DRAFT ENVIRONMENTAL IMPACT ASSESSMENT

&

ENVIRONMENT MANAGEMENT PLAN

FOR OBTAINING

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

"B1" CATEGORY (Cluster) – MINOR MINERAL - PATTA LAND – NON-FOREST LAND

THIRU M.R. GOVINDAN ROUGH STONE AND GRAVEL QUARRY

Cluster Extent: 23.90.11 ha

(3 Proposed + 6 Existing Quarries)

Project Proponent

Thiru. M.R. Govindan,

No.398, Sandhi Street,

Unaimancherry, Chennai,

Tamil Nadu - 600048

PROPOSED PRODUCTION	PROJECT LOCATION
First Five Year Production 92,005 m^3 of Rough stone, & 24,120 m^3 of Gravel Peak Production = 18,925 m^3 of Rough Stone & 8,640 m^3 of Gravel **Second Five Year Production** 92,005 m^3 of Rough stone, & 24,120 m^3 of Gravel Peak Production = 18,925 m^3 of Rough Stone & 8,640 m^3 of Gravel Mining Plan Period – 10 Years Proposed Depth – 32m Bgl	S.F.Nos. 331/4A, 331/4B, 331/5A, 331/5B, 331/6, 331/7A, 331/7B, 331/8A & 331/8B Extent: **1.76.50 Ha** Sirudhamur Village, Uthiramerur Taluk, Kancheepuram District

ToR obtained vide

File No.11001 TOR Identification No. TO24B0108TN5296358N Dated: 29.07.2024

Environmental Consultant

GEO EXPLORATION AND MINING SOLUTIONS

Old No. 260-B, New No. 17,
Advaitha Ashram Road, Alagapuram,
Salem – 636 004, Tamil Nadu, India

Accredited for sector 1 Cat 'A', sector 31 & 38 Cat 'B'
Certificate No : NABET/EIA/2225/RA 0276

Phone: 0427-2431989,
Email: infogeoexploration@gmail.com
Web: www.gemssalem.com

Laboratory

CHENNAI METTEX LAB PRIVATE LIMITED

Jothi Complex, 83, M.K.N. Road Guindy, Chennai – 600 032, Tamil Nadu, India,

Approved By AAI, AGMARK, APEDA, BIS, EIC, FSSAI, GAFTA, IOPEPC, MOEF & TEA BOARD

Baseline Monitoring Period

March 2023 to May 2023

March 2025

UNDERTAKING

I, M. R. Govindan given undertaking that this EIA & EMP report prepared for our Rough Stone and Gravel quarry situated in S.F. No 331/4A, 331/4B, 331/5A, 331/5B, 331/6, 331/7A, 331/7B, 331/8A & 331/8B over an extent of 1.76.50 Ha in Siruthamur Village, Uthiramerur Taluk and Kancheepuram District based on the ToR issued by the State Level Environmental Impact Assessment Authority (SEIAA), Tamil Nadu vide File No.11001 TO24B0108TN5296358N Dated: 29.07.2024-

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

Signature of the Project Proponent

M.R.Govindan

Place: Kancheepuram
Dated:

DECLARATION

I Dr. M.Ifthikhar Ahmed – EIA Co Ordinator declare that the EIA & EMP report for the Rough stone and Gravel quarry in S.F.No 331/4A, 331/4B, 331/5A, 331/5B, 331/6, 331/7A, 331/7B, 331/8A & 331/8B, over an extent of 1.76.50 Ha in Siruthamur Village, Uthiramerur Taluk and Kancheepuram District has been prepared by Geo Exploration and Mining Solutions, Salem, Tamil Nadu.

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

Signature of the EIA Co-ordinator

Dr. M. Ifthikhar Ahmed

Managing Partner

M/s. Geo Exploration and Mining Solutions

Place : Salem

Dated :

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

PROPOSED QUARRIES					
CODE	**Name of the Owner**	**Village**	**S.F. Nos**	**Extent in Ha**	**Status**
P1	Thiru. M.R.Govindan	Sirudhamur	331/4, 331/4B, 331/5A, 331/5B, 331/6, 331/7A, 331/7B, 331/8A & 331/8B	1.76.50	File No.11001 TO24B0108TN5296358N Dated: 29.07.2024-
P2	Thiru. M.R.Govindan	Sirumailur & Sithalapakkam	.3/1A, 3/1B, 3/2 & 5/2, 86/1, 86/2, 87/1(P)	4.37.5	File No.11247 TO24B0108TN5553717N Dated: 22.10.2024
P3	M/s. Murugappa Blue Metals	Sirumailur	15/1, 16/1 etc	1.39.81	Lr No. SEIAA-TN/F.No.9806/ToR- 1456/2023 Dated: 10.05.2023
			TOTAL EXTENT	**7.53.81**	
EXISTING QUARRIES					
CODE	**Name of the Owner**	**Village**	**S.F. Nos**	**Extent in Ha**	**Status**
E-1	Thiru.S.Murugesan	Sirudhamur	324/4A, 4B1	3.11.00	07.02.2023 to 06.02.2028
E-2	Thiru.D.Arunkumar	Sirudhamur	338/1(P)	4.95.00	19.05.2023 to 18.05.2028
E-3	Thiru.M.Ganesan	Sirudhamur	324/1A, 1B etc.,	2.40.00	17.11.2023 to 16.11.2033
E-4	Thiru.M.Ganesan	Sirudhamur	323/3, 323/4 etc.,	2.13.00	28.11.2023 to 27.11.20233
E-5	Thiru.N.Kanniyappan	Sirudhamur	319/1, 319/2 etc.,	1.62.00	22.11.2023 to 21.11.2033
E-6	Thiru.K.Prabakaran	Sirudhamur	320/5	2.15.30	17.05.2023 – 16.05.20233
			TOTAL EXTENT	**16.36.30**	
EXPIRED QUARRIES					
Nil					
ABANDONED QUARRIES					
A-1	Thiru.D.Nandakumar	Sirumailur	11/1, 11/2A, 11/2B, 12/1, 12/2, 12/3, 12/4, 12/5	3.92.50	08.12.2017 to 07.12.2022
A-2	RCS Infrastructure Pvt Ltd	Sirudhamur	323/1A, 323/2A, 324/10B, 324/7B, 327/3B, 327/4	1.80.0	23.02.2015 to 22.02.2020
A-3	RCS Infrastructure Pvt Ltd	Sirudhamur	327/6	2.39.0	20.12.2011 to 19.12.2016
A-4	Thiru.S.Jayachandran	Sirudhamur	326(P)	2.00.0	16.02.2007 to 15.02.2012
A-5	Thiru.S.Krishnakumar	Sirudhamur	106	0.79.50	16.02.2007 to 15.02.2012
			TOTAL EXTENT	**10.91.0**	
			TOTAL CLUSTER EXTENT	**23.90.11**	

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

TERMS OF REFERENCE (ToR) COMPLIANCE

Thiru.M. R, Govindan

"ToR issued vide File No.11001 TOR Identification No: TO24B0108TN5296358N Dated:29.07.2024

	SPECIFIC CONDITIONS	
1	A Cluster Management Committee (CMC) shall be constituted including all the mines inthe cluster as Committee Members for the effective management of the mining operation in the cluster through systematic & scientific approach with appointment of statutory personnel, appropriate environmental monitoring, good maintenance of haul roads and village/panchayat roads, authorized blasting operation etc. The PP shall submit the following details in the form of an Affidavit during the EIA appraisal:(i) Copy of the agreement forming CMC. (ii) The Organisation chart of the Committee with defining the role of the members (iii) The 'Standard Operating Procedures' (SoP) executing the planned activities	**Noted & agreed.**
2	The Proponent shall take necessary action to shift to the EB line as indicated by the Deputy Director, Dept of G&M vide Letter dated 08.03.2024	**Noted & agreed.**
3	Since waterbodies are situated nearby, the PP shall carry out the scientific studies to assess the hydrogeological condition of the quarry to determine impacts of the mining operation on the ground water conditions in the waterbodies.	**Noted & agreed.** The hydro-geological study was conducted to evaluate the possible impact on the ground water table. No significant impacts are anticipated on the water bodies around the project area. Details are discussed under Chapter No. 3.
4	The structures within the project site & within the radius of (i) 50 m, (ii) 100 m, (iii) 200 m and (iv) 300 m & upto 1km shall be enumerated with details such as dwelling houses with number of occupants, whether it belongs to the owner (or) not, places of worship, industries, factories, sheds,etc. and spell out the mitigation measures to be proposed for the protection of the above structures, if any during the quarrying operations.	**Noted and agreed.**
5	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.** Greenbelt development and Fencing photographs furnished. The Barbed Wire fencing has been erected all around the boundary. No trees within the project site, hence transplantation not required.
6	The Proponent shall carry out Bio diversity study as a part of EIA study and the same shall be included in the Report.	**Noted and agreed.** Biodiversity study has been carried out by Functional Area Expert by the NABET accredited consultant. The detailed study is given in the Chapter No.3
7	The PP shall prepare the EMP for the entire project life of mine, i.e, 10 years and also furnish the sworn affidavit stating to abide the EMP for the entire life of mine.	**Noted and agreed.** The PP prepared the EMP for the entire project life of mine and discussed in chapter 10.
8	The PP shall carry out the comprehensive studies on the cumulative environmental impacts of the existing & proposed quarries which included drilling & blasting, loading & hauling on the surrounding village and structures.	**Noted and agreed.** The cumulative impact study on the agriculture area due to mining crushers and other activities around the project site is discussed in Chapter 7.
	2.SEAC STANDARD CONDITIONS	
1	In the case of existing/operating mines, a letter obtained from the concerned AD (Mines) shall be	Not applicable It is a fresh lease

	submitted and it shall include the following: (i) Original pit dimension (ii) Quantity achieved Vs EC Approved Quantity (iii) Balance Quantity as per Mineable Reserve calculated. (iv) Mined out Depth as on date Vs EC Permitted depth (v) Details of illegal/illicit mining (vi) Violation in the quarry during the past working. (vii) Quantity of material mined out outside the mine lease area (viii) Condition of Safety zone/benches (ix) Revised/Modified Mining Plan showing the benches of not exceeding 6 m height and ultimate depth of not exceeding 50m.	
2	Details of habitations around the proposed mining area and latest VAO certificate regarding the location of habitations within 300m radius from the periphery of the site.	**Noted & agreed.** The PP obtained VAO Certificate regarding the location of habitations within 300m radius from the periphery of the site and enclosed with as annexure.
3	The proponent is requested to carry out a survey and enumerate on the structures located within the radius of (i) 50 m, (ii) 100 m, (iii) 200 m and (iv) 300 m (v) 500m shall be enumerated with details such as dwelling houses with number of occupants, whether it belongs to the owner (or) not, places of worship, industries, factories, sheds, etc with indicating the owner of the building, nature of construction, age of the building, number of residents, their profession and income, etc.	**Noted & agreed.** Structure Map included in the Chapter-3 Socioeconomic environment Report.
4	The PP shall submit a detailed hydrological report indicating the impact of proposed quarrying operations on the waterbodies like lake, water tanks, etc are located within 1 km of the proposed quarry.	**Noted and agreed** The hydro-geological study was conducted to evaluate the possible impact on the ground water table. No significant impacts are anticipated on the water bodies around the project area. Details are discussed under Chapter No. 3 • Odai –240m - SW • Tank – 320m-E • Tank – 1.5km-SE • Cheyyar River – 3.2km-NW • Kaveripakkam lake – 3.8km-NE • Palar River – 5.0km-N • Salavakkam lake – 5.8km-SE
5	The Proponent shall carry out Bio diversity study through reputed Institution and the same shall be included in EIA Report.	**Noted and agreed** Biodiversity study has been carried out by Functional Area Expert by the NABET accredited consultant. The detailed study is given in the Chapter No.3
6	The DFO letter stating that the proximity distance of Reserve Forests, Protected Areas, Sanctuaries, Tiger reserve etc., up to a radius of 25 km from the proposed site.	**Noted and agreed** DFO letter will be submitted along with the Final EIA/EMP report
7	In the case of proposed lease in an existing (or old) quarry where the benches are not formed (or) partially formed as per the approved Mining Plan, the Project Proponent (PP) shall the PP shall carry out the scientific studies to assess the slope stability of the working benches to be constructed and existing quarry wall, by involving any one of the reputed Research and Academic Institutions CSIR-Central Institute of Mining & Fuel Research / Dhanbad, NIRM/Bangalore, Division of Geotechnical Engineering-IIT-Madras, NIT-Dept of Mining Engg, Surathkal, and Anna University Chennai-CEG Campus.	Fresh Lease

	The PP shall submit a copy of the aforesaid report indicating the stability status of the quarry wall and possible mitigation measures during the time of appraisal for obtaining the EC.	
8	However, in case of the fresh/virgin quarries, the Proponent shall submit a conceptual 'Slope Stability Plan' for the proposed quarry during the appraisal while obtaining the EC, when the depth of the working is extended beyond 30 m below ground level.	**Noted and agreed** Proponent requested as will be carrying the slope stability Plan after commencement of quarrying operation and ensure that the reports will be submitted along with HYCR.
9	The PP shall furnish the affidavit stating that the blasting operation in the proposed quarry is carried out by the statutory competent person as per the MMR 1961 such as blaster, mining mate, mine foreman, II/I Class mines manager appointed by the proponent.	**Noted and agreed** Proponent given affidavit stating that the blasting will be carried out under the supervision of Competent person.
10	The PP shall present a conceptual design for carrying out only controlled blasting operation involving line drilling and muffle blasting in the proposed quarry such that the blast-induced ground vibrations are controlled as well as no fly rock travel beyond 30 m from the blast site.	**Noted and agreed**
11	The EIA Coordinators shall obtain and furnish the details of quarry/quarries operated by the proponent in the past, either in the same location or elsewhere in the State with video and photographic evidences	**Noted and agreed.** There are two quarries including this proposal in the cluster belongs to the Proponent Thiru.M.R.Govindan
12	If the proponent has already carried out the mining activity in the proposed mining lease area after 15.01.2016, then the proponent shall furnish the following details from AD/DD, mines,	Fresh Lease
13	What was the period of the operation and stoppage of the earlier mines with last work permit issued by the AD/DD mines?	Fresh Lease
14	Quantity of minerals mined out. · Highest production achieved in any one year · Detail of approved depth of mining. · Actual depth of the mining achieved earlier. · Name of the person already mined in that leases area. · If EC and CTO already obtained, the copy of the same shall be submitted. · Whether the mining was carried out as per the approved mine plan (or EC if issued) with stipulated benches.	
15	All corner coordinates of the mine lease area, superimposed on a High-Resolution Imagery/Topo sheet, topographic sheet, geomorphology, lithology and geology of the mining lease area should be provided. Such an Imagery of the proposed area should clearly show the land use and other ecological features of the study area (core and buffer zone).	**Noted and agreed** Satellite imagery of the project area along with boundary coordinates is given in the Chapter No 2, Figure No.2.2, Page No.11. Geomorphology of the area is given in Chapter No 2, Figure No.2.10, Page No.23 Land use pattern of the project area is tabulated in the Chapter No.2. Table no 2.4, Pg.No.18
16	The PP shall carry out Drone video survey covering the cluster, green belt, fencing, etc.,	**Noted and agreed.** PP carried out the drone video survey and will be submitted during the appraisal while obtaining the EC.
17	The proponent shall furnish photographs of adequate fencing, green belt along the periphery including replantation of existing trees & safety distance between the adjacent quarries & water bodies nearby provided as per the approved mining plan.	**Noted and agreed** The area has been fenced and plantation activities carried out within the project site.

18	The Project Proponent shall provide the details of mineral reserves and mineable reserves, planned production capacity, proposed working methodology with justifications, the anticipated impacts of the mining operations on the surrounding environment, and the remedial measures for the same.	**Noted and agreed** The details of mineral reserves have been provided in Chapter No 1, Mineable reserves– 1,80,355 m^3 Ultimate Depth 189m(L) x 72m (W) x 32m (D) Year wise production for first five years – 92,005m^3 Peak Production – 18,925m^3 of ROM Depth – 32m bgl
19	The Project Proponent shall provide the Organization chart indicating the appointment of various statutory officials and other competent persons to be appointed as per the provisions of the Mines Act'1952 and the MMR, 1961 for carrying out the quarrying operations scientifically and systematically in order to ensure safety and to protect the environment.	**Noted and agreed.** The PP provided Organization chart indicating the appointment of various statutory officials and other competent persons to be appointed as per the provisions of the Mines Act'1952 and the MMR, 1961
20	The Project Proponent shall conduct the hydro-geological study considering the contour map of the water table detailing the number of groundwater pumping & open wells, and surface water bodies such as rivers, tanks, canals, ponds, etc. within 1 km (radius) along with the collected water level data for both monsoon and non-monsoon seasons from the PWD / TWAD so as to assess the impacts on the wells due to mining activity. Based on actual monitored data, it may clearly be shown whether working will intersect groundwater. Necessary data and documentation in this regard may be provided.	**Noted and agreed** The hydro-geological study was conducted to evaluate the possible impact on the ground water table. No significant impacts are anticipated on the water bodies around the project area. Details are discussed under Chapter No. 3,
21	The proponent shall furnish the baseline data for the environmental and ecological parameters with regard to surface water/ground water quality, air quality, soil quality & flora/fauna including traffic/vehicular movement study	**Noted and agreed** Baseline Data were collected for One Season (Pre Monsoon) March to May 2023 as per CPCB Notification and MoEF & CC Guidelines. Details in Chapter No. 3
22	The Proponent shall carry out the Cumulative impact study due to mining operations carried out in the quarry specifically with reference to the specific environment in terms of soil health, biodiversity, air pollution, water pollution, climate change and flood control & health impacts. Accordingly, the Environment Management plan should be prepared keeping the concerned quarry and the surrounding habitations in the mind.	**Noted and agreed** The Cumulative impact study due to mining operations is explained in chapter - 7
23	Rain water harvesting management with recharging details along with water balance (both monsoon & non-monsoon) be submitted.	Noted and agreed
24	Land use of the study area delineating forest area, agricultural land, grazing land, wildlife sanctuary, national park, migratory routes of fauna, water bodies, human settlements and other ecological features should be indicated. Land use plan of the mine lease area should be prepared to encompass preoperational, operational and post operational phases and submitted. Impact, if any, of change of land use should be given.	**Noted and agreed** Land use and land cover of the study area is discussed in Chapter No. 3. Land use plan of the project area showing pre-operational, operational and post-operational phases are discussed in Chapter No. 2
25	Details of the land for storage of Overburden/Waste Dumps (or) Rejects outside the mine lease, such as extent of land area, distance from mine lease, its land use, R&R issues, if any, should be provided.	Not applicable.
26	Proximity to Areas declared as 'Critically Polluted' (or) the Project areas which attracts the court	Not Applicable.

	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.	Project area / Study area is not declared in 'Critically Polluted' Area and does not come under 'Aravalli Range.
27	Description of water conservation measures proposed to be adopted in the Project should be given. Details of rainwater harvesting proposed in the Project, if any, should be provided.	**Noted and agreed** Part of the working pit will be allowed to collect rain water during the spell of rain will be used for greenbelt development and dust suppression. The Mine Closure Plan is prepared for converting the excavated pit into rain water harvesting structure and serve as water reservoir for the project village during draught season.
28	Impact on local transport infrastructure due to the Project should be indicated.	**Noted and agreed** Transportation details mentioned in Chapter -2
29	A tree survey study shall be carried out (nos., name of the species, age, diameter etc.,) both within the mining lease applied area & 300m buffer zone and its management during mining activity.	**Noted and agreed** Details of the trees in the buffer zone given in Chapter No.3&4
30	A detailed mine closure plan for the proposed project shall be included in EIA/EMP report which should be site-specific	**Noted and agreed** After the completion of mining operation, the part of the quarried-out land will be utilized as temporary storage reservoir. The details are given in the Chapter No.4
31	As a part of the study of flora and fauna around the vicinity of the proposed site, the EIA coordinator shall strive to educate the local students on the importance of preserving local flora and fauna by involving them in the study, wherever possible	**Noted and agreed** Details are given in the Chapter No.3
32	The purpose of Green belt around the project is to capture the fugitive emissions, carbon sequestration and to attenuate the noise generated, in addition to improving the aesthetics. A wide range of indigenous plant species should be planted as given in the Appendix-I in consultation with the DFO, State Agriculture University. The plant species with dense/moderate canopy of native origin should be chosen. Species of small/medium/tall trees alternating with shrubs should be planted in a mixed manner.	**Noted and agreed** Noted & agreed. It is proposed to plant a 900nos of trees in the 7.5m safety barrier and village roads.
33	Taller/one-year-old Saplings raised in appropriate size of bags, preferably ecofriendly bagsshould be planted as per the advice of local forest authorities/botanist/Horticulturist with regard to site specific choices. The proponent shall earmark the greenbelt area with GPS coordinates all along the boundary of the project site with at least 3 meters wide and in between blocks in an organized manner	**Noted and agreed** It is a Fresh Lease. No trees within the project site. it is proposed to plant 900Nos of Trees in the safety barrier and Village roads.
34	A Disaster Management Plan shall be prepared and included in the EIA/EMP Report for the complete life of the proposed quarry (or) till the end of the lease period	**Noted and agreed** Disaster management Plan details in Chapter-7
35	A Risk Assessment and management Plan shall be prepared and included in the EIA/EMP Report for the complete life of the proposed quarry (or) till the end of the lease period	**Noted and agreed** A Risk Assessment and management Plan Chapter- 7
36	Occupational Health impacts of the Project should be anticipated and the proposed preventive measures spelt	**Noted and agreed** Occupational Health impacts chapter- 10

	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.	
37	Public health implications of the Project and related activities for the population in the impact zone should be systematically evaluated and the proposed remedial measures should be detailed along with budgetary allocations.	**Noted and agreed** No Public Health Implications anticipated due to this project. Details of CER are discussed under Chapter 8
38	The Socio-economic studies should be carried out within a 5 km buffer zone from the mining activity. Measures of socio-economic significance and influence to the local community proposed to be provided by the Project Proponent should be indicated. As far as possible, quantitative dimensions may be given with time frames for implementation.	**Noted and agreed** It is explained in Chapter -3
39	Details of litigation pending against the project, if any, with direction /order passed by any Court of Law against the Project should be given.	**Noted and agreed** No, Litigation against the project
40	Benefits of the Project if the Project is implemented should be spelt out. The benefits of the Project shall clearly indicate environmental, social, economic, employment potential, etc.	**Noted and agreed** Chapter-8 discussed about benefits of projects.
41	If any quarrying operations were carried out in the proposed quarrying site for which now the EC is sought, the Project Proponent shall furnish the detailed compliance to EC conditions given in the previous EC with the site photographs which shall duly be certified by MoEF&CC, Regional Office, Chennai (or) the concerned DEE/TNPCB.	It is a fresh lease
42	The PP shall prepare the EMP for the entire life of mine and also furnish the sworn affidavit stating to abide the EMP for the entire life of mine.	**Noted and agreed** The EMP prepared for the life of the mine and discussed in chapter 10.
43	Concealing any factual information or submission of false/fabricated data and failure to comply with any of the conditions mentioned above may result in withdrawal of this Terms of Conditions besides attracting penal provisions in the Environment (Protection) Act, 1986.	Noted & agreed.

SEIAA STANDARD CONDITIONS		
Cluster Management Committee		
1	Cluster Management Committee shall be framed which must include all the proponents in the cluster as members including the existing as well as proposed quarry.	**Noted and agreed** Cluster management committee has been formed with mutual agreement with the proponents including Proposed quarry at present are framed.
2	The members must coordinate among themselves for the effective implementation of EMP as committed including Green Belt Development, Water sprinkling, tree plantation, blasting etc.,	**Noted and agreed** As per the committee agreement proponents will coordinates for the Greenbelt development, Water sprinkling and tree plantation activities combinedly.
3	The List of members of the committee formed shall be submitted to AD/Mines before the execution of mining lease and the same shall be updated every year to the AD/Mines.	**Noted and agreed** The formation of committee with list of members has been submitted to the AD mines office, Krishnagiri and the same will be update in every year.
4	Detailed Operational Plan must be submitted which must include the blasting frequency with respect to the nearby quarry situated in the cluster, the usage of haul	**Noted and agreed** As per the committee agreement the blasting frequency will be discussed and carryout by

	roads by the individual quarry in the form of route map and network.	the Mines Manager appointed by the proponents and the same will be updated in the committee minutes. Transport details in chapter-2
5	The committee shall deliberate on risk & emergency management plan, fire safety & evacuation plan and sustainable development goals pertaining to the cluster in a holistic manner especially during natural calamities like intense rain and the mitigation measures considering the inundation of the cluster and evacuation plan.	**Noted and agreed** Details discussed in chapter 7 of Draft EIA report
6	The Cluster Management Committee shall form Environmental Policy to practice sustainable mining in a scientific and systematic manner in accordance with the law. The role played by the committee in implementing the environmental policy devised shall be given in detail in the EIA Report.	**Noted and agreed** Details discussed in chapter-6 of Draft EIA report
7	The committee shall furnish action plan regarding the restoration strategy with respect to the individual quarry falling under the cluster in a holistic manner.	Noted & agreed
8	The committee shall deliberate on the health of the workers/staff involved in the mining as well as the health of the public in the vicinity.	**Noted and agreed** Details discussed in chapter 10.
Agriculture & Agro-Biodiversity		
9	Impact on surrounding agricultural fields around the proposed mining Area.	**Noted and agreed** Detailed discussed in chapter 4.
10	Impact on soil flora & vegetation around the project site.	Detailed discussed in chapter 4.
11	Details of type of vegetation including no. of trees & shrubs within the proposed mining area and. If so, transplantation of such vegetation all along the boundary of the proposed mining area shall committed mentioned in EMP.	**Noted and agreed** The area is proposed Lease & Few trees present with in lease.
12	The Environmental Impact Assessment should study the agro-biodiversity, agro-forestry, horticultural plantations, the natural ecosystem, the soil micro flora, fauna and soil seed banks and suggest measures to maintain the natural Ecosystem.	Details in Chapter 3
13	Action should specifically suggest for sustainable management of the area and restoration of ecosystem for flow of goods and services.	Noted & agreed
14	The project proponent shall study and furnish the impact of project on plantations in adjoining patta lands, Horticulture, Agriculture and livestock	**Noted and agreed** The project area is dry barren land no agriculture activities carried out. This is a proposed lease area.
Forests		
15	The project proponent shall detailed study on impact of mining on Reserve forests and free ranging wildlife	**Noted and agreed.** Nearest Reserve Forest is Kavanipakkam-R.F- 3.0km-SE
16	The Environmental Impact Assessment should study impact on forest, vegetation, endemic, vulnerable and endangered indigenous flora and fauna.	**Noted and agreed** The area is surrounded by Barren land. Details of flora and fauna studies given in the Chapter No.3.
17	The Environmental Impact Assessment should study impact on standing trees and the existing trees should be numbered and action suggested for protection	No major trees within the project area.
18	The Environmental Impact Assessment should study impact on protected areas, Reserve Forests, National	**Noted & agreed.** Karikili Birds Sanctuary – 18.8km-S Vedanthangal Birds Sanctuary 19km-S

	Parks, Corridors and Wildlife pathways, near project site	
Water Environment		
19	Hydro-geological study considering the contour map of the water table detailing the number of ground water pumping & open wells, and surface water bodies such as rivers, tanks, canals, ponds etc. within 1 km (radius) so as to assess the impacts on the nearby waterbodies due to mining activity. Based on actual monitored data, it may clearly be shown whether working will intersect groundwater. Necessary data and documentation in this regard may be provided, covering the entire mine lease period	**Noted and agreed** There are 8 open wells and 9 bore wells within the radius of 1km from the project area, Hydrogeological study has been conducted by the resistivity method
20	Erosion Control measures	Noted & agreed
21	Detailed study shall be carried out in regard to impact of mining around the proposed mine lease area on the nearby Villages, Water-bodies/ Rivers, & any ecological fragile areas.	Details in Chapter 2
22	The project proponent shall study impact on fish habitats and the food WEB/ food chain in the water body and Reservoir	Details in Chapter 2 and 4 impact of bio diversity
23	The project proponent shall study and furnish the details on potential fragmentation impact on natural environment, by the activities.	Noted & agreed
24	The project proponent shall study and furnish the impact on aquatic plants and animals in water bodies and possible scars on the landscape, damages to nearby caves, heritage site, and archaeological sites possible land form changes visual and aesthetic impacts.	Noted & agreed. Detailed under Chapter 3.
25	The Terms of Reference should specifically study impact on soil health, soil erosion, the soil physical, chemical components and microbial components	Details in Chapter 3 Soil environment.
26	The Environmental Impact Assessment should study on wetlands, water bodies, rivers streams, lakes and farmer sites	Details in Chapter 3 Water environment.
27	The EIA shall include the impact of mining activity on the following: a) Hydrothermal/Geothermal effect due to destruction in the Environment. b) Bio-geochemical processes and its foot prints including environmental stress. c) Sediment geochemistry in the surface streams.	**Noted and agreed** There are 8 open wells and 9 bore wells within the radius of 1km from the project area, Hydrogeological study has been conducted by the resistivity method
Energy		
28	The measures taken to control Noise, Air, Water, Dust Control and steps adopted to efficiently utilise the Energy shall be furnished.	**Noted and agreed** Details in Chapter 3 environmental monitoring details.
Climate Change		
29	The Environmental Impact Assessment shall study in detail the carbon emission and also suggest the measures to mitigate carbon emission including development of carbon sinks and temperature reduction including control of other emission and climate mitigation activities	**Noted and agreed** Details of carbon emission and mitigation activities are given in the Chapter No.4
30	The Environmental Impact Assessment should study impact on climate change, temperature rise, pollution and above soil & below soil carbon stock, soil health and physical, chemical & biological soil features	**Noted and agreed** Details in Chapter-3 for meteorological and climate/weather data representation of graphs.
31	Impact of mining on pollution leading to GHGs emissions and the impact of the same on the local livelihood.	**Noted and agreed** Details of GHGs emissions and mitigation activities are given in the Chapter No.4

Mine Closure Plan		
32	Detailed Mine Closure Plan covering the entire mine lease period as per precise area communication order issued.	Details in Chapter 2 mine closure plan
EMP		
33	Detailed Environment Management Plan along with adaptation, mitigation & remedial strategies covering the entire mine lease period as per precise area communication order issued and the scope for achieving SDGs	Detailed under Chapter 10
34	The Environmental Impact Assessment should hold detailed study on EMP with budget for Green belt development and mine closure plan including disaster management plan.	Details in Green belt development in chapter 4
Risk Assessment		
35	To furnish risk assessment and management plan including anticipated vulnerabilities during operational and post operational phases of Mining.	Detailed under Chapter 7
Disaster Management Plan		
36	To furnish disaster management plan and disaster mitigation measures in regard to all aspects to avoid/reduce vulnerability to hazards & to cope with disaster/untoward accidents in & around the proposed mine lease area due to the proposed method of mining activity & its related activities covering the entire mine lease period as per precise area communication order issued.	Details in Study 7.3 Disaster Management Plan in Chapter -7
Others		
37	The project proponent shall furnish VAO certificate with reference to 300m radius regard to approved habitations, schools, Archaeological sites, Structures, railway lines, roads, water bodies such as streams, odai, vaari, canal, channel, river, lake pond, tank etc.	Noted & agreed. Detailed under Chapter 4
38	As per the MoEF& CC office memorandum F.No.22-65/2017-IA.III dated: 30.09.2020 and 20.10.2020 the proponent shall address the concerns raised during the public consultation and all the activities proposed shall be part of the Environment Management Plan.	Noted and agreed
39	The project proponent shall study and furnish the possible pollution due to plastic and microplastic on the environment. The ecological risks and impacts of plastic & microplastics on aquatic environment and fresh water systems due to activities, contemplated during mining may be investigated and reported	Details of carbon emission and mitigation activities are given in the Chapter No.4

Standard Terms of Reference for (Mining of minerals)		
S.No	**Terms of Reference**	**Reply**
1.1	An EIA-EMP Report shall be prepared for peak capacity (…..MTPA) operation in an ML/project area of.....ha based on the generic structure specified in Appendix III of the EIA Notification, 2006.	Peak Production – 18,925m^3 of ROM Depth – 32m bgl Mine Lease area – 1.76.50 Ha

1.2	An EIA-EMP Report would be prepared for peak capacity operation to cover the impacts and environment management plan for the project specific activities on the environment of the region, and the environmental quality encompassing air, water, land, biotic community, etc. through collection of data and information, generation of data on impacts including prediction modeling for.... MTPA of mineral production based on approved project/Mining Plan for.... MTPA. Baseline data collection can be for any season (three months) except monsoon.	Peak capacity of 18,925m^3 operation to cover the impacts and environment management plan in chapter- IV and Chapter 10 covered in project specific activities. Baseline Data were collected for Pre monsoon Season Mar to May 2023 as per CPCB Notification and MoEF & CC Guidelines. Details in Chapter No. III
1.3	Proper KML file with pin drop and coordinate of mine at 500-1000 m interval be provided.	Noted, Google earth image showing lease area with Coordinates of pillars in chapter-II.
1.4	A Study area map of the core zone (project area) and 10 km area of the buffer zone (1: 50,000 scale) clearly delineating the major topographical features such as the land use, surface drainage pattern including rivers/streams/nullahs/canals, locations of human habitations, major constructions including railways, roads, pipelines, major industries, mines, and other polluting sources. In case of ecologically sensitive areas such as Biosphere Reserves/National Parks/WL Sanctuaries/ Elephant Reserves, forests (Reserved/Protected), migratory corridors of fauna, and areas where endangered fauna and plants of medicinal and economic importance found in the 15 km study area should be given. The above details to be furnished in tabular form also.	Land use and land cover of the 10km Radius of study area is discussed in Chapter No. III. Geology map of the project area covering 10km radius Figure No. 2.9, Page No. 22. Geomorphology of the area is given in Chapter No 2 Figure No 2.10, Page No. 23 There are No National Parks, Biosphere Reserves, Wildlife Corridors, and Tiger/Elephant Reserves within 10 km Radius from the periphery of the project area.
1.5	Map showing the core zone delineating the agricultural land (irrigated and un-irrigated, uncultivable land as defined in the revenue records, forest areas (as per records), along with other physical features such as water bodies, etc should be furnished.	Land use and land cover of the study area is discussed in Chapter No. III with Physical features such as waterbodies, odai, canal etc.,
1.6	A contour map showing the area drainage of the core zone and 25 km of the study area (where the water courses of the core zone ultimately join the major rivers/streams outside the lease/project area) should also be clearly indicated in the separate map.	DEM data using Drainage pattern around 10km radius showing streams and lakes etc., discussed in Chapter No. 3.
1.7	Catchment area with its drainage map of 25 km area within and outside the mine shall be provided with names, details of rivers/ riverlet system and its respective order. The map should clearly indicate drainage pattern of the catchment area with basin of major rivers. Diversion of drains/ river need elaboration in form of length, quantity and quality of water to be diverted.	Drainage pattern around 10km radius showing streams and lakes etc., is discussed in Chapter No. 3.

1.8	(Details of mineral reserves, geological status of the study area and the seams to be worked, ultimate working depth and progressive stage-wise working scheme until the end of mine life should be provided on the basis of the approved rated capacity and calendar plans of production from the approved Mining Plan. Geological maps and sections should be included. The Progressive mine development and Conceptual Final Mine Closure Plan should also be shown in figures. Details of mine plan and mine closure plan approval of Competent Authority should be furnished for green field and expansion projects.	Details in chapter-2 showing the land features. And also enclosed Approved 3rd Scheme of mining plan in annexure.
1.9	Details of mining methods, technology, equipment to be used, etc., rationale for selection of specified technology and equipment proposed to be used vis-à-vis the potential impacts should be provided.	It is an opencast quarrying operation proposed to operate in Mechanized method. The height and width of the bench will be maintained as 5m with 90^0 bench angles. Quarrying activities will be carried out under the supervision of Competent Persons like Mines Manager, Mines Foreman and Mining Mate. Necessary permissions will be obtained from DGMS after obtaining Environmental Clearance.
1.10	Impact of mining on hydrology, modification of natural drainage, diversion and channeling of the existing rivers/water courses flowing though the ML and adjoining the lease/project and the impact on the existing users and impacts of mining operations thereon.	Impact Studies and Mitigation Measures of Water Environment including Surface Water and Ground Water are discussed in Chapter 4.
1.11	A detailed Site plan of the mine showing the proposed break-up of the land for mining operations such as the quarry area, OB dumps, green belt, safety zone, buildings, infrastructure, Stockyard, township/colony (within and adjacent to the ML), undisturbed area -if any, and landscape features such as existing roads, drains/natural water bodies to be left undisturbed along with any natural drainage adjoining the lease /project areas, and modification of thereof in terms of construction of embankments/bunds, proposed diversion/re-channeling of the water courses, etc., approach roads, major haul roads, etc should be indicated.	Not Applicable. The details of waste dump management are given in the Chapter No. 4

1.12

Original land use (agricultural land/forestland/grazing land/wasteland/water bodies) of the area should be provided as per the tables given below. Impacts of project, if any on the land use, in particular, agricultural land/forestland/grazing land/water bodies falling within the lease/project and acquired for mining operations should be analyzed. Extent of area under surface rights and under mining rights should be specified. Area under Surface Rights

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

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

Land use and land cover of the study area is discussed in Chapter No. 3.
Land use plan of the project area showing pre-operational, operational and post-operational phases are discussed in Chapter No. 2,

`	Present area in Ha	Area to be required during this present Scheme period (ha)	Area at the end of Life of Quarry (Ha)
Area Under Quarry	Nil	1.25.65	1.21.65
Site Services	Nil	0.01.00	0.01.00
Roads	Nil	0.01.00	0.01.00
Green Belt	Nil	0.24.64	0.50.55
Unutilized Area	1.76.50	0.24.21	0.02.30
Grand Total	**1.76.50**	**1.76.50**	**1.76.50**

1.13

Study on the existing flora and fauna in the study area (10km) should be carried out by an institution of relevant discipline. The list of flora and fauna duly authenticated separately for the core and study area and a statement clearly specifying whether the study area forms a part of the migratory corridor of any endangered fauna should be given. If the study area has endangered flora and fauna, or if the area is occasionally visited or used as a habitat by Schedule-I species, or if the project falls within 15 km of an ecologically sensitive area, or used as a migratory corridor then a Comprehensive Conservation Plan along with the appropriate budgetary provision should be prepared and submitted with EIA-EMP Report; and comments/observation from the CWLW of the State Govt.

Detailed biological study of the study area [core zone and buffer zone (10 km radius of the periphery of the mine lease)] was carried out and discussed under Chapter No. 3.
There is no schedule I species of animals observed within study area as per Wildlife Protection Act 1972 as well as no species is in vulnerable, endangered or threatened category as per IUCN. There is no endangered red list species found in the study area.

1.14

One-season (other than monsoon) primary baseline data on environmental quality - air (PM10, PM2.5, SOx, NOx and heavy metals such as Hg, Pb, Cr, As, etc), noise, water (surface and groundwater), soil - along with one-season met data coinciding with the same season for AAQ collection period should be provided. The detail of NABL/ MoEF&CC certification of the respective laborartory and NABET accreditation of the consultant to be provided.

Baseline Data were collected for Pre monsoon Season March to May 2023 as per CPCB Notification and MoEF & CC Guidelines. Details in Chapter No. 3.

