect of safety both by management and the workers.
- The width of road will be maintained more than thrice the width of the vehicle. A code of traffic rules will be implemented.
- In respect of contract work, safety code for contractors and workers will be implemented. They will be allowed to work under strict supervision of statutory person/officials only after they will impart training at vocational training centres. All personal protective equipment's will be provided to them.
- A safety committee meeting every month will be organized to discuss the safety of the mines and the persons employed.
- Celebration of annual mines safety week and environmental week in order to develop safety awareness and harmony amongst employees and co quarry owners.

FIGURE 10.1: PERSONAL PROTECTIVE EQUIPMENT TO THE MINE WORKERS – P1

10.9.3: Health and Safety Training Programme

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

TABLE 10.10: LIST OF PERIODICAL TRAININGS PROPOSED FOR EMPLOYEES – P1

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

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

10.9.4.: Budgetary Provision for Environmental Management –

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

TABLE 10.11: EMP BUDGET FOR PROPOSED PROJECT – P1

Activity	Mitigation measure	Provision for Implementation	Cost of EMP INR	
			Capital Cost INR	Recurring Cost INR
Haul Road Dust Suppression	Compaction, gradation and drainage on both sides	Rental Dozer & drainage construction on haul road length 200 m @ 300/ Meter	60,000/-	20,000/-
	Fixed Water Sprinkling Arrangements + thrice a day water sprinkling by own water tankers	Water @ Rs 200/- per tanker	7,00,000/-	1,80,000/-
	Air Quality will be regularly monitored as per norms within ML area & Ambient Area	Yearly Compliance as per CPCB norms	0	76,000/-
Mine Pit Operations	Muffle blasting to control fly rocks during blasting	Blasting face will be covered with sand bags/ steel mesh/ old tyres used conveyor belts	0	5,000/-
	Wet drilling procedure/ latest eco friendly drill machine with separate dust extractor unit	Provision made in operational cost	0	0
Truck Loading	No overloading of trucks/tippers/tractors	Manual Monitoring through Security guard	0	5,000/-
	Stone carrying trucks will be covered by tarpaulin to avoid escape of fines to the atmosphere	Monitoring if trucks will be covered by tarpaulin	0	10,000/-
	Enforcing speed limits of 20 km/hr within ML area	Manual Monitoring through Security guard	0	5,000/-
	Regular monitoring of exhaust fumes as per RTO norms	Monitoring of Exhaust Fumes	0	5,000/-

Attribute	Activity	Mitigation measure	Provision for Implementation		Cost of EMP INR
Transportation over roads		Regular sweeping and maintenance of roads for at least about 200 m from quarry entrance	Provision for 3 labours @ Rs.20,000/labour (Contractual)	0	60,000/-
		Installing wheel wash system near exit gate of quarry	Installation + Maintenance + Supervision	50,000/-	10,000/-
Noise Management	Mine Pit Operations	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
		Plantation along periphery of lease area will act as attenuation.	Provision made in Operating Cost	0	0
Vibrations	Drilling & Blasting	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 in opposite side of bench face to reduce vibration during 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.	Installation of Warning System	25,000/-	2,000/
		Provision for Portable blaster shed	Installation of Portable blasting shelter	50,000/-	2,000/-
		Occasionally NONEL Blasting to control Fly rocks & ground vibration	Provision made in Operating Cost	0	7,00,000
Attribute	Activity	Mitigation measure	Provision for Implementation		Cost of EMP INR

				Capital Cost INR	Recurring Cost INR
Surface Water	Water collected during Monsoon period	During monsoon period surface runoff around the quarry will follow the garland drains/storm water drains as per natural drain pattern. Eroded sediments, through a garland drain will be entrapped before being discharged to the natural drainage system. Otherwise, the water from garland drains shall be collected in temporary pit reservoirs, after settling and this collected water shall be used for a plantation and dust suppression.	Provision for garland drain drains @ Rs. 300/Running Meter (Provision for Peripheral Length 700m) + Recurring for maintenance	*2,10,000/-	20,000/-
Solid Waste	Mine Pit Operations	Any domestic waste generated due to human activity will be collected and handed over to solid waste handling agency.	Provision for domestic waste collection and disposal through authorized agency (Capital Cost Member ship fee + Recurring for collection /disposal charges)	5,000/-	20,000/-
		Provision for dust bins etc.	Installation of dust bins	10,000/-	1000/-
Toilets/ Sanitation	Mine Pit Operations	Bio toilets will be made available outside mine lease on the land of owner itself	Provision made in Operating Cost	0	0
EC Condition	Display Board	Size 6' X 5' with blue background and white letters mentioning detailing as per Appendix – II in SEAC, Minutes	Fixed Display Board at the Quarry Entrance as permanent structure	30,000/-	1,000/-
Occupational Health and Safety	Mine Pit Operations	Workers will be provided with Personal Protective Equipment's	Provision of 38 kits	0	1,59,600/-