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

1.22	Impact of mining and water abstraction from the mine on the hydrogeology and groundwater regime within the core zone and 10 km buffer zone including long-term monitoring measures should be provided. Details of rainwater harvesting and measures for recharge of groundwater should be reflected in case there is a declining trend of groundwater availability and/or if the area falls within dark/grey zone.	The ground water table is at 55-60m below ground level. In these projects, ultimate depth is 32 m Bgl It is inferred the quarrying activities in the Cumulative EIA project (Quarry) will not intersect the Ground water table.
1.23	Study on land subsidence including modeling for prediction, mitigation/prevention of subsidence, continuous monitoring measures, and safety issues should be carried out.	**Noted and agreed** Detailed in Chapter-IV Anticipated and mitigation measures of in the study area.
1.24	Detailed water balance should be provided. The breaku p of water requirement as per different activities in the mining operations, including use of water for sand stowing should be given separately. Source of water for use in mine, sanction of the Competent Authority in the State Govt. and impacts vis-à-vis the competing users should be provided.	**Noted and agreed** Total Water Requirement: 2.1 KLD Discussed under Chapter 2, The required water will be met from rainwater accumulated in mine pit (when available) and from the approved water vendors.
1.25	PP shall submit design details of all Air Pollution control equipment (APCEs) to be implemented as part of Environment Management Plan vis-à-vis reduction in concentration of emission for each APCEs	**Noted and agreed** Methodology And Instrument Used for Air Quality Analysis in chapter-3and Air Pollution control equipment (APCEs) in chapter-10 sub 10.2 Environmental policy.
1.26	PP shall propose to use LNG/CNG based mining machineries and trucks for mining operation and transportation of mineral. The measures adopted to conserve energy or use of renewable sources shall be explored.	Details in Machinery and equipment details in Chapter-2 Table No 2.16
1.27	PP to evaluate the green house emission gases from the mine operation/ washery plant and corresponding carbon absorption plan.	Noted and agreed
1.28	Site specific Impact assessment with its mitigation measures, Risk Assessment and Disaster Preparedness and Management Plan should be provided.	A Risk Assessment and Disaster Preparedness and management Plan Chapter- 7
1.29	Impact of choice of mining method, technology, selected use of machinery and impact on air quality, mineral transportation, handling & storage/stockyard, etc, Impact of blasting, noise and vibrations should be provided.	Detailed in Machinery and technology used Chapter-3.Methodology and Instrument Used for Air Quality Analysis Detailed study in chapter-4 Impact of choice of mining method and impact on air quality and blasting and noise and vibrations.
1.30	Impacts of mineral transportation within the mining area and outside the lease/project along with flow-chart indicating the specific areas generating fugitive emissions should be provided. Impacts of transportation, handling, transfer of mineral and waste on air quality, generation of effluents from workshop etc, management plan for maintenance of HEMM and other machinery/equipment should be given. Details of various facilities such as rest areas and canteen for workers and effluents/pollution load emanating from these activities should also be provided.	Traffic density survey was carried out to analyse the impact of Transportation in the study area as per IRC guidelines 1961 and it is inferred that there is no much significant impact due to the proposed transportation from the project area. Details in Chapter 2. Infrastructure & other facilities will be provided to the Mine Workers after the grant of quarry lease and the same has been discussed in the Chapter No.2.
1.31	Details of various facilities to be provided to the workers in terms of parking, rest areas and canteen, and effluents/pollution load resulting from these activities should also be given.	Infrastructure & other facilities will be provided to the Mine Workers after the grant of quarry lease and the same has been discussed in the Chapter No.2

1.32	The number and efficiency of mobile/static water jet, Fog cannon sprinkling system along the main mineral transportation road inside the mine, approach roads to the mine/stockyard/siding, and also the frequency of their use in impacting air quality should be provided.	Detailed in chapter-2 for mineral transportation route with approach roads etc., and impacting air quality detailed given chapter-4
1.33	Conceptual Final Mine Closure Plan and post mining land use and restoration of land/habitat to the pre- mining status should be provided. A Plan for the ecological restoration of the mined-out area and post mining land use should be prepared with detailed cost provisions. Impact and management of wastes and issues of re-handling (wherever applicable) and backfilling and progressive mine closure and reclamation should be furnished.	Discussed under Chapter 2. Mine Closure Plan is a part of Approved Mining Plan enclosed as Annexure Volume – 1.
1.34	Adequate greenbelt nearby areas, mineral stock yard and transportation area of mineral shall be provided with details of species selected and survival rate Greenbelt development should be undertaken particularly around the	**Noted and agreed** Greenbelt Development Plan is discussed under Chapter 4,
1.35	Cost of EMP (capital and recurring) should be included in the project cost and for progressive and final mine closure plan.	**Noted and agreed** The total cost and the details are given in the Chapter No. 10
1.36	Details of R&R. Detailed project specific R&R Plan with data on the existing socio- economic status of the population (including tribals, SC/ST, BPL families) found in the study area and broad plan for resettlement of the displaced population, site for the resettlement colony, alternate livelihood concerns/employment for the displaced people, civic and housing amenities being offered, etc. and costs along with the schedule of the implementation of the R&R Plan should be given.	**Not Applicable.** There are no approved habitations within a radius of 300 meters. Therefore, R&R Plan / Compensation details for the Project Affected People (PAP) is not anticipated and Not Applicable for this project.
1.37	CSR Plan along with details of villages and specific budgetary provisions (capital and recurring) for specific activities over the life of the project should be given.	CSR are discussed under Chapter 8. And specific budgetary provisions (capital and recurring) for specific activities over the life of the project in chapter-10
1.38	Corporate Environment Responsibility:	CER are discussed under Chapter 8.
1.39	a) The Company must have a well laid down Environment Policy approved by the Board of Directors.	Detailed in chapter-10 The Environment Policy
1.40	b) The Environment Policy must prescribe for standard operating process/procedures to bring into focus any infringements/deviation/violation of the environmental or forest norms/conditions.	
1.41	c) The hierarchical system or Administrative Order of the company to deal with environmental issues and for ensuring compliance with the environmental clearance conditions must be furnished.	The Environment Monitoring Cell discussed under Chapter 6
1.42	d) To have proper checks and balances, the company should have a well laid down system of reporting of non-compliances/violations of environmental norms to the Board of Directors of the company and/or shareholders or stakeholders at large.	The Environment Monitoring Cell discussed under Chapter 6
1.43	e) Environment Management Cell and its responsibilities to be clearly spell out in EIA/ EMP report	The Environment Monitoring Cell discussed under Chapter 6
1.44	f) In built mechanism of self-monitoring of compliance of environmental regulations should be indicated.	The Environment Monitoring Cell discussed under Chapter 6
1.45	Status of any litigations/ court cases filed/pending on the project should be provided.	No litigation is pending in any court against this project

1.46	PP shall submit clarification from DFO that mine does not falls under corridors of any National Park and Wildlife Sanctuary with certified map showing distance of nearest sanctuary.	Karikili Bird Sanctuary – 18.8km –S Vedanthangal Bird Sanctuary – 19km- S DFO Letter will be Submitted final EIA/EMP report
1.47	Copy of clearances/approvals such as Forestry clearances, Mining Plan Approval, mine closer plan approval. NOC from Flood and Irrigation Dept. (if req.), etc. wherever applicable	Noted and agreed
1.48	Details on the Forest Clearance should be given as per the format given: Total Mine lease area (ha): Total Forest Land (Ha) : Date of FC : Extent of Forest Land : Balance area for which FC is yet to be obtained: Status of application for diversion of forest Land: If more than one provides details of each FC	**Noted and agreed** Kavanipakkam R.F-2.2km-SE Total Mine Lease area 1.76.50ha Details on the Forest Clearance will Submit final EIA/EMP report.
1.49	In case of expansion of the proposal, the status of the work done as per mining plan and approved mine closure plan shall be detailed in EIA/ EMP report.	Enclosed Approved 3rd Scheme mining plan in Annexure volume-I
1.50	Details on Public Hearing should cover the information relating to notices issued in the newspaper, proceedings/minutes of Public Hearing, the points raised by the general public and commitments made by the proponent and the time bound action proposed with budgets in suitable time frame. These details should be presented in a tabular form. If the Public Hearing is in the regional language, an authenticated English Translation of the same. should be provided.	The outcome of public hearing will be updated in the final EIA/AMP report.
1.51	PP shall carry out survey through drone highlighting the ground reality for at least 10 minutes.	Noted and agreed
1.52	Detailed Chronology of the project starting from the first lease deed allotted/Block allotment/ Land acquired to its No. of renewals, CTO /CTE with details of no. renewals, previous EC(s) granted details and its compliance details, NOC details from various Govt bodies like Forest NOC(s), CGWA permissions, Power permissions, etc as per the requisites respectively to be furnished in tabular f	Fresh lease
1.53	The first page of the EIA/ EMP report must mention the peak capacity production, area, detail of PP, Consultant (NABET accreditation) and Laboratory (NABL / MoEF & CC certification)	**Noted and agreed** As per detailed in front page of Draft EIA/EMP, NABET, NABL certification detailed given in the report.
1.54	The compliances of Tor must be properly cited with respective chapter section and page no in tabular form and also mention sequence of the respective ToR complied within the EIA-EMP report in all the chapters section.	As per Tor compliance each chapter wise page and table, figure no given in the EIA/EMP report.

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1.INTRODUCTION

1.1 PURPOSE OF THE REPORT

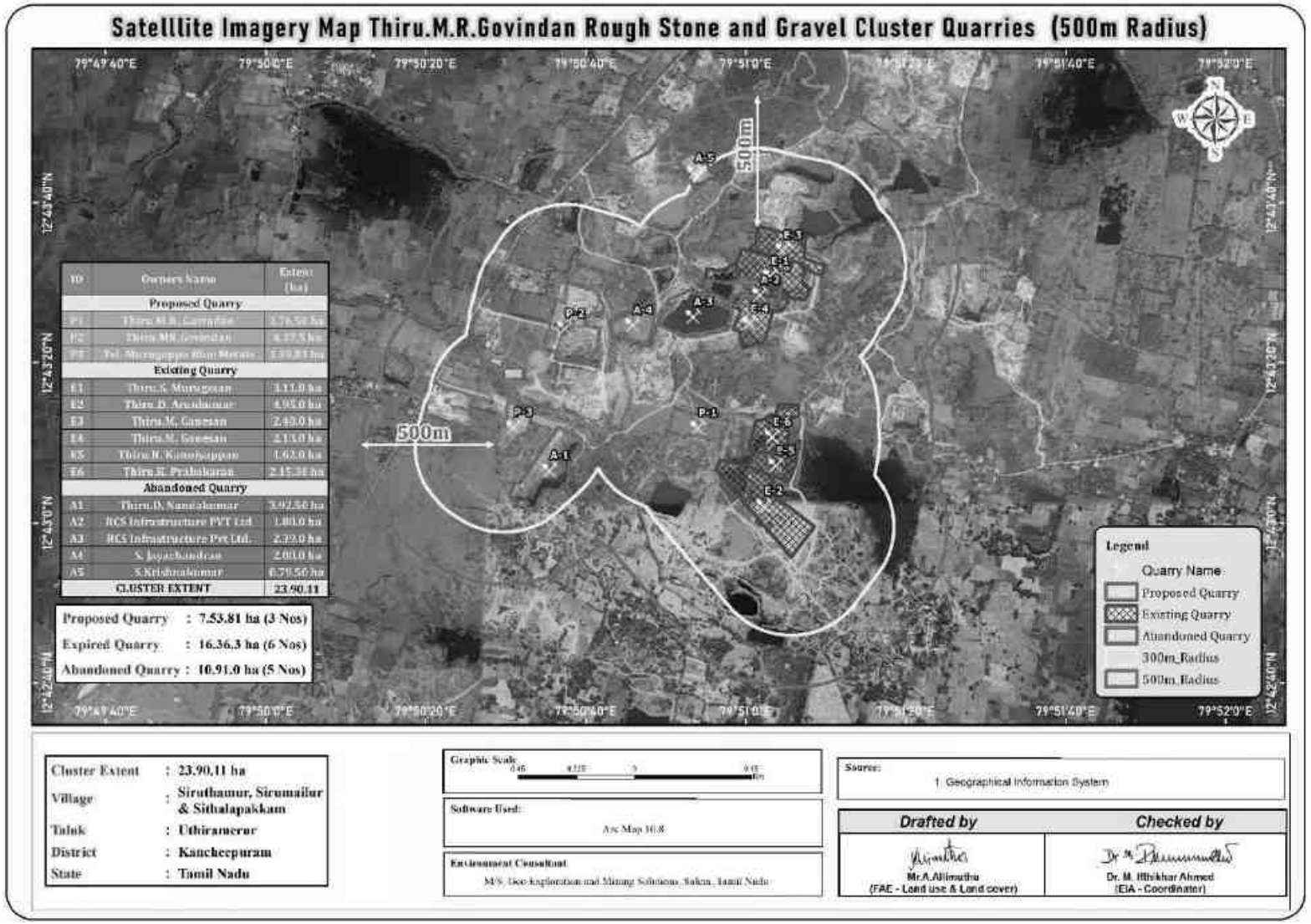
The Ministry of Environment and Forests, Govt. of India, through its EIA notification S.O. 1533(E) of 14th September 2006 and its subsequent amendments as per Gazette Notification S.O. 1889 of 20thApril 2022, Mining Projects are classified under two categories i.e. A (> 250 Ha) and B (≤ 250 Ha), and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

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

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

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

FIGURE 1.1 SATELLITE IMAGERY CLUSTER QUARRIES



1.1 IDENTIFICATION OF PROJECT AND PROJECT PROPONENTS

1.1.1 Identification of Project Proponent

TABLE 1.1: DETAILS OF PROJECT PROPONENT

Name of the Project Proponent	Thiru. M. R.Govindan Rough Stone and Gravel Quarry
Address	S/o. Ramasamy, No.398, Gandhi Street, Unamancherry, Kolapakkam, Chennai
Mobile	9840130609
Email	Mr_govindan@yahoo.com
Status	Individual

1.1.2 Identification of Project

TABLE 1.2: SALIENT FEATURES OF THE PROPOSED PROJECT – P1

Name of the Project	Thiru.M.R.Govindan Rough Stone and Gravel Quarry	
S.F. No.	331/4A, 331/4B,331/5A, 331/5B, 331/6, 331/7A, 331/7B, 331/8A and 331/8B	
Extent	1.76.50 ha	
Village, Taluk and District	Siruthamur Village, Uthiramerur Taluk & Kancheepuram District	
Land Type	It is an Own Patta land – Patta No. 1204	
Existing quarry operation	It is a Fresh quarry proposal	
Toposheet No	57- P/14	
Latitude between	**12° 43' 10.06"N to 12° 43' 14.35"N**	
Longitude between	**79° 50' 50.24"E to 79° 50' 57.80"E**	
Elevation of the area	78m AMSL	
Lease period	10 Years	
Mining Plan period	10 years	
Proposed Depth of Mining as per ToR	32m BGL (2m Gravel + 30m Rough Stone)	
	Rough Stone in m^3	Gravel m^3
Geological Resources	5,29,500	35,300
Mineable Reserves	1,80,355	24,120
Year wise Production for First Five Year as per Mining Plan	92,005	24,120
Year wise Production for Second Five Year as per Mining Plan	88,350	-
Peak Production	18,925	-
Ultimate Pit Dimension	189m(L) x 72m(B) x 32m(D)(BGL)	
Water Level in the region	55m -60m bgl	
Method of Mining	Opencast Mechanized Mining Method involving small drilling and Controlled blasting using Slurry Explosives	
Topography	The lease applied area is exhibiting plain terrain. The area has gentle sloping towards Eastern side and altitude of the area is 78m above from Mean Sea Level. The area is covered by 2m thickness of Gravel and followed by Massive Charnockite which is clearly inferred from the nearby Existing quarries	
Machinery proposed	Jack Hammer	4Nos
	Compressor	1Nos
	Excavator with Bucket and Rock Breaker	1Nos
	Trucks	2Nos
	Water Sprinkling Tanker	1Nos

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.	
Proposed Manpower Deployment	26 Nos	
Project Cost	Rs.87,77,00/-	
Half year Compliance Monitoring Cost	Rs.7,60,000/-	
Total Project cost	Rs.95,35,000/-	
CER Cost	Rs. 5,00,000/-	
Nearby Water Bodies	Odai	240m SW
	Odai	270m NE
	Periya Eri	300m East
	Kuttai	750m NW
	Pond	860m NE
	Kuttai	980m West
	Siruthamur Lake	1km SE
	Chithalapakkam Eri	1.2km NW
	Edaimichi Eri	1.6km SE
	Cheyyar River	3.2km NW
	Palar River	5km NE
Greenbelt Development Plan	Proposed to plant 1000 Nos of trees considering 500 Nos of trees/ Ha criteria The plantation will be developed around the project site and nearby village roads	
Proposed Water Requirement	2.1 KLD	
Nearest Habitation	700m – South	
Nearest Reserve Forest	Kavanipakkam R.F. – 2.44 km – South East	
Nearest Wild Life Sanctuary	Karikili Bird Sanctuary- 18.8 km – South Vedanthangal Bird Sanctuary – 19 km South	

Source: Approved Mining & Land Documents.

TABLE 1.2A: SALIENT FEATURES OF THE PROPOSED PROJECT – P2

Name of the Project	Thiru.M.R.Govindan Rough Stone and Gravel Quarry	
S.F. No.	3/1A, 3/1B, 3/2 & 5/2 – Sirumailur Village, 86/1, 86/2, 87/1 (P) Sithalapakkam Village	
Extent	4.37.5 ha	
Village, Taluk and District	Sirumailur & Sithalapakkam Village, Uthiramerur Taluk & Kancheepuram District	
Land Type	It is an Own Patta land – Patta No. 639, 333, 361	
Existing quarry operation	It is a Fresh quarry proposal	
Toposheet No	57- P/14	
Latitude between	**12° 43' 20.11"N to 12° 43' 29.94"N**	
Longitude between	**79° 50' 34.60"E to 79° 50' 42.37"E**	
Elevation of the area	72m AMSL	
Lease period	Lease Period Extension – 2023-24 to 2025-26	
Mining Plan period	3 years	
Proposed Depth of Mining as per ToR	37m BGL (2m Dumped Gravel + 35m Rough Stone)	
	Rough Stone in m^3	Gravel m^3
Geological Resources	13,87,850	87,500
Mineable Reserves	1,00,919	12,464
Year wise Production for Five Year as per Mining Plan	97,319	-
Peak Production	49,765	-

Ultimate Pit Dimension	263m(L) x 178m(B) x 37m(D)(BGL)	
Water Level in the region	53m -58m bgl	
Method of Mining	Opencast Mechanized Mining Method involving small drilling and Controlled blasting using Slurry Explosives	
Topography	The lease applied area is exhibiting plain terrain. The area has gentle sloping towards NorthEastern side and altitude of the area is 72m above from Mean Sea Level. The area is covered by 2m thickness of Gravel and followed by Massive Charnockite which is clearly inferred from the nearby Existing quarries	
Machinery proposed	Jack Hammer	4Nos
	Compressor	1Nos
	Excavator with Bucket and Rock Breaker	1Nos
	Trucks	3Nos
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.	
Proposed Manpower Deployment	29 Nos	
Project Cost	Rs.48,30,000/-	
Half year Compliance Monitoring Cost	Rs.2,28,000/-	
Total Project cost	Rs.50,58,000/-	
CER Cost	Rs. 5,00,000/-	
Nearby Water Bodies	Kuttai	180m North
	Odai	210m SW
	Odai	480m NE
	Kuttai	500m SW
	Chithalapakkam Eri	570m NW
	Periya Eri	850m SE
	Pond	1.3km SE
	Siruthamur Lake	1.5km SE
	Edaimichi Eri	2km SE
	Cheyyar River	2.5km NW
	Palar River	4.5km NE
Greenbelt Development Plan	Proposed to plant 2500 Nos of trees considering 500 Nos of trees/ Ha criteria The plantation will be developed around the project site and nearby village roads	
Proposed Water Requirement	2.7 KLD	
Nearest Habitation	650m – SouthWest	
Nearest Reserve Forest	Kavanipakkam R.F. – 3.02 km – South East	
Nearest Wild Life Sanctuary	Karikili Bird Sanctuary- 18.8 km – South Vedanthangal Bird Sanctuary – 19 km South	

1.2 BRIEF DESCRIPTION OF THE PROJECT

1.2.1 Nature and Size of the Project – P1

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 Trucks are used for Loading and transportation. Rock Breakers are deployed to avoid secondary blasting.

The production of Rough stone is 1,80,355 m^3 maximum in a year (60m^3 per day/ 5 Trucks per day considering 12m^3 per load). The depth of the mining is 32m bgl.

1.2.1A Nature and Size of the Project – P2

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 Trucks are used for Loading and transportation. Rock Breakers are deployed to avoid secondary blasting.

The production of Rough stone is 97,319 m^3 maximum in a year (108m^3 per day/ 9 Trucks per day considering 12m^3 per load). The depth of the mining is 32m bgl

1.2.2 Location of the Project for P1

- The project site is located in Siruthamur, Village, Uthiramerur Taluk & Kancheepuram District.
- The lease applied area is located about 25km Southeast side of Kancheepuram town, 15 km Northeastern side of Uthiramerur and 1km Northernwest side of Siruthamur Village.

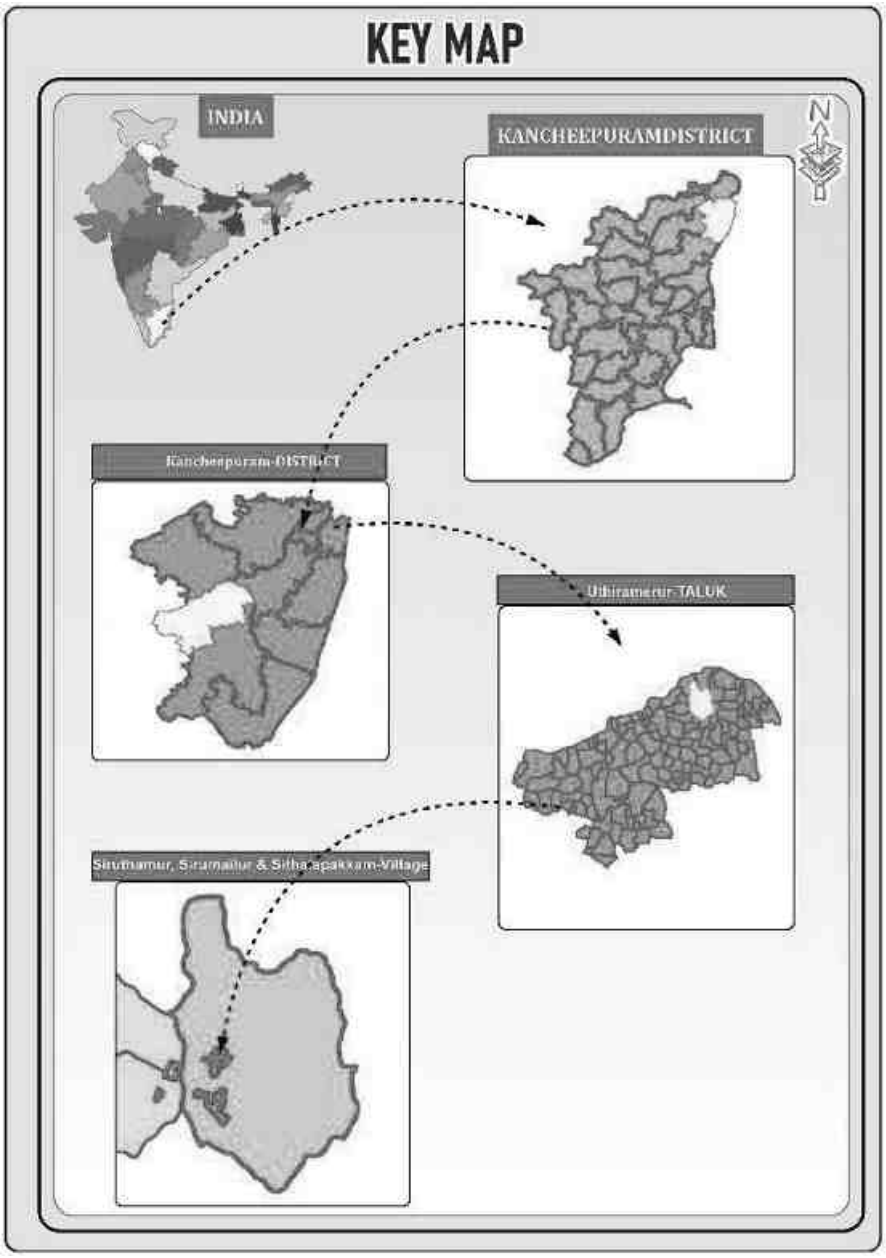
	25 km		15 km		1.km	
Kancheepuram	⟶	Uthiramerur	⟶	Siruthamur	⟶	Lease applied area
	Southeast		Northeast		Northwest	

1.2.3 Location of the Project for P2

- The project site is located in Sithalapakkam & Sirumailur Village, Uthiramerur Taluk & Kancheepuram District.
- The lease applied area is located about 25km Northernwest side of Kancheepuram town, 15km Southeastern side of Uthiramerur and 1km Southeastern side of Sithalapakkam Village.

	25 km		15 km		1km	
Kancheepuram	⟶	Uthiramerur	⟶	Sithalapkkam	⟶	Lease applied area
	Southeast		Northeast		Southeast	

FIGURE 1.2 LOCATION MAP OF THE PROJECT SITE



Source: Survey of India Toposheet 58-A/15 & 16

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

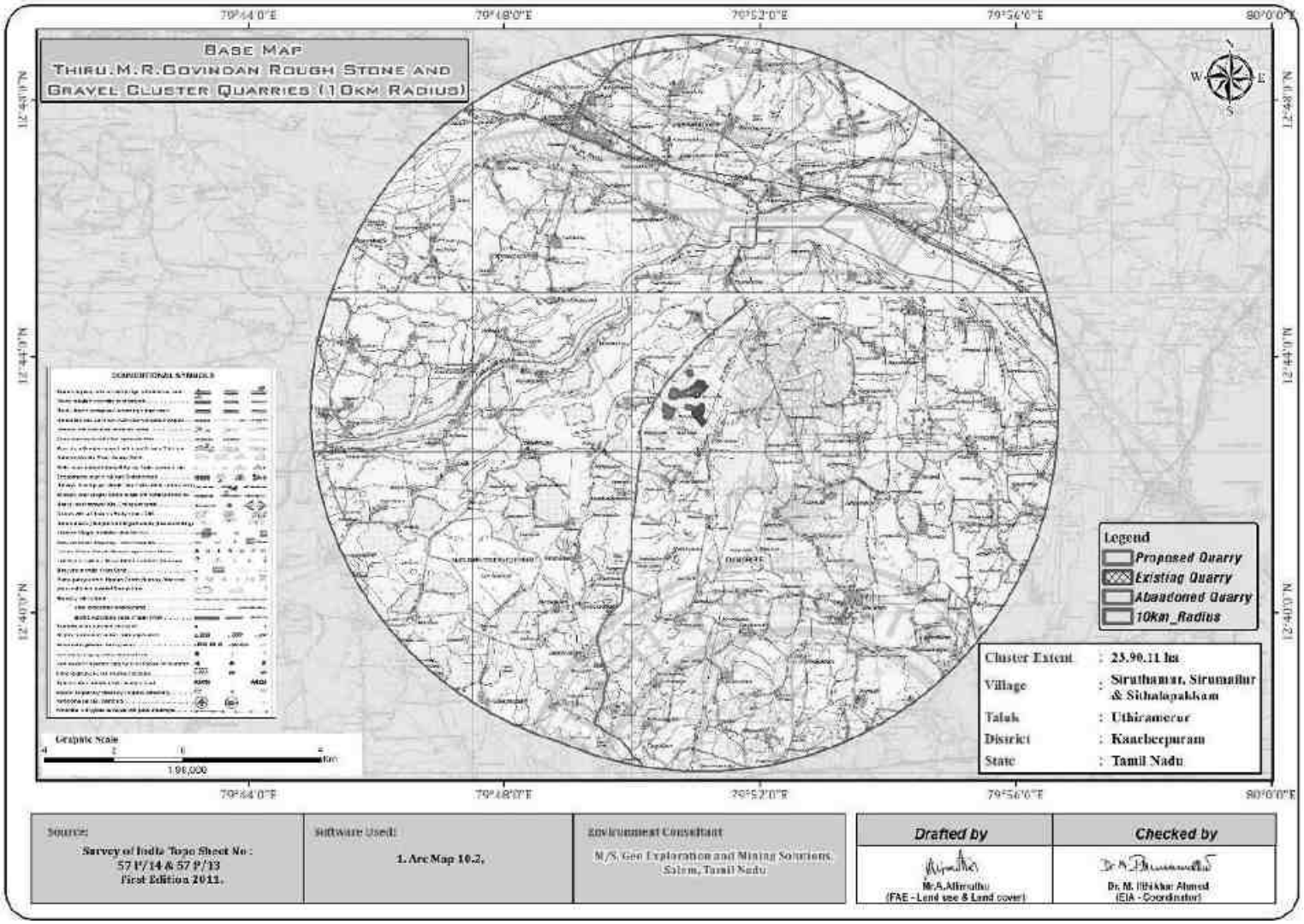
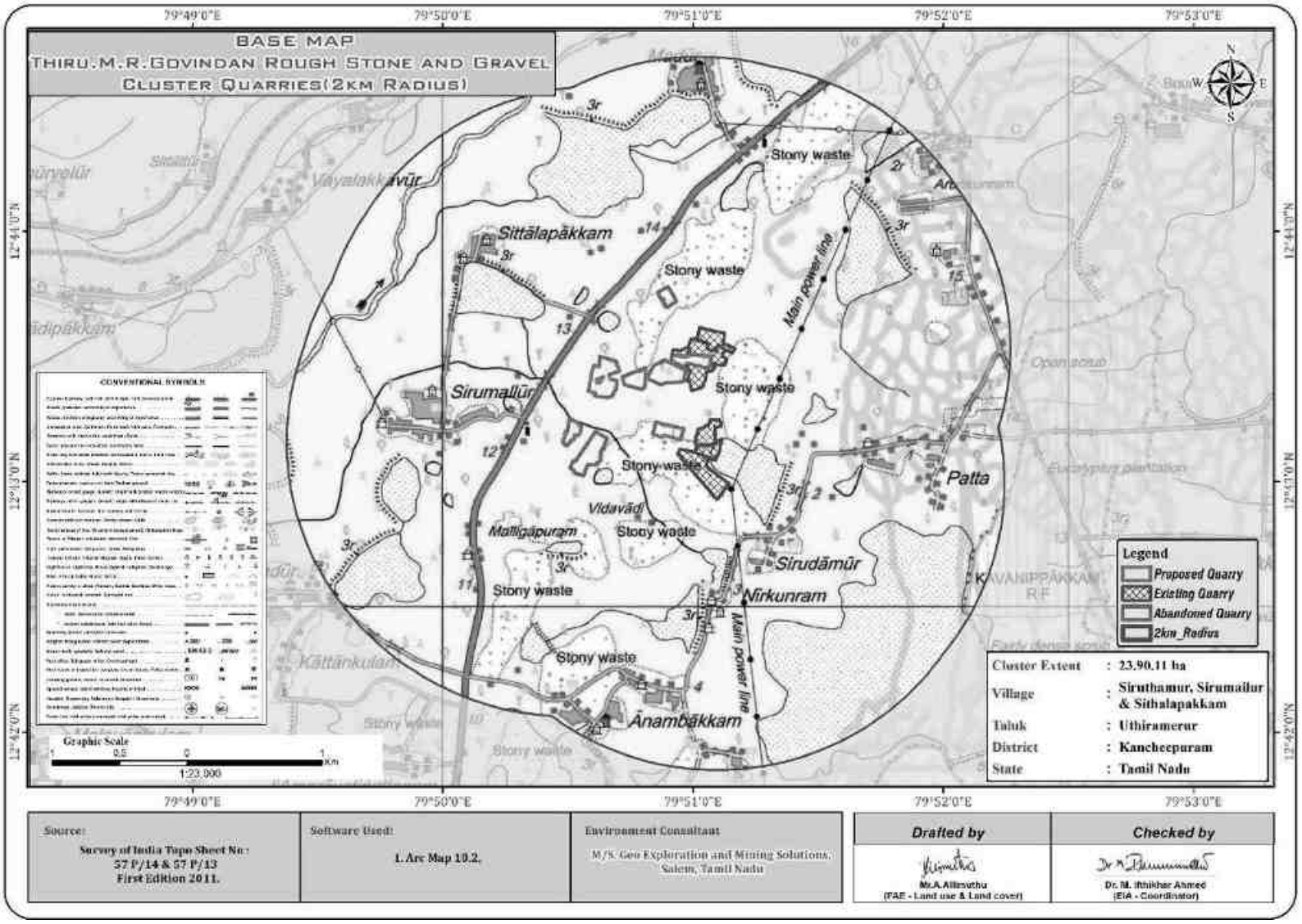


FIGURE 1.4: TOPOSHEET MAP OF THE STUDY AREA 2KM RADIUS



1.3 THE SCOPE OF THE STUDY

The main scope of the EIA study is to quantify the cumulative impact in the study area due to cluster quarries and formulate the effective mitigation measures. A detailed account of the emission sources, emissions control equipment, background Air quality levels, Meteorological measurements, Dispersion model and all other aspects of pollution like effluent discharge, Dust generation etc., have been discussed in this report. The baseline monitoring study has been carried out during the summer season (March 2022 to May 2022) for various environmental components so as to assess the anticipated impacts of the cluster quarry projects on the environment and suggest suitable mitigation measures for likely adverse impacts due to the proposed project.

TABLE 1.3: ENVIRONMENT ATTRIBUTES

Sl.No.	Attributes	Parameters	Source and Frequency
1	Ambient Air Quality	PM_{10}, $PM_{2.5}$, SO_2, NO_2	Continuous 24-hourly samples twice a week for three months at 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)	9 locations – data monitored once for 24 hours during EIA study
6	Soil Characteristics	Physical and Chemical Parameters	Once at 7 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

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

- Application for Quarrying Lease as per Tamil Nadu Minor Mineral Concession Rules, 1959.
- Obtained Precise Area Communication Letter as per Tamil Nadu Minor Mineral Concession Rules, 1959 for Preparation of Mining Plan and obtaining Environmental Clearance.
- The Mining Plan has been approved under Rule 41 & 42 as amended of Tamil Nadu Minor Mineral Concession Rules, 1959.
- ToR vide Lr No.SEIAA-TN/F.No.10350/SEAC/ToR-1601/2023 Dated: 06.11.2023

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2. PROJECT DESCRIPTION

2.0 TYPE OF THE PROJECT

The Proposed Rough Stone & Gravel Quarries requires Environmental Clearance. There are 3 proposed, and 6 existing quarry forming a cluster; calculated as per MoEF & CC Notification S.O. 2269(E) Dated 1st July 2016 and the total extent of cluster is 23.90.11 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 NEED FOR THE PROJECT

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

2.2 LOCATION OF THE PROJECT

Location of the Project for P1

- The project site is located in Siruthamur, Village, Uthiramerur Taluk & Kancheepuram District.
- The lease applied area is located about 25km Southeast side of Kancheepuram town, 15 km Northeastern side of Uthiramerur and 1km Northernwest side of Siruthamur Village.

	25 km		15 km		1.km	
Kancheepuram	⟶	Uthiramerur	⟶	Siruthamur	⟶	Lease applied area
	Southeast		Northeast		Northwest	

Location of the Project for P2

- The project site is located in Sithalapakkam & Sirumailur Village, Uthiramerur Taluk & Kancheepuram District.
- The lease applied area is located about 25km Northernwest side of Kancheepuram town, 15km Southeastern side of Uthiramerur and 1km Southeastern side of Sithalapakkam Village.

	25 km		15 km		1km	
Kancheepuram	⟶	Uthiramerur	⟶	Sithalapkkamr	⟶	Lease applied area
	Southeast		Northeast		Southeast	

TABLE 2.1: SITE CONNECTIVITY

Nearest Roadway	Kancheepuram to Chengalpattu Road (NH-132B) – 6km – NE Kancheepuram to Uthiramerur Road (SH-118A) – 10km – West
Nearest Village	Anambakkam – 2.0km – SW
Nearest Town	Walajabad – 9.0km-NW
Nearest Railway Station	Walajabad – 9.0km-NW
Nearest Airport	Chennai – 46.0km – NE

Source: Survey of India Toposheet

TABLE 2.2: CO-ORDINATES – PROJECT BOUNDARY-P1

Corner Nos.	Latitude	Longitude
1	12°43'10.64"N	79°50' 52.43"E
2	12°43'11.51"N	79°50' 50.24"E
3	12°43'14.35"N	79°50' 51.13"E
4	12°43'13.81"N	79°50' 52.67"E
5	12°43'12.78"N	79°50' 57.80"E
6	12°43'10.06"N	79°50' 56.92"E
7	12°43'10.92"N	79°50' 53.95"E
8	12°43'11.01"N	79°50' 52.68"E
Datum: UTM-WGS84		

Source: Approved Mining Plan

TABLE 2.3: CO-ORDINATES – PROJECT BOUNDARY- P2

Corner Nos.	Latitude	Longitude
1	12°43'21.72"N	76°50' 34.60"E
2	12°43'24.85"N	76°50' 35.36"E
3	12°43'24.96"N	76°50' 35.22"E
4	12°43'27.81"N	76°50' 36.02"E
5	12°43'27.65"N	76°50' 37.32"E
6	12°43'29.94"N	76°50' 37.43"E
7	12°43'28.95"N	76°50' 41.30"E
8	12°43'28.76"N	76°50' 41.52"E
9	12°43'26.49"N	76°50' 42.37"E
10	12°43'25.57"N	76°50' 39.91"E
11	12°43'24.70"N	76°50' 39.97"E
12	12°43'24.34"N	76°50' 41.71"E
13	12°43'21.89"N	76°50' 41.40"E
14	12°43'20.54"N	76°50' 40.56"E
15	12°43'20.11"N	76°50' 39.42"E
16	12°43'20.59"N	76°50' 36.13"E
17	12°43'21.28"N	76°50' 36.26"E
18	12°43'23.74"N	76°50' 37.00"E
19	12°43'24.46"N	76°50' 36.88"E
20	12°43'24.95"N	76°50' 38.17"E
21	12°43'23.72"N	76°50' 37.26"E
Datum: UTM-WGS84		

Source: Approved Mining Plan

FIGURE 2.1: TOPOGRAPHICAL VIEW OF PROJECT

P1

P2

FIGURE 2.1A: PHOTOS OFGREEN BELT & FENCING

P1

P2

P1

P2

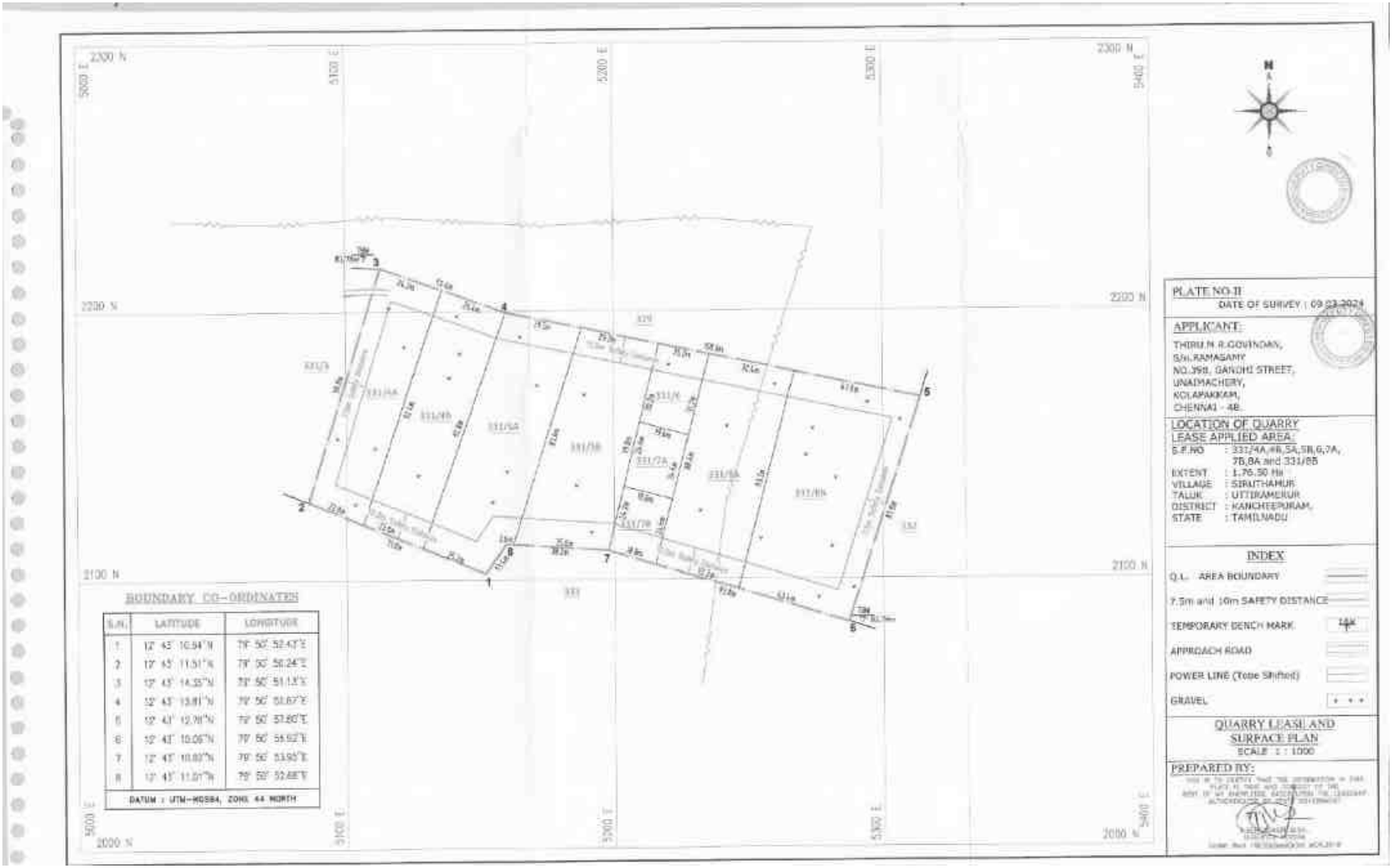
FIGURE 2.2: GOOGLE IMAGE OF THE PROJECT AREA –P1

Source: Google Earth Imagery

FIGURE 2.3: GOOGLE IMAGE OF THE PROJECT AREA-P2

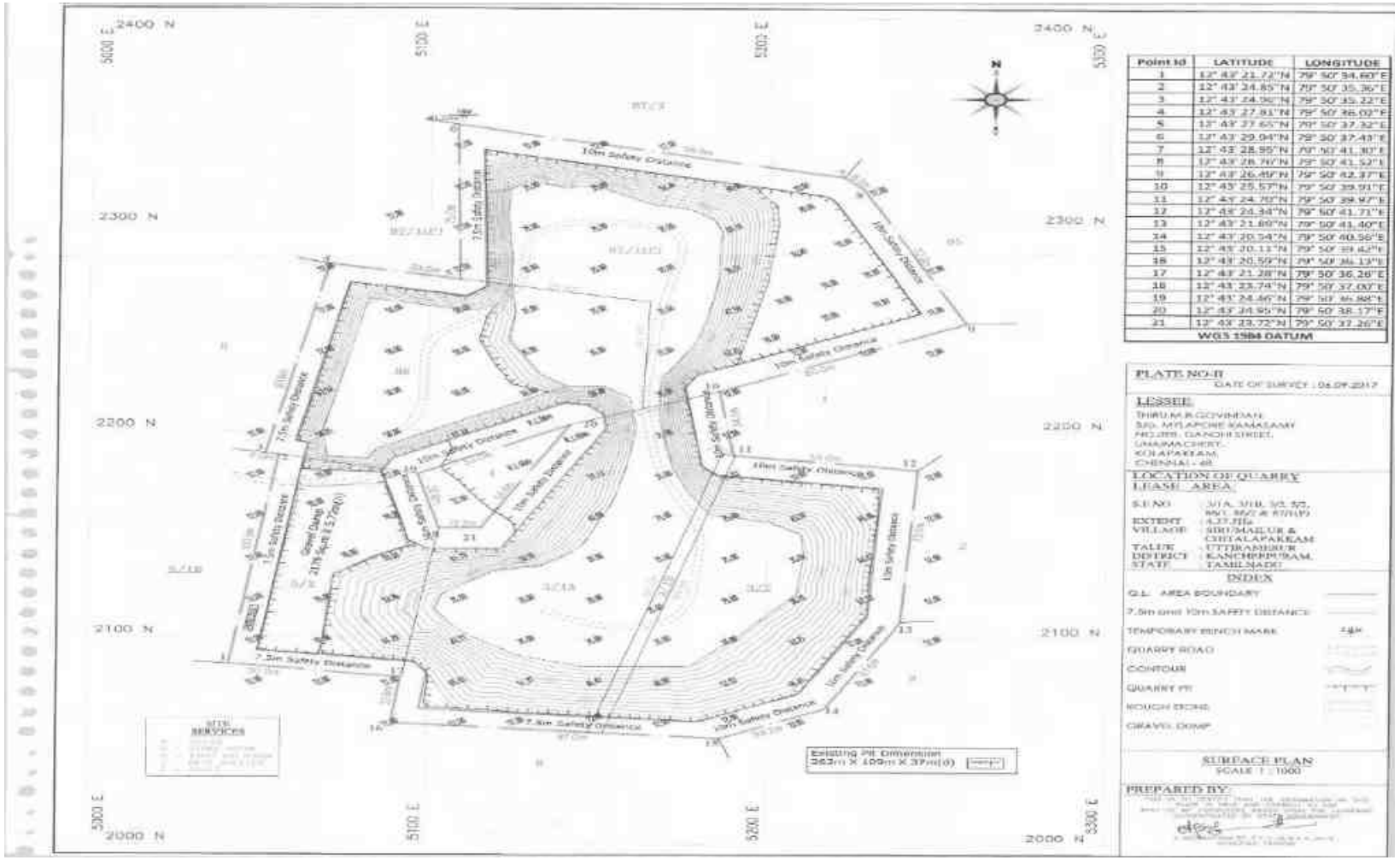
Source: Google Earth Imagery

FIGURE 2.4: QUARRY LEASE PLAN / SURFACE PLAN- P1



Source: Approved Mining Plan

FIGURE 2.5: QUARRY LEASE PLAN / SURFACE PLAN-P2



Source: Approved Mining Plan

FIGURE 2.6: VILLAGE MAP SUPERIMPOSED ON GOOGLE EARTH IMAGE

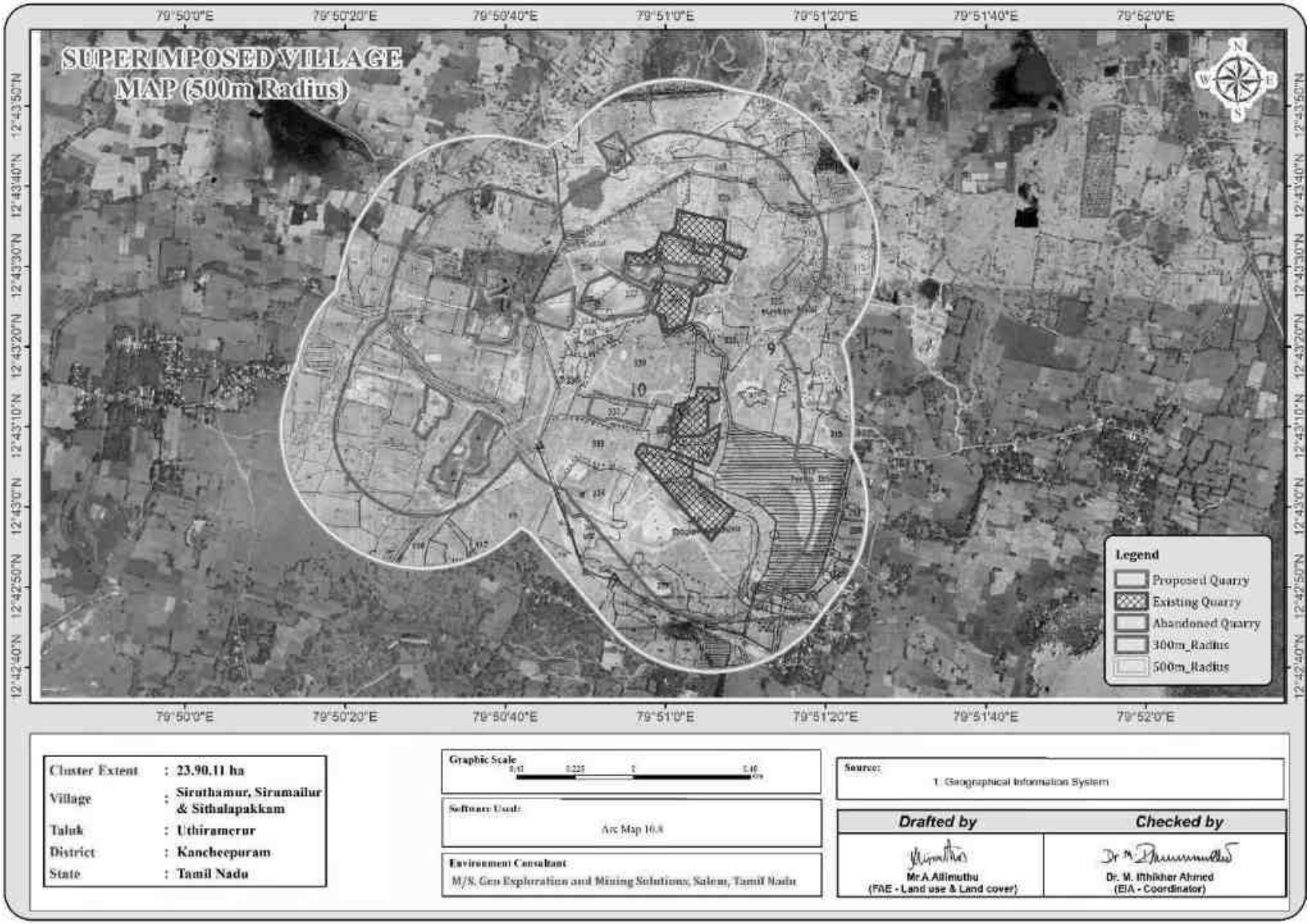


FIGURE 2.7: IMAGE SHOWING SURFACE FEATURES AROUND 10 KM RADIUS

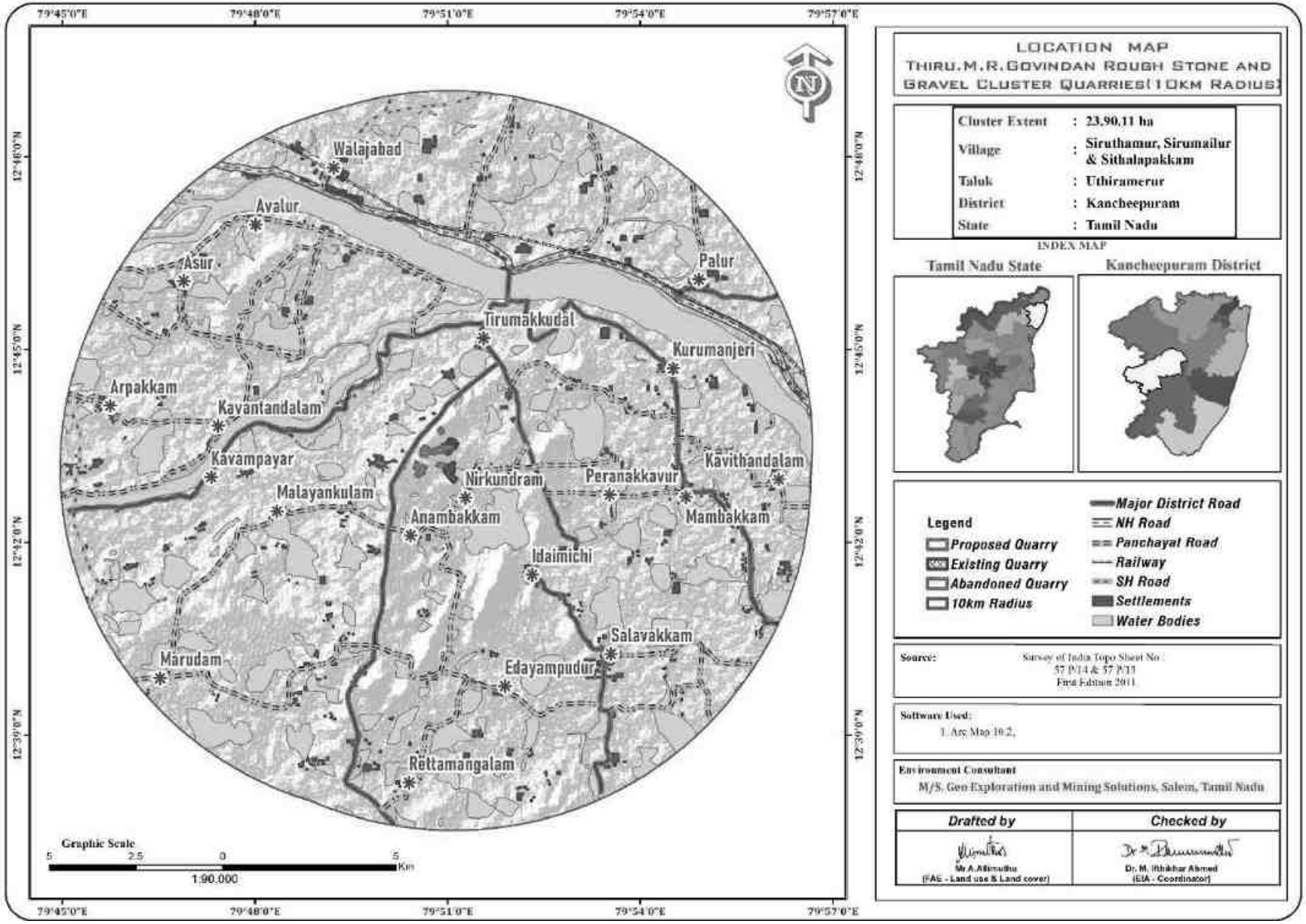
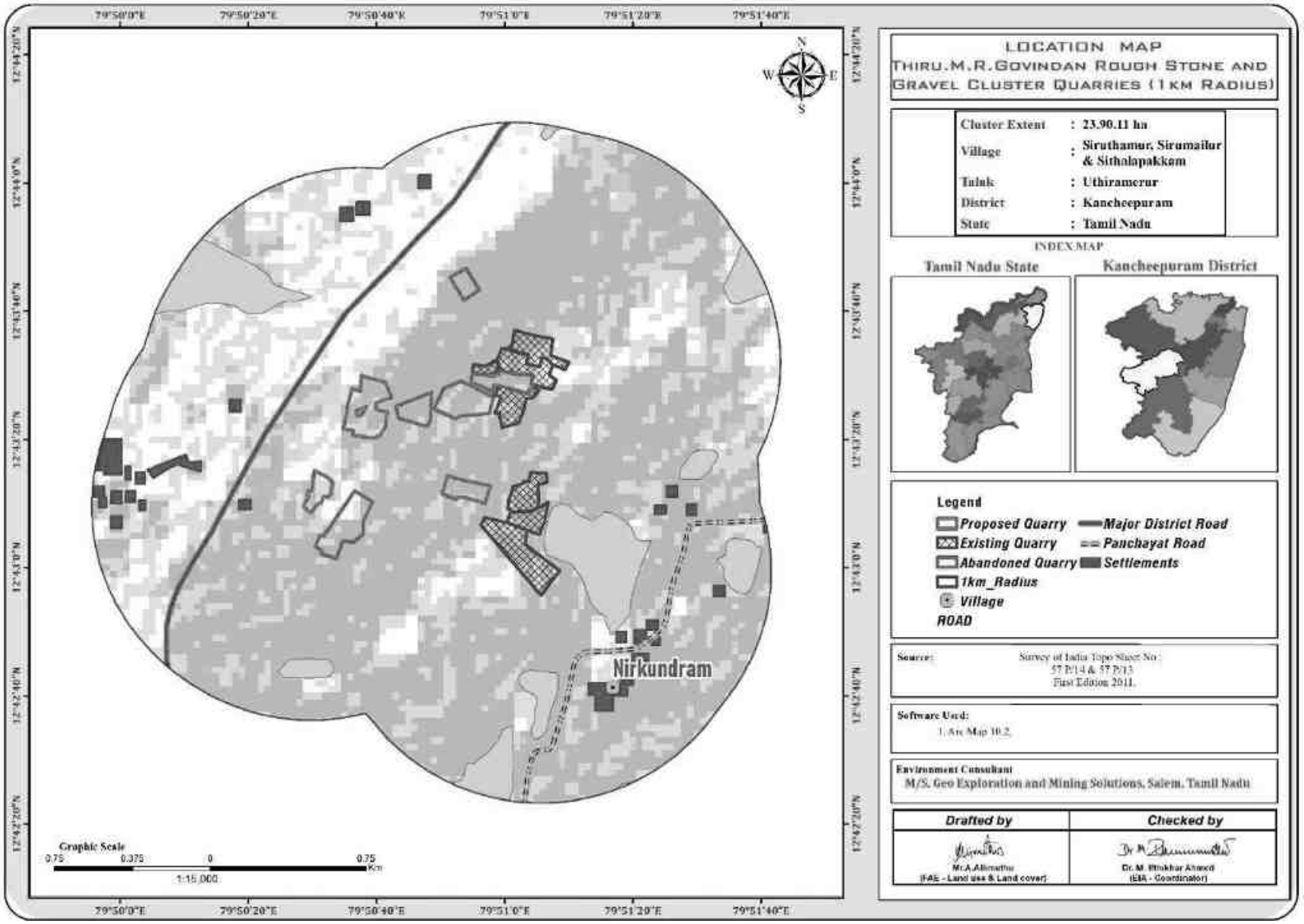


FIGURE 2.8: IMAGE SHOWING SURFACE FEATURES AROUND 1 KM RADIUS



2.2.1 Project Area

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

TABLE 2.4: LAND USE PATTERN-P1

Description	Present area (Ha)	Area at the end of this quarrying period (Ha)
Area under quarrying	Nil	1.21.65
Infrastructure	Nil	0.01.00
Roads	Nil	0.01.00
Green Belt	Nil	0.50.55
Unutilized Area	1.76.50	0.02.30
Grand Total	**1.76.50**	**1.76.50**

Source: Approved Mining

TABLE 2.5: LAND USE PATTERN- P2

Description	Present area (Ha)	Area at the end of this quarrying period (Ha)
Area under quarrying	3.35.5	3.35.5
Infrastructure	0.01.0	0.01.0
Roads	0.03.0	0.03.0
Green Belt	Nil	0.20.2
Unutilized Area	0.98.0	0.77.8
Grand Total	**4.37.5**	**4.37.5**

Source: Approved Mining

2.2.2 Size or Magnitude of Operation

TABLE 2.6: RESOURCES AND RESERVES – P1

PARTICULARS	DETAILS	
	Rough Stone in m^3	Gravel in m^3
Geological Resources	5.29,500	35,300
Mineable Reserves	1,80,355	24,120
Production for Ten-years plan period	1,80,355	24,120
Peak Production	18,925	8,640
Mining Plan Period / Lease Applied Period	5 Years/ 10Years	
Number of Working Days	300 Days	
Production per day	60	27
No of Lorry loads ($12m^3$ per load)	5	2
Ultimate Depth of Mining	32m (2m Gravel + 30m Rough Stone) below ground level.	

Source: Approved mining plan.

TABLE 2.7: RESOURCES AND RESERVES –P2

PARTICULARS	DETAILS	
	Rough Stone in m^3	Dumped Gravel in m^3
Geological Resources	13,87,850	87,500
Mineable Reserves	1,00,919	12,464
Production for Three- year plan period	97,319	12,464
Peak Production	49,765	12,464
Mining Plan Period / Lease Applied Period	3 Years	

Number of Working Days	300 Days	
Production per day	108	14
No of Lorry loads (12m^3 per load)	9	1
Ultimate Depth of Mining	37m (2m Gravel + 35m Rough Stone) below ground level.	

Source: Approved mining plan.

2.3 GEOLOGY

2.3.1 Regional Geology

Peninsular gneiss forms the oldest rock formations, in which the massive formation of Charnockite lies over with rich accumulation of recent quaternary formation. On regional scale the Charnockite body N30°E to S30°W with dipping SE60°.

Stratigraphy of the area –

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

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 Pleistocene 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 is covered with gravel formation of 2m thickness; Massive Charnockite formation is found after 2 m gravel formation which is clearly inferred from the nearby existing quarry pit.

2.3.3 Hydrogeology

The Kancheepuram district is principally made up of hardrocks and sedimentary formations. These are overlained by laterites and alluvium. The study area is underlain by formations of Quarternary, Tertiary and Mesozoic ages followed by the basement complex of crystalline rocks of Archaean age. The general trend of the gneiss is NE-SW direction and the regional trend observed is NNE-SSW to NW-SE direction. The deposition of Gondwana raocks, the sedimentary rocks, in faulted troughs and in the rugges topography of crystalline rocks took place during Jurasic period. The insitu soils laterites and alluvial deposits were deposited along the Palar and Cheyyar rivers during the quarternary period.

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 Chengalpattu 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 12m. These formations are porous and permeable which have good water bearing zones.

Charnockite

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

Aquifer Parameters

The Transmissivity values in weathered, partly weathered and jointed rocks vary from 10.- 125 m^2 /day and specific yield in these formations is 1.5%. The specific yield of the porus formation varied from 1.4 – 10.6%. The transmissivity in the semi-consolidated and unconsolidated are varies from 23 to 52 m^2 /day and 200 – 300 m^2 /day respectively.

TABLE 2.8: RANGE OF AQUIFER PARAMETERS

Parameters	Range
Specific yield in %	1.4-10.6%
Transmissivity (T) m^2 /day	10-125 m^2 /day
semi-consolidated and unconsolidated	23-52 m^2/day and 200 – 300 m^2 /day

Source: http://cgwb.gov.in/district_profile/tamilnadu/kancheepuram.pdf

TABLE 2.9: GROUND WATER LEVEL VARIATION OF KANCHEEPURAM DISTRICT

Jan 2017	May 2017	Jan 2018	May 2018	Jan 2019	May 2019	Jan 2020	May 2020	Jan 2021	May 2021	5 Years PreMonsoon Average	5Years Post Monsoon Average
10.7	8.4	6.2	9.7	7.5	13.1	4.6	16.9	7.1	14.9	10.8	5.6

Source: https://www.twadboard.tn.gov.in/content/kanchipuram-district

FIGURE 2.9: REGIONAL GEOLOGY MAP

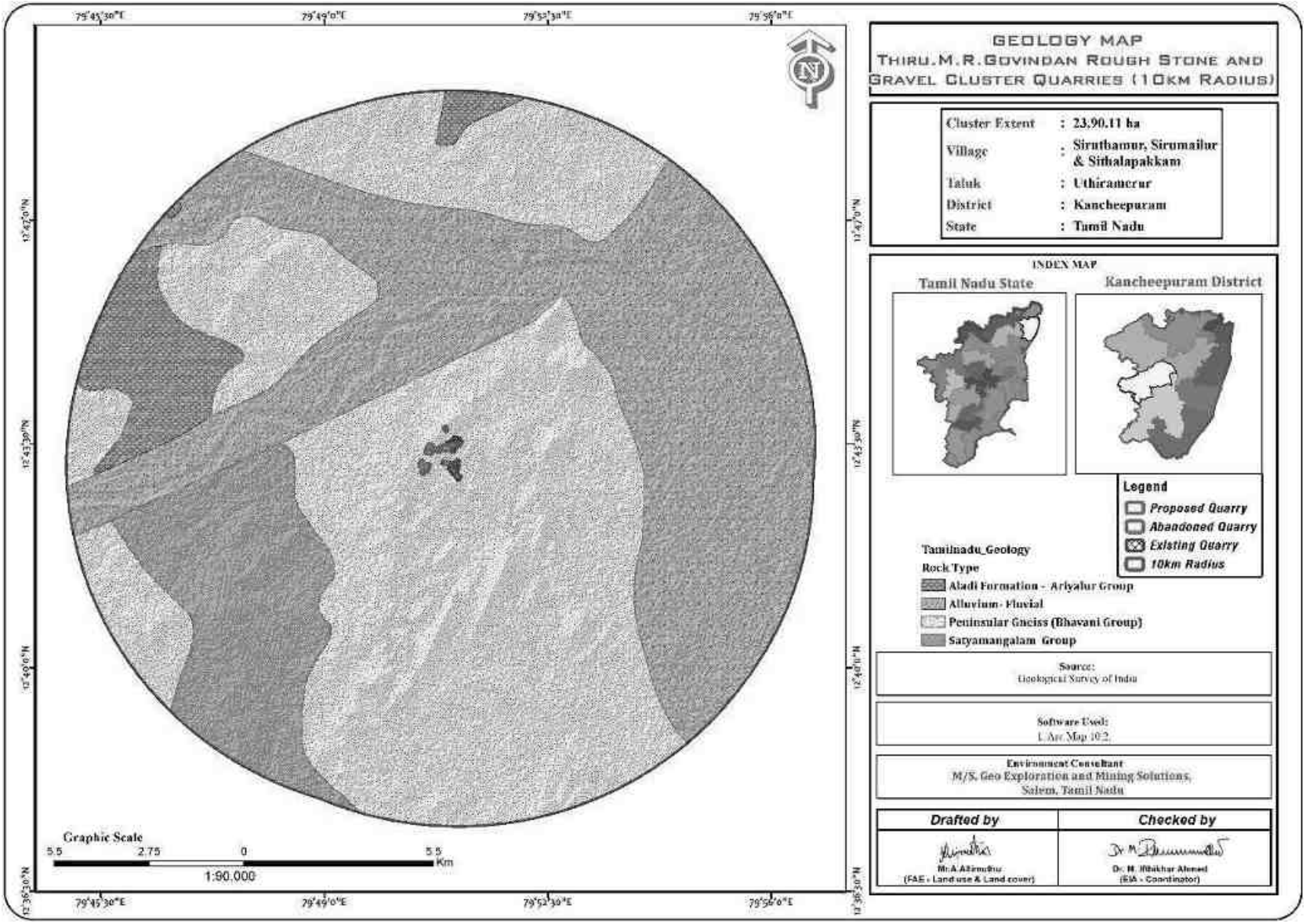
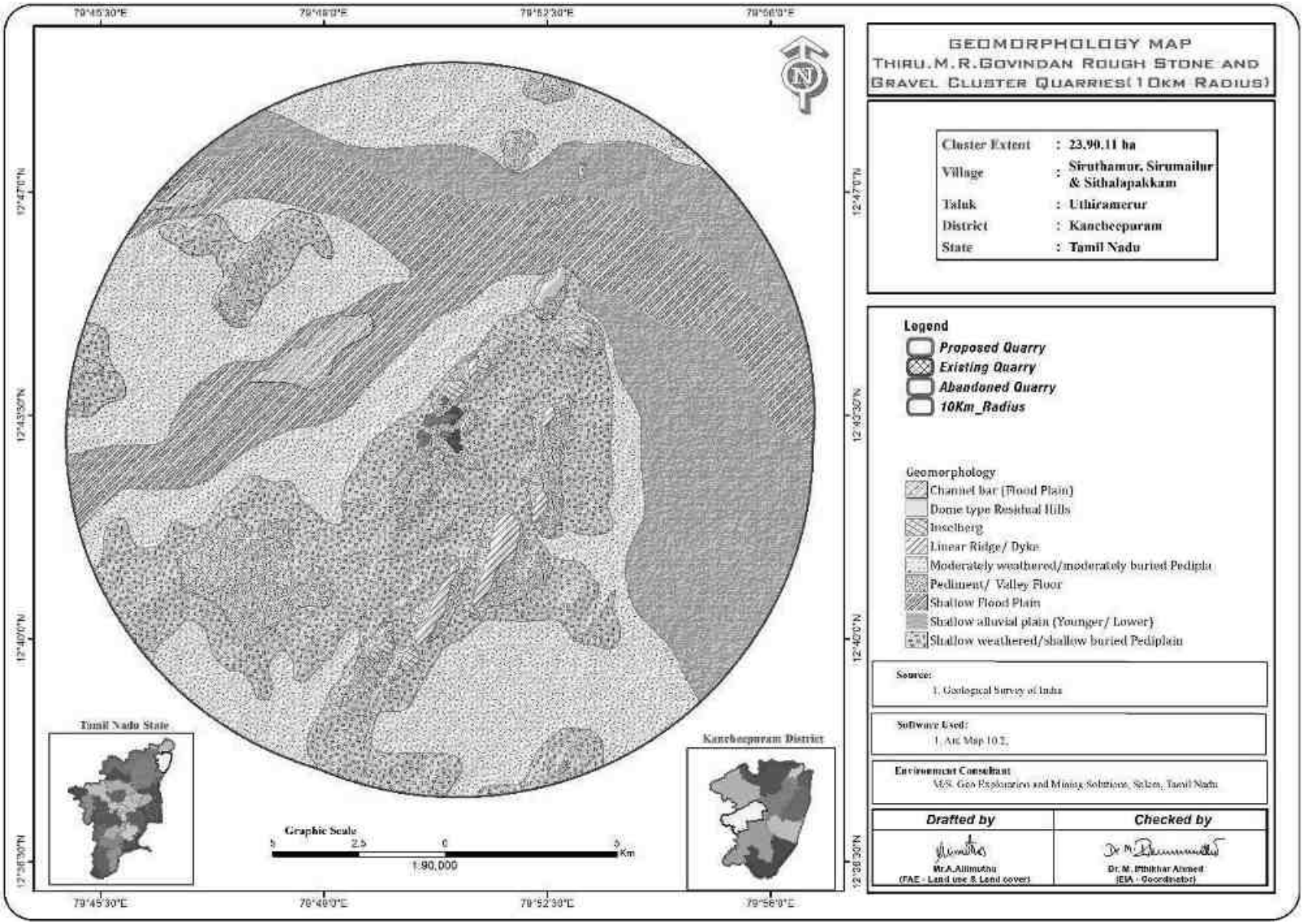


FIGURE 2.10: GEOMORPHOLOGY MAP



2.4 RESOURCES AND RESERVES

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

TABLE 2.10: RESOURCES AND RESERVES

Resources and Reserves – P1		
Description	**Rough Stone m^3**	**Gravel m^3**
Geological Resource in m^3	5.29,500	35,300
Mineable Resource in m^3	1,80,355	24,120
Year wise production for Ten-year plan period as per ToR	1,80,355	24,120
Resources and Reserves – P2		
Description	**Rough Stone m^3**	**Gravel m^3**
Geological Resource in m^3	13,87,850	87,500
Mineable Resource in m^3	1,00,919	12,464
Year wise production for Three-year plan period as per ToR	97,319	12,464

Source: Approved Mining Plan

TABLE 2.11: YEAR-WISE PRODUCTION PLAN

P1		
YEAR	**ROUGH STONE (m^3)**	**GRAVEL (m^3)**
I	18,810	8640
II	18,925	7800
III	18,750	7680
IV	18,195	-
V	17,325	-
VI	17,400	-
VII	17490	-
VIII	17,250	-
IX	17,340	-
X	18,870	-
TOTAL	**1,80,355**	**24,120**
P2		
YEAR	**ROUGH STONE (m^3)**	**DUMPED GRAVEL (m^3)**

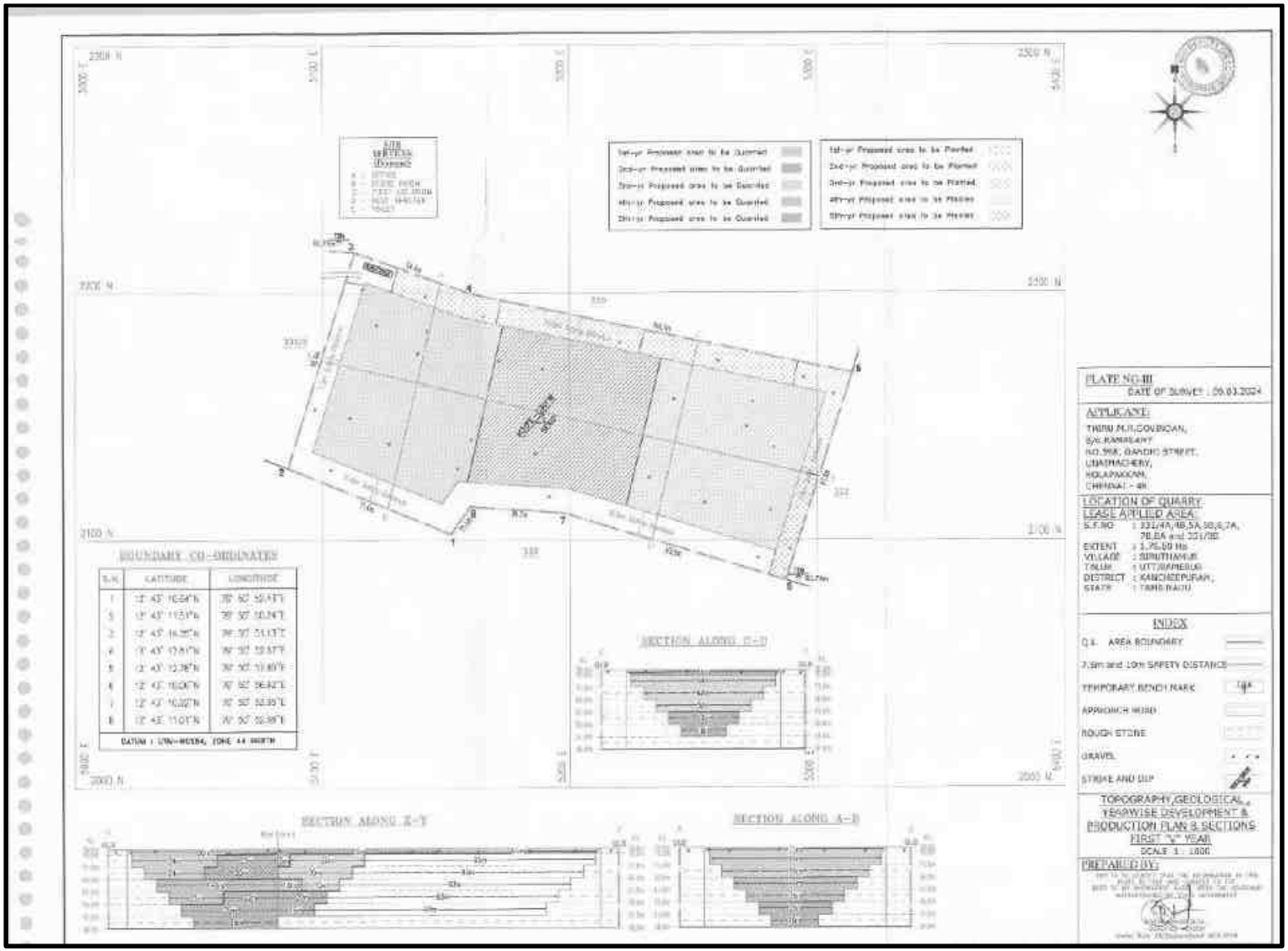
I	49765	**12,464**
II	30969	
III	16585	

Source: Approved Mining Plan

Disposal of Waste

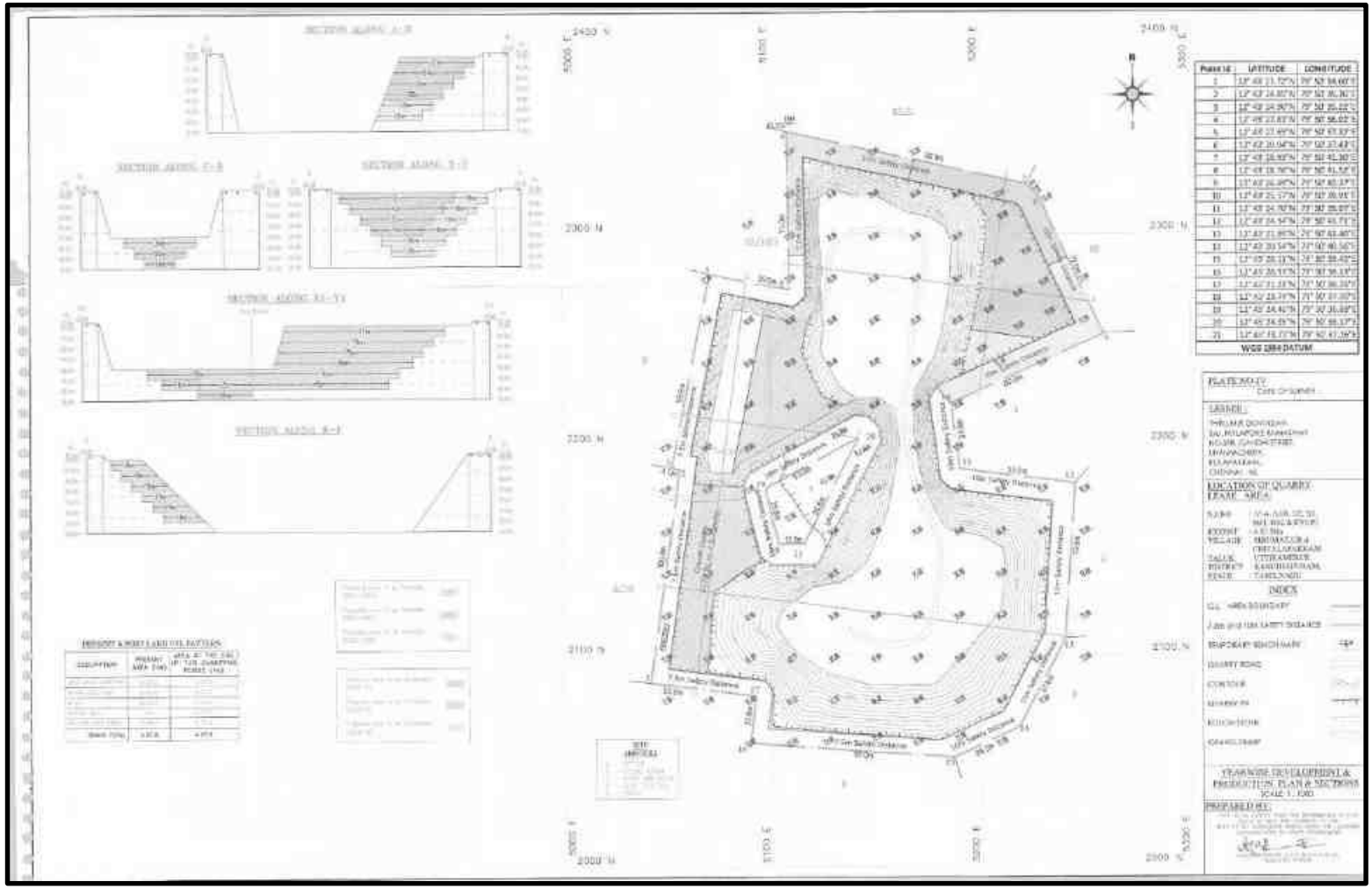
The overburden in the form of Gravel is about 24,120m^3 up to depth 2m for during this period, the Gravel will be directly loaded into trucks for the filling and levelling of low-lying areas, this will be done only after obtaining permission and paying necessary seigniorage fees to the Government.

FIGURE 2.11: TOPOGRAPHY, GEOLOGICAL, YEAR-WISE DEVELOPMENT PRODUCTION PLAN AND SECTIONS –P1



Source: Approved Mining Plan

FIGURE 2.12: TOPOGRAPHY, GEOLOGICAL, YEAR-WISE DEVELOPMENT PRODUCTION PLAN AND SECTIONS –P2



Source: Approved Mining Plan

Conceptual Mining Plan/ Final Mine Closure Plan

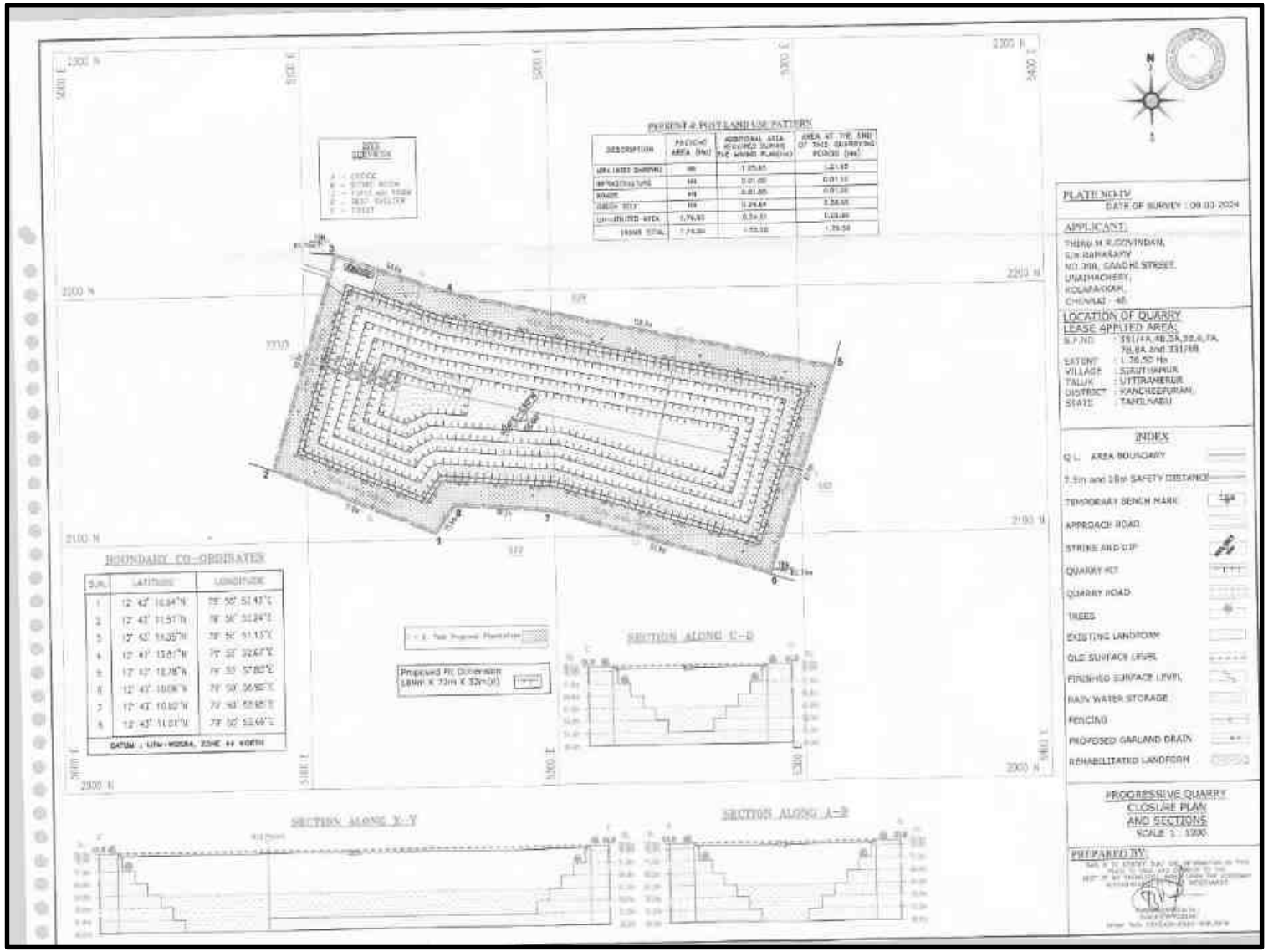
The ultimate pit size is designed based on certain practical parameters such as economical depth of mining, safety zones, permissible area, etc.

TABLE 2.12: ULTIMATE PIT DIMENSION

CODE	Length (Max) (m)	Width (Max) (m)	Depth (Max)
P1	189	72	32m bgl
P2	263	178	37m bgl

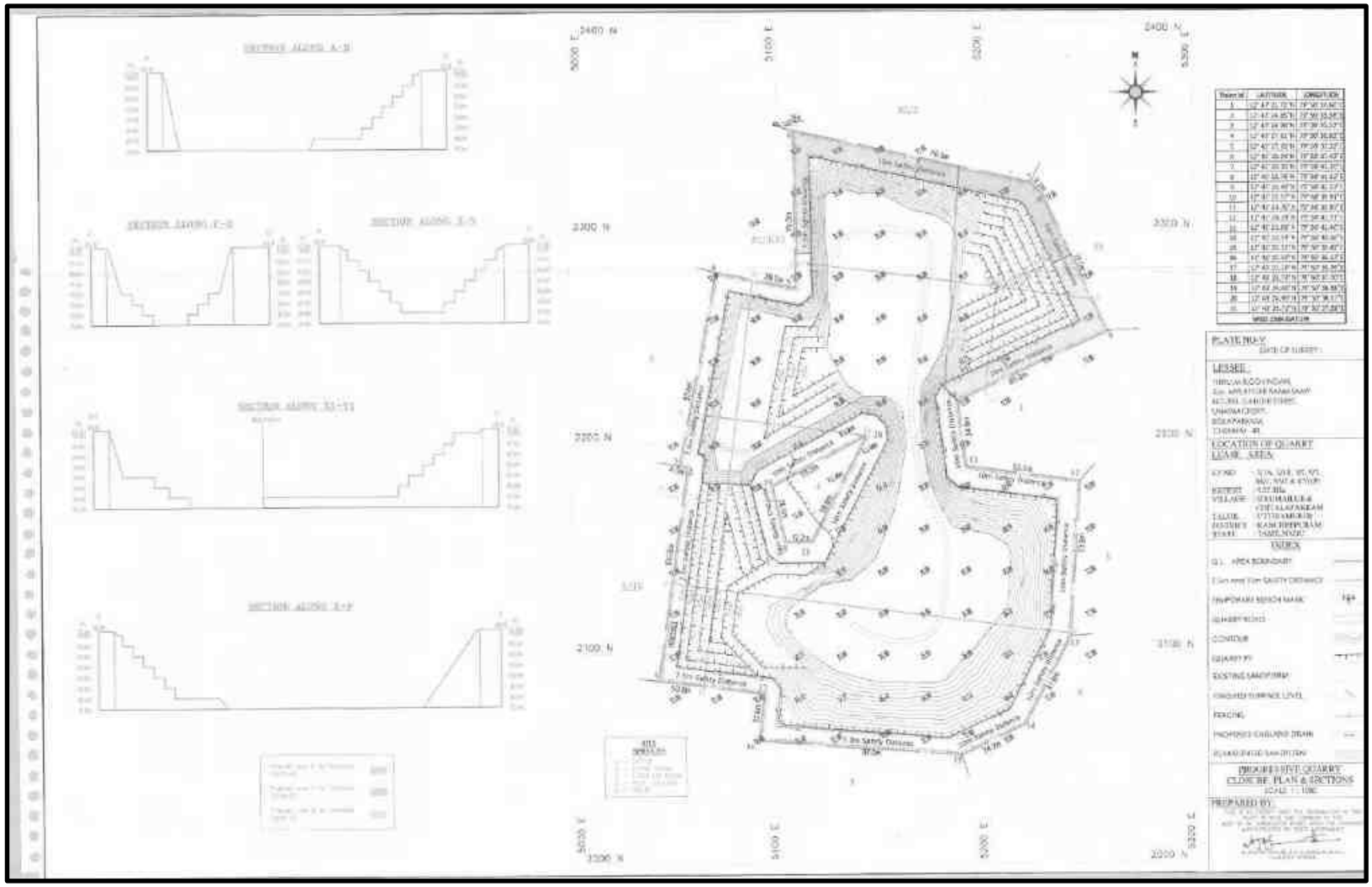
Source: Approved Mining Plan

FIGURE 2.13: CLOSURE PLAN AND SECTIONS – P1



Source: Approved Mining Plan

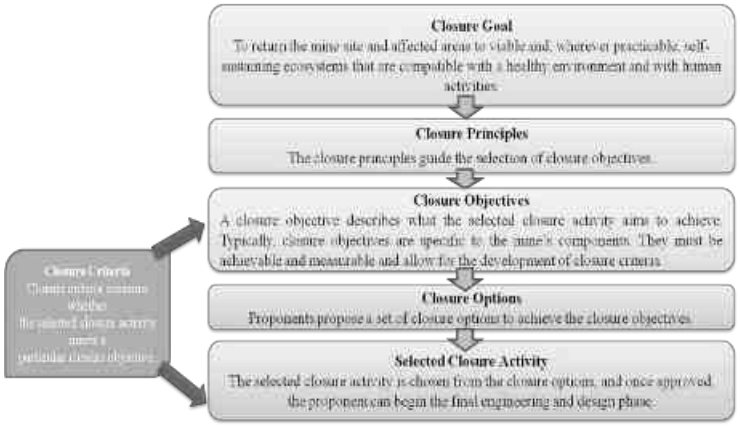
FIGURE 2.14: CLOSURE PLAN AND SECTIONS-P2



Source: Approved Mining Plan

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

Closure Objectives –



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

Closure Planning & Options Considerations in Mine Design –

- The closure of mine is well planned at the initial stage of planning & design consideration by the internal and external stake holders
- Construction of 2m height bund all along the mine pit boundary and ensure its stability all time & construction of garland drain along the natural slope to avoid sliding and collection of soil to the pit & surface runoff during rainfall
- After complete exploitation of mineral, the lowest bench foot wall side will be maintained as plain surface without any sump pits to avoid any accidents
- All the sharp edges will be dressed to smoother face before the closure of mine and ensure no loose debris on hanging wall side
- The project proponent as a part of social responsibilities assures to supply the stored mine pit water to the nearby villages after effective treatment process as per the standards of TNPCB & TWAD

- Native species will be planted in 3 row patterns on the boundary barriers and 1st bench, a full-time sentry will be appointed at the gate to prevent inherent entry of public & cattle.
- The access road to the quarry will be cut-off immediately after the closure
- The layout design shall be prepared and get approved from Department of Geology and Mining.
- The proponent is instructed to construct as per the layout approved
- Physical and chemical stability of structures left in place at the site, the natural rehabilitation of a biologically diverse, stable environment, the ultimate land use is optimized and is compatible with the surrounding area and the requirements of the local community, and taking the needs of the local community into account and minimizing the socio-economic impact of closure
- There will be a positive change in the environmental and ecology due to the mine closure

2.5 METHOD OF MINING

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

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

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

2.5.1 Drilling & Blasting Parameters

Drilling will be carried out using Wagon Drill, the depth of the hole will be maximum 6.5m.