		Health check up for workers will be provisioned	IME & PME Health check up	0	1,14,000/-
		First aid facility will be provided	Provision of 6 kits	0	18,000/-
		Mine will have safety precaution signages, boards.	Provision for signages and boards made	20,000/-	2,000/-
		Barbed Wire Fencing to quarry area will be provisioned.	Wire Fencing @ 300 per Meter for 770m	*2,31,000/-	30,000/-
Development of Green Belt	Mine Pit Operations Transportation over roads	About 1750 Nos of trees along peripheral length within 7.5m safety zone	Site clearance, preparation of land, digging of pits / trenches, soil amendments, transplantation of saplings @ 200 per plant and maintenance	3,50,000/-	30,000/-
Mine Closure Activity	Mine Pit Operations	Closure includes Greenbelt development, wire fencing, garland drains	Provision made in Closure Cost	* 5,08,000/-	0
Traffic Management	Mine Pit Operations Transportation over roads	No parking will be provided on the transport routes. Separate provision within ML will be made for vehicles /HEMMs. Flaggers will be deployed for traffic management	Parking area with shelter and flags	50,000/-	10,000/-
Monitoring System	Mine pit, Operation & Vehicle movement	Installation of CCTV cameras in the mines and mine entrance	Camera 4 Nos, DVR, Monitor with internet facility	25,000/-	6,000/-
Attribute	**Activity**	**Mitigation measure**		**Cost of EMP INR**	

			Provision for Implementation	Capital Cost INR	Recurring Cost INR
Employment of Statutory / Competent Personnel	Supervision of Quarrying activities	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	0	7,80,000/-
TOTAL EMP BUDGET				**13,75,000/-**	**22,61,600/-**

*Marked cost is already discussed in the mining plan hence that is not included in the total Environmental Management plan cost

Total Cost for the five years

Year	Total Cost
1st	₹ 36,36,600
2nd	₹ 23,74,680
3rd	₹ 24,93,414
4th	₹ 26,18,085
5th	₹ 27,48,989

Cost inflation   5% per annum

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

10.10: CONCLUSION –

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

11.   SUMMARY AND CONCLUSION

The Chikkarampalayam Rough Stone and Gravel Cluster (Extent – 38.01.55 ha) consisting of 1 Proposed, 9 Nearest Proposed and 7 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 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".

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

The main scope of the EIA study is to quantify the cumulative impact in the study area due to cluster quarries and formulate the effective mitigation measures for each individual leases. A detailed account of the emission sources, emissions control equipment, background Air quality levels, Meteorological measurements, Dispersion model and all other aspects of pollution like effluent discharge, Dust generation etc., have been discussed in this report. The baseline monitoring study has been carried out during the months December 2022– February 2023 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 38 people directly in the proposed projects and indirectly around 30 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 Chikkarampalayam Rough Stone and Gravel Cluster Quarries (Extent – 38.01.55 ha).

12.   DISCLOSURE OF CONSULTANT

The Project Proponents –
   1.   Thiru. A. Nandakumar
   have engaged M/s Geo Exploration and Mining Solutions, an Accredited Organization under Quality Council of India – National Accreditation Board for Education & Training, New Delhi, for carrying out the EIA Study as per the ToR Issued for the proposed projects.

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

Declaration by experts contributing to the Cluster EIA/EMP for Chikkarampalayam Rough Stone & Gravel Quarry Project over an Extent of 38.01.55 ha in Chikkarampalayam Village of Mettupalayam Taluk, Coimbatore District of Tamil Nadu. It is also certified that information furnished in the above EIA study are true and correct to the best of our knowledge.

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

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

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

Date & Signature:
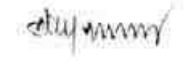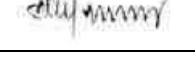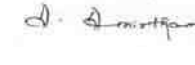
Period of Involvement: **January 2019 to till date**
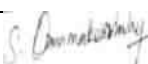
Associated Team Member with EIA Coordinator:
1. **Mr. S. Nagamani**
2. **Mr.P. Viswanathan**
3. **Mr. M. Santhoshkumar**
4. **Mr. S. Ilavarasan**
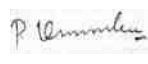
FUNCTIONAL AREA EXPERTS ENGAGED IN THE PROJECT

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

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

LIST OF TEAM MEMBERS ENGAGED IN THIS PROJECT

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

			▪ Assist in Resources & Reserve Calculation and preparation of Production Plan & Conceptual Plan	
5	Mr. A. Allimuthu	SE	▪ Site Visit with FAE ▪ Assist FAE with collection of data's ▪ Provide inputs by analysing primary and secondary data	
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 Chikkarampalayam Rough Stone & Gravel Quarry Project over a Cluster Extent of 38.01.55 ha in Chikkarampalayam Village of Mettupalayam Taluk, Coimbatore District of Tamil Nadu. It is also certified that information furnished in the EIA study are true and correct to the best of our knowledge.

Signature& Date:

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

Designation: **Managing Partner**

Name of the EIA Consultant Organization: **M/s. Geo Exploration and Mining Solutions**

NABET Certificate No & Issue Date: **NABET/EIA/2225/RA 0276 Dated: 20.02.2023**
Validity: **Valid till 06.08.2025**