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

Spacing	–	2.5 m
Burden	–	2.0 m
Depth of hole	–	6.5 m
Charge per hole	–	25.0kg
Powder factor	–	6.0 tonnes/kg
Diameter of hole	–	110 mm
Production Capacity	=	568m^3 of Rough stone per day
Spacing X Burden X Depth	=	2.5m X 2.0m X 6.5m = 32.5m^3
	=	32.5m^3X 2.6(Bulk Density) = 84.5Ts per hole

hence for the production of 568m^3 (1477Ts) = 246 Nos of holes to be drilled per day

Explosives per hole = ½ kg hence 123 kg of Explosives will be utilized maximum considering the peak production

Type of Explosives to be used –

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

Storage of Explosives –

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

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

2.5.2 Extent of Mechanization

TABLE 2.13 PROPOSED MACHINERY DEPLOYMENT

P1				
S.NO.	**TYPE**	**NOS**	**SIZE/CAPACITY**	**MOTIVE POWER**
1	Jack hammers	4	1.2m to 2.0m	Compressed air
2	Compressor	1	400 psi	Diesel Drive
3	Excavator with Bucket and Rock Breaker	1	300 HP	Diesel Drive
4	Trucks	2	35Tonnes	Diesel Drive
P2				
S.NO.	**TYPE**	**NOS**	**SIZE/CAPACITY**	**MOTIVE POWER**
1	Jack hammers	4	1.2m to 2.0m	Compressed air
2	Compressor	1	400 psi	Diesel Drive
3	Excavator with Bucket and Rock Breaker	1	300 HP	Diesel Drive
4	Trucks	3	35Tonnes	Diesel Drive

Source: Approved Mining Plan

2.6 GENERAL FEATURES

2.6.1 Existing Infrastructures

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

2.6.2 Drainage Pattern

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

2.6.3 Traffic Density

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

Traffic density measurements were performed at two locations

1. Panchayat Road-1.5km SE,
2. Kanvoy Kutroad(District Road)- 2.2km-NE

Traffic density measurement was made continuously for 24 hours by visual observation and counting of vehicles under three categories, viz., Heavy motor vehicles, light motor vehicles and two/three wheelers. As traffic densities on the

roads are high, two skilled persons were deployed simultaneously at each station during each shift- one person on either direction for counting the traffic. At the end of each hour, fresh counting and recording was undertaken.

TABLE.2.14: TRAFFIC SURVEY LOCATIONS

Station Code	Road Name	Distance and Direction	Type of Road
TS1	Panchayat Road	1.5km SE	Village Road
TS2	Kanvoy Kutroad(District Road)	2.2km NE	Major District Road

Source: On-site monitoring by GEMS FAE & TM

TABLE 2.15: EXISTING TRAFFIC VOLUME

Station code	HMV		LMV		2/3 Wheelers		Total PCU
	No	PCU	No	PCU	No	PCU	
TS1	40	120	50	50	250	125	295
TS2	125	375	90	90	300	150	615

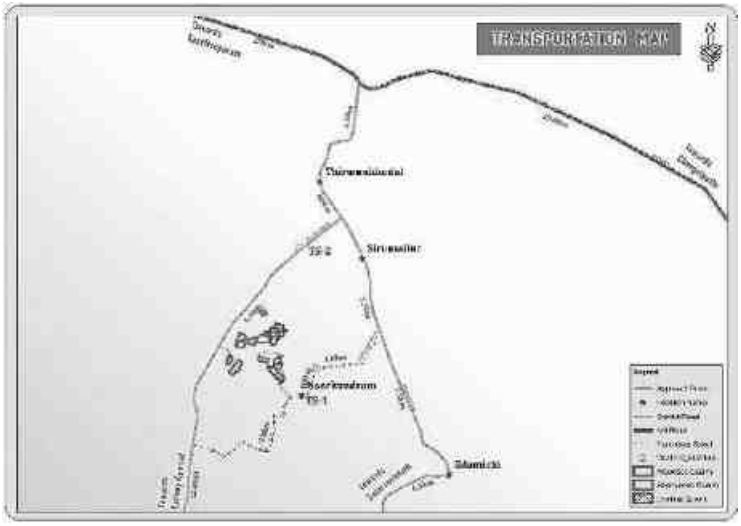
Source: On-site monitoring by GEMS FAE & TM

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

TABLE 2.16: ROUGH STONE & GRAVEL HOURLY TRANSPORTATION REQUIREMENT

Transportation of Rough Stone & Gravel per day		
Capacity of trucks	No. of Trips per day	Volume in PCU
20 tonnes	17	34

FIGURE.2.11: MINERAL TRANSPORTATION ROUTE MAP



Proposed Transportation Route:

1. The existing approach road is situated on the northern side of this road which connects to the main road at a distance of 90m.
2. Madukkari to Chettipalayam Road (MD-623) at a distance of 5.7km – North-east side from the project site.
3. No Major Habitation, Schools in the proposed transportation route.

TABLE 2.17: 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
Karumbukadai-Kumarapalayam (Panchayat Road)	295	34	329	1200
Okkilipalayam-Valanthavalam (District Road)	615	34	649	1500

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

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

2.6.4 Mineral Beneficiation and Processing

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

2.7 PROJECT REQUIREMENT

2.7.1 Water Source & Requirement

Detail of water requirements in KLD as given below:

TABLE 2.18: WATER REQUIREMENT FOR THE PROJECT

P1		
Purpose	**Quantity**	**Source**
Dust Suppression	0.8KLD	From the existing pit or from the water vendors
Green Belt	0.7KLD	From the existing pit or from the water vendors
Sanitation & Drinking	0.6KLD	From the existing pit or from the water vendors.
Total	**2.1KLD**	
P2		
Purpose	**Quantity**	**Source**
Dust Suppression	1.0KLD	From the existing pit or from the water vendors
Green Belt	0.9KLD	From the existing pit or from the water vendors
Sanitation & Drinking	0.8KLD	From the existing pit or from the water vendors.
Total	**2.7KLD**	

Source: Prefeasibility report

2.7.2 Power and Other Infrastructure Requirement

Power is not required for the mining operation; the mining operation will be carried out using Diesel Generator and Earth moving machineries using diesel. The quarrying activity is proposed during day time only (General Shift 8 AM – 5 PM, Lunch Break 1 PM – 2 PM). Electricity for use in office and other internal infrastructure will be obtained from TNEB by project proponent.

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

2.7.3 Fuel Requirement

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

Production of Rough stone = 73m^3

Production of Gravel = 21m^3

Type of machinery	Working hours	Average Diesel consumption/ Hour	Quantity of Diesel in Ltrs
Working hours of Excavator (Aprx)	568m^3/25m^3 = 23Hrs (Rough stone)	18 Ltrs	414
	40/60m^3 = 0.6Hrs (Gravel)	18 Ltrs	11
Compressor	Working hours per day 2 Hrs	8 Ltrs	16
Trucks, Motor pumps to drain water	Occasionally		20
Total Diesel Consumption			**461**

The Maximum diesel consumption is around 461Ltrs per day considering the peak production.

2.7.4 Project Cost

The Environmental Management plan has been prepared considering the mode of working, Safety of the employees and Monitoring periods the total Cost is 145.93 Lakhs.

2.8 EMPLOYMENT REQUIREMENT:

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

TABLE 2.19: PROPOSED MANPOWER DEPLOYMENT FOR P1 & P2

P1	
Designation	**No of persons**
Mines Manager	1
Geologist	1
Mine Foreman	1
Blaster	1
Excavator Operator	3
Truck Drivers	2
Water Sprinkler Operator	3
Jack – Hammer Operator	8
Security	2
Labour & Helper	4
Cleaner & Co-operator	4
Total	**26**
P2	
Designation	No of persons
Mine Foreman	1
Blaster	1
Excavator Operator	4
Jack – Hammer Operator	12
Security	2
Labour & Helper	5

Cleaner & Co-operator	4
Total	29

Source: Approved Mining Plan & Pre-Feasibility report.

2.9 PROJECT IMPLEMENTATION SCHEDULE

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

TABLE 2.20: EXPECTED TIME SCHEDULE

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

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

CHAPTER – 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.

As per the MoEF & CC Office Memorandum F. No IA3-22/10/2022.IA.III (E 177258) Dated 8th June, 2022 the baseline data is utilized for this proposal.

The baseline environment quality represents the background environmental scenario of various environmental components such as Land, Water, Air, Noise, Biological and Socio-economic status of the study area. Field monitoring studies to evaluate the base line status of the project site were carried out covering March to May 2023 with CPCB guidelines. Environmental data has been collected with reference to cluster quarries by Chennai Mettex Lab Private Limited, – An accredited by ISO/IEC 17025:2017 (NABL) Laboratory, for the below attributes-

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

3.1 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 quarries 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.

3.2 STUDY PERIOD

The baseline study was conducted during the Summer season (**Pre Monsoon**) i.e., Mar2023 –May2023.

3.3 STUDY METHODOLOGY

1. The project area (Core zone) was surveyed in detail with the help of Total Station survey instrument and the boundary pillars were picked up with the help of handheld 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).
2. Soil samples were collected and analysed for relevant physico-chemical characteristics, exchangeable cations, nutrients & micro nutrients etc., in order to assess the impact of mining activities and proposed greenbelt development.
3. Ground water samples were collected during the study period from the open wells and bore wells, while surface water was collected from river and lake 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 quarries.
4. A meteorological station was setup in pachapalayam village. Wind speed, Wind direction, Dry and wet bulb temperature, Relative humidity, Rainfall with cloud cover and general weather conditions were recorded throughout the study period.
5. 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

6. 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
7. Baseline Ecology and Biodiversity studies were carried out to assess the ecology of the study area to study the existing flora and fauna pattern of the area
8. 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 – ENVIRONMENTAL MONITORING ATTRIBUTES AND FREQUENCY OF MONITORING- P1&P2

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	6 (1 core & 5 buffer zone)	IS 2720 Agriculture Handbook - Indian Council of Agriculture Research, New Delhi
Water quality	Physical, Chemical and Bacteriological Parameters	Once during the study period	6 (2 surface water & 4 ground water)	IS 10500& CPCB Standards
Meteorology	Wind Speed Wind Direction Temperature Cloud cover Dry bulb temperature Rainfall	1 Hourly Continuous Mechanical/Automatic Weather Station	1	Site specific primary data& Secondary Data from IMD Station
Ambient Air Quality	PM_{10} $PM_{2.5}$ SO_2, NO_X CO Fugitive Dust	24 hourly twice a week (March 2023 –May 2023)	8 (1core & 7 buffer)	IS 5182 Part 1-23 National Ambient Air Quality Standards, CPCB
Noise Levels	Ambient Noise	Hourly observation for 24 Hours per location	8 (1core & 7 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
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 Chennai Mettex Private Limited in association with GEMS
* All monitoring and testing are being carried out as per the Guidelines of CPCB and MoEF & CC.

3.5 LAND ENVIRONMENT

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

3.5.1 LAND USE/ LAND COVER

To study the land use pattern of the core as well as a buffer zone, land use/land cover details have been identified/ maps have been prepared in accordance with the **Standard ToR point no. 4 & 10 Stating**:

Point No. 4 All comer coordinates of the mine lease area, superimposed on a High-Resolution Imagery/ topo sheet. 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 ofthe study area (core and buffer zone).

Point No. 10. Lard 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.

Current vintage data of Indian Remote Sensing Satellite ResourceSat1 LIII FMX (False Color Composite) has been used for Land Use / Land Cover study. Satellite image has been procured from National Remote Sensing Centre, Hyderabad.

3.5.2 OBJECTIVE

The objectives of the LULC study are as follow:

- To develop the Land use & Land cover map using land coordinates of the plant area (Core Zone) and 10 km radius from the plant site (Buffer area).
- To Identify and mark the important Land use and Land cover features using the primary and secondary data collected.
- To evaluate the impacts on existing land use/cover features of the buffer area by the Proposed Project activities.
- To identify the mitigative measures for the sustainable use of land and to protect the buffer zone from the adverse impacts.

Technical specification of Satellite Imagery Data Used:

Current vintage data of Indian Remote Sensing Satellite RESOURCESAT-2A (LISSIII MX) digital FCC (False Color Composite) has been used for preparation of Land use/ Land cover thematic map of study area. Satellite image has been procured from National Remote Sensing Centre, Hyderabad. Survey of India Toposheet as a reference map on 1:50,000 scale has been used for preparation of base layer data like road, rail network; village for geo-referencing of satellite image.

- Satellite Image - Resourcesat1-LISSIII, 23.5m Resolution
- Satellite Data Source - NRSC, Hyderabad
- Satellite Vintage - 14st July 2020, Swath 141km wide.
- SOI Toposheet No - 57 P/14
- Software Used - ArcGIS 10.8

The satellite image (FCC color 3,2,1) of the buffer zone is given in 3.1

The spatial resolution and the spectral bands in which the sensor collects the remotely sensed data are two important parameters for any land use survey. Resourcesat1-LISSIII, Resolution of 23.5m and a 141 km wide swath of the earth in 23.5m resolution covering wide areas the data is collected in 4 visible bands namely band number and Resolution.

TABLE 3.2: Resourcesat1-LISSIII SENSOR characteristics

Band Number	Description	Wavelength	Resolution
Band 1	Green	0.52-0.59 µm	23.5 meters
Band 2	Red	0.62-0.68 µm	23.5meters
Band 3	NIR	0.77-0.86 µm	23.5meters
Band 4	SWIR	1.55-1.70 µm	70meters

Source: NRSC, Hyderabad

3.5.3 METHODOLOGY

The land use / land cover map is prepared by adopting the interpretation techniques of the Satellite image in combination with collateral data such as Survey of India topographical maps. Image classification is done by using

visual interpretation techniques and digital classification using any of the image processing software. The various activities for preparation of LULC include preprocessing, rectification, image enhancements and classifying the satellite data for assessing the change in land use land cover due to proposed developmental activities.

- Preliminary/primary data collection of the study area
- Satellite data procurement from NRSC
- Secondary data collection from authorized bodies
- Survey of India Toposheet (SOI)
- Mine Layout
- Cadastral / Khasra map
- GPS Coordinates of Lease Boundary
- Processing of satellite data using ArcGIS 10.8 and preparing the Land Use & Land cover maps (e.g. Plant/Mine area, Existing Quarries, Settlements, Agriculture land, Non agriculture land, water bodies, etc.) by Digital Image Processing (DIP) technique.
- Geo-Referencing of the Survey of India Toposheet
- Geo-Referencing of satellite Imagery with the help of Geo-Referenced Toposheets
- Enhancement of the Satellite Imagery
- Base Map layer creation (Roads, Railway, Village Names, and other Secondary data, etc.)
- Data analysis and Classification using Digital interpretation techniques.
- Ground truth studies or field Verification.
- Error fixing / Reclassification
- Final Map Generation.

The land use/Land cover Map of the buffer zone is given in 3.4(b).
Land Use Pattern of the Buffer Zone (Study area)
Details of the same are given in Table - 3.3 and the map is shown in Figure - 3.3

TABLE: 3.3 LAND USE / LAND COVER DETAILS OF STUDY AREA

S.No	CLASSIFICATION	AREA_HA	AREA_%
	BUILTUP		
1	URBAN	238.13	0.75
2	RURAL	1149.69	3.60
3	MINING	107.34	0.34
	AGRICULTURAL LAND		
4	CROP LAND	20210.73	63.32
5	PLANTATION	840.51	2.63
	FOREST		
6	FOREST	1238.62	3.88
	BARREN/WASTE LANDS		
7	SCRUB LAND	903.05	2.83
8	SALT AFFECTED LAND	310.99	0.97
	WETLANDS/ WATER BODIES		
9	WATER BODIES/LAKE/RIVER	6919.33	21.68
TOTAL		31918.40	100.00

Source: NRSC, Bhuvan LU/LC Map for Buffer Zone.

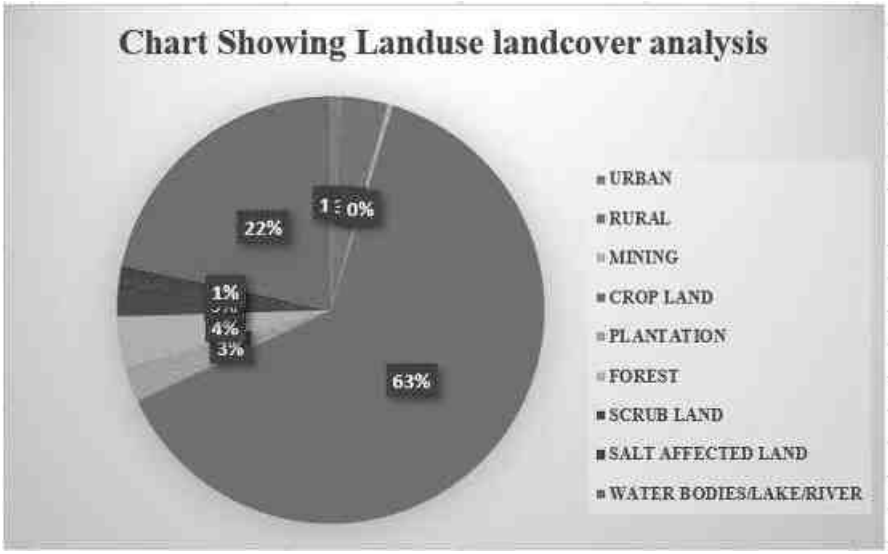
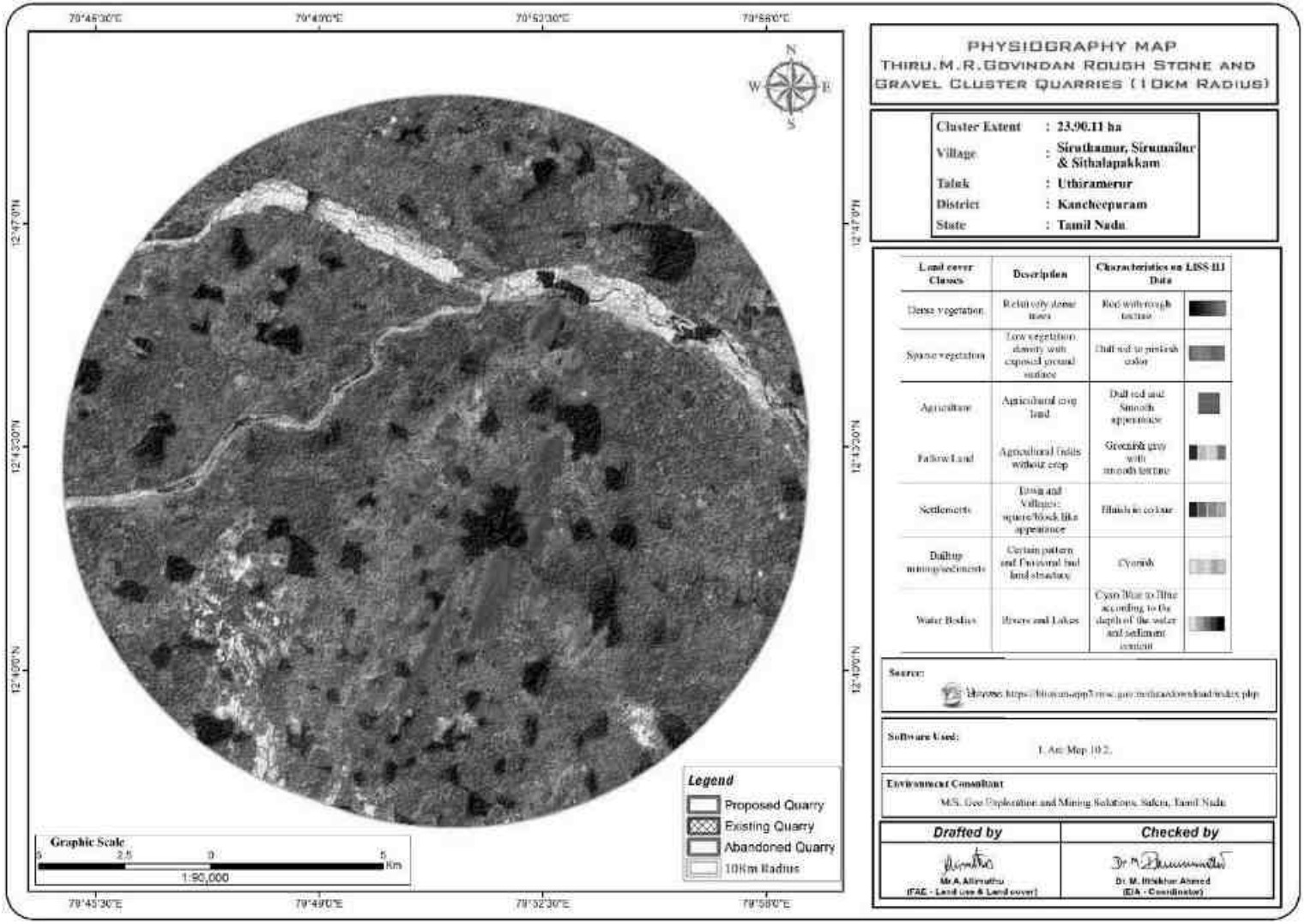
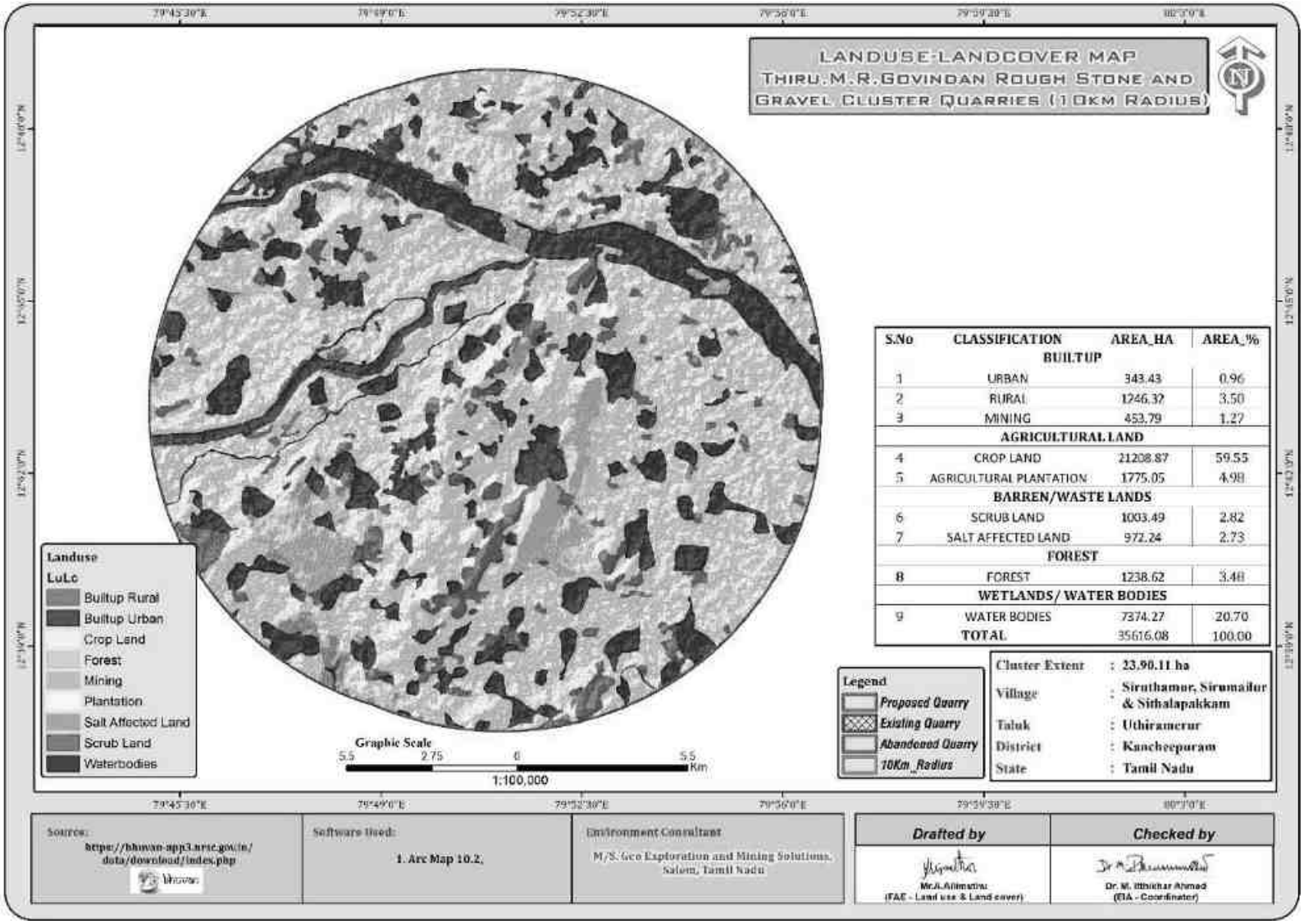


FIGURE 3.1: CHART SHOWING LANDUSE/LANDCOVER ANALYSIS USING LISS III Data

FIGURE 3.2: MAP SHOWING FALSE COLOR COMPOSITE (3,2,1) SATELLITE IMAGERY OF THE STUDY AREA





S.No	CLASSIFICATION	AREA_HA	AREA_%
	BUILTUP		
1	URBAN	343.43	0.96
2	RURAL	1246.32	3.50
3	MINING	453.79	1.27
	AGRICULTURAL LAND		
4	CROP LAND	21208.87	59.55
5	AGRICULTURAL PLANTATION	1775.05	4.98
	BARREN/WASTE LANDS		
6	SCRUB LAND	1003.49	2.82
7	SALT AFFECTED LAND	972.24	2.73
	FOREST		
8	FOREST	1238.62	3.48
	WETLANDS/ WATER BODIES		
9	WATER BODIES	7374.27	20.70
	TOTAL	35616.08	100.00

FIGURE 3.3: LAND USE LAND COVER MAP 10KM RADIUS

3.5.4 INTERPRETATION

- The 10 km radius study area mainly comprises of Agricultural land & open Scrub land accounting of 63.32 % & 2.83% of the total study area. The study area also consists of vegetation/plantation of 2.63%.
- The buffer zone studied has no ecological sensitive area (National Park, Wildlife Sanctuary, Biosphere Reserve/ etc.). 3.88 % of the total project area is occupied by the Reserve Forest land such as Kavanipakkam RF (3 Km in E direction).
- Water Bodies such as ponds/ lakes comprises of 21.68% of the total buffer area. The two seasonal rivers such as Palar River at 5Km, Cheyyar River 2.8km-NW direction and Sirudhamur Lake at 1.3 Km in SE direction of the total study area.
- The Scrub land accounts of 2.83%. As per the primary survey, it was observed the scrub land is mainly occupied by the stony waste and left-over domestic waste generated by the nearby areas.
- 0.34% of the total study area is occupied by the mine industries of captive mines. The area occupied by Mainly Crusher and Roughstone, gravel of the total buffer area. As also observed within the primary survey, the 10 km buffer area is also occupied by the medium scaled granite industries also located in the study area.
- 4.35% of the area is covered under the human Settlement. The nearest village within the 3 km radius from the project site boundary is observed to be villages Madhur, Neerkundram and Chitlapakkam etc.,

3.5.5 Cropping Pattern of the Buffer Zone

Agriculture is the main occupation of the people to which 47% of the population is engaged. Peanuts, Sugarcane, Cereals Millets, and Pulses are other important crops grown. Tanks and wells along the Palar river are important sources of irrigation in the district. The majority of the people of this district are engaged in agriculture. In Chengalpattu Rice is the major crop, sugarcane is also cultivated in some parts of the district.

Groundnur are also grown as a major crop in areas where/when there is a shortage of water, lack of rainfall. The cheyyur and Thirupporur taluks are famous for their cash crops like groundnut, Urad Dal, Moong dhal, Karamani, Seasame, etc., Vegetables like Eggplant, Okra is also grown in Thirupporur, Thirukkazhukkundram and Madurantagam regions. Watermelons are grown in summer in Kodur, Cheyyur and Surrounding areas. Beetroot leaves were grown in Karunguzhi. Source: https://www.agrifarming.in/district-wise-crop-production-in-tamil-nadu

3.5.6 Interpretation and Conclusion

- Sirumailour Village Roughstone and gravel quarries has proposed Project which will be done within the existing mines.
- Out of the total project area i.e. 31918.40 ha, 0.06% (i.e., 840.51 ha) will be developed under 2.63% greenbelt development/ plantation.
- As new Proposed mine is coming in the area, percentage of human settlement will be increased in surrounding of project site and Infrastructure facilities also will be developed on the basis of requirement.
- The 10 km study area mostly covers of agricultural land 63.32%.
- The project site falls under the Roughstone and gravel region. Therefore, the area is appropriate for developing Road development and building etc., it shows that the region has good prospects in the future. Due to proposed Roughstone and gravel in this region, economic condition of locals is expected to be improved directly & indirectly. Hence project will prove to be the best economic proposal for the coming times.

3.5.7 topography

The lease applied area is exhibits flat terrain. The area has gentle sloping towards Southern side from Kancheepuram district. The altitude of the area is 60m above Mean Sea level. The area is covered by 2m thickness of Gravel formation. Massive Charnockite which is clearly inferred from the existing and proposed quarry pits.

3.5.8 Drainage Pattern of the Area

There are no developed surface drainage channels in the study area. Noyyal, a non-perennial pass 12.0km-North from the project site. The area is studded with few tanks that serve as the source of drinking water and also their surplus feeds adjoining tanks. The area is mostly dry in all seasons except rainy seasons.

The general drainage pattern of the area is of sub dendritic and dendritic pattern. No prominent water course or nallah is inferred. During rainy season the surface runoff flows in W to E direction. The drainage pattern of the study area is given in Fig. 3.5. The quarrying activity will not hinder the natural flow of rainwater.

3.5.9 Environmental Features in the Study Area

There is no Wildlife Sanctuaries, National Park and Archaeological monuments within the study 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 mine lease area i.e., 10 km radius of the mine lease area, are given in the below Table 3.3.

3.5.10 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.

TABLE 3.4 – DETAILS OF ENVIRONMENT SENSITIVITY AROUND THE PROJECT AREA

Sl. No	Sensitive Ecological Features	Name	Arial Distance in km from Mine Lease Boundary
1	National Park / Wild life Sanctuaries	Karikili Bird Santuary	13km-S
2	Reserve Forest	KavanipakkamR.F-3km-E	3km-E
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	Defence Installation	None	Nil within 10KM Radius

Source: Survey of India Toposheet, Village Cadastral Map& Google Earth/Maps

TABLE 3.5 – WATER BODIES WITHIN THE CLUSTER FROM PROPOSED QUARRY

S.No	NAME	DISTANCE & DIRECTION
1	Odai	10m Safety
2	Kuttai	290m South
	Kuttai	380m West
3	Kalthangal Eri	670m South
4	Eri Near Chitalapakkam	820m NW
5	Periya Eri	1km East
6	Sirudhamur Lake	1.3km SE
7	Pond	1.5km East
8	Edaimachi Eri	2.2km SE
9	Cheyyar River	2.8km NW
10	Palar River	5km NE

Source: Village Cadastral Map and Field Survey

3.5.11 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 3.6 and Figure 3.6.

TABLE 3.6 – SOIL SAMPLING LOCATIONS

S. No	Location Code	Monitoring Locations	Distance & Direction	Coordinates
1	S-1	Core Zone	Project Area	12°43'10.99"N 79°50'29.66"E
2	S-2	Madhur	530m NW	12°43'15.05"N 79°50'11.98"E
3	S-3	Pullampakkam	3.7km North	12°45'14.19"N 79°50'34.17"E
4	S-4	Kavanipakkam	5.5km East	12°43'15.79"N 79°53'33.46"E
5	S-5	Vayalakavur	2.6km NW	12°44'3.92"N 79°49'21.12"E
6	S-6	Sirumailur	3.4km NE	12°44'17.17"N 79°52'4.46"E

Source: On-site monitoring/sampling by Chennai Mettex Private Limited in association with GEMS

The objective of the soil sampling is

1. To determine the baseline soil characteristics of the study area;
2. To determine the impact of proposed activity on soil characteristics and;

To determine the impact on soil more importantly agriculture production point of view.

Methodology

For studying soil quality, sampling locations were selected to assess the existing soil conditions in and around the proposed quarry site representing various land use conditions. The samples were collected by auger boring into the soil up to 90-cm depth. Eight (8) 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 sealed 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 3.5.

TABLE 3.7 – 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* ***Chennai Mettex 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 classification of soil and physico-chemical characteristics of the soils are presented below in Table 3.6 & Test Results in Table 3.7.

FIGURE 3.4: SOIL SAMPLING LOCATIONS AROUND 10 KM RADIUS

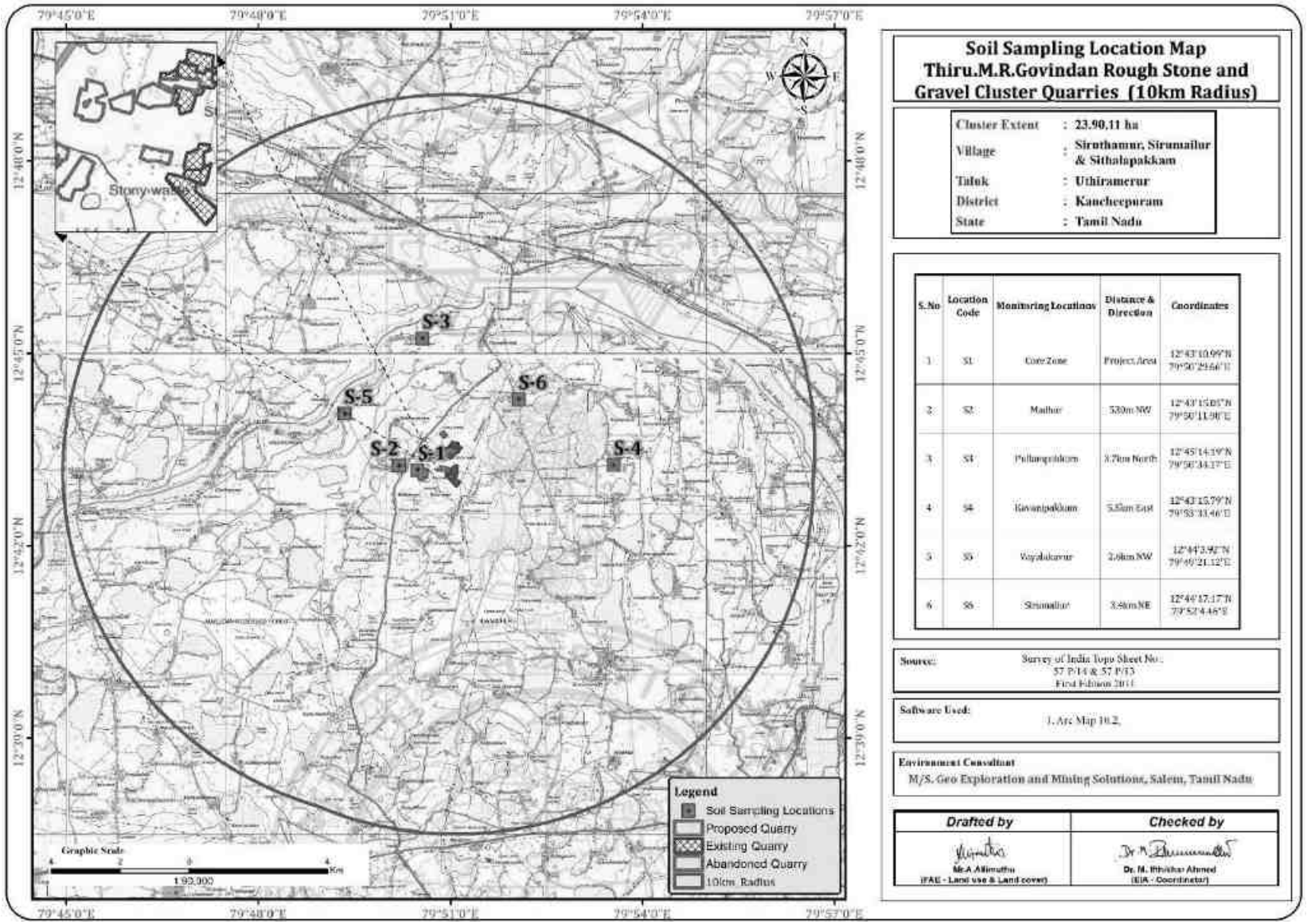


FIGURE 3.5: SOIL MAP

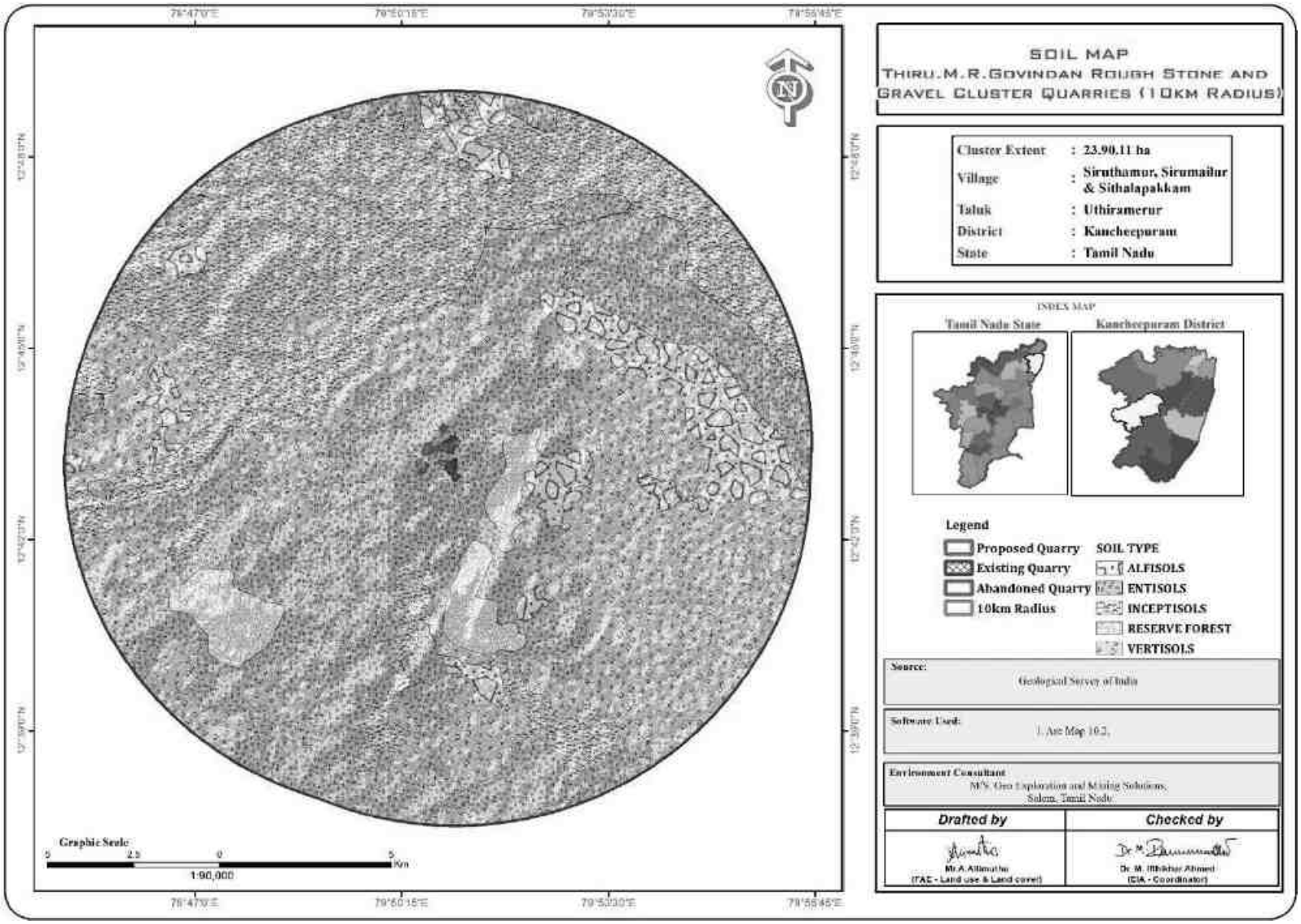


TABLE 3.8 – SOIL QUALITY MONITORING DATA

Sno	Test Parameters	Protocols	S1-core Zone	S2- Madhur	S3- Pullampakkam	S4- Kavanipakkam	S5- Vayalakavur	S6- Sirumailur
1	pH @ 25°C	IS 2720 Part 26 - 1987	8.53	8.77	8.03	8.34	8.86	7.68
2	Conductivity @ 25°C	IS 14767 - 2000 (Reaff : 2016)	590 µmhos/cm	473 µmhos/cm	423 µmhos/cm	450 µmhos/cm	376 µmhos/cm	673 µmhos/cm
3	Texture :							
	Clay	Gravimetric Method	30.8 %	31.2 %	35.4 %	39.2 %	32.1 %	34.5 %
	Sand		31.8 %	36.7 %	32.2 %	35.5 %	28.6 %	32.8 %
	Silt		37.4 %	32.1 %	32.4 %	25.3 %	39.3 %	32.7 %
4	Water Holding Capacity	By Gravimetric Method	45.3 %	45.3 %	46.5 %	45.7 %	44.9 %	46.6 %
5	Bulk Density	By Cylindrical Method	1.01 g/cm^3	1.06 g/cm^3	0.99 g/cm^3	1.09 g/cm^3	1.01 g/cm^3	0.87 g/cm^3
6	Porosity	By Gravimetric Method	46.6 %	46.4 %	47.1 %	47.5 %	47.1 %	47.5 %
7	Calcium as Ca	USEPA 3050 B – 1996 &	143 mg/kg	170 mg/kg	144 mg/kg	162 mg/kg	142.6 mg/kg	168.7 mg/kg
8	Magnesium as Mg	USEPA 6010 C - 2000	61.7 mg/kg	110 mg/kg	60.1 mg/kg	107.9 mg/kg	90.8 mg/kg	72 mg/kg
9	Manganese as Mn		22 mg/kg	21.4 mg/kg	21 mg/kg	26 mg/kg	18.6 mg/kg	24.4 mg/kg
10	Zinc as Zn		1.17 mg/kg	1.02 mg/kg	3.6 mg/kg	3.10 mg/kg	4.1 mg/kg	1.6 mg/kg
11	Boron as B		1.8 mg/kg	0.64 mg/kg	0.8 mg/kg	0.71 mg/kg	2.5 mg/kg	0.19 mg/kg
12	Chloride as Cl	APHA 23rd Edn 2019 4500 Cl B	92.4 mg/kg	176 mg/kg	50.1 mg/kg	89.3 mg/kg	155 mg/kg	103 mg/kg
13	Total Soluble Sulphate as SO_4	IS 2720 Part 27 : 1977 (Reaff:2015)	0.010 %	0.018 %	0.0011 %	0.021 %	0.005 %	0.009 %
14	Potassium as K	USEPA 3050 B – 1996 & USEPA 6010 C - 2000	21.1 mg/kg	31.4 mg/kg	44.5 mg/kg	35.5 mg/kg	200 mg/kg	27.6 mg/kg
15	Total Phosphorus as P	IS 10158 : 1982 (Reaff: 2019)	2.6 mg/kg	1.6 mg/kg	1.6 mg/kg	1.29 mg/kg	1.5 mg/kg	2.9 mg/kg
16	Total Nitrogen as N	IS 14684 : 1999 (Reaff:2019)	374.2 mg/kg	510 mg/kg	400 mg/kg	254.1 mg/kg	480 mg/kg	410 mg/kg
17	Cadmium as Cd	USEPA 3050 B – 1996 &	BDL (DL : 1.0 mg/kg)	BDL (DL : 1.0 mg/kg)	BDL (DL : 1.0 mg/kg)	BDL (DL : 1.0 mg/kg)	BDL (DL : 1.0 mg/kg)	BDL (DL : 1.0 mg/kg)
18	Total Chromium as Cr	USEPA 6010 C - 2000	BDL (DL : 1.0 mg/kg)	BDL (DL : 1.0 mg/kg)	BDL (DL : 1.0 mg/kg)	BDL (DL : 1.0 mg/kg)	BDL (DL : 1.0 mg/kg)	BDL (DL : 1.0 mg/kg)
19	Copper as Cu		BDL (DL : 1.0 mg/kg)	BDL (DL : 1.0 mg/kg)	BDL (DL : 1.0 mg/kg)	BDL (DL : 1.0 mg/kg)	BDL (DL : 1.0 mg/kg)	BDL (DL : 1.0 mg/kg)
20	Lead as Pb		0.6 mg/kg	0.19 mg/kg	0.53 mg/kg	0.35 mg/kg	0.21 mg/kg	0.51 mg/kg
21	Iron as Fe		1.91 mg/kg	2.64 mg/kg	2.45 mg/kg	2.06 mg/kg	1.98 mg/kg	2.74 mg/kg
22	Organic Matter	IS : 2720 Part 22: 1972 (Reaff: 2015)	1.74 %	2.17 %	1.74 %	3.20 %	2.10 %	1.86 %
23	Organic Carbon	IS : 2720 Part 22: 1972 (Reaff: 2015)	1.01 %	1.26 %	1.01 %	1.86 %	1.22 %	1.08 %
24	Cation Exchange Capacity	USEPA 9080 – 1986	40.1 meq/100g of soil	38.9 meq/100g of soil	40.1 meq/100g of soil	34.4 meq/100g of soil	44 meq/100g of soil	42.7 meq/100g of soil

Source: Sampling Results by Chennai Mettex Private Limited ,

- This proposed mining activity is for rough stone and Gravel Quarry by opencast mechanized mining method involving occasional drilling & blasting activities on the weathered formation and removal of topsoil and preserving in safety barrier of the lease area to facilitate greenbelt development and winning of rough stone by eco-friendly wire-saw cutting method.
- Dust generation due to this quarrying activity becomes air borne and gets carried away to surrounding areas which may retard the photosynthesis activities of plants and heavy metals naturally occur in soil, but additional pollution come from anthropogenic activities such as agriculture, urbanisation, industrialisation, and mining.
- The proposed rough stone project is a Charnockite formation which does not source to heavy metal contamination.
- This proposed mining is a small-scale activity and in order to mitigate the impact of mining around the proposed mine lease area on Soil Health and Biodiversity its proposed by ways of daily three times water sprinkling by own water tanker and water sprinkling arrangements and greenbelt development all along the mine lease boundary
- Therefore, the implementation of proposed mitigation measures for winning of mineral may not have much of impact on the surrounding Soil Health and Biodiversity.

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 Clay is about ranging from (30.8 -39.2%) and Sandy Soil is about ranging from (28.6 -36.7%) and Bulk Density of Soils in the study area varied between 0.87 – 1.09g/cc. The Water Holding Capacity and Porosity of the soil samples is found to be medium i.e., ranging from 44.9 – 46.6 % and 46.4– 47.5%.

Chemical Characteristics –

- The nature of soil is slightly alkaline to strongly alkaline in nature with pH range 7.68 to 8.86
- The available Nitrogen content range between 254.1 to 510 mg/kg
- The available Phosphorus content range between 1.5 to 2.9 mg/kg
- The available Potassium range between 21.1 mg/kg to 200 mg/kg

Whereas, the micronutrient as zinc (Zn), iron (Fe) and copper (Cu) were found in the range of 1.02 to 4.1 mg/kg; 1.91 to 2.74 mg/kg and ND

Wilting co efficient in significant level would mean that the soil would support the vegetation. The soil properties in the buffer zone reveal that the soil can sustain vegetation. If amended suitability the core area can also withstand plantation.

3.6 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.

3.6.1 Surface Water Resources:

Palaru river lies at 5 Km North East, Cheyyar River2.8km in North West from the project cluster. The buffer area is studded with few tanks that serve as the source for agriculture and also their surplus feeds adjoining tanks. The rainfall over the area is moderate, the rainwater storage in open wells, trenches is in practice over the area and the stored water acts as source of freshwater for couple of months after rainy season.

3.6.2 Ground Water Resources:

The terrain is underlain by hard rock formations, Fissured and fractured crystalline rocks constitute the important aquifer systems in the Chengalpattu region. Ground water occurs under phreatic to semi-confined conditions in these formations and is being developed by means of dug wells and filter points. Proterozoic formation is the basement rocks which consist of quartzite, crystalline limestone, calc-granulite, hornblende – biotite gneiss,

charnockite or pyroxene granulite, granite and pegmatite. Weathered, a fissured crack, shear zones and joints in the basement rock act as a good groundwater potential zone in the study area.

The study area falls in the Maduranthagam block which is categorized as over-exploited zone as per G.O (MS) No 113 dated 09.06.2016.

3.6.3 Methodology

Reconnaissance survey was undertaken to collect the sampling and locations were finalized based on;

1. Drainage pattern;
2. Location of residential areas representing different activities/likely impact areas; and
3. Likely areas, which can represent baseline conditions

Two (2) surface water and four (4) ground water samples were collected in the study area and physico-chemical, heavy metals and bacteriological parameters were analysed. The samples were analysed as per the procedures specified by CPCB, IS-10500:2012 and 'Standard methods for the Examination of Water and Waste water' published by American Public Health Association (APHA). The water sampling locations are given in Table 3.8 and shown as Figure 3.5.

TABLE 3.6 – WATER SAMPLING LOCATIONS

S. No	Location code	Monitoring Locations	Distance & Direction from the cluster	Coordinates
1	SW-1	Lake Near Neerkundram	2.4km SE	12°42'32.01"N 79°51'40.61"E
2	SW-2	Cheyyaru	2.8km NW	12°44'40.48"N 79°49'46.13"E
3	WW-1	Near Project Area	150m North	12°43'20.05"N 79°50'30.39"E
4	WW-2	Sirumailur	3.4km NE	12°44'12.89"N 79°52'4.95"E
5	BW-1	Near Project Area	280m West	12°43'14.02"N 79°50'20.10"E
6	BW-2	Nariambakkam	4.2km SW	12°41'59.29"N 79°48'29.86"E

Source: On-site monitoring/sampling by ***Chennai Mettex Private Limited in*** association with GEMS
Note: SW- Surface water, WW – Well Water, BW – Bore well

FIGURE 3.6: WATER SAMPLING LOCATIONS AROUND 10 KM RADIUS

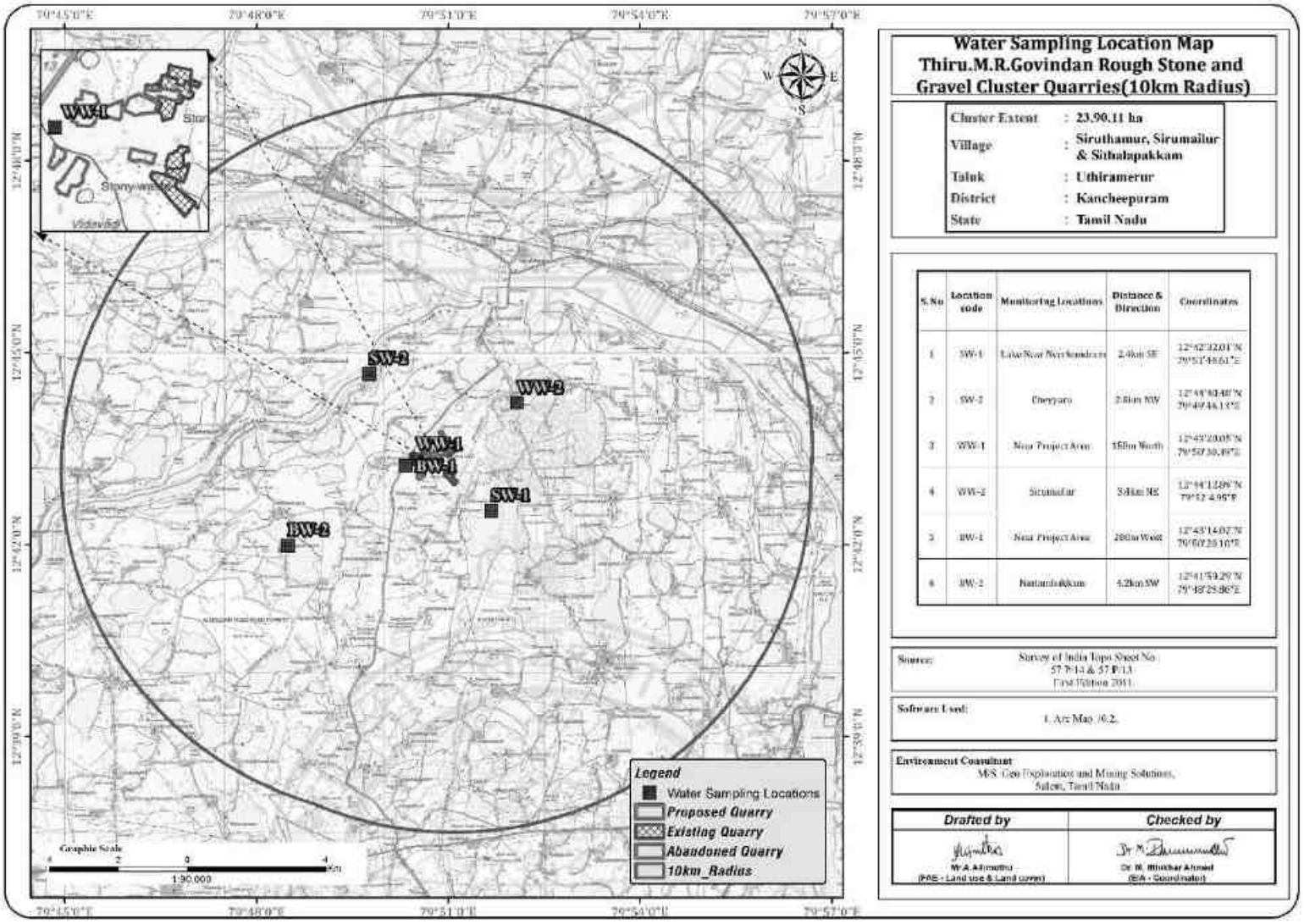


TABLE 3.10 – SURFACE WATER ANALYSIS RESULTS

SNO	TEST	PROTOCOL	Surface Water (SW-1) - Lake Near Neerkundram	Surface Water (SW-2) Cheyyaru
1	Colour	IS 3025 Part 4:1983 (Reaff:2017)	5 Hazen	10 Hazen
2	Odour	IS 3025 Part 5:2018	Agreeable	Agreeable
3	pH at 25°C	IS 3025 Part 11:1983 (Reaff:2017)	7.59	7.51
4	Conductivity @ 25°C	IS 3025 Part 14:2013 (Reaff:2019)	1137 µmhos/cm	1281 µmhos/cm
5	Turbidity	IS 3025 Part 10:1984 (Reaff:2017)	3.1 NTU	4.1 NTU
6	Total Dissolved Solids	IS 3025 Part 16:1984 (Reaff:2017)	671 mg/l	755 mg/l
7	Total Hardness as $CaCO_3$	IS 3025 Part 21:2009 (Reaff:2019)	163.51 mg/l	215.54 mg/l
8	Calcium as Ca	IS 3025 Part 40:1991 (Reaff:2019)	30.6 mg/l	38.6 mg/l
9	Magnesium as Mg	IS 3025 Part 46:1994 (Reaff:2019)	21.2 mg/l	29 mg/l
10	Total Alkalinity as $CaCO_3$	IS 3025 Part 23:1986 (Reaff:2019)	240 mg/l	288 mg/l
11	Chloride as Cl	IS 3025 Part 32:1988 (Reaff:2019)	192.4 mg/l	216.5 mg/l
12	Sulphate as SO_4	IS 3025 Part 24:1986 (Reaff:2019)	88 mg/l	91.4 mg/l
13	Iron as Fe	IS 3025 Part 53:2003 (Reaff:2019)	0.39 mg/l	0.39 mg/l
14	Residual Free Chlorine	IS 3025 Part 26:1986 (Reaff:2019)	BDL (DL:0.1 mg/l)	BDL (DL:0.1 mg/l)
15	Fluoride as F	APHA 23rd Edn. 2017:4500 F,D	0.31 mg/l	0.18 mg/l
16	Nitrate as NO_3	IS 3025 Part 34:1988 (Reaff:2019)	7.6 mg/l	8.7 mg/l
17	Copper as Cu	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)
18	Manganese as Mn	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.02 mg/l)	BDL (DL:0.02 mg/l)
19	Mercury as Hg	USEPA 200.8	BDL (DL:0.0005 mg/l)	BDL (DL:0.0005 mg/l)
20	Cadmium as Cd	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.001 mg/l)	BDL (DL:0.001 mg/l)
21	Selenium as Se	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)
22	Aluminium as Al	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)
23	Lead as Pb	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)
24	Zinc as Zn	IS 3025 Part 65:2014 (Reaff:2019)	BDL(DL : 0.05 mg/l)	BDL(DL : 0.05 mg/l)
25	Total Chromium as Cr	IS 3025 Part 65:2014 (Reaff:2019)	BDL(DL : 0.02 mg/l)	BDL(DL : 0.02 mg/l)
26	Boron as B	IS 3025 Part 65:2014 (Reaff:2019)	BDL(DL : 0.05 mg/l)	BDL(DL : 0.05 mg/l)
27	Mineral Oil	IS 3025 Part 39-1991 (Reaff. 2019)	BDL(DL : 0.01 mg/l)	BDL(DL : 0.01 mg/l)
28	Phenolic compounds as C_6H_5OH	IS 3025 Part 43-1992(Reaff: 2019)	BDL (DL:0.0005 mg/l)	BDL (DL:0.0005 mg/l)
29	Anionic Detergents (as MBAS)	IS 13428 – 2005 (Reaff:2019) (Annex K)	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)
30	Cyanide as CN	IS 3025 Part 27-1986 (Reaff. 2019)	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)
31	BOD @ 27°C for 3 days	IS 3025 Part 44:1993 (Reaff:2019)	9.5 mg/l	6.1 mg/l
32	Chemical Oxygen Demand	IS 3025 Part 58:2006 (Reaff:2017)	40 mg/l	32 mg/l
33	Dissolved Oxygen	IS 3025 Part 38:1989 (Reaff:2019)	5.2 mg/l	5.6 mg/l
34	Barium as Ba	IS 3025 Part 65:2014 (Reaff:2019)	BDL(DL:0.05 mg/l)	BDL(DL:0.05 mg/l)
35	Ammonia (as total ammonia-N)	IS 3025 Part 34-1988 (Reaff. 2019)	BDL (DL:0.01 mg/l)	1.9 mg/l
36	Sulphide as H_2S	IS 3025 Part 29-1986 (Reaff: 2019)	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)
37	Molybdenum as Mo	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.02 mg/l)	BDL (DL:0.02 mg/l)
38	Total Arsenic as As	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)
39	Total Suspended Solids	IS 3025 Part 17 -1984 (Reaff:2017)	8.1 mg/l	10.2 mg/l
40	**Total Coliform**	**APHA 23rd Edn. 2017:9221B**	970 MPN/100ml	850 MPN/100ml
41	***Escherichia coli***	**APHA 23rd Edn. 2017:9221F**	110 MPN/100ml	100 MPN/100ml
Note : APHA – American Public Health Association, BDL – Below Detection Limit, DL – Detection Limit, MPN – Most Probable Number				

TABLE 3.11 – GROUND WATER ANALYSIS RESULTS

Sno	Test	Protocol	Ground Water (WW-1) – Near Project Area	Ground Water (WW-2) – Sirumailur	Ground Water (BW1) Near Project Area	Ground Water (BW-2) – Nariambakkam
1	Colour	IS 3025 Part 4:1983 (Reaff:2017)	5	5 Hazen	5 Hazen	5 Hazen
2	Odour	IS 3025 Part 5:2018	Agreeable	Agreeable	Agreeable	Agreeable
3	pH at 25°C	IS 3025 Part 11:1983 (Reaff:2017)	8.01	7.71	6.99	7.07
4	Conductivity @ 25°C	IS 3025 Part 14:2013 (Reaff:2019)	1005 µmhos/cm	1235 µmhos/cm	1181 µmhos/cm	907 µmhos/cm
5	Turbidity	IS 3025 Part 10:1984 (Reaff:2017)	1.1 NTU	1.0 NTU	1.0 NTU	1.0 NTU
6	Total Dissolved Solids	IS 3025 Part 16:1984 (Reaff:2017)	593 mg/l	729 mg/l	697 mg/l	535 mg/l
7	Total Hardness as $CaCO_3$	IS 3025 Part 21:2009 (Reaff:2019)	181.80 mg/l	201.05 mg/l	169.98 mg/l	146.26 mg/l
8	Calcium as Ca	IS 3025 Part 40:1991 (Reaff:2019)	37.6 mg/l	35.1 mg/l	32.7 mg/l	25.5 mg/l
9	Magnesium as Mg	IS 3025 Part 46:1994 (Reaff:2019)	21.4 mg/l	27.6 mg/l	21.5 mg/l	20.1 mg/l
10	Total Alkalinity as $CaCO_3$	IS 3025 Part 23:1986 (Reaff:2019)	179.2 mg/l	294.3 mg/l	287 mg/l	191.5 mg/l
11	Chloride as Cl	IS 3025 Part 32:1988 (Reaff:2019)	150 mg/l	164 mg/l	170 mg/l	135 mg/l
12	Sulphate as SO_4	IS 3025 Part 24:1986 (Reaff:2019)	80.1 mg/l	95.7 mg/l	70.3 mg/l	67.3 mg/l
13	Iron as Fe	IS 3025 Part 53:2003 (Reaff:2019)	0.19 mg/l	0.11 mg/l	0.25 mg/l	0.25 mg/l
14	Residual Free Chlorine	IS 3025 Part 26:1986 (Reaff:2019)	BDL (DL:0.1 mg/l)	BDL (DL:0.1 mg/l)	BDL (DL:0.1 mg/l)	BDL (DL:0.1 mg/l)
15	Fluoride as F	APHA 23rd Edn. 2017:4500 F,D	0.16 mg/l	0.19 mg/l	0.12 mg/l	0.20 mg/l
16	Nitrate as NO_3	IS 3025 Part 34:1988 (Reaff:2019)	4.9 mg/l	7.1 mg/l	7.1 mg/l	6.3 mg/l
17	Copper as Cu	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)
18	Manganese as Mn	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.02 mg/l)	BDL (DL:0.02 mg/l)	BDL (DL:0.02 mg/l)	BDL (DL:0.02 mg/l)
19	Mercury as Hg	USEPA 200.8	BDL (DL:0.0005 mg/l)	BDL (DL:0.0005 mg/l)	BDL (DL:0.0005 mg/l)	BDL (DL:0.0005 mg/l)
20	Cadmium as Cd	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.001 mg/l)	BDL (DL:0.001 mg/l)	BDL (DL:0.001 mg/l)	BDL (DL:0.001 mg/l)
21	Selenium as Se	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)
22	Aluminium as Al	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)
23	Lead as Pb	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)
24	Zinc as Zn	IS 3025 Part 65:2014 (Reaff:2019)	BDL(DL : 0.05 mg/l)	BDL(DL : 0.05 mg/l)	BDL(DL : 0.05 mg/l)	BDL(DL : 0.05 mg/l)
25	Total Chromium as Cr	IS 3025 Part 65:2014 (Reaff:2019)	BDL(DL : 0.02 mg/l)	BDL(DL : 0.02 mg/l)	BDL(DL : 0.02 mg/l)	BDL(DL : 0.02 mg/l)
26	Boron as B	IS 3025 Part 65:2014 (Reaff:2019)	BDL(DL : 0.05 mg/l)	BDL(DL : 0.05 mg/l)	BDL(DL : 0.05 mg/l)	BDL(DL : 0.05 mg/l)
27	Mineral Oil	IS 3025 Part 39-1991 (Reaff. 2019)	BDL(DL : 0.01 mg/l)	BDL(DL : 0.01 mg/l)	BDL(DL : 0.01 mg/l)	BDL(DL : 0.01 mg/l)
28	Phenolic compounds as C_6H_5OH	IS 3025 Part 43-1992(Reaff: 2019)	BDL (DL:0.0005 mg/l)	BDL (DL:0.0005 mg/l)	BDL (DL:0.0005 mg/l)	BDL (DL:0.0005 mg/l)
29	Anionic Detergents (as MBAS)	IS 13428 – 2005 (Reaff:2019) (Annex K)	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)
30	Barium as Ba	IS 3025 Part 27-1986 (Reaff. 2019)	BDL(DL:0.05 mg/l)	BDL(DL:0.05 mg/l)	BDL(DL:0.05 mg/l)	BDL(DL:0.05 mg/l)
31	Ammonia (as total ammonia-N)	IS 3025 Part 44:1993 (Reaff:2019)	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)
32	Sulphide as H_2S	IS 3025 Part 58:2006 (Reaff:2017)	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)
33	Molybdenum as Mo	IS 3025 Part 38:1989 (Reaff:2019)	BDL (DL:0.02 mg/l)	BDL (DL:0.02 mg/l)	BDL (DL:0.02 mg/l)	BDL (DL:0.02 mg/l)
34	Total Arsenic as As	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)
35	Total Suspended Solids	IS 3025 Part 17 -1984 (Reaff:2017)	BDL (DL:1.0 mg/l)	BDL (DL:1.0 mg/l)	BDL (DL:1.0 mg/l)	BDL (DL:1.0 mg/l)
36	**Total Coliform**	APHA 23rd Edn. 2017:9221B	120 MPN/100ml	90 MPN/100ml	40 MPN/100ml	110 MPN/100ml
37	***Escherichia coli***	APHA 23rd Edn. 2017:9221F	< 1.8 MPN/100ml	< 1.8 MPN/100ml	< 1.8 MPN/100ml	< 1.8 MPN/100ml

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

* 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.

Source: Sampling Results by Chennai Mettex Private Limited

3.6.4 Interpretation& Conclusion

Surface Water

The pH of surface 7.51-7.59 while turbidity found within the standards. Total Dissolved Solids 671-755mg/l and Chloride 192.4-216.5mg/l. Nitrates 7.6-8.7 mg/l, while sulphates 88.0-91.4 mg/l.

Ground Water

The pH of the water samples collected ranged from 6.99 to 8.01and within the acceptable limit of 6.5 to 8.5. pH, Sulphates and Chlorides of water samples from all the sources are within the limits as per the Standard. on Turbidity, the water samples meet the requirement. Total Dissolved Solids were found in the range of 535- 729mg/l in all samples. Total hardness varied between 146.26 mg/l – 201.05 mg/l 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.

3.6.5 Hydrology and Hydrogeological studies

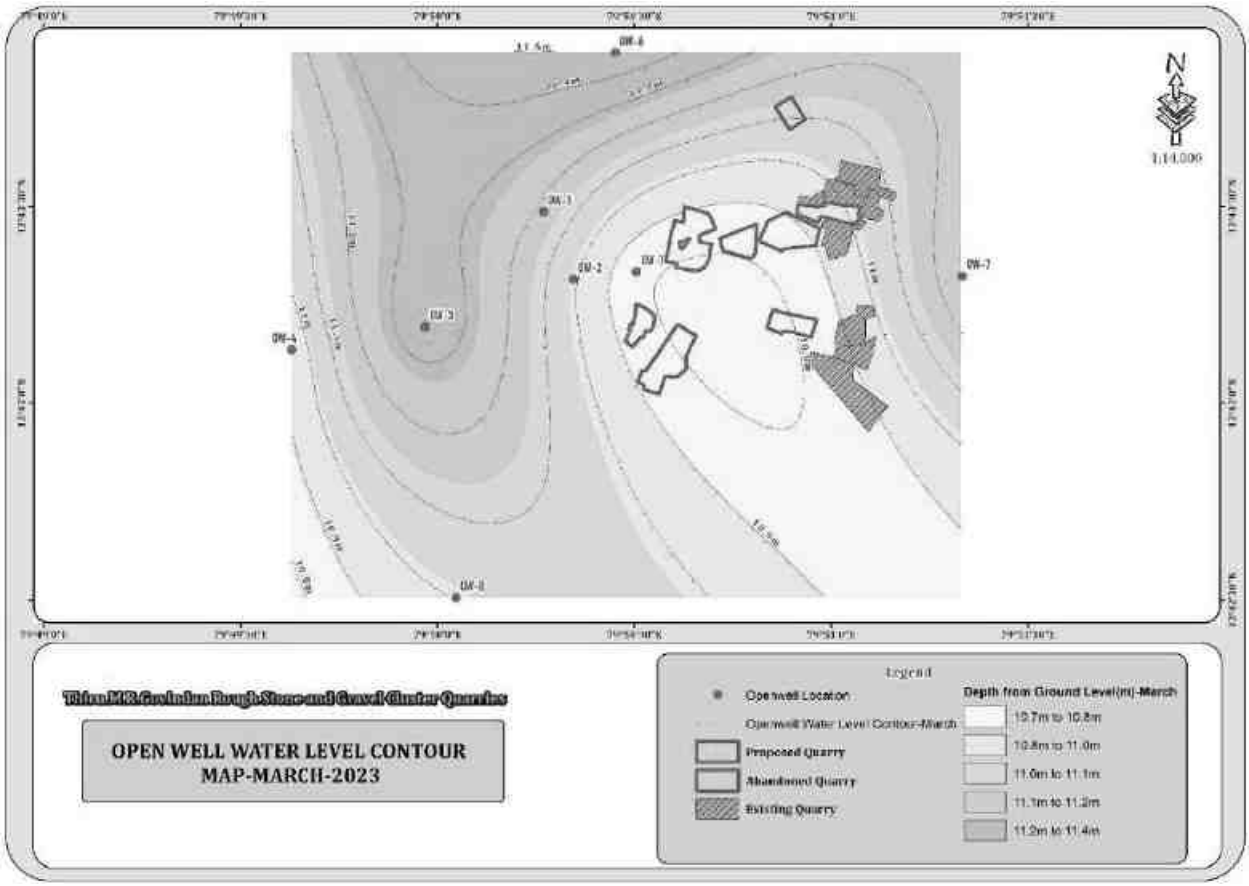
The district is underlain by hard rock formation fissured and fractured crystalline rocks constitute the important aquifer systems in the district. Geophysical prospecting was carried out in that area by SSRMP-80 Instrument by qualified Geo physicist with the help of IGIS software and it was inferred that the low resistance encountered at the depth between 68 - 65m. The Maximum depth of the quarrying operation in this proposal is 35m 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 this upcoming project.

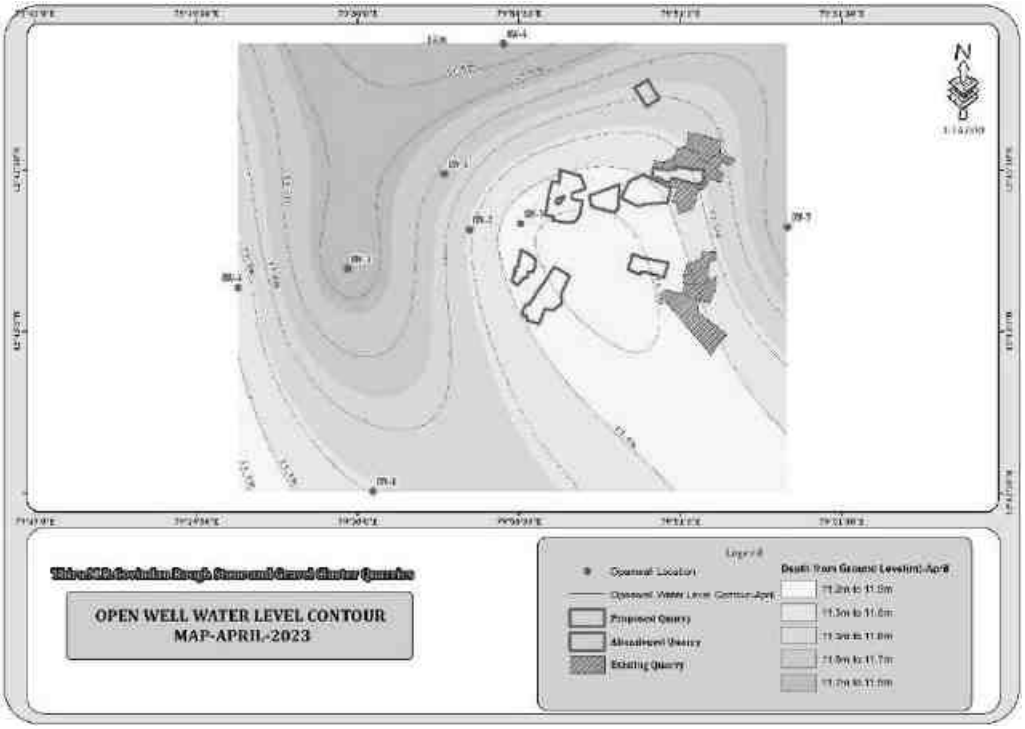
During the rainy season there is a possibility of collection of seepage water from the subsurface levels this is due to the high intensity of fracture and weathered portion upto a depth of 10m thus the collected seepage water will be stored in the mine sump pits and will be used for dust suppression and greenbelt development and during the end of the life of the mine this collected water will be as a temporary reservoir in that area.

TABLE 3.12: SUMMER SEASON WATER LEVEL OF OPEN WELLS 1 KM RADIUS

S.No	Name	LATITUDE	LONGITUDE	Mar-23	Apr-23	May-23
1	OW-1	79° 50' 30.3401" E	12° 43' 20.0462" N	10.8	11.3	11.7
2	OW-2	79° 50' 20.7304" E	12° 43' 18.8975" N	11	11.5	11.9
3	OW-3	79° 49' 58.1517" E	12° 43' 11.6702" N	11.4	11.9	12.3
4	OW-4	79° 49' 37.7446" E	12° 43' 08.1625" N	10.9	11.4	11.8
5	OW-5	79° 50' 16.1411" E	12° 43' 29.2277" N	11.2	11.7	12.1
6	OW-6	79° 50' 27.0717" E	12° 43' 53.4916" N	11.5	12	12.4
7	OW-7	79° 51' 19.9761" E	12° 43' 19.4156" N	11.3	11.8	12.2
8	OW-8	79° 50' 02.8161" E	12° 42' 30.3543" N	11	11.5	11.9

FIGURE 3.9: CONTOUR MAP OF OPEN WELL WATER LEVEL




OPEN WELL WATER LEVEL CONTOUR
MAP-APRIL-2023

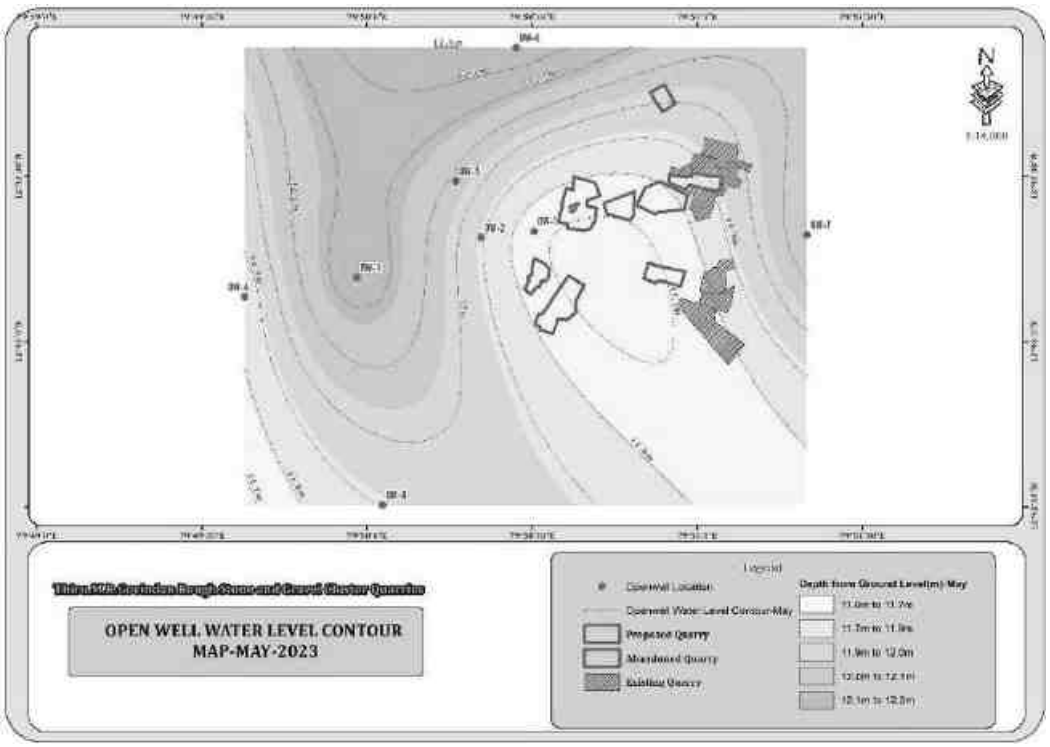
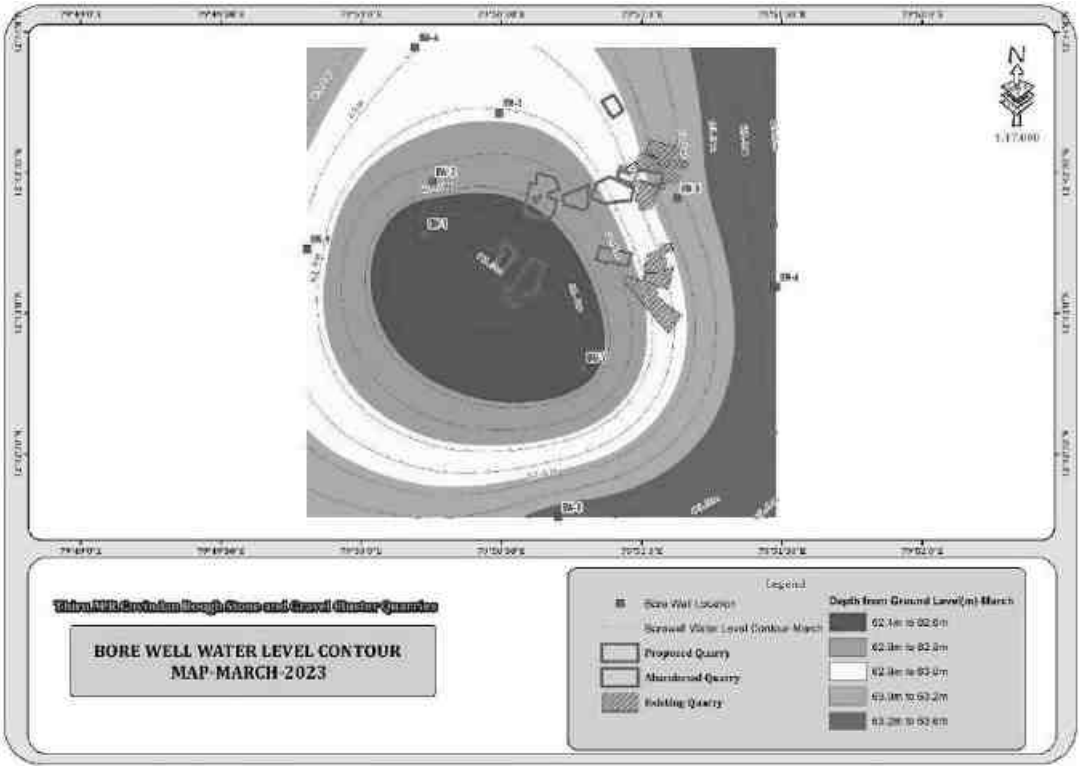
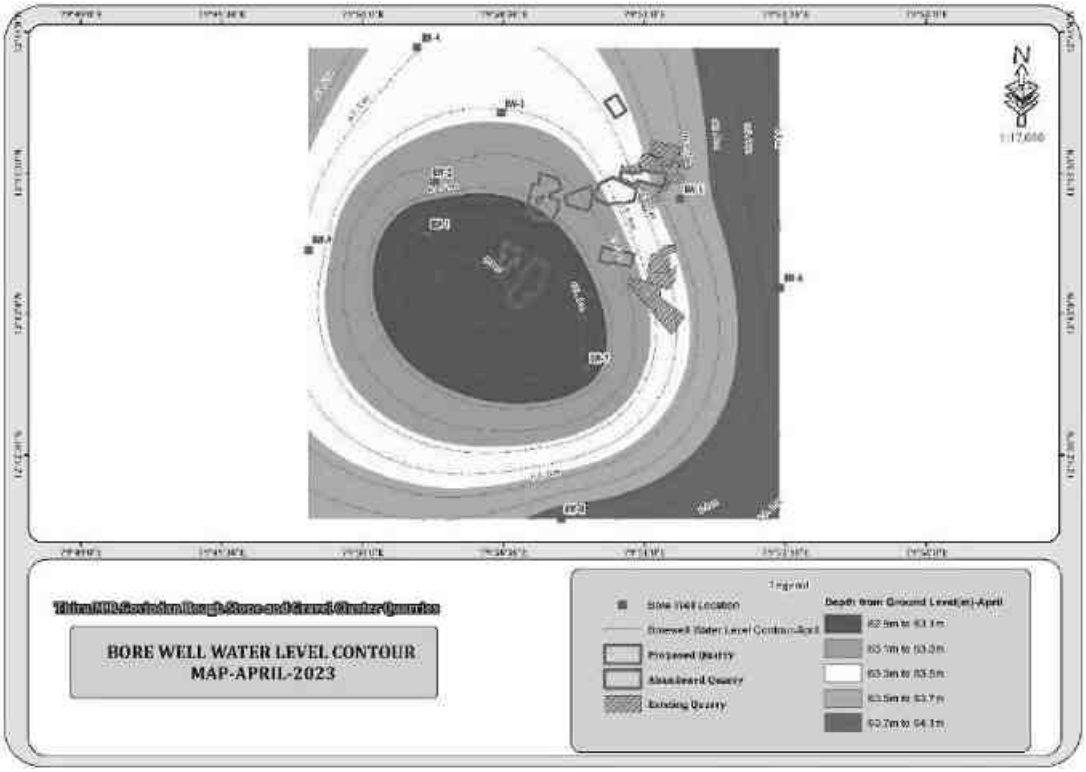

OPEN WELL WATER LEVEL CONTOUR
MAP-MAY-2023

TABLE 3.13: SUMMER SEASON WATER LEVEL OF BOREWELLS 1 KM RADIUS

S.No	Name	LATITUDE	LONGITUDE	Mar-23	Apr-23	May-23
1	BW-1	79° 50' 13.6103" E	12° 43' 17.0761" N	62.5	63	63.4
2	BW-2	79° 50' 15.2178" E	12° 43' 28.1170" N	62.8	63.3	63.7
3	BW-3	79° 50' 29.4745" E	12° 43' 42.7612" N	62.9	63.4	63.8
4	BW-4	79° 50' 11.5729" E	12° 43' 56.7436" N	63	63.5	63.9
5	BW-5	79° 51' 07.6194" E	12° 43' 24.5373" N	63.2	63.7	64.1
6	BW-6	79° 51' 28.7576" E	12° 43' 05.6203" N	63.5	64	64.4
7	BW-7	79° 50' 47.5243" E	12° 42' 48.4840" N	62.6	63.1	63.5
8	BW-8	79° 50' 42.2316" E	12° 42' 16.4983" N	63.4	63.9	64.3
9	BW-9	79° 49' 48.4614" E	12° 43' 13.6780" N	63	63.5	63.9

FIGURE 3.10: CONTOUR MAP OF BORE WELL WATER LEVEL




BORE WELL WATER LEVEL CONTOUR
MAP-APRIL-2023
Legend
Bore Well Location
Proposed Quarry
Abandoned Quarry
Existing Quarry
Depth from Ground Level(m)-April

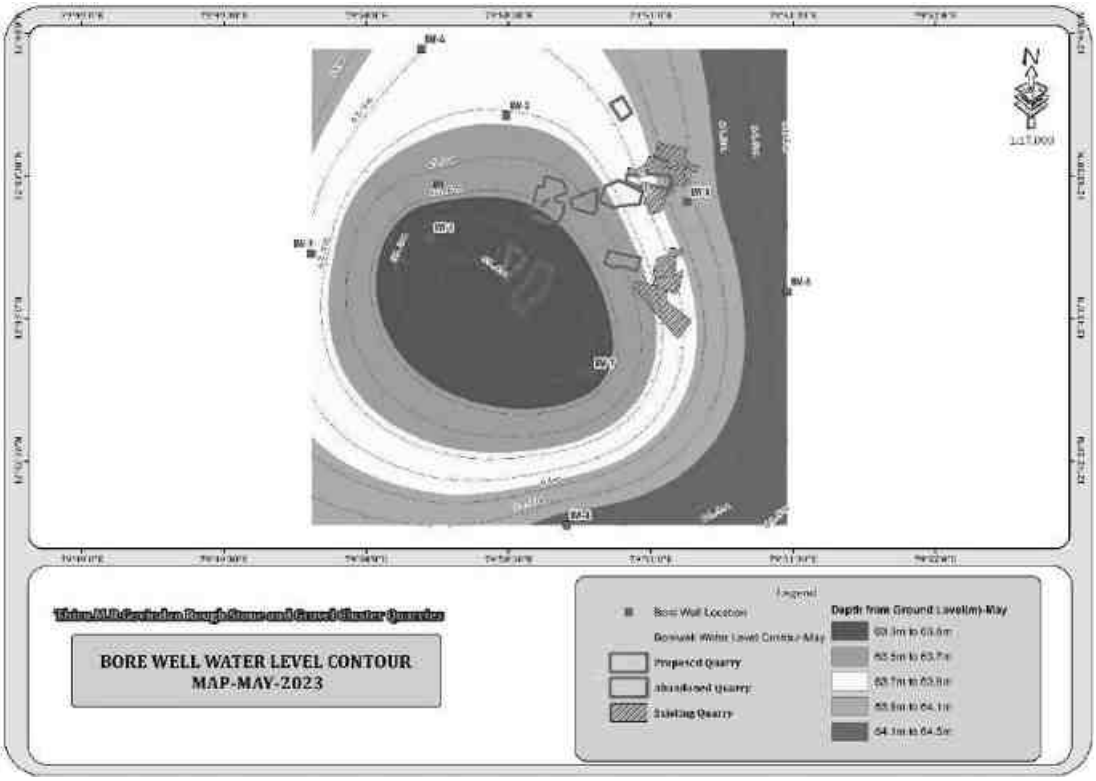

BORE WELL WATER LEVEL CONTOUR
MAP-MAY-2023
Legend
Bore Well Location
Proposed Quarry
Abandoned Quarry
Existing Quarry
Depth from Ground Level(m)-May

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

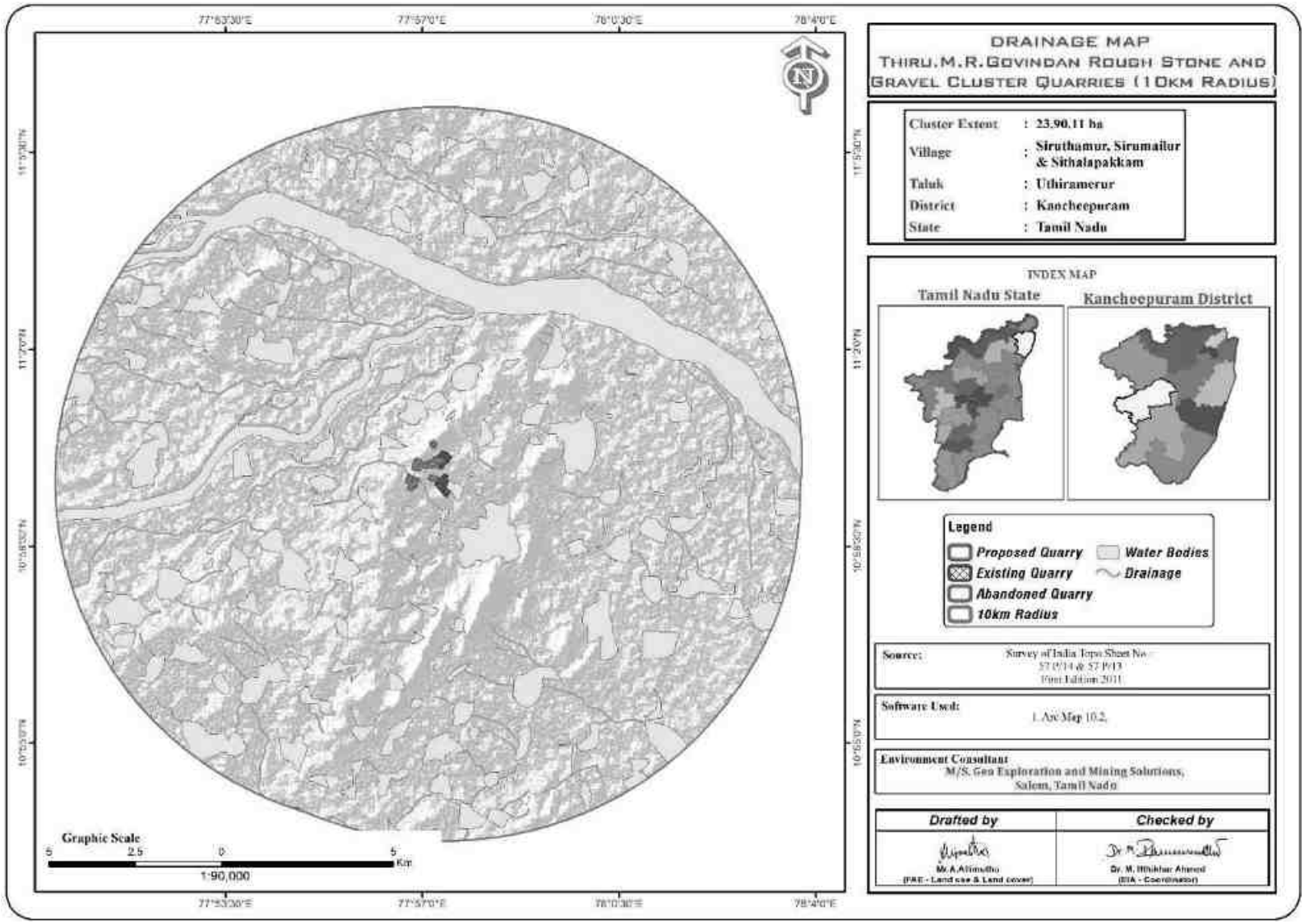
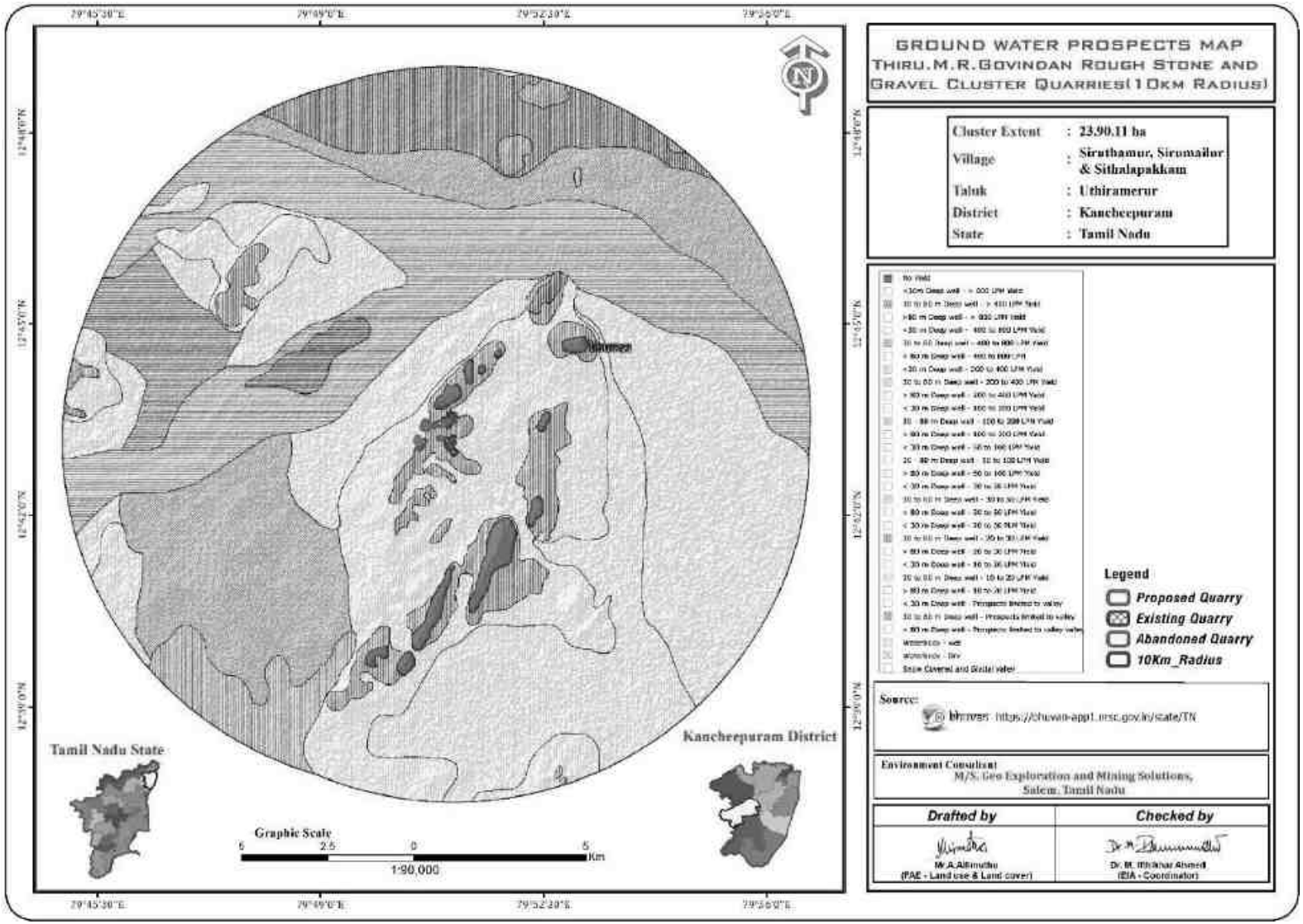


FIGURE 3.12: GROUND WATER LEVEL MAP



3.6.5.1 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

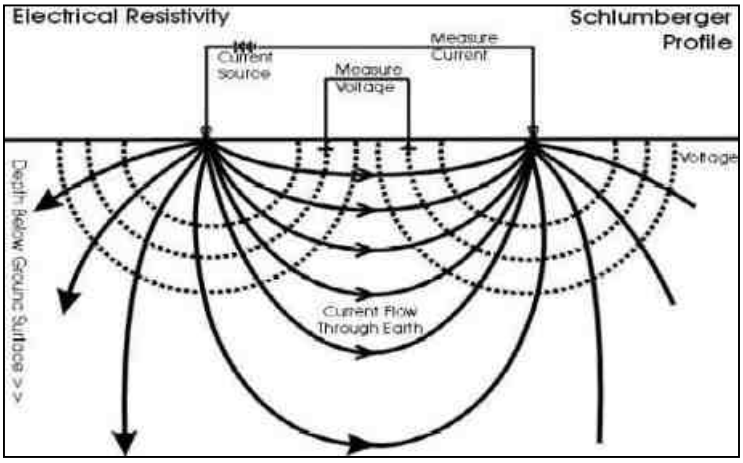
A = Constants with values ranging from 0.5 to 2.5

3.3.6.2 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.

3.3.6.3 Data Presentation

It was inferred that the low resistance encountered at the depth between 68-65m. The maximum depth proposed in this cluster quarries 35 m 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.

3.3.6.4 Geophysical Data Interpretation and Conclusion

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.

Based on the Geophysical interpretation water table fracture zone is expected above 60m bgl, Water level in the open well is ranges from 10.4m to 12.5m bgl it is only collected from the seepage water in shallow depth open wells are selected on the basis of suitable lineament and hydro fractures environment in shallow depth. Water level in the bore well is ranges from 65.8 to 68m bgl which will clearly evidence that the potential aquifer in the area is above 65m bgl. The depth of the mining operation in the cluster is maximum 35m bgl hence this mining operation will not intersect the Ground water table**.** Seepage water will be collected in the mine pit will be utilized for greenbelt development and dust suppression.

3.7 AIR ENVIRONMENT

The ambient air quality with respect to the study area of 10 km radius including the cluster quarries forms the baseline information. The prime objective of baseline air quality monitoring is to assess existing air quality of the area. This will also be useful in assessing the conformity to standards of the ambient air quality during the operations

The existing ambient air quality of the area is important for evaluating the impact of mining activities on the ambient air quality. These will also be useful for assessing the conformity to standards of the ambient air quality during the operation of Existing and proposed quarries within the radius of 500m.

The sources of air pollution in the region are mostly due to vehicular traffic, dust arising from unpaved village road and domestic & agricultural activities. This section describes the identification of sampling locations, methodology adopted during the monitoring period and sampling frequency.

The baseline status of the ambient air quality has been assessed through scientifically designed ambient air quality network. The design of monitoring network in the air quality surveillance program has been based on the following considerations:

- Meteorological conditions.
- Topography of the study area.
- Likely impact area.

3.7.1 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. The station was installed at a height of 4 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

- ✓ This city has a tropical climate. In Kancheepuram, the level of precipitation during summers surpasses that of winters. The climate here is classified as Aw by the Köppen-Geiger. The mean yearly temperature recorded in Kancheepuram is 27.7 °C | 81.9 °F, as per the available data. About 967 mm | 38.1 inch of precipitation falls annually.
- ✓ The Kancheepuram is situated close to the equator, making summers difficult to define. It is highly recommended to plan your visit during the months of January, February, March, December for an optimal experience.
- ✓ The least amount of rainfall occurs in February. The average in this month is 10 mm | 0.4 inch. The highest amount of precipitation occurs during the month of October, with an average quantity reaching up to 195 mm | 7.7 inch.
- ✓ The temperatures are highest on average in May, at around 31.8 °C | 89.3 °F. The month of January registers the most frigid temperatures throughout the year, with an average low temperature of 23.6 °C | 74.5 °F.

  Source: https://en.climate-data.org/asia/india/tamil-nadu/kancheepuram-26316/

Rainfall

The average annual rainfall and the 5 years' rainfall is as follows:

TABLE 3.14 – Rainfall Data

Actual Rainfall in mm					Normal Rainfall In Mm
2017	2018	2019	2020	2021	
1191.7	833.0	1131.4	1258.4	1698.1	985

Source: https://www.twadboard.tn.gov.in/content/kanchipuram-district

TABLE 3.15– Ground Water Level

Jan 2017	May 2017	Jan 2018	May 2018	Jan 2019	May 2019	Jan 2020	May 2020	Jan 2021	May 2021	5 Years Pre Monsoon Average	5Years Post Monsoon Average
10.7	8.4	6.2	9.7	7.5	13.1	4.6	16.9	7.1	14.9	10.8	5.6

Source: https://www.twadboard.tn.gov.in/content/kanchipuram-district

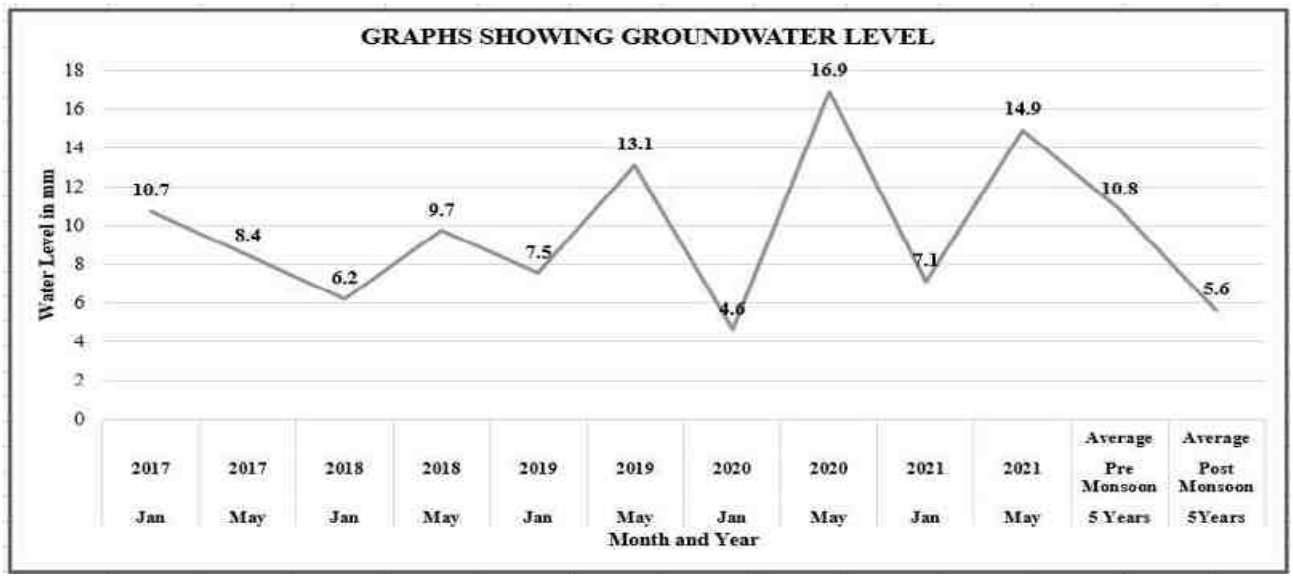


FIGURE 3.13: Graphs showing Groundwater Level

TABLE 3.16– METEOROLOGICAL DATA RECORDED AT SITE

S.No	Parameters		Mar– 2023	April – 2023	May– 2023
1	Temperature (^{0}C)	**Max**	29.44	31.4	33.23
		Min	26.07	28.8	27.88
		Avg	27.75	30.1	30.55
2	Relative Humidity (%)	**Avg**	71.09	66.34	72.78
3	Wind Speed (m/s)	**Max**	4.95	5.38	5.11
		Min	3.42	2.45	1.79
		Avg	4.18	3.91	3.45
4	Cloud Cover (OKTAS)		0-8	0-8	0-8
5	Wind Direction		ENE,SSE	SSE,S	S,SSW

Source: On-site monitoring/sampling by **Chennai Mettex Private Limited in** association with GEMS.

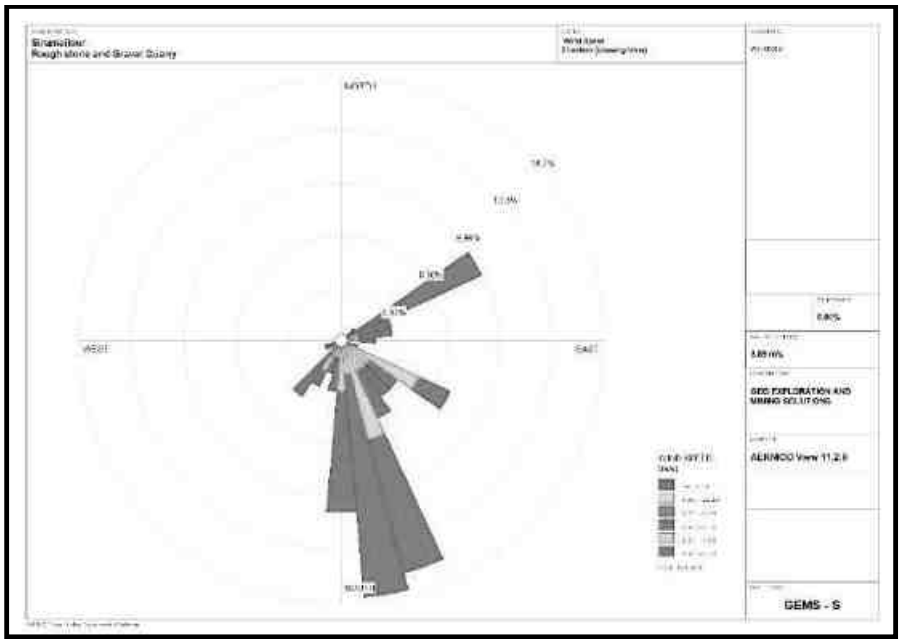
Correlation between Secondary and Primary Data

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

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

Windrose diagram of the study site is depicted in Figure. 3.8. Predominant downwind direction of the area during study season is North East to South West.

FIGURE 3.14: WINDROSE DIAGRAM



Environmental In the abstract of collected data wind rose were drawn on presented in figure No.3.15 during the monitoring period in the study area

1. Predominant winds were from ENE, SSE, S,SSW
2. Wind velocity readings were recorded between 0.50 to 5.70 km / hour
3. Calm conditions prevail of about 0.00% of the monitoring period
4. Temperature readings ranging from 26.07^0 to 32.23^0C
5. Relative humidity ranging from 66.34to 72.78%
6. The monitoring was carried out continuously for three months

3.7.2 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.,

3.7.3 Sampling and Analytical Techniques

TABLE 3.17 – METHODOLOGY AND INSTRUMENT USED FOR AIR QUALITY ANALYSIS

Parameter	Method	Instrument
$PM_{2.5}$	Gravimetric Method Beta attenuation Method	Fine Particulate Sampler Make – Thermo Environmental Instruments – TEI 121

PM_{10}	Gravimetric Method Beta attenuation Method	Respirable Dust Sampler Make –Thermo Environmental Instruments – TEI 108
SO_2	IS-5182 Part II (Improved West & Gaeke method)	Respirable Dust Sampler with gaseous attachment
NO_x	IS-5182 Part II (Jacob & Hochheiser modified method)	Respirable Dust Sampler with gaseous attachment
Free Silica	NIOSH – 7601	Visible Spectrophotometry

Source: Sampling Methodology followed by Chennai Mettex Private Limited & CPCB Notification.

TABLE 3.18 – NATIONAL AMBIENT AIR QUALITY STANDARDS

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

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

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

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

3.7.4 Frequency & Parameters for Sampling

Ambient air quality monitoring has been carried out with a frequency of two samples per week at seven (8) locations, adopting a continuous 24 hourly (3 shift of 8-hour) schedule for the period Mar-May2023. The baseline data of ambient air has been generated for PM_{10}, $PM_{2.5}$, Sulphur Dioxide (SO_2) & Nitrogen Dioxide (NO_2).

3.7.5 Ambient Air Quality Monitoring Stations

The (eight) monitoring stations were set up in the study area as depicted in Figure 3.18 for assessment of the existing ambient air quality. Details of the sampling locations are as per given below.

TABLE 3.19 – AMBIENT AIR QUALITY (AAQ) MONITORING LOCATIONS

S. No	Location Code	Monitoring Locations	Distance & Direction	Coordinates
1	**AAQ-1**	Core Zone	Project Area	12°43'8.90"N 79°50'29.77"E
2	**AAQ-2**	Madhur	480m NW	12°43'16.85"N 79°50'14.16"E
3	**AAQ-3**	Pullampakkam	3.7km North	12°45'13.36"N 79°50'26.53"E
4	**AAQ-4**	Anambakkam	1.8km SW	12°42'9.86"N 79°50'40.23"E
5	**AAQ-5**	Nariambakkam	4.2km SW	12°42'0.40"N 79°48'29.43"E
6	**AAQ-6**	Kavanipakkam	5.5km East	12°43'17.14"N 79°53'36.68"E
7	**AAQ-7**	Vayalakavur	2.6km NW	12°44'4.86"N 79°49'19.88"E
8	**AAQ-8**	Sirumailur	3.4km NE	12°44'17.97"N 79°52'4.28"E

Source: On-site monitoring/sampling by Chennai Mettex Private Limited in association with GEMS

FIGURE 3.15 AMBIENT AIR QUALITY LOCATIONS AROUND 10 KM RADIUS

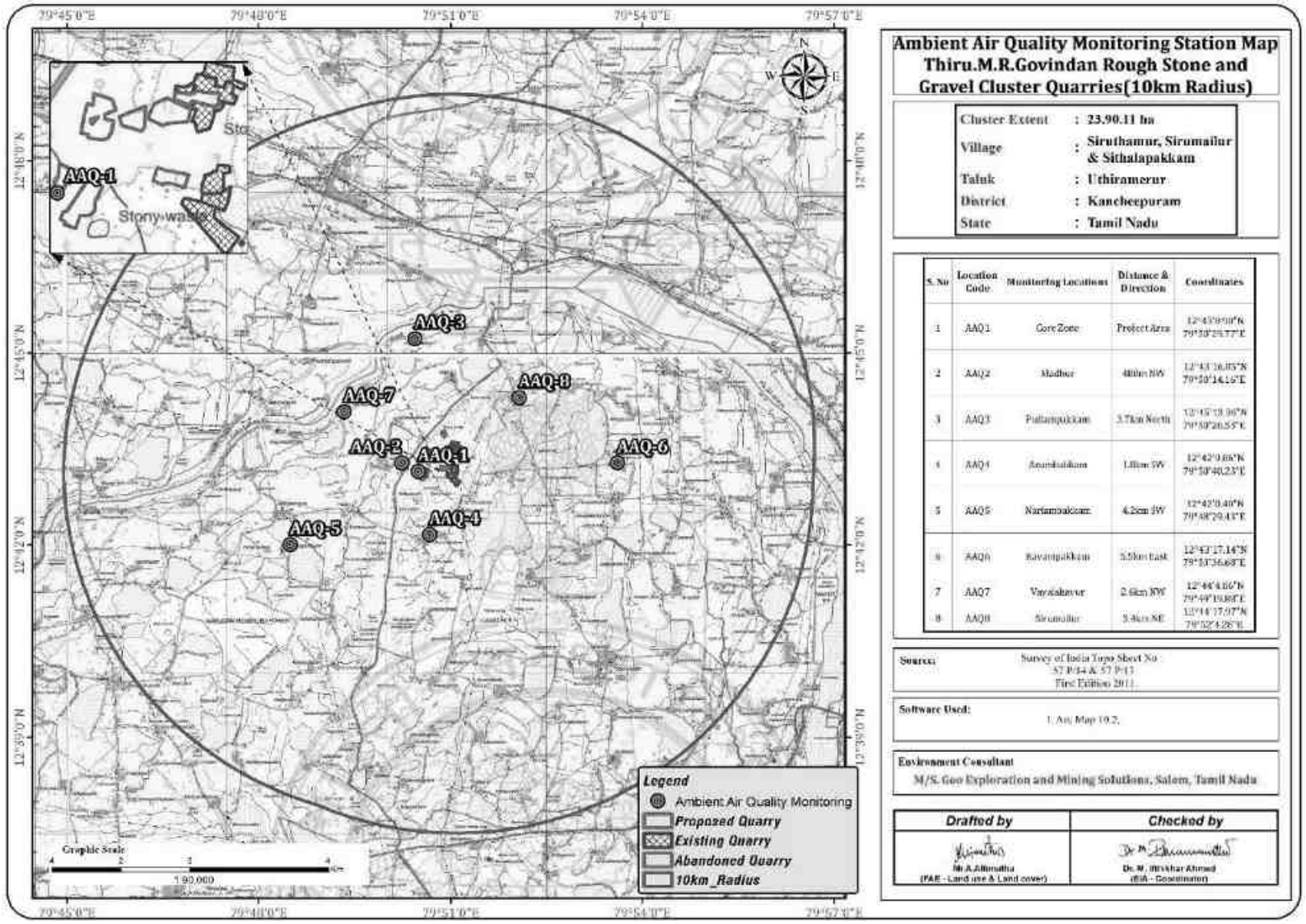


TABLE 3.20– AAQ1- CORE ZONE

Period: Mar– May2023 *Location: AAQ1- Core Zone* Sampling Time: 24-hourly

Ambient Air Monitoring Details		Particulate Pollutant			Gaseous Pollutant					Metals Pollutant			Organic Pollutant	
Parameters		SPM	$PM_{2.5}$	PM_{10}	SO_2	NO_2	NH_3	O_3	CO	Pb	Ni	As	C_6H_6	BaP
NAAQ Norms		200	60	100	80	80	400	180	4	1	20	6	5	1
Unit		µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	mg/m³	µg/m³	ng/m³	ng/m³	µg/m³	ng/m³
Date	Period.hrs	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
03.03.2023	7:00-7:00	67.6	22.6	45.6	8.2	26.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04.03.2023	7:15-7:15	66.7	22.1	46.7	8.9	24.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10.03.2023	7:00-7:00	66.9	23.6	47.1	9.6	23.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11.03.2023	7:15-7:15	66.5	23.9	44.2	8.7	22.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17.03.2023	7:00-7:00	65.8	22.3	44.6	8.3	21.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18.03.2023	7:15-7:15	65.4	22.4	45.7	7.4	23.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24.03.2023	7:00-7:00	65.8	23.2	43.9	7.1	25.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25.03.2023	7:15-7:15	65.1	23.1	43.3	9.5	24.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
31.03.2023	7:00-7:00	65.3	23.3	46.1	8.3	20.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01.04.2023	7:15-7:15	65.7	22.8	44.0	8.8	23.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07.04.2023	7:00-7:00	68.4	23.6	43.5	7.0	20.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.04.2023	7:15-7:15	68.2	23.3	42.3	7.2	21.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.04.2023	7:00-7:00	68.5	24.1	45.8	9.7	24.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.04.2023	7:15-7:15	68.9	24.3	45.6	9.5	23.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21.04.2023	7:00-7:00	66.7	22.8	44.0	8.9	21.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22.04.2023	7:15-7:15	65.5	24.7	46.7	8.1	22.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28.04.2023	7:00-7:00	65.9	23.9	46.6	9.9	23.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.04.2023	7:15-7:15	65.7	23.1	43.3	7.6	22.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
05.05.2023	7:00-7:00	68.8	22.9	42.1	7.1	23.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
06.05.2023	7:15-7:15	66.9	22.8	43.8	9.8	20.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
12.05.2023	7:00-7:00	66.4	21.3	47.5	9.2	21.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13.05.2023	7:15-7:15	69.1	21.1	48.9	9.8	20.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
19.05.2023	7:00-7:00	69.7	22.9	43.4	7.1	21.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20.05.2023	7:15-7:15	65.3	22.3	43.9	7.6	23.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
26.05.2023	7:00-7:00	65.5	22.7	45.5	7.7	22.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
27.05.2023	7:15-7:15	66.1	23.1	44.1	7.9	21.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Note:BDL: Below Detection Limit ;**DL**: Detection Limit ; **NH_3**: BDL (DL:20); **O_3**: BDL (DL:20); **CO**: BDL (DL:1.0); **Pb**: BDL (DL:0.1); **Ni**: BDL (DL:1.0); **As**: BDL (DL:1.0); **C_6H_6**: BDL (DL:1.0); **BaP**: BDL (DL:0.1) **Remarks:** The values observed for the pollutants given above are within the CPCB standards.

TABLE 3.21 – AAQ2 - MADHUR

Period: Mar– May2023 *Location: AAQ2- Madhur* Time: 24-hourly

Ambient Air Monitoring Details		Particulate Pollutant			Gaseous Pollutant					Metals Pollutant			Organic Pollutant	
Parameters		SPM	$PM_{2.5}$	PM_{10}	SO_2	NO_2	NH_3	O_3	CO	Pb	Ni	As	C_6H_6	BaP
NAAQ Norms		200	60	100	80	80	400	180	4	1	20	6	5	1
Unit		µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	mg/m³	µg/m³	ng/m³	ng/m³	µg/m³	ng/m³
Date	Period.hrs	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
03.03.2023	7:00-7:00	68.5	23.2	46.2	7.8	20.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04.03.2023	7:15-7:15	68.1	22.6	45.1	7.3	20.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10.03.2023	7:00-7:00	68.1	24.9	46.9	7.5	22.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11.03.2023	7:15-7:15	68.9	21.1	44.6	6.3	21.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17.03.2023	7:00-7:00	67.2	21.5	45.3	6.1	20.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18.03.2023	7:15-7:15	67.4	20.1	44.7	7.9	21.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24.03.2023	7:00-7:00	67.3	22.0	45.5	7.2	22.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25.03.2023	7:15-7:15	67.1	23.6	46.1	6.3	20.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
31.03.2023	7:00-7:00	67.8	21.9	46.5	6.4	20.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01.04.2023	7:15-7:15	67.2	22.1	44.3	7.6	21.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07.04.2023	7:00-7:00	66.5	23.6	45.7	7.9	20.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.04.2023	7:15-7:15	66.9	20.4	46.0	7.5	21.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.04.2023	7:00-7:00	67.9	23.7	47.4	8.9	20.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.04.2023	7:15-7:15	67.5	24.5	46.5	8.2	20.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21.04.2023	7:00-7:00	68.2	22.5	45.6	8.6	20.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22.04.2023	7:15-7:15	68.9	23.1	45.4	7.9	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28.04.2023	7:00-7:00	67.5	24.3	47.2	7.0	21.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.04.2023	7:15-7:15	68.9	24.5	46.0	6.5	20.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
05.05.2023	7:00-7:00	69.4	23.3	46.8	6.9	22.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
06.05.2023	7:15-7:15	68.2	23.5	46.1	8.5	20.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
12.05.2023	7:00-7:00	67.9	22.7	44.9	8.1	20.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13.05.2023	7:15-7:15	68.6	23.6	48.4	7.9	21.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
19.05.2023	7:00-7:00	68.9	22.1	46.5	7.5	20.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20.05.2023	7:15-7:15	68.1	23.3	45.2	7.1	20.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
26.05.2023	7:00-7:00	68.5	23.6	45.9	7.5	23.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
27.05.2023	7:15-7:15	67.8	23.9	44.3	7.2	21.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Note: BDL: Below Detection Limit; **DL**: Detection Limit; **NH_3**: BDL (DL:20); **O_3**: BDL (DL:20); **CO**: BDL (DL:1.0); **Pb**: BDL (DL:0.1); **Ni**: BDL (DL:1.0); **As**: BDL (DL:1.0); **C_6H_6**: BDL (DL:1.0); **BaP**: BDL (DL:0.1) **Remarks:** The values observed for the pollutants given above are within the CPCB standards.

TABLE 3.22– AAQ3 – PULLAMPAKKAM

Period: Mar–May 2023 *AAQ3- Pullampakkam* Sampling Time: 24-hourly

Ambient Air Monitoring Details		Particulate Pollutant			Gaseous Pollutant					Metals Pollutant			Organic Pollutant	
Parameters		SPM	$PM_{2.5}$	PM_{10}	SO_2	NO_2	NH_3	O_3	CO	Pb	Ni	As	C_6H_6	BaP
NAAQ Norms		200	60	100	80	80	400	180	4	1	20	6	5	1
Unit		µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	mg/m³	µg/m³	ng/m³	ng/m³	µg/m³	ng/m³
Date	Period.hrs	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
03.03.2023	7:00-7:00	60.2	20.6	44.5	5.2	18.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04.03.2023	7:15-7:15	60.8	21.2	43.1	5.3	19.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10.03.2023	7:00-7:00	61.5	22.5	42.9	6.9	17.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11.03.2023	7:15-7:15	61.9	21.5	42.5	7.5	18.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17.03.2023	7:00-7:00	61.7	22.8	42.1	6.1	18.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18.03.2023	7:15-7:15	62.9	22.1	44.6	6.9	20.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24.03.2023	7:00-7:00	62.5	23.1	43.1	7.3	21.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25.03.2023	7:15-7:15	61.3	22.5	42.8	7.1	18.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
31.03.2023	7:00-7:00	61.7	22.0	44.6	5.6	19.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01.04.2023	7:15-7:15	64.2	22.5	44.5	5.8	19.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07.04.2023	7:00-7:00	60.6	21.8	43.1	7.2	20.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.04.2023	7:15-7:15	60.9	22.1	45.5	7.9	19.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.04.2023	7:00-7:00	61.4	22.8	45.2	7.5	18.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.04.2023	7:15-7:15	61.8	23.7	43.6	7.1	18.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21.04.2023	7:00-7:00	61.3	22.4	43.1	6.9	19.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22.04.2023	7:15-7:15	62.5	21.4	43.5	6.5	18.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28.04.2023	7:00-7:00	63.5	22.8	42.1	7.2	20.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.04.2023	7:15-7:15	63.7	22.4	43.9	6.8	18.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
05.05.2023	7:00-7:00	64.5	23.1	43.5	5.3	18.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
06.05.2023	7:15-7:15	62.2	22.8	43.9	5.1	19.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
12.05.2023	7:00-7:00	62.8	22.4	42.8	5.5	19.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13.05.2023	7:15-7:15	64.5	21.9	44.5	7.2	19.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
19.05.2023	7:00-7:00	65.3	21.1	42.2	6.9	20.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20.05.2023	7:15-7:15	63.5	22.5	43.9	7.2	21.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
26.05.2023	7:00-7:00	65.5	21.9	43.3	6.4	20.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
27.05.2023	7:15-7:15	65.9	21.4	42.1	7.6	20.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Note: BDL: Below Detection Limit ;**DL**: Detection Limit ; **NH_3**: BDL (DL:20); **O_3**: BDL (DL:20); **CO**: BDL (DL:1.0); **Pb**: BDL (DL:0.1); **Ni**: BDL (DL:1.0); **As**: BDL (DL:1.0); **C_6H_6**: BDL (DL:1.0); **BaP**: BDL (DL:0.1) **Remarks:** The values observed for the pollutants given above are within the CPCB standards.

TABLE 3.23– AAQ4 – SEETHAPATTI

Period: Mar– May2023 Location: AAQ4 - *Seethapatti* Sampling Time: 24-hourly

Ambient Air Monitoring Details		Particulate Pollutant			Gaseous Pollutant					Metals Pollutant			Organic Pollutant	
Parameters		SPM	$PM_{2.5}$	PM_{10}	SO_2	NO_2	NH_3	O_3	CO	Pb	Ni	As	C_6H_6	BaP
NAAQ Norms		200	60	100	80	80	400	180	4	1	20	6	5	1
Unit		µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	mg/m³	µg/m³	ng/m³	ng/m³	µg/m³	ng/m³
Date	Period.hrs	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
03.03.2023	7:00-7:00	62.4	22.5	41.6	6.3	19.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04.03.2023	7:15-7:15	62.7	23.9	41.2	6.4	19.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10.03.2023	7:00-7:00	62.3	21.8	42.5	6.2	18.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11.03.2023	7:15-7:15	62.8	22.3	42.9	6.9	20.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17.03.2023	7:00-7:00	62.9	20.5	43.6	6.2	19.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18.03.2023	7:15-7:15	63.2	22.6	46.9	6.1	18.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24.03.2023	7:00-7:00	63.7	21.5	44.3	6.8	18.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25.03.2023	7:15-7:15	63.9	22.9	44.6	6.5	18.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
31.03.2023	7:00-7:00	64.8	23.3	41.3	6.2	19.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01.04.2023	7:15-7:15	62.8	18.6	44.0	6.8	20.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07.04.2023	7:00-7:00	62.9	19.9	40.6	6.9	20.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.04.2023	7:15-7:15	64.5	19.6	41.1	6.4	21.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.04.2023	7:00-7:00	64.8	18.8	42.6	6.8	22.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.04.2023	7:15-7:15	62.8	20.5	41.1	6.3	19.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21.04.2023	7:00-7:00	61.4	20.9	42.8	6.9	19.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22.04.2023	7:15-7:15	62.3	19.6	42.9	6.4	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28.04.2023	7:00-7:00	62.9	19.5	41.6	6.2	21.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.04.2023	7:15-7:15	63.7	19.0	42.8	5.9	22.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
05.05.2023	7:00-7:00	63.8	19.1	40.3	5.8	20.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
06.05.2023	7:15-7:15	64.5	19.7	43.8	6.1	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
12.05.2023	7:00-7:00	65.5	19.3	42.9	6.8	20.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13.05.2023	7:15-7:15	65.1	21.1	41.2	6.2	21.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
19.05.2023	7:00-7:00	61.2	21.5	41.3	6.5	20.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20.05.2023	7:15-7:15	61.9	21.9	43.9	6.6	21.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
26.05.2023	7:00-7:00	62.7	20.3	42.7	6.5	20.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
27.05.2023	7:15-7:15	62.9	20.9	42.1	6.7	22.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Note: BDL: Below Detection Limit ;**DL**: Detection Limit ; **NH_3**: BDL (DL:20); **O_3**: BDL (DL:20); **CO**: BDL (DL:1.0); **Pb**: BDL (DL:0.1); **Ni**: BDL (DL:1.0); **As**: BDL (DL:1.0); **C_6H_6**: BDL (DL:1.0); **BaP**: BDL (DL:0.1) **Remarks:** The values observed for the pollutants given above are within the CPCB standards.

TABLE 3.24 – AAQ5 – NARIAMBAKKAM

Period: Mar– May2023 Location *: AAQ5- Nariambakkam* Sampling Time: 24-hourly

Ambient Air Monitoring Details		Particulate Pollutant			Gaseous Pollutant					Metals Pollutant			Organic Pollutant	
Parameters		SPM	$PM_{2.5}$	PM_{10}	SO_2	NO_2	NH_3	O_3	CO	Pb	Ni	As	C_6H_6	BaP
NAAQ Norms		200	60	100	80	80	400	180	4	1	20	6	5	1
Unit		µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	mg/m³	µg/m³	ng/m³	ng/m³	µg/m³	ng/m³
Date	Period.hrs	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
03.03.2023	7:00-7:00	63.5	19.2	43.4	6.5	19.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04.03.2023	7:15-7:15	63.7	18.6	42.9	6.0	19.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10.03.2023	7:00-7:00	63.8	19.5	43.1	5.8	18.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11.03.2023	7:15-7:15	64.5	18.9	43.8	6.2	20.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17.03.2023	7:00-7:00	64.9	19.5	44.2	5.9	18.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18.03.2023	7:15-7:15	64.5	19.9	43.1	6.6	18.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24.03.2023	7:00-7:00	65.2	18.9	42.8	6.8	18.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25.03.2023	7:15-7:15	64.7	19.3	42.1	5.6	20.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
31.03.2023	7:00-7:00	63.7	19.2	43.6	6.3	21.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01.04.2023	7:15-7:15	63.9	19.5	42.5	6.6	20.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07.04.2023	7:00-7:00	65.2	18.6	42.9	7.3	21.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.04.2023	7:15-7:15	65.5	17.3	43.1	6.9	20.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.04.2023	7:00-7:00	63.2	19.5	43.8	6.2	21.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.04.2023	7:15-7:15	63.4	18.1	42.4	6.5	20.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21.04.2023	7:00-7:00	65.8	19.5	42.5	6.1	19.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22.04.2023	7:15-7:15	65.8	18.8	43.9	5.9	19.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28.04.2023	7:00-7:00	64.2	19.6	43.1	6.3	18.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.04.2023	7:15-7:15	64.8	18.1	42.6	6.0	18.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
05.05.2023	7:00-7:00	64.9	18.9	42.4	6.5	19.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
06.05.2023	7:15-7:15	66.2	19.1	43.2	7.4	18.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
12.05.2023	7:00-7:00	64.1	19.6	44.5	6.5	18.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13.05.2023	7:15-7:15	62.7	18.2	44.9	5.9	17.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
19.05.2023	7:00-7:00	65.3	19.9	43.2	6.2	18.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20.05.2023	7:15-7:15	64.2	19.1	43.7	6.4	18.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
26.05.2023	7:00-7:00	64.8	18.6	42.1	6.5	18.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
27.05.2023	7:15-7:15	64.7	18.4	42.5	6.7	18.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Note: BDL: Below Detection Limit ;**DL**: Detection Limit ; **NH_3**: BDL (DL:20); **O_3**: BDL (DL:20); **CO**: BDL (DL:1.0); **Pb**: BDL (DL:0.1); **Ni**: BDL (DL:1.0); **As**: BDL (DL:1.0); **C_6H_6**: BDL (DL:1.0); **BaP**: BDL (DL:0.1) **Remarks:** The values observed for the pollutants given above are within the CPCB standards.

TABLE 3.25 – AAQ6 - KAVANIPAKKAM

Period: Mar– May2023 *Location: AAQ6* – Kavanipakkam Sampling Time: 24-hourly

Ambient Air Monitoring Details		Particulate Pollutant			Gaseous Pollutant					Metals Pollutant			Organic Pollutant	
Parameters		SPM	$PM_{2.5}$	PM_{10}	SO_2	NO_2	NH_3	O_3	CO	Pb	Ni	As	C_6H_6	BaP
NAAQ Norms		200	60	100	80	80	400	180	4	1	20	6	5	1
Unit		µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	mg/m³	µg/m³	ng/m³	ng/m³	µg/m³	ng/m³
Date	Period.hrs	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
03.03.2023	7:00-7:00	65.5	22.1	41.5	7.6	19.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04.03.2023	7:15-7:15	65.7	22.6	41.9	7.5	19.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10.03.2023	7:00-7:00	65.2	23.1	42.6	7.1	20.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11.03.2023	7:15-7:15	65.8	22.4	42.2	7.2	19.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17.03.2023	7:00-7:00	66.3	21.8	41.6	7.8	19.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18.03.2023	7:15-7:15	64.2	22.1	42.1	7.6	20.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24.03.2023	7:00-7:00	65.8	21.6	41.9	7.2	21.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25.03.2023	7:15-7:15	68.2	20.1	40.1	7.8	20.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
31.03.2023	7:00-7:00	67.2	19.8	40.6	7.3	19.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01.04.2023	7:15-7:15	67.9	19.1	41.6	7.9	18.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07.04.2023	7:00-7:00	68.4	21.2	42.8	8.2	18.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.04.2023	7:15-7:15	65.3	18.9	40.5	8.4	18.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.04.2023	7:00-7:00	65.1	18.6	40.3	8.6	18.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.04.2023	7:15-7:15	64.5	19.8	42.6	8.2	18.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21.04.2023	7:00-7:00	63.5	20.3	43.5	7.6	19.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22.04.2023	7:15-7:15	64.8	21.5	42.6	7.9	19.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28.04.2023	7:00-7:00	64.8	22.3	43.4	7.2	18.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.04.2023	7:15-7:15	67.5	22.8	42.8	7.1	18.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
05.05.2023	7:00-7:00	67.9	23.1	43.3	7.9	19.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
06.05.2023	7:15-7:15	67.5	22.7	42.9	7.5	19.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
12.05.2023	7:00-7:00	67.2	23.6	43.5	8.2	18.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13.05.2023	7:15-7:15	68.5	23.1	43.9	8.8	18.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
19.05.2023	7:00-7:00	68.9	22.7	42.6	7.6	18.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20.05.2023	7:15-7:15	67.1	22.5	42.1	7.5	18.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
26.05.2023	7:00-7:00	67.3	22.9	42.5	7.8	18.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
27.05.2023	7:15-7:15	67.4	22.4	43.1	7.3	18.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Note: BDL: Below Detection Limit ;**DL**: Detection Limit ; **NH_3**: BDL (DL:20); **O_3**: BDL (DL:20); **CO**: BDL (DL:1.0); **Pb**: BDL (DL:0.1); **Ni**: BDL (DL:1.0); **As**: BDL (DL:1.0); **C_6H_6**: BDL (DL:1.0); **BaP**: BDL (DL:0.1) **Remarks:** The values observed for the pollutants given above are within the CPCB standards.

TABLE 3.26 – AAQ7 - VAYALAKAVUR

Period: Mar– May2023 *Location: AAQ7– Vayalakavur* Sampling Time: 24-hourly

Ambient Air Monitoring Details		Particulate Pollutant			Gaseous Pollutant					Metals Pollutant			Organic Pollutant	
Parameters		SPM	$PM_{2.5}$	PM_{10}	SO_2	NO_2	NH_3	O_3	CO	Pb	Ni	As	C_6H_6	BaP
NAAQ Norms		200	60	100	80	80	400	180	4	1	20	6	5	1
Unit		µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	mg/m³	µg/m³	ng/m³	ng/m³	µg/m³	ng/m³
Date	Period.hrs	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
03.03.2023	7:00-7:00	64.1	25.3	43.6	8.3	20.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04.03.2023	7:15-7:15	64.8	24.2	44.5	8.2	21.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10.03.2023	7:00-7:00	64.2	25.3	43.9	8.4	22.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11.03.2023	7:15-7:15	64.7	24.6	44.7	8.2	20.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17.03.2023	7:00-7:00	63.2	24.1	43.5	8.3	20.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18.03.2023	7:15-7:15	63.8	23.5	44.1	8.8	21.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24.03.2023	7:00-7:00	63.4	25.1	44.9	8.9	20.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25.03.2023	7:15-7:15	63.8	24.6	43.1	9.1	20.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
31.03.2023	7:00-7:00	63.1	23.6	44.8	9.5	22.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01.04.2023	7:15-7:15	64.8	24.1	45.1	9.4	22.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07.04.2023	7:00-7:00	64.2	23.5	43.0	9.7	20.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.04.2023	7:15-7:15	65.5	21.2	43.5	9.2	22.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.04.2023	7:00-7:00	65.8	21.9	44.9	9.3	21.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.04.2023	7:15-7:15	63.2	23.6	43.1	9.4	20.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21.04.2023	7:00-7:00	63.9	23.2	44.2	8.2	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22.04.2023	7:15-7:15	63.7	24.5	43.7	8.1	22.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28.04.2023	7:00-7:00	64.1	25.1	44.6	7.6	20.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.04.2023	7:15-7:15	64.8	23.0	43.1	7.4	22.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
05.05.2023	7:00-7:00	64.2	24.8	43.8	7.2	20.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
06.05.2023	7:15-7:15	64.1	23.8	44.5	7.7	21.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
12.05.2023	7:00-7:00	65.2	23.4	43.0	7.5	21.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13.05.2023	7:15-7:15	65.9	24.7	45.1	8.2	20.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
19.05.2023	7:00-7:00	65.7	23.9	44.9	8.1	20.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20.05.2023	7:15-7:15	64.2	24.1	44.2	8.6	21.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
26.05.2023	7:00-7:00	64.4	24.6	44.1	8.7	20.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
27.05.2023	7:15-7:15	64.7	24.8	44.5	8.4	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Note: BDL: Below Detection Limit ;**DL**: Detection Limit ; **NH_3**: BDL (DL:20); **O_3**: BDL (DL:20); **CO**: BDL (DL:1.0); **Pb**: BDL (DL:0.1); **Ni**: BDL (DL:1.0); **As**: BDL (DL:1.0); **C_6H_6**: BDL (DL:1.0); **BaP**: BDL (DL:0.1) **Remarks:** The values observed for the pollutants given above are within the CPCB standards.

TABLE 3.27 – AAQ8 - SIRUMAILUR

Ambient Air Monitoring Details		Particulate Pollutant			Gaseous Pollutant					Metals Pollutant			Organic Pollutant	
Parameters		SPM	$PM_{2.5}$	PM_{100}	SO_2	NO_2	NH_3	O_3	CO	Pb	Ni	As	C_6H_6	BaP
NAAQ Norms		200	60	100	80	80	400	180	4	1	20	6	5	1
Unit		µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	mg/m³	µg/m³	ng/m³	ng/m³	µg/m³	ng/m³
Date	Period.hrs	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
03.03.2023	7:00-7:00	60.1	22.5	40.7	6.3	20.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04.03.2023	7:15-7:15	60.4	23.3	40.1	5.6	19.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10.03.2023	7:00-7:00	60.2	22.7	41.6	5.9	19.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11.03.2023	7:15-7:15	60.3	23.8	41.0	6.3	19.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17.03.2023	7:00-7:00	61.2	22.1	42.1	5.8	21.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18.03.2023	7:15-7:15	61.7	21.9	42.5	6.9	18.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24.03.2023	7:00-7:00	61.8	21.4	41.1	5.4	21.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25.03.2023	7:15-7:15	61.4	22.2	42.0	6.6	19.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
31.03.2023	7:00-7:00	61.3	21.8	40.9	5.3	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01.04.2023	7:15-7:15	61.8	21.9	41.5	6.2	19.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07.04.2023	7:00-7:00	61.4	22.6	40.6	5.8	19.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.04.2023	7:15-7:15	60.2	22.7	41.4	6.2	22.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.04.2023	7:00-7:00	60.4	21.0	40.2	5.5	18.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.04.2023	7:15-7:15	60.5	22.6	41.5	6.1	21.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21.04.2023	7:00-7:00	61.2	21.1	39.9	5.7	21.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22.04.2023	7:15-7:15	61.3	21.3	40.1	6.0	20.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28.04.2023	7:00-7:00	62.7	21.2	40.6	5.8	19.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.04.2023	7:15-7:15	62.4	22.1	40.9	5.7	20.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
05.05.2023	7:00-7:00	62.8	22.6	41.3	5.6	19.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
06.05.2023	7:15-7:15	60.4	22.1	41.0	6.1	19.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
12.05.2023	7:00-7:00	60.9	23.8	41.6	6.9	18.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13.05.2023	7:15-7:15	61.8	22.9	41.6	5.3	20.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
19.05.2023	7:00-7:00	61.5	23.7	40.9	6.5	19.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20.05.2023	7:15-7:15	62.2	22.8	41.2	5.1	22.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
26.05.2023	7:00-7:00	62.9	23.1	42.8	6.5	19.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
27.05.2023	7:15-7:15	64.7	23.4	42.5	6.8	20.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Note: BDL: Below Detection Limit ;**DL**: Detection Limit ; **NH_3**: BDL (DL:20); **O_3**: BDL (DL:20); **CO**: BDL (DL:1.0); **Pb**: BDL (DL:0.1); **Ni**: BDL (DL:1.0); **As**: BDL (DL:1.0); **C_6H_6**: BDL (DL:1.0); **BaP**: BDL (DL:0.1) **Remarks:** The values observed for the pollutants given above are within the CPCB standards.

Period: Mar– May2023 *Location: AAQ8– Sirumailur* Sampling Time: 24-hourly

TABLE 3.28– ABSTRACT OF AMBIENT AIR QUALITY DATA

1	**Parameter**	**PM10**	**PM2.5**	**SO_2**	**NO_2**
2	No. of Observations	260	260	260	260
3	10th Percentile Value	41.1	19.1	5.8	18.4
4	20th Percentile Value	42.0	19.9	6.2	18.9
5	30th Percentile Value	42.5	21.3	6.5	19.5
6	40th Percentile Value	42.9	21.9	6.8	20.0
7	50th Percentile Value	43.3	22.4	7.1	20.3
8	60th Percentile Value	43.7	22.7	7.3	20.6
9	70th Percentile Value	44.1	23.1	7.6	21.1
10	80th Percentile Value	44.8	23.6	8.1	21.7
11	90th Percentile Value	46.0	24.1	8.8	22.4
12	95th Percentile Value	46.7	24.7	9.4	22.9
13	98th Percentile Value	47.5	25.1	9.8	23.6
14	Arithmetic Mean	44.1	22.5	7.6	20.8
15	Geometric Mean	44.0	22.5	7.5	20.8
16	Standard Deviation	2.0	1.9	1.3	1.7
17	Minimum	41.1	19.1	5.8	18.4
18	Maximum	47.5	25.1	9.8	23.6
19	**NAAQ Norms***	**100.0**	**60.0**	**80.0**	**80.0**
	% Values exceeding Norms*	0.0	0.0	0.0	0.0

Legend: $PM_{2.5}$-Particulate Matter size less than 2.5 µm; PM_{10}-Respirable Particulate Matter size less than 10 µm; SO_2-Sulphur dioxide; NO_2-Nitrogen Dioxide; CO-Carbon monoxide; O_3-Ozone; NH_3-Ammonia; Pb-Particulate Lead; As-Particulate Arsenic; Ni-Particulate Nickel; C_6H_6-Benzene & BaP- Benzo (a) pyrene in particulate phase levels were monitored below their respective detectable limits.

* NAAQ Norms-National Ambient Air Quality Norms-Revised as per GSR 826(E) dated 16.11.2009 for Industrial, Residential, Rural and other Area.

FIGURE 3.16: BAR DIAGRAM OF SUMMARY OF AIR QUALITY MODEL(AAQ1-AAQ8)

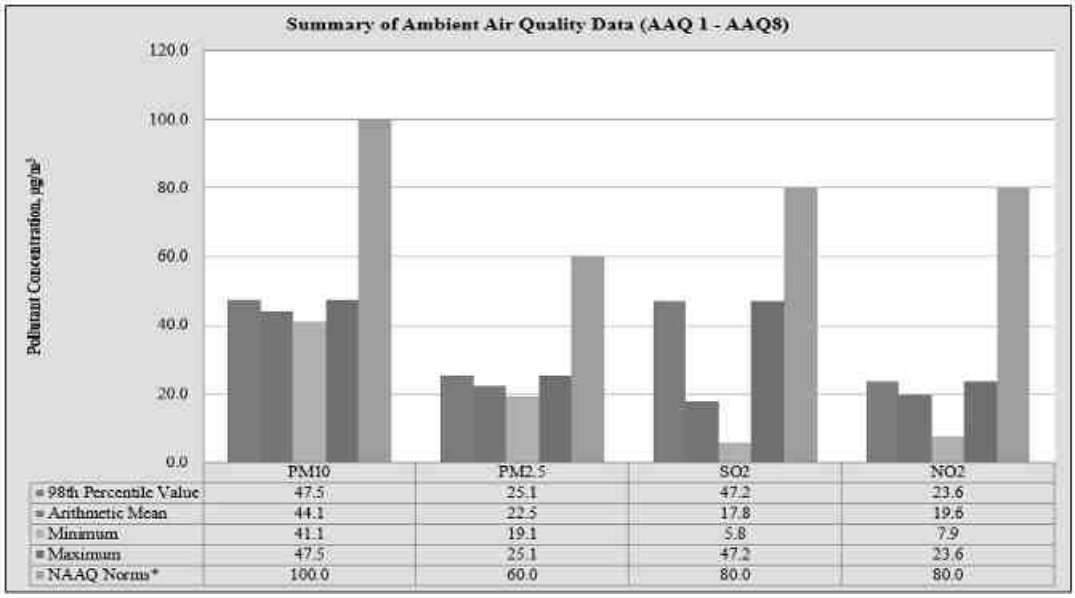
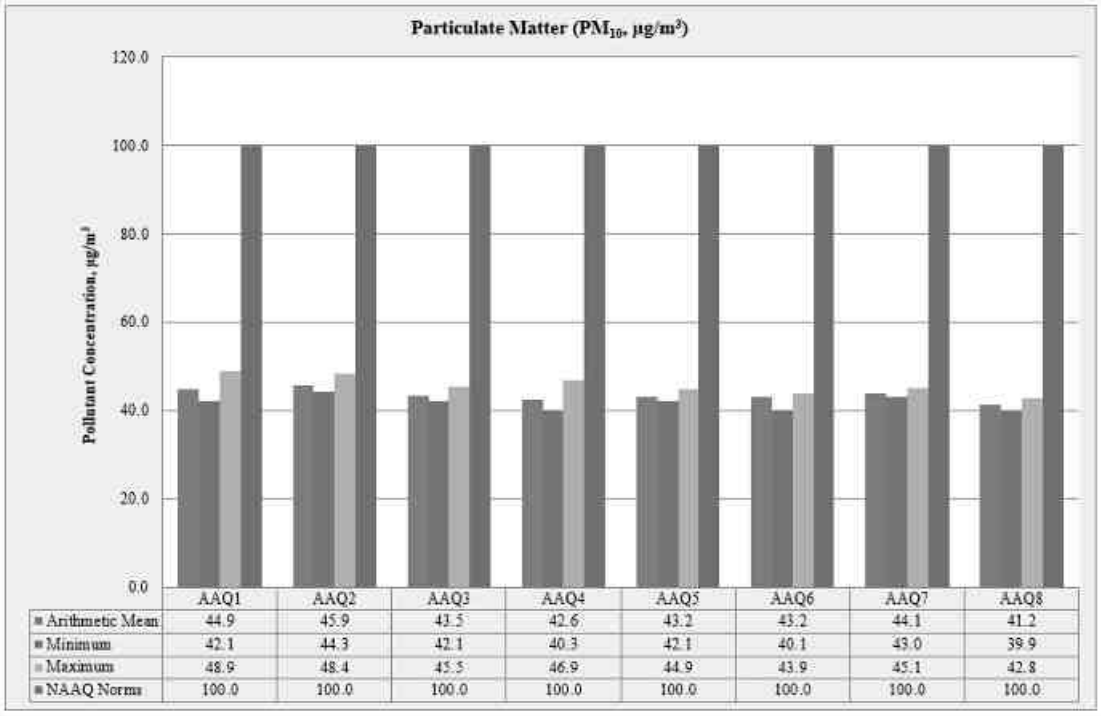
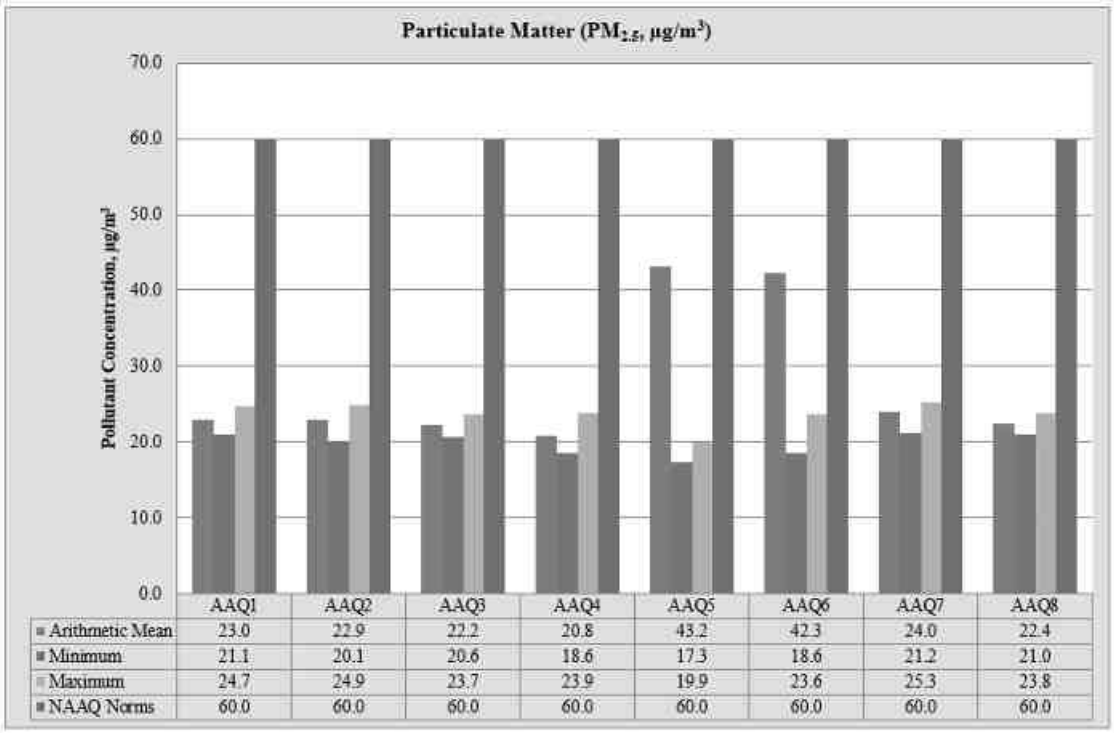


FIGURE 3.17: BAR DIAGRAM OF PARTICULATE MATTER (PM_{10})



	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8
Arithmetic Mean	44.9	45.9	43.5	42.6	43.2	43.2	44.1	41.2
Minimum	42.1	44.3	42.1	40.3	42.1	40.1	43.0	39.9
Maximum	48.9	48.4	45.5	46.9	44.9	43.9	45.1	42.8
NAAQ Norms	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

FIGURE 3.18: BAR DIAGRAM OF PARTICULATE MATTER (PM2.5)



	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8
Arithmetic Mean	23.0	22.9	22.2	20.8	43.2	42.3	24.0	22.4
Minimum	21.1	20.1	20.6	18.6	17.3	18.6	21.2	21.0
Maximum	24.7	24.9	23.7	23.9	19.9	23.6	25.3	23.8
NAAQ Norms	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0

FIGURE 3.19: BAR DIAGRAM OF PARTICULATE MATTER (SO_2)

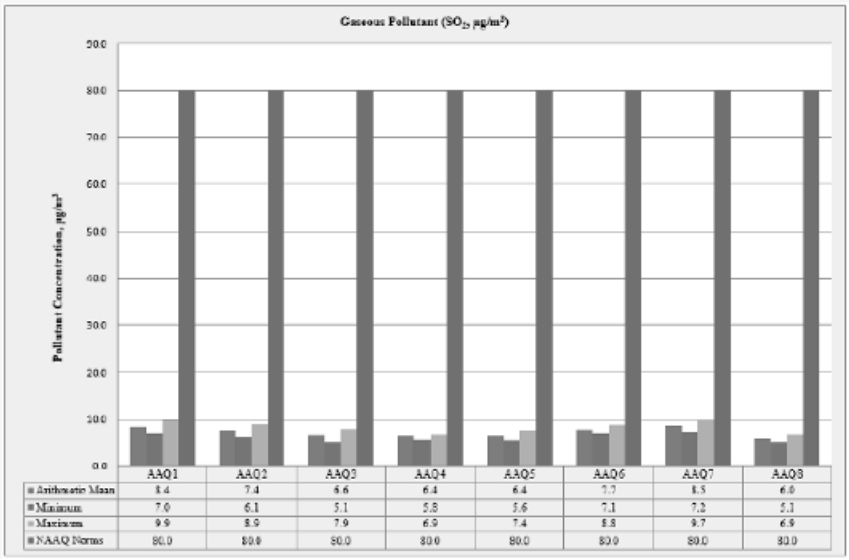
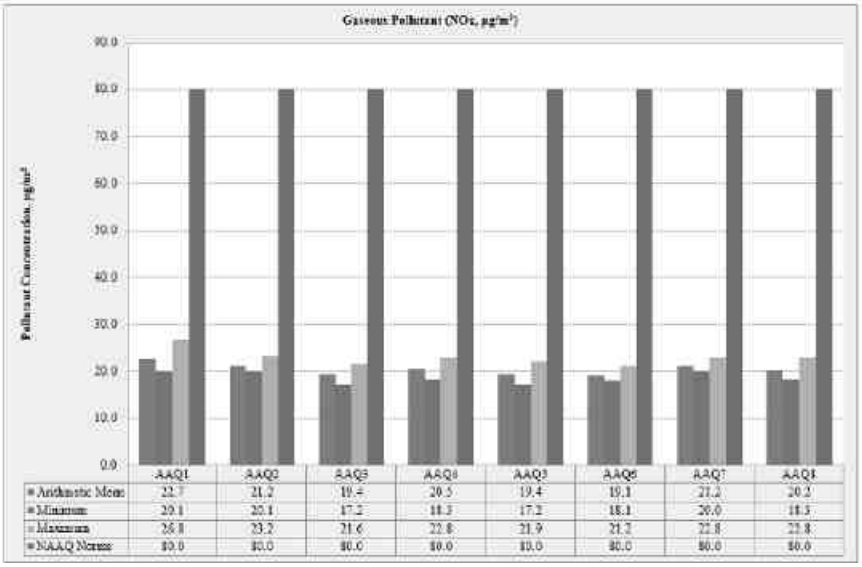


FIGURE 3.20: BAR DIAGRAM OF PARTICULATE MATTER (NO_x)



3.7.6 Interpretations & Conclusion

As per monitoring data, PM_{10} ranges from 39.9 µg/m^3 to 48.9 µg/m^3, $PM_{2.5}$ data ranges from 17.3 µg/m^3 to 25.3 µg/m^3, SO_2 ranges from 5.1 µg/m^3 to 9.9 µg/m^3 and NO_2 data ranges from 17.2 µg/m^3 to 26.8 µg/m^3. The concentration levels of the above criteria pollutants were observed to be well within the limits of NAAQS prescribed by CPCB.

The minimum & maximum concentrations of PM_{10} were found to be 39.9µg/m^3 in Sirumailur village & 48.9µg/m^3 in Core zone respectively. The minimum & maximum concentrations of $PM_{2.5}$ were found to be 17.3 µg/m^3 in Nariambakkam Village & 25.3 µg/m^3 in Vayalakavur village area respectively. The maximum concentration in the core zone is due to the cluster of quarries situated within 500m radius.

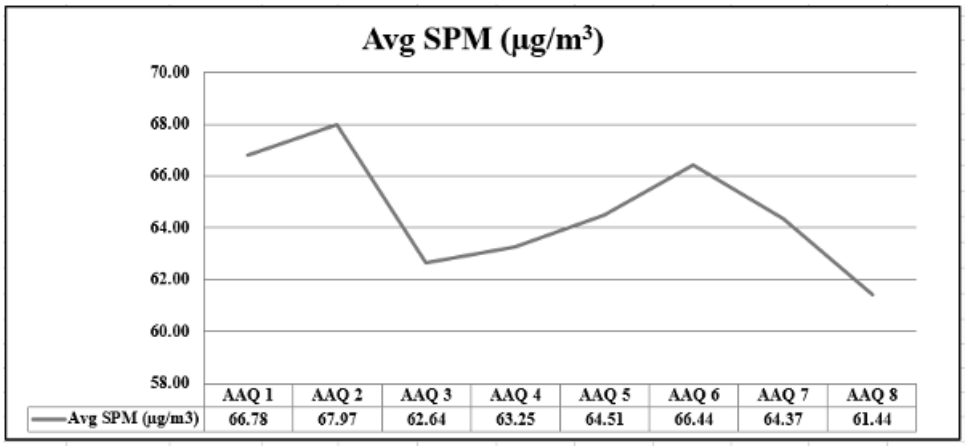
3.7.7 FUGITIVE DUST EMISSION

Fugitive dust was recorded at 8 AAQ monitoring stations for 30 days' average during the study period.

TABLE 3.29– AVERAGE FUGITIVE DUST SAMPLE VALUES IN µg/m³

AAQ Locations	Avg SPM (µg/m³)
AAQ 1	66.78
AAQ 2	67.97
AAQ 3	62.64
AAQ 4	63.25
AAQ 5	64.51
AAQ 6	66.44
AAQ 7	64.37
AAQ 8	61.44

Source: Onsite monitoring/ sampling by Chennai Mettex Private Limited

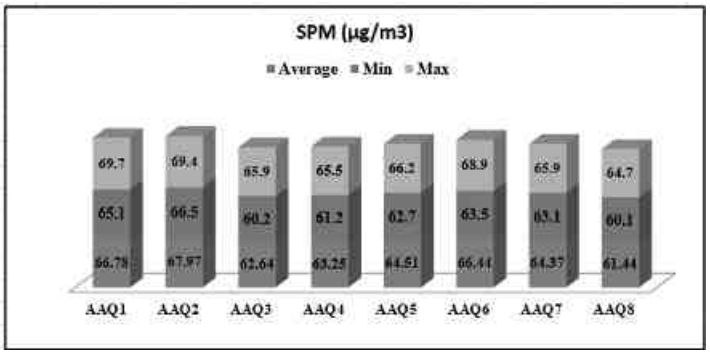


Source: Line Diagram of Table 3.29

TABLE 3.30– FUGITIVE DUST SAMPLE VALUES IN µg/m³ –

SPM (µg/m³)	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8
Average	66.78	67.97	62.64	63.25	64.51	66.44	64.37	61.44
Max	65.1	66.5	60.2	61.2	62.7	63.5	63.1	60.1
Min	69.7	69.4	65.9	65.5	66.2	68.9	65.9	64.7

Source: Calculations from Lab Analysis Reports



Source: Bar Diagram of table 3.30

3.8 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.

3.8.1 Identification of Sampling Locations

In order to assess the ambient noise levels within the study area, noise monitoring was carried out at eight (8) 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	N-1	Core Zone	Project Area	12°43'11.73"N 79°50'32.55"E
2	N-2	Madhur	480m NW	12°43'16.73"N 79°50'14.09"E
3	N-3	Pullampakkam	3.7km North	12°45'13.72"N 79°50'29.29"E
4	N-4	Anambakkam	1.8km SW	12°42'9.96"N 79°50'40.09"E
5	N-5	Nariambakkam	4.2km SW	12°42'0.49"N 79°48'29.25"E
6	N-6	Kavanipakkam	5.5km East	12°43'15.94"N 79°53'31.05"E
7	N-7	Vayalakavur	2.6km NW	12°44'4.81"N 79°49'19.60"E
8	N-8	Sirumailur	3.4km NE	12°44'17.87"N 79°52'4.21"E

Source: On-site monitoring/sampling by Chennai Mettex Private Limited in association with GEMS

3.8.2 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.

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

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

T = Time interval of observation

3.8.3 Analysis of Ambient Noise Level in the Study Area

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 3.6

Day time : 6:00 hours to 22.00 hours.

Night time : 22:00 hours to 6.00 hours

TABLE 3.32 – NOISE MONITORING RESULTS IN CORE AND BUFFER ZONE

S. No	Locations	Noise level (dB (A) Leq)		Ambient Noise Standards
		Day Time	Night Time	
1	Core Zone	41.4	38.1	**Industrial Day Time- 75 dB (A) Night Time- 70 dB (A)**
2	Madhur	41.2	36.3	
3	Pullampakkam	33.9	36.1	
4	Anambakkam	41.8	37.9	
5	Nariambakkam	40.5	35.7	**Residential Day Time– 55 dB (A) Night Time- 45 dB (A)**
6	Kavanipakkam	39.7	36.8	
7	Vayalakavur	41.1	37.9	
8	Sirumailur	41.5	38.1	

Source: On-site monitoring/sampling by Chennai Mettex Private Limited in association with GEMS

FIGURE 3.21: NOISE MONITORING STATIONS AROUND 10 KM RADIUS

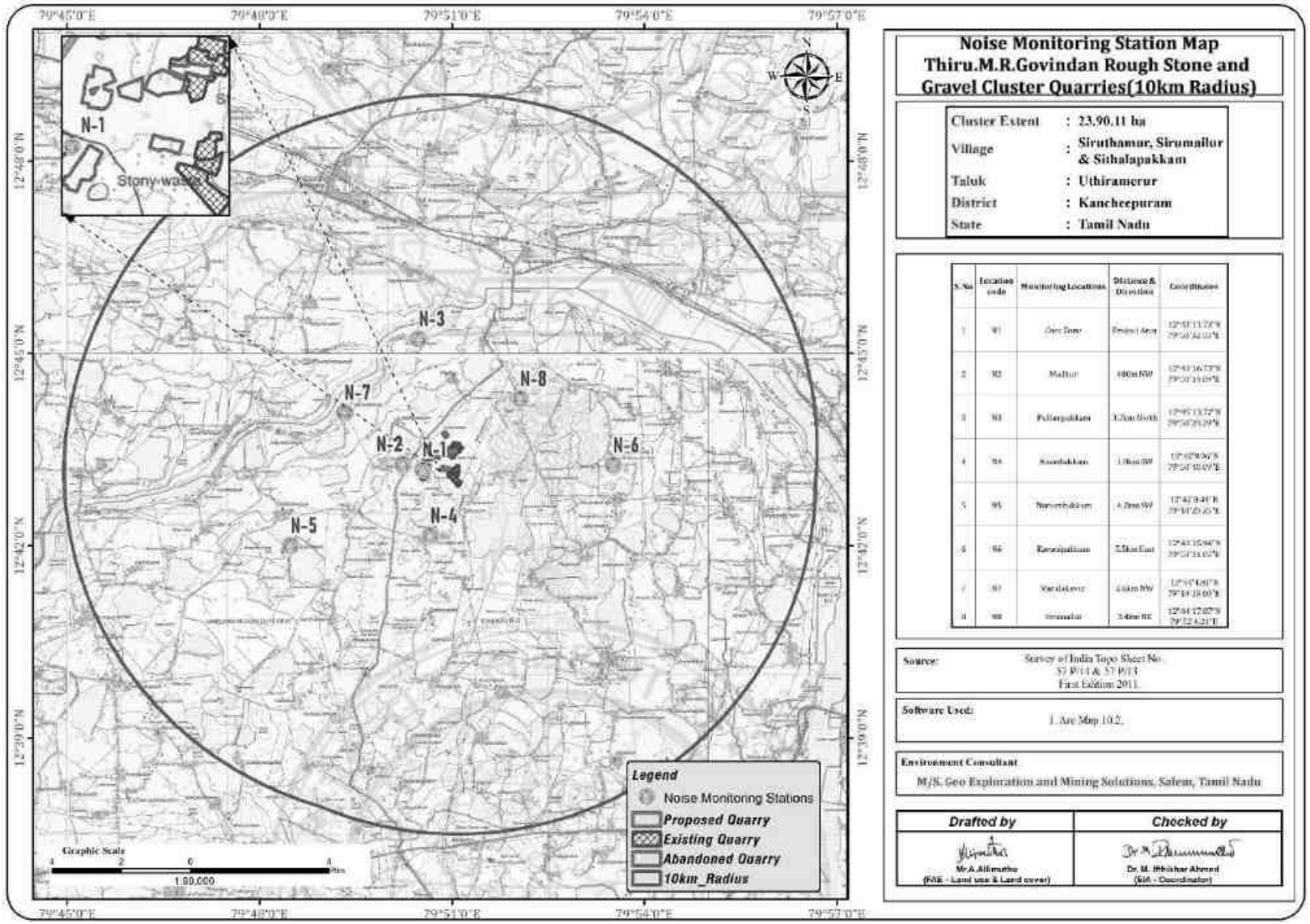
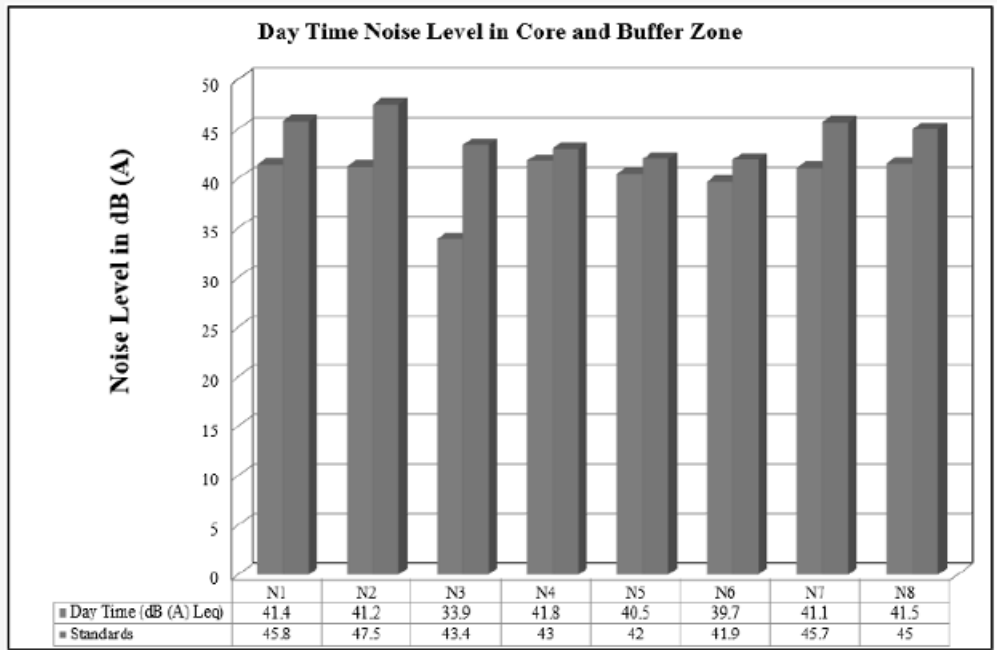
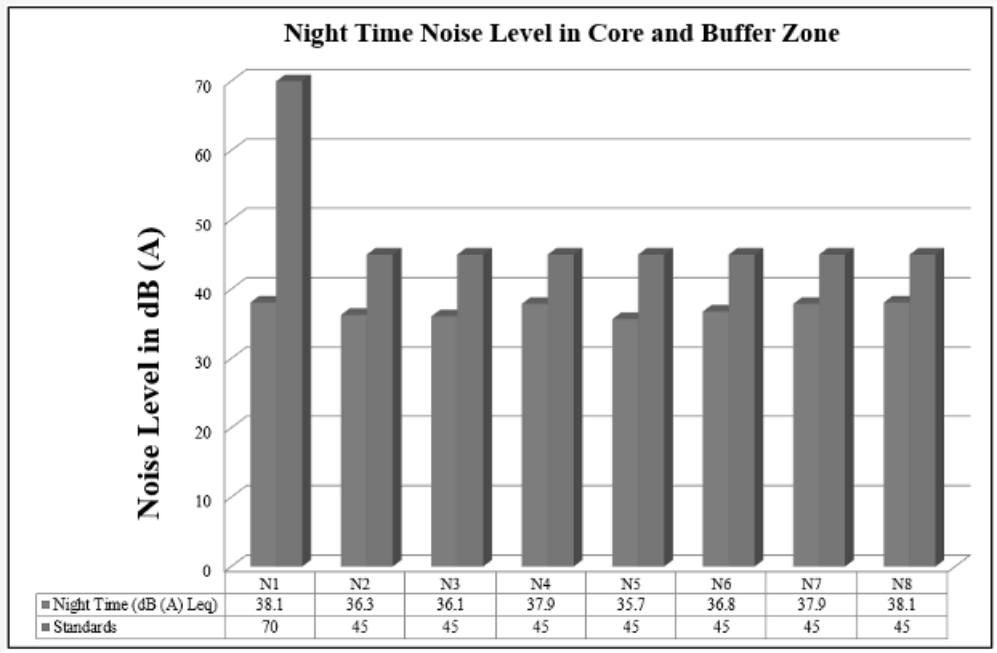


FIGURE 3.22: DAY & NIGHT TIME NOISE LEVELS IN CORE AND BUFFER ZONE



	N1	N2	N3	N4	N5	N6	N7	N8
Day Time (dB (A) Leq)	41.4	41.2	33.9	41.8	40.5	39.7	41.1	41.5
Standards	45.8	47.5	43.4	43	42	41.9	45.7	45



	N1	N2	N3	N4	N5	N6	N7	N8
Night Time (dB (A) Leq)	38.1	36.3	36.1	37.9	35.7	36.8	37.9	38.1
Standards	70	45	45	45	45	45	45	45

3.5.4 Interpretation & Conclusion:

Ambient noise levels were measured at 8 (eight) locations around the project area considering cluster quarries. Noise levels recorded in core zone during day time were from 41.4 dB (A) Leq and during night time were from 31.4 dB (A) Leq. Noise levels recorded in buffer zone during day time were from 33.9 – 41.8dB (A) Leq and during night time were from 35.7– 38.1 dB (A) Leq.

The values of noise observed in some of the areas are primarily owing to quarrying activities due to cluster of quarries within 500m radius, movement of vehicles and other anthropogenic activities. Noise monitoring results reveal that the maximum & minimum noise levels at day time were recorded in the range of 31.2 dB(A) in Madhur

Village and 51.2 dB(A) in Sirumailur Village and 31.2 dB(A) in core zone area & 41.9 dB(A) in core zone area respectively in night time. Thus, the noise level for Industrial and Residential area meets the requirements of CPCB.

3.9 ECOLOGY AND BIO DIVERSITY ENVIRONMENT

3.9.1 Study area Ecology

The core area extent of 1.39.81 Ha of Rough Stone and Gravel quarry has an impact on the diversity of flora and fauna of the surrounding area. But present work was carried out the on detailed study of the impacts of Rough stone and Gravel quarry on the ecology and biodiversity of the core lease area with the proper mitigation and sustainable management plan. The Core mining area is situated with exhibits plain topography. whereas in the buffer zone some places agricultural land is dominated. The following methods were applied during the baseline study of flora, fauna, and diversity assessment.

3.9.2. Objectives of Biological Studies

a) Identification and listing of flora and fauna are important as per the Wildlife (Protection) Act 1972.
b) Suggest Wildlife conservation (species specific/habitat specific) and management plan for the threatened (critically endangered & endangered species - schedule I) faunal species if any reported within the study area.
c) To identify the impacts of mining on agricultural lands and how it affects.
d) Proper collection of information about wildlife Sanctuaries/ national parks/ biosphere reserves of the project area.
e) Devise management & conservation measures for biodiversity.

3.9.3 Methodology of Sampling

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

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

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

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

3.9.3.1 Sampling

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

3.9.3.2. Sampling Size

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

3.9.3.3. Timing of Study

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

3.9.3.4. Observations from Sampling

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

3.9.3.5. Equipment/ References

- Canon Mark III Camera with 50-500mm lens– Snap shots taken
- Leica Binoculars (8x 20) to spot/identify species
- IUCN Red Data Book – https://www.iucnredlist.org/species

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

3.9.4. Part I Field Sampling Techniques

3.9.4.1. Transect walk – Birds

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

3.9.4.2. Modified Pollard Walk – for Butterflies

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

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

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

3.9.4.4. Observational methods- Mammals

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

3.9.4.5. Multiple Stage Quadrat – Vegetation

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

3.9.5 Flora

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

Table No: 3.33 Flora in the Core zone of the lease area

SI.No	English Name	Vernacular Name	Scientific Name	Family Name
Trees				
1.	Neem	Vembu	*Azadirachta indica*	Meliaceae
2.	Velvet mesquite	Mullu maram	*Prosopis juliflora*	Fabaceae
3.	Noni	Nuna maram	*Morinda citrifolia*	Rubiaceae
4.	Coconut tree	Thennai maram	*Cocos nucifera*	Arecaceae
5.	Asian Palmyra palm	Panai maram	*Borassus flabellifer*	Arecaceae
Shrubs				
6.	Touch-me-not	Thottalchinungi	*Mimosa pudica*	Mimosaceae
7.	Ipomoea cornea	Neivelikattamanaku	*Ipomoea cornea*	Convolvulaceae
8.	Avaram	Avarai	*Senna auriculata*	Fabaceae
9.	Milk Weed	Erukku	*Calotropis gigantea*	Apocynaceae
Herbs				
10.	Common leucas	Thumbai	*Leucas aspera*	Lamiaceae
11.	Devil‘s thorn	Nerunji	*Tribulus terrestris*	Zygophyllales
12.	Yellow-fruit Nightshade	Kantang kathrikai	*Solanum virginianum*	Solanaceae
13.	Cleome viscosa	Nai kadugu	*Celome viscosa*	Capparidaceae
14.	Fish poison	Kolinchi	*Tephrosia purpurea*	Fabaceae
15.	Coat buttons	Thatha poo	*Tridax procumbens*	Asteraceae
16.	Indian Catmint	Pei viratti	*Anisomeles malabarica*	Lamiaceae
17.	Goatweed	Kallurukki	*Scoparia dulcis*	Plantaginaceae
18.	Pignut	-	*Mesosphaerum suaveolens*	Lamiaceae
Climber				
19.	Stemmed vine	Perandai	*Cissus quadrangularis*	Vitaceae
20.	Stinking passionflower	Poonai puduku chedi	*Passiflora foetida L*	Passifloraceae
Grasses				
21.	Indian doab	Arugampul	*Cynodon dactylon*	Poaceae
22.	Eragrostis	Pullu	*Eragrostis ferruginea*	Poaceae
23.	Great brome	Thodappam	*Bromus diandrus*	Poaceae

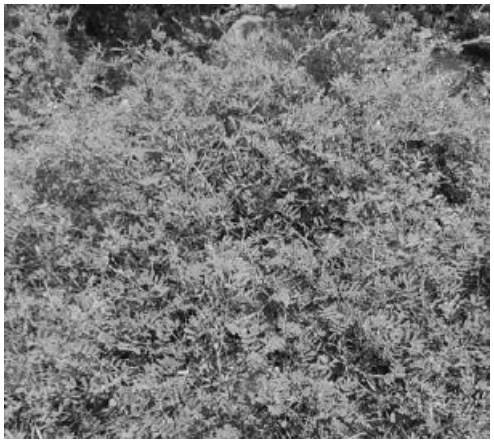
3.9.5.1. Flora’s Composition of the Core Zone

Taxonomically a total of 23 species have been recorded from the core mining lease area. Based on the habitat classification of the enumerated plants the majority of species were Herbs 9 followed by Tress 5, Shrubs 4, Grasses 3, and Climber 2. A baseline study area showed low species richness because lease area the exhibits a topography dry area. Details of flora with the scientific name were mentioned in Table No.3.34 No species were found in the threatened category (Table No. 3.33).

Calotropis gigantea

Prosopis juliflora

Morinda citrifolia



Tephrosia purpurea

Leucas aspera

Scoparia dulcis

Fig No: 3.23 Flora species observation in the core zone area

Table No: 3.34 Flora in Buffer Zone Rough stone and Gravel quarry

SI.No	English Name	Vernacular Name	Scientific Name	Family Name
Trees				
1.	Coconut	Thennai maram	*Cocos nucifera*	Arecaceae
2.	Neem or Indian lilac	Vembu	*Azadirachta indica*	Meliaceae
3.	Frywood	Vaagai	*Albizia lebbeck*	Mimosaceae
4.	Indian plum	Elanthai maram	*Ziziphus mauritiana*	Rhamnaceae
5.	Pongamia pinnata	Pongam	*Millettia pinnata*	Fabaceae
6.	Oil cake tree	Wunja	*Albizia amara*	Fabaceae
7.	Eucalyptus	Thailam maram	*Eucalyptus tereticornis*	Myrtaceae
8.	Velvet mesquite	Velikatthaan	*Prosopis juliflora*	Fabaceae
9.	River tamarind	Savunda	*Leucaenaleucocephala*	Fabaceae
10.	Indian rosewood	Shisham	*Dalbergia sissoo*	Fabaceae
11.	Madras thorn	Kudukapuli	*Pithecellobium dulce*	Fabaceae
12.	Portia tree	Poovarasan	*Thespesia Populnea*	Malvaceae
13.	Lemon	Ezhumuchaipalam	*Citrus lemon*	Rutaceae
14.	Jamun Fruit Plant	Naval maram	*Syzygium cumini*	Myrtaceae
15.	Gum arabic tree	Karuvelam	*Vachellia nilotica*	Fabaceae
16.	Kassod Tree	ManjalKonrai	*Cassia siamea*	Fabaceae
17.	Butterfly Tree	Mandarai	*Bauhinia purpurea*	Fabaceae
18.	Chinaberry	Malaivembu	*Meliaazedarach*	Meliaceae
19.	Monkey pod tree	Kondraimaram	*Samaneasaman*	Fabaceae
20.	Senna siamea	Manjal Konnai	*Sennasiamea*	Fabaceae
21.	Indian cork tree	Maramalli	*Millingtoniahortensis*	Bignoniaceae
22.	Asian Palmyra palm	Panai maram	*Borassus flabellifer*	Arecaceae
23.	Bamboo	Moongil	*Bambusoideae*	Poaceae
24.	Indian-almond	Vadamaram	*Terminaliacatappa*	Fabaceae
25.	Spanish cherry	Mahizhamaram	*Mimusopselengi*	Sapotaceae
26.	Teak	Thekku	*Tectona grandis*	Verbenaceae
27.	Indian mulberry	Nuna maram	*Morinda tinctoria*	Rubiaceae
28.	Banyan	Alai	*Ficus benghalensis*	Moraceae
29.	Kapok tree	Ilavamaram	*Ceibapentandra*	Malvaceae
30.	Common fig	Athi Maram	*Ficus Carica*	Anacardiaceae
31.	Horsetail She-oak	Savukku maram	*Casuarina equisetifolia*	Casuarinaceae
32.	Tamarind	Puliyamaram	*Tamarindus indica*	Legumes
33.	Creamy peacock flower	Perungondrai	*Delonix elata*	Fabaceae
34.	Sapodilla	Sappotta	*Manilkarazapota*	Sapotaceae
35.	Indian bael	Vilvam	*Aegle marmelos*	Rutaceae
36.	Indian gooseberry	Nelli	*Phyllanthus emblica*	Phyllanthaceae
37.	Guava	Koyya	*Psidium guajava*	Myrtaceae
38.	Mango	Manga	*Mangifera indica*	Anacardiaceae
39.	Papaya	Pappali maram	*Carica papaya L*	Caricaceae
40.	Banana tree	Vazhaimaram	*Musa acuminata*	Musaceae
41.	Jack fruit	Palamaram	*Artocarpus heterophyllus*	Moraceae
Shrubs				
1.	Bush Morning Glory	Neiveli Kattamani	*Ipomoea carnea*	Convolvulaceae
2.	Chinese chastetree	Nochi	*Vitex negundo*	Lamiaceae
3.	Triangular spruge	Chaturakalli	*Euphorbia antiquorum*	Euphorbiaceae
4.	Malabar nut	Adhatoda	*Justicia adhatoda*	Acanthaceae
5.	Milk Weed	Erukku	*Calotropis gigantea*	Apocynaceae
6.	Solanum pubescens	Malaisundai	*Solanum pubescens Willd*	Solanaceae
7.	Plumeria alba	Malaiarali	*Plumeria alba*	Appocynaceae
8.	Night shade plan	Sundaika	*Solanum torvum*	Solanaceae
9.	Stachytarpheta urticifolia	Rat tai	*Stachytarpheaurticifolia*	Verbenaceae

10.	Devil's trumpet	Umathai	*Datura metel*	Solanaceae
11.	Castor bean	Amanakku	*Ricinus communis*	Euphorbiaceae
12.	Shoe flower	Chemparuthi	*Hibiscu rosa-sinensis*	Malvaceae
13.	Bellyache bush	Kaatamanaku	*Jatropagossypifolia*	Euphorbiaceae
14.	Touch-me-not	Thottalchinungi	*Mimosa pudica*	Mimosaceae
15.	Indian mallow	Maanikham	*Abutilon indicum*	Meliaceae
16.	Avaram	Avarai	*Senna auriculata*	Fabaceae
17.	Indian Oleander	Arali	*Nerium indicum*	Apocynaceae
18.	West Indian Lantana	Unni chedi	*Lantana camara*	Verbenaceae
Herbs				
1.	Mexican prickly poppy	Kudiyotti	*Argemone mexicana*	Papaveraceae
2.	Purple pitcher plant	Kavali	*Tephrosia purpurea*	Fabaceae
3.	Septicweed	Kattuttakarai	*Senna occidentalis*	Fabaceae
4.	Rough cocklebur	Marul-umattai	*Xanthium strumarium*	Asteraceae
5.	Billygoat weed	Aappakkoti	*Ageratum conyzoides*	Asteraceae
6.	Chamber bitter	Malai Kizhanelli	*Phyllanthus urinaria L.*	Euphorbiaceae
7.	Carrot grass	Vishapoondu	*Parthenium hysterophorus*	Asteraceae
8.	Billygoat weed	Pumpillu	*Ageratum conyzoides*	Asteraceae
9.	Aloe barbadensis	Katrazhai	*Aloe vera*	Asphodelaceae
10.	Indian Mercury	Kuppamani	*Acalypha indica*	Euphorbiaceae
11.	Indian nettle	Nayuruvi	*Achyranthes aspera*	Amaranthaceae
12.	Indian doab	Arugampul	*Cynodon dactylon*	Poaceae
13.	Rough cocklebur	Marul-umattai	*Xanthium strumarium*	Asteraceae
14.	Riceweeds	Seruppadai	*Coldenia procumbens*	Boraginaceae
15.	Goatweed	Kallurukki	*Scoparia dulcis*	Plantaginaceae
16.	Septicweed	Kattuttakarai	*Senna occidentalis*	Fabaceae
17.	Cleome viscosa	Nai kadugu	*Celome viscosa*	Capparidaceae
18.	Common leucas	Thumbai	*Leucas aspera*	Lamiaceae
19.	Asthma-plant	Amman pacharisi	*Euphorbia hirta*	Euphorbiaceae
20.	Poor land flatsedg	Kunnakora	*Cyperus compressus*	Cyperaceae
21.	Holy basil	Thulasi	*Ocimum tenuiflorum*	Lamiaceae
22.	Tridax daisy	Thatha poo	*Tridax procumbens*	Asteraceae
23.	Gale of the wind	Keelaneeli	*Phyllanthus niruri*	Phyllanthaceae
Climber				
1.	Balloon vine	Mudakathan	*Cardiospermum halicacabum*	Sapindaceae
2.	Ivy gourd	Kovai	*Coccinia grandis*	Cucurbitaceae
3.	Bitter apple	Peikkumatti	*Citrullus colocynthis*	Cucurbitaceae
4.	Wild water lemon	Poonai puduku chedi	*Passiflora foetida*	Passifloraceae
5.	Stemmed vine	Perandai	*Cissus quadrangularis*	Vitaceae
6.	Stinking passionflower	Poonai puduku chedi	*Passiflora foetida L*	Passifloraceae
7.	Butterfly pea	Sangu poo	*Clitoria ternatea*	Fabaceae
8.	Rosary pea	Kundumani	*abrus precatorius*	Fabaceae
Grass				
1.	Great brome	Thodappam	*Bromus diandrus*	Poaceae
2.	Windmill grass	Chevvarakupul	*Chloris barbata*	Amaranthaceae
3.	Eragrostis	Pullu	*Eragrostis ferruginea*	Poaceae
4.	Narrowleaf cattail	Sambu	*Typha angustifolia*	Typhaceae
Cactus				
1.	Prickly pear	Nagathali	*Opuntia*	Cactaceae

Reference: http://www.ethnobiomed.com/content/2/1/43 **and Prmary survey data.**

A list of floral species has been prepared based on primary survey (site observations) and discussion with local people. The total number of different plant life forms under trees, shrubs, herbs, and climbers is shown in Table 3.35 and their % distribution is shown in Figure 3.23

Table 3.35 Number of floral life forms in the Study Area

S. No	Plant Life Form	Number of Species
1	Trees	41
2	Shrubs	18
3	Herbs	23
4	Climber	8
5	Grassess	4
6	Cactus	1
Total No. of Species		95
Total No. of Family		40

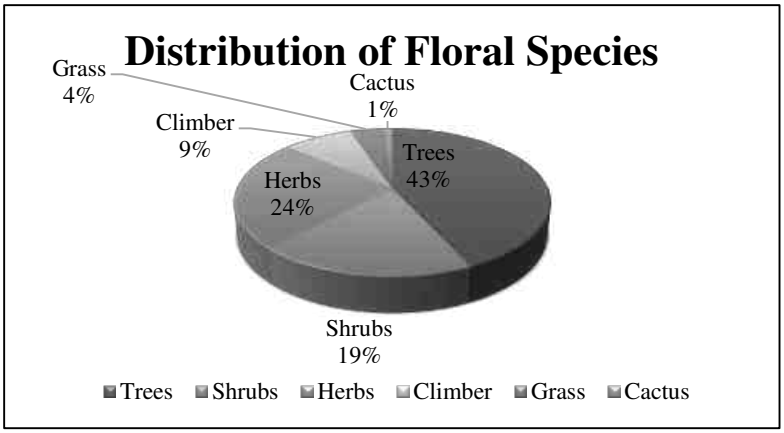


Fig No. 3.24: Pie diagram showing distribution of floral life forms

3.9.6 Flora Composition in the Buffer Zone

The buffer region has a similar type of habitat, but it has a wider variety of vegetation than the core zone area. The proposed lease area has plain terrain. There are 95 different species identified in the buffer zone. Among the identified, floral (95) species were 41 trees, 23 herbs, 18 shrubs, 8 climbers, 4 grasses, and Cactus 1. According to the findings of the buffer zone flora studies, the dominant species in the study area are Fabaceae, Asteraceae, and Euphorbiaceae, as shown in Table No.3.2. Apart from the proposed project area, there is agricultural land. Horticulture and agricultural land are untouched. There are no Rare, Endangered, and Threatened Flora species in the mining area and their surrounding study area. Details of flora with the scientific name were mentioned in Table No.3.34

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

There are no National Parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, Ramsar sites, Tiger/Elephant Reserves/(existing as well as proposed) within 10 km of the mine lease area. There are few reserve forest located way from the proposed project site. Kavinipakkam R.F. is located about 3km on the Southeast side and Marudam R.F is located about 5.5.km on the southwest side. There is no Eco Sensitive zone/ critically polluted area/ HACA/CRZ located within 10 km radius of the area. There are no protected forests within the project area. Hence submission of clearance from the National Board of Wildlife does not arise. No Wildlife Sanctuary in the study area. In addition, No Biosphere Reserves, Wildlife corridors, or, Tiger / Elephant reserves within 10 km of the project area. No protected (PF) forests either in the mine lease area or in the buffer zone. Thus, no forest land is involved in any manner.

There are no protected or ecologically sensitive areas such as National parks or Important Bird Areas (IBAs), or Wetlands or migratory routes of fauna or water bodies or human settlements within the proposed mine lease area. There are no Biosphere reserves or wildlife sanctuaries or National parks or Important Bird Areas (IBAs), or migratory

routes of fauna. Thus, the area under study (Mine lease area and the 10 Km buffer zone) is not ecologically sensitive. It is away from the proposed project site.

Thus, no forest land is involved in any manner. There are no impacts due to this mining activity. There are neither forests nor forest dwellers nor forest-dependent communities in the mine lease area. There shall be no forest-impacted families (PF) or people (PP). Thus, the rights of Traditional Forest Dwellers will not be compromised on account of the project.

3.9.8 Fauna

3.9.8.1. Fauna Composition in the Core Zone

A total of 22 varieties of species were observed in the Core zone of Sirumailour Village, Rough stone and gravel quarry (Table No.3.36) among them numbers of Insects 9, Reptiles 4, Mammals 3, and Avian 6. None of these species are threatened or endemic in the study area and surroundings. There is no Schedule I species according to the Indian wildlife Act 1972. A total of 6 species of bird were sighted in the mining lease area. There are no critically endangered, endangered, vulnerable, and endemic species were observed.

Table No: 3.36 Fauna in the Core zone of lase area

SI.No	Scientific Name	Family Name	WPA Schedule	IUCN List
Insects				
1.	*Danaus plexippus*	Nymphalidae	Schedule IV	LC
2.	*Catopsilia pyranthe*	Peridae	NL	LC
3.	*Hieroglyphus sp*	Acrididae	NL	LC
4.	*Hamitermes silvestri*	Blattodea	NL	LC
5.	*Mantis religiosa*	Mantidae	NL	NL
6.	*Crausius morosus*	Lonchodidae	NL	LC
7.	*Sympetrum fonscolombii*	Libellulidae	NL	LC
8.	*Acraea violae*	Nymphalidae	NL	LC
9.	*Danaus genutia*	Nymphalidae	NL	NL
Reptiles				
1.	*Hemidactylus frenatus*	Gekkonidae	NL	LC
2.	*Eutropis carinata*	Scincidae	NL	LC
3.	*Calotes versicolor*	Agamidae	NL	LC
4.	*Sitanaponticeriana*	Agamidae	NL	LC
Mammals				
1.	*Rattus rattus*	Muridae	Schedule IV	LC
2.	*Mus booduga*	Muridae	Schedule IV	NL
3.	*Herpestes javanicus*	Herpestidae	Schedule II	LC
Aves				
1.	*Meropsorientalis*	Meropidae	NL	LC
2.	*Bubulcus ibis*	Ardeidae	NL	LC
3.	*Acridotheres tristis*	Sturnidae	NL	LC
4.	*Coturnix coturnix*	Phasianidae	Schedule IV	LC
5.	*Corvussplendens*	Corvidae	NL	LC
6.	*Dicrurus macrocercus*	Dicruridae	Schedule IV	LC

*NL- Not listed, LC- Least Concern

3.9.8.2. Fauna Composition in the Buffer Zone

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

There are no Sanctuaries, National Parks, Tiger Reserve or Biosphere Reserve or Elephant Corridor or other protected areas within 10 km radius from core area. It is evident from the available records, reports, and circumstantial evidence that the entire study area including the core and buffer areas were free from any endangered animals. There

were no resident birds other than common bird species such as green bee eaters, Common Mynas, Black drangos, Crows, etc.

The list of bird species recorded during field survey and literature from the study area is given in Table 3.38 The list of reptilian species recorded during field survey and literature from the study area are given in Table 3.40. The list of insect species recorded during field survey and literature from the study area are given in Table 3.39 The list of Amphibian species recorded during the field survey and literature from the study area are given in Table 3.43and List of Butterflies identified from the project site and their conservation status is given in Table No.3.41. It is apparent from the list that none of the species either spotted or reported is included in Schedule I of the Wildlife Protection Act. Similarly, none of them comes under the REET category.

Taxonomically a total of 62 species were identified from the project site. Based on habitat classification the majority of species were Insects 14, followed by birds 17, Reptiles 8, Mammals 5, amphibians 3, and Butterflies 15. A total of 17 species of bird were sighted in the study area. There are no critically endangered, endangered, vulnerable, and endemic species were observed. There are no impacts on nearby fauna species. Dominant species are mostly birds and insects, and three were observed during the extensive field visit Sphaerotheca breviceps, Euphlyctis hexadactylus, Bufomelanostictus, there is no schedule I Species in the study area. There are no critically endangered, endangered, vulnerable, and endemic species were observed.

Table 3.37 List of Fauna & Their Conservation Status (Mammals)

SI. No	Scientific Name	Common Name	IUCN Conservation Status
1.	*Funambulus palmarum*	Indian palm squirrel	LC
2.	*Mus booduga*	Indian Field Mouse	LC
3.	*Herpestes javanicus*	Asian Small Mongoose	LC
4.	*Lepus nigricollis*	Indian hare	LC
5.	*Rattus norwegicus*	Brown rat	LC

Near Threatened; VU – Vulnerable, DA – Data Deficient, NE – Not Evaluated

Table 3.38 Listed Bird's

SI. No	Scientific Name	Family Name	WPA Schedule	IUCN List
1.	*Eudynamys*	Cucalidae	Schedule IV	LC
2.	*Bubulcus ibis*	Ardeidae	NL	LC
3.	*Acridotheres tristis*	Sturnidae	NL	LC
4.	*Corvussplendens*	Corvidae	NL	LC
5.	*Meropsorientalis*	Meropidae	NL	LC
6.	*Pycnonotuscafer*	Pycnonotidae	Schedule IV	LC
7.	*Psittacula krameri*	Psittaculidae	NL	LC
8.	*Accipiter badius*	Accipitridae	NL	LC
9.	*Coturnix coturnix*	Phasianidae	Schedule IV	LC
10.	*Dicrurus macrocercus*	Dicruridae	Schedule IV	LC
11.	*Alcedo atthis*	Alcedinidae	Schedule IV	LC
12.	*Coturnix coturnix*	Phasianidae	Schedule IV	LC
13.	*Amaurornis phoenicurus*	Rallidae	NL	LC
14.	*Fulica atra*	Rallidae	Schedule IV	LC
15.	*Cuculus canorus*	Cuculidae	Schedule IV	LC
16.	*Ardeola grayii*	Ardeidae	Schedule IV	LC
17.	*Milvus migrans*	Accipitridae	Schedule IV	LC

Not Evaluated (NE) Least Concern (LC) Near Threatened (NT) Endangered (E)

Table 3.39 List of insects either spotted or reported from the study area

SI. No	Scientific Name	Family	IUCN Conservation Status	IUCN List
1	*Apis cerana*	Apidae	Schedule IV	LC

2	*Danaus plexippus*	Nymphalidae	Schedule IV	LC
3	*Danaus chrysippus*	Nymphalidae	Schedule IV	LC
4	*Danaus genutia*	Nymphalidae	Schedule IV	LC
5	*Eurythyrea austriaca*	Buprestidae	Schedule IV	NA
6	*Sympetrum fonscolombii*	Libellulidae	NL	LC
7	*Camponotus Vicinus*	Formicidae	NL	NL
8	*Ceratogomphus pictus*	Gomphidae	Schedule IV	-
9	*Danainae*	Nymphalidae	NL	LC
10	*Euploea core*	Nymphalidae	Schedule IV	LC
11	*Mantis religiosa*	Mantidae	NL	NL
12	*Hieroglyphus sp*	Acrididae	NL	LC
13	*Zizina Otis indica*	Lycaenidae	Schedule IV	LC
14	*Tirumala limniace*	Nymphalidae	Schedule IV	LC

NT – Near Threatened; VU – Vulnerable, DA – Data Deficient, NE – Not Evaluated

Table 3.40 List of Reptiles either spotted or reported from the study area

SI. No	Scientific Name	Common Name	IUCN Red List data
1	*Calotes versicolor*	Oriental garden lizard	LC
2	*Hemidactylus flaviviridis*	House lizards	NL
3	*Naja naja*	Indian cobra	LC
4	*Vipera russseli*	Russell's viper	NL
5	*Ahaetulla nasuta*	Green vine snake	LC
6	*Ptyas mucosa*	Rat snake	NL
7	*Bungarus caeruleus*	Common krait	LC
8	*Mabuya carinatus*	Common skink	LC

Table.3.41 List of Butterflies identified from the project site and their conservation status

SI. No	Scientific Name	Common Name	IUCN Conservation Status
1	*Danaus genutia*	Striped Tiger	LC
2	*Danaus chrysippuschrysippus*	Plain Tiger	LC
3	*Acraea terpsicore*	Tawny Coster	LC
4	*Papiliopolytespolytes*	Common Mormon	LC
5	*Papiliopolytesromulus*	Common Mormon	LC
6	*Papiliodemoleusdemoleus*	Lime Butterfly	LC
7	*Junoniahierta*	Yellow Pansy	LC
8	*Junonialemonias*	Lemon Pansy	LC
9	*Phalantaphalantha*	Common Leopard	LC
10	*Zizulahylax*	Tiny Grass Blue	LC
11	*Euploea core*	Common Crow	LC
12	*Melanitisledaleda*	Common Evening Brown	LC
13	*Jamidescelenoceleno*	Common Cerulean	LC
14	*Evereslacturnus*	Indian Cupid	LC
15	*Pachlioptaaristolochiae*	Common Rose	LC

3.9.9 Aquatic Ecology

Small seasonal waterbodies are located nearby the study area. There is no aquatic flora and, aquatic fauna. Aquatic weeds are found to be growing everywhere in 10 km radius area, in every water bog, pond, etc. *Typha angustata* can be found growing all along the drains of villages, small water-logged depressions, and agricultural fields lacking water but containing enough moisture to support its growth. And where water is present, *Eichhornia crassipes* has taken its roots and covers the entire water surface by its sprawl and invasion.

3.9.9.1. Objectives of Aquatic Studies

- ✓ Generating data through actual field collection in these locations over the study period.
- ✓ Impacts on aquatic fauna/flora

- ✓ Consulted with locals to obtain knowledge about aquatic flora and animals.

3.9.9.2. Macrophytes

The macrophytes observed within the study area are tabulated in Table 3.42

Table No.3.42. Description of Macrophytes

S.No	Scientific name	Common Name	IUCN Red List of Threatened Species
1.	*Aponogetonnatans*	Floating laceplant	NA
2.	*Cyperus exaltatus*	Tall Flat Sedge	LC
3.	*Carex cruciata*	Cross Grass	NA
4.	*Chrysopogon aciculatus*	Golden false beardgrass	NA
5.	*Hydrilla verticillata*	Waterthymes	LC
6.	*Eichornia crassipe*	Water hyacinth	NA
7.	*Marsilea quadrifolia*	Water clover	LC

3.9.9.3 Aquatic Faunal Diversity

Amphibian species like the common Indian Burrowing frog, and Indian Pond Frog, Indian Toad, Indian Bull Frog, were sighted near the water bodies located in the study area.

Table no. 3.43 Amphibians Observed/Recorded from the Study Area

SI. No	Scientific Name	Common Name	IUCN Red List data
1.	*Sphaerotheca breviceps*	Indian Burrowing frog	LC
2.	*Euphlyctis hexadactylus*	Green pond frog	LC
3.	*Bufomelanostictus*	Indian Toad	LC

*Status assigned by the IUCN, where – CR – Critically Endangered; EN – Endangered; LC – Least Concern; NT – Near Threatened; VU – Vulnerable, DA – Data Deficient, NE – Not Evaluated

3.9.9.4. Fishes

Fish is commonly found in all types of natural water bodies and very common source of food in Easterner South India. The local fishermen were enquired and also the secondary resources were reviewed to collect information on the fish found in the study area. Few common species are; Catla (Catla catla), Dwarf panchax (Aplocheilus parvus), Mrigal (Cirrhinus mrigala), Roho (Labeo rohita) etc., Species of fish reported in the study area are given in table 3.44

Table 3.44 Based on Actual Sighting, based on inputs from locals and Perused from Secondary Data

S.No	Common name	Scientific name	Family
1.	Dwarf panchax	*Aplocheilus parvus*	Aplocheilidae
2.	Mrigal	*Cirrhinus mrigala*	Chordata
3.	Catla	*Catla Catla*	Cyprinidae
4.	Rohu	*Labeo rohita*	Cyprinidae
5.	Catfish	*Siluriformes*	Diplomystidae

3.9.10 Findings/Results

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

Records of threatened species in the area

No threatened species were observed

Endangered Species as per Wildlife (Protection) Act

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

Endemic Species of the Project areas

No endemic species were observed in the project area.

Migratory species of the Project areas

No migratory fauna observed in project area.

Migratory corridors and Flight paths

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

Breeding and spawning grounds

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

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

There are few reserve forest located way from the proposed project site. Kavinipakkam R.F. is located about 3km on the Southeast side and Marudam R F is located about 5.5.km on the southwest side. There is no Eco Sensitive zone/ critically polluted area/ HACA/CRZ located within 10 km radius of the area. There are no National Parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, Ramsar sites, Tiger/Elephant Reserves (existing as well as proposed) within 10 km of the mine lease area. There are no protected forests within the project area. Hence submission of clearance from the National Board of Wildlife does not arise.

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

3.6.11 Conclusion

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

Reference : Reptiles : https://www.researchgate.net/publication/354269704

Butterflies : https://www.researchgate.net/publication/346393903

Birds : https://avibase.bsc-eoc.org/checklist.jsp?region=INsetnkc

Trees : http://www.ethnobiomed.com/content/2/1/43

3.10 SOCIO ECONOMIC ENVIRONMENT

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

3.10.1 Objectives of the Study

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

a) To study the socio-economic status of the people living in the study area of the project.
b) To identify the basic needs of the nearby villages within the study area.
c) To assess the impact on socio-economic environment due to the project.
d) To provide the employment and improved living standards.
e) To study the socio-economic status of the people living in the study area Roughstone and Gravel quarry project region
f) To assess the impact on socio-economic environment due to Roughstone and Gravel quarry project region
g) To analysis of impact of socio economic and Environmental Infrastructure facilities and road accessibility.

3.10.2 Scope of Work

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

3.10.3 Methodology

The methodology adopted for the socio-economic impact assessment is as follows:
a) The details of the activities and population structure have been obtained from Census 2001 and 2011 and analyzed.
b) Based on the above data, impacts due to plant operation on the community have been assessed and recommendations for further improvement have been made.

3.10.4 Sources of Information and Data Base

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

3.10.5 Primary Survey

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

The questionnaires were designed to suit the subjects considering their rural background enabling to furnish correct information and data as far as possible. Data were collected at village level and household level by questionnaires and focused group discussions.
The study area for the field survey has been divided into three major segments namely Primary Zone (0 - 3 km), Secondary Zone (3 - 7 km) and Outer Zone (7 - 10 km).

3.7.6 Collection of Data from Secondary Sources

Data from secondary sources were collected on following aspects:

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

Table 3.45 Type of Information and Sources

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

b) Data Presentation and Analysis

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

3.10.7 Background Information of the Area

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

The State can be divided broadly into two natural divisions (a) the Coastal plains of South India and (b) the hilly western area. Parallel to the coast and gradually rising from it is the broad strip of plain country. It can further be subdivided into coromandal plains comprising the districts of Kancheepuram, Cuddalore and Vellore. The alluvial plains of the Cauvery Delta extending over Thanjavur and part of Tiruchirapally districts and dry southern plains in Madurai, Dindigul, Ramanathapuram, Sivaganga, Virudhnagar, Tirunelveli and Tuticorin districts. It extends a little beyond Western Ghats in Kanyakumari District. The Cauvery Delta presents some extremely distinctive physical and human features, its power being a main factor in the remarkable growth, the towns of Tamilnadu have witnessed.

3.10.8 Geography of the Area

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

- in eastern - Point Calimere
- in western - hills of Anaimalai
- in northern - Pulicat lake
- in southern - Cape Comorin

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

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

3.10.9 Population Growth Rate

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

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

1981	17.50	24.66
1991	15.39	23.86
2001	11.19	21.34
2011	15.61	5.96
2021	5.96	1.0

3.10.10 Kancheepuram District

Kancheepuram district is situated on the northern East Coast of Tamil Nadu and is adjacent by Bay of Bengal and Chennai city and is bounded in the west by Vellore and Thiruvannamalai district, in the north by Thiruvallur district and Chennai district, in the south by Villuppuram district in the east by Bay of Bangal. It lies between 11° 00′ to 12° 00' North latitudes and 77° 28′ to 78° 50′ East longitudes. The district has a total geographical area of 1704.79 Sq. Kms and coastline of 87.2 Kms. Kancheepuram, the temple town is the district headquarters. For administrative reasons, the district has been divided into 2 revenue divisions comprising of 5 taluks with 520 revenue villages. For development reasons, it is divided into 5 development blocks with 274 Village Panchayats.

Source: https://kancheepuram.nic.in/about-district/

3.10.10.1Study area- Sirumailour Village, Uthiramerur Taluk

Sirumailour is a village located in Uthiramerur Taluk of Kancheepuram district in Tamil Nadu. Around 185 families reside in Sirumailur village. Sirumailur village is administered by Sarpanch (Head of village) who is elected every five years.

As per the Census India 2011, Sirumailur village has population of 765 of which 396 are males and 369 are females. The population of children between age 0-6 is 69 which is 9.02% of total population.

The sex-ratio of Sirumailur village is around 932 compared to 996 which is average of Tamil Nadu state.

The literacy rate of Sirumailur village is 60.78% out of which 68.18% males are literate and 52.85% females are literate.

There are 65.23% Scheduled Caste (SC) and 1.05% Scheduled Tribe (ST) of total population in Sirumailur village.

Table. 3.46 Sirumailour Village Population Facts

Number of Households	185
Population	765
Male Population	396 (51.76%)
Female Population	369 (48.24%)
Children Population	69
Sex-ratio	932
Literacy	60.78%
Male Literacy	68.18%
Female Literacy	52.85%
Scheduled Tribes (ST) %	1.05%
Scheduled Caste (SC) %	65.23%

Source: https://www.censusindia2011.com/tamil-nadu/kancheepuram/uthiramerur/sirumailur-population.html

Working Population- Sirumailour Village, Uthiramerur Taluk

In Sirumailur village out of total population, 603 were engaged in work activities. 60.5% of workers describe their work as Main Work (Employment or Earning more than 6 Months) while 39.5% were involved in Marginal activity providing livelihood for less than 6 months. Of 603 workers engaged in Main Work, 45 were cultivators (owner or co-owner) while 250 were Agricultural labourers.

Table. 3.47 Sirumailour Village Working Population Facts

Particulars	Total	Male	Female
Main Workers	365	287	78
Cultivators	45	42	3
Agriculture Labourer	250	191	59
Household Industries	10	5	5
Other Workers	60	49	11
Marginal Workers	238	48	190
Non Working	426	175	251

https://www.censusindia.co.in/villages/sirumailur-population-kancheepuram-tamil-nadu-629771

3.10.13 Recommendation and Suggestions

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

- **Women empowerment–** Home based income generation activities, vocational training programs and common education centre for increasing the literacy rate.
- **Education –** Free uniform, construction of common rooms and library, computer education and physical education, additional schools for girls, furniture and equipment in schools, up-gradation of existing school infrastructure.
- **Agriculture/livestock –** Infrastructure such as agricultural practices, electricity connections, assistance with buying improved tools and equipment, capacity building, supply and/or knowledge of better variety of seeds, pasture land development and trainings on animal husbandry& facility of veterinary doctor.
- **Health –** Improvements in sanitary conditions of villages, assistance with construction of latrines, improvement in drainage system, health camps and awareness campaigns for diseases like Covid-19, malaria, typhoid, tuberculosis, yellow fever and pneumonia. Repairing of PHCs and Anganwadi centers.
- **People with disability –** Establishment of center for special education, sensitization of the community towards disabled and awareness on Government schemes.
- While **Developing an Action Plan**, it is very important to identify the population who falls under the marginalized and vulnerable groups. So that special attention can be given to these groups with special provisions while making action plans.
- **Connectivity –**Transport connectivity to easiness accessibility to the region.

3.10.14 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.

To evaluate the impacts of proposed quarry project on the surrounding area, it is vital to assess the baseline status of the environmental quality in the locality of the site. Hence it can be concluded that the present environment status of the study area will not be affected by the project as Sirumailour rough stone and gravel cluster Quarries**,** will adopt adequate control measures to protect the surrounding environment and will contribute in development of the study areas.

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.

CHAPTER – 4: ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

4.0 General

The environmental impact can be categorized as either primary or secondary, primary impacts which are attributed directly by the project; secondary impacts are those which are indirectly induced. The open cast mining operations involve development of benches, Approach Road, Haul Road, Excavation and handling of material. If adequate control measures are not taken to prevent/mitigate the adverse environmental impacts/lead to damage of the eco-system.

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 for sustainable resource extraction. Based on the baseline environmental status at the existing mine site, the environmental factors that are likely to be affected (Impacts) are identified, quantified and assessed. The various anticipated impacts will be on

- Land environment
- Water Environment
- Air Environment
- Noise Environment
- Socio economic environment
- Solid waste
- Soil environment

In general, the main findings regarding the potential impacts of climate change are Land Use Type, Energy Use, Water use & Dust emission and Biodiversity & rehabilitation.

Whereas, this mining activity is restricted to a small-scale mining and the proposal falls in "B1" Category, the surrounding environment is already subjected to mining activities and based on the past weather data its inferred that there is no much of change in the climate data of the region and the district profile has no records or past history of climate change leading to Droughts and floods.

- The mine pit shall act as a rain water harvesting structure and formation of garland drains along the mine lease boundary to divert the surface runoff and collecting the runoff water for greenbelt development and dust suppression activities shall prove beneficial.
- The greenbelt development plan, all along the mine lease boundary, along with the budget allocation for the proposed mitigation measures shall prove beneficial to surrounding environment.
- Therefore, the implementation of proposed mitigation measures for winning of mineral may not have much of impact on the surrounding Climate Change

4.1 Land Environment

4.1.2 Anticipated Impact from all Proposed Projects

- 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 cause the siltation of water course.
- Impact due to heritage site, Archaeological sites.

4.1.2.1 Common Mitigation Measures for Proposed Projects

- 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
- There are no Archaeological sites, heritage site in the vicinity of the project area, the topography will be changed due to excavation of rough stone and Gravel.

4.2 Soil Environment

4.2.1 Impact on Soil Environment

The top layer of the project site in the form of Gravel formation, the Gravel will be directly loaded into tippers for the filling and levelling of low-lying areas. There is no disposal of Gravel. The excavated rough stone will be directly loaded into dumpers to the needy customers.

There will be no disposal of waste water from the quarry operation, No discharge of toxic effluent from the proposed projects. The dust emission at working face and haul roads will be controlled by water sprinkling and plantation.

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).

4.2.2 Common Mitigation Measures

- 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 sediments and reduce suspended sediment loads before runoff is discharged from the quarry site. Sedimentation ponds should be designed based on runoff, retention times, and soil characteristics. There may be a need to provide a series of sedimentation ponds to achieve the desired outcome.
- Retain vegetation – Retain existing or re-plant the vegetation at the site wherever possible.
- Monitoring and maintenance – Weekly monitoring and daily maintenance of erosion control systems so that they perform as specified specially during rainy season.

4.2.3 Waste Dump Management

There are no wastages anticipated in this rough stone and gravel quarrying operation. The entire quarried out materials will be utilized (100%). The overburden in the form of gravel formation the gravel will be also sold to needy customers for the filling and levelling of low-lying areas.

4.3 Water Environment

4.3.1 Anticipated Impact on Surface and ground water

The impact due to quarrying on the water quality is expected to be insignificant because of no use of chemicals or hazardous substances during quarrying process. The quarrying activity will not intersect ground water table as the maximum depth of the quarry in 43m and water table is found at 70m in summer season and 65m in rainy season.

The quarrying operation will be carried out well above the water table. There is no intersection of surface water bodies (Streams, Canal, Odai etc.,) in the project area. During rainy season rain water will be collected in the quarry pit and later used for greenbelt development and for the water sprinkling in the haul roads. There is no proposal for discharging of quarry pit water outside the project area.

TABLE 4.1: WATER REQUIREMENTS FOR P1&P2

P1		
***Purpose**	**Quantity**	**Source**
Dust Suppression	0.8KLD	From Existing bore wells from nearby area
Green Belt development	0.7KLD	From Existing bore wells from nearby area
Domestic purpose	0.6KLD	From existing, bore wells and drinking water will be sourced from Approved water vendors.
Total	**2.1 KLD**	
P2		
***Purpose**	**Quantity**	**Source**
Dust Suppression	1.0KLD	From Existing bore wells from nearby area
Green Belt development	0.9KLD	From Existing bore wells from nearby area
Domestic purpose	0.8KLD	From existing, bore wells and drinking water will be sourced from Approved water vendors.
Total	**2.7 KLD**	

Source: Approved Mining Plan Pre-Feasibility Report

Total water requirement in the proposed project is about 4.8 KLD, the water for dust suppression and greenbelt development will be sourced from Existing bore wells from nearby area collected during rainy seasons, the water for domestic purpose and drinking will be sourced from the approved water vendors.

4.3.2 Common Mitigation measures:

- Garland drain, settling tank will be constructed along the 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 months once) analysis of quarry pit water and ground water quality in nearby villages.
- Domestic sewage from site office & urinals/latrines provided in ML is discharged in septic tank followed by soak pits.
- Waste water discharge from mine will be treated in settling tanks before using for dust suppression and tree plantation purposes.
- De-silting will be carried out before and immediately after the monsoon season.
- Regular monitoring (every 6 months once) and analysing the quality of water in open well, bore wells and surface water.

Possibilities of water contamination and impact on an aquatic ecosystem health

- Anticipated impact from this proposed mining activity is surface runoff from cleared surfaces, or discharges from the quarry pit or floor, is likely to have elevated levels of sediment (both suspended and dissolved). The quality of the water discharged from the site can have impacts on downstream ecological communities and water users.
- Therefore, Run-off diversion is proposed – 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 with only clear water after the garland drains are enrooted through settlement traps.
- And, the depth of the mining is maximum 43m bgl and the ground water level in the surrounding areas is about 70-65 m bgl and there are no possibilities of encountering any ground water aquifers system and hence no ground water table intersection is anticipated.
- After the completion of quarry operation, the quarried out open pit mine may have utilized for pici-culture or temporary reservoir pit for use of water for domestic purpose during dry seasons.
- Therefore, its inferred that the implementation of proposed mitigation measures for winning of mineral may not have much of impact on the possibilities of water contamination and impact on an aquatic ecosystem health.

4.4 Air Environment

The air borne particulate matter is the main air pollutant in this opencast mining. The mining operation will be carried out by jackhammer drilling (35mm dia) and Hydraulic Excavators will be utilized for excavation of Rough Stone waste.

4.4.1. Anticipated

Impact

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

4.4.1.1. Modelling of Incremental Concentration from all Proposed Projects

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

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

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

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.

4.4.1.2 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 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 4-2.

TABLE 4.2: ESTIMATED EMISSION RATE FOR PROPOSED PROJECT

EMISSION ESTIMATION FOR QUARRY "P1"				
	Activity	**Source type**	**Value**	**Unit**
Estimated Emission Rate for PM_{10}	Drilling	Point Source	0.062708290	g/s
	Blasting	Point Source	0.000234552	g/s
	Mineral Loading	Point Source	0.039018645	g/s
	Haul Road	Line Source	0.002486437	g/s/m
	Overall Mine	Area Source	0.048513895	g/s
Estimated Emission Rate for SO_2	Overall Mine	Area Source	0.000280021	g/s
Estimated Emission Rate for NOx	Overall Mine	Area Source	0.000011225	g/s
EMISSION ESTIMATION FOR QUARRY "P2"				
	Activity	**Source type**	**Value**	**Unit**
Estimated Emission Rate for PM_{10}	Drilling	Point Source	0.083809142	g/s
	Blasting	Point Source	0.001000164	g/s
	Mineral Loading	Point Source	0.041393180	g/s
	Haul Road	Line Source	0.002489883	g/s/m
	Overall Mine	Area Source	0.070779024	g/s
Estimated Emission Rate for SO_2	Overall Mine	Area Source	0.000585006	g/s
Estimated Emission Rate for NOx	Overall Mine	Area Source	0.000053594	g/s

4.4.2 Frame work of Computation & Model details

The prediction included the impact of Excavation, Drilling, Blasting, loading and movement of vehicles during transportation and meteorological parameters such as wind speed, wind direction, temperature, rainfall, humidity and Cloud cover.

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

Air Pollution Dispersion Modelling.

Baseline Air Quality –

Baseline air quality has been measured at 1 location in the cluster and 7 locations within the buffer zone of the study area. The 24 - hourly average samples of particulate matters (PM_{10} and $PM_{2.5}$), SO_2 and NO_x were measured following the National Ambient Air Quality Standards (NAAQS), 2009. Monitoring data of 8 sampling stations are given below –

Meteorological Data –

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 and monitored continually for study period without break. The station was installed at a height of 4 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. A weather data was collected from IMD, Kancheepuram agro for the month of Mar 2023– May 2023 to correlate with site data and found not much of change in the parameters.

FIGURE 4.1: AERMOD TERRAIN MAP

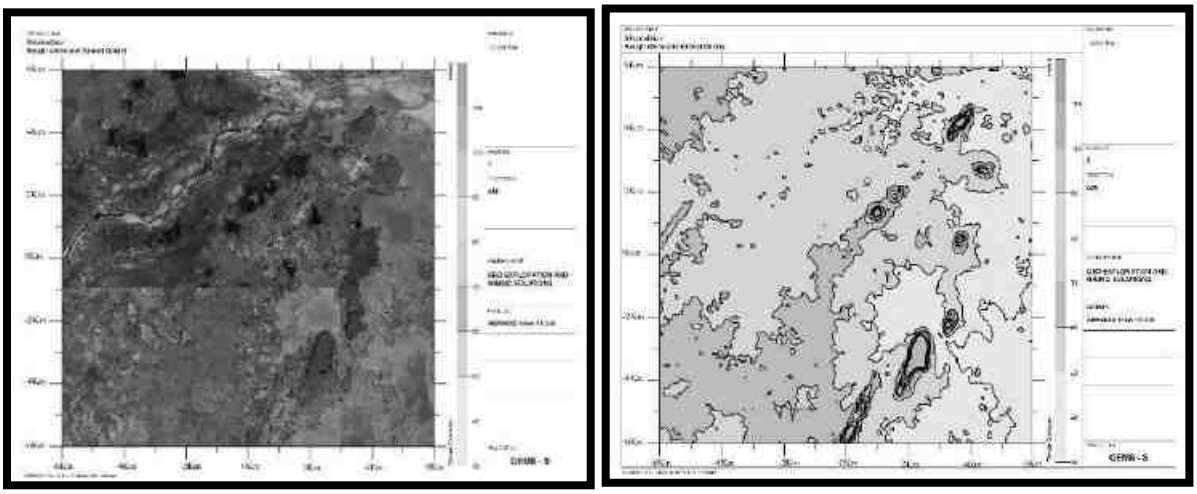


FIGURE 4.2: PREDICTED INCREMENTAL CONCENTRATION OF PM_{10}

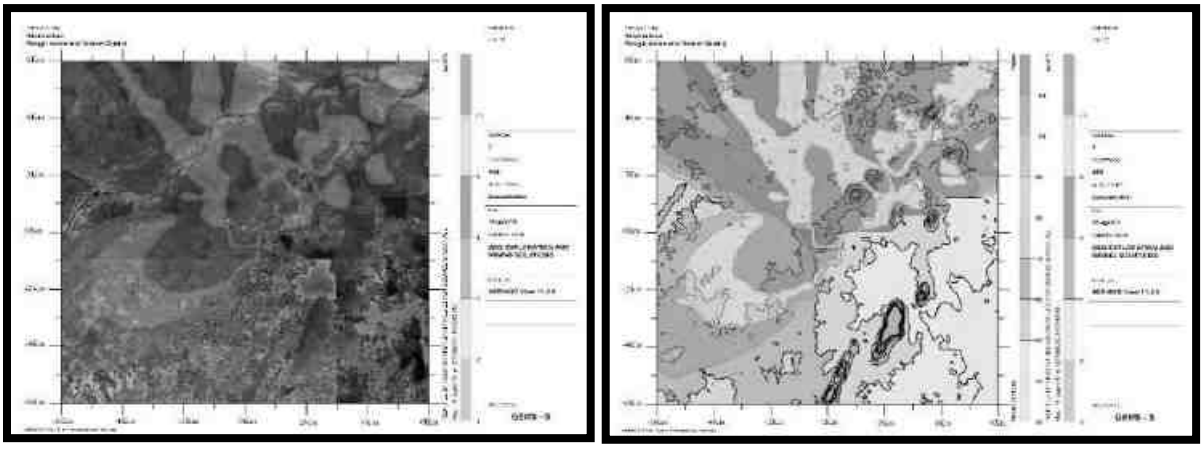


FIGURE 4.2A: PREDICTED INCREMENTAL CONCENTRATION OF PM2.5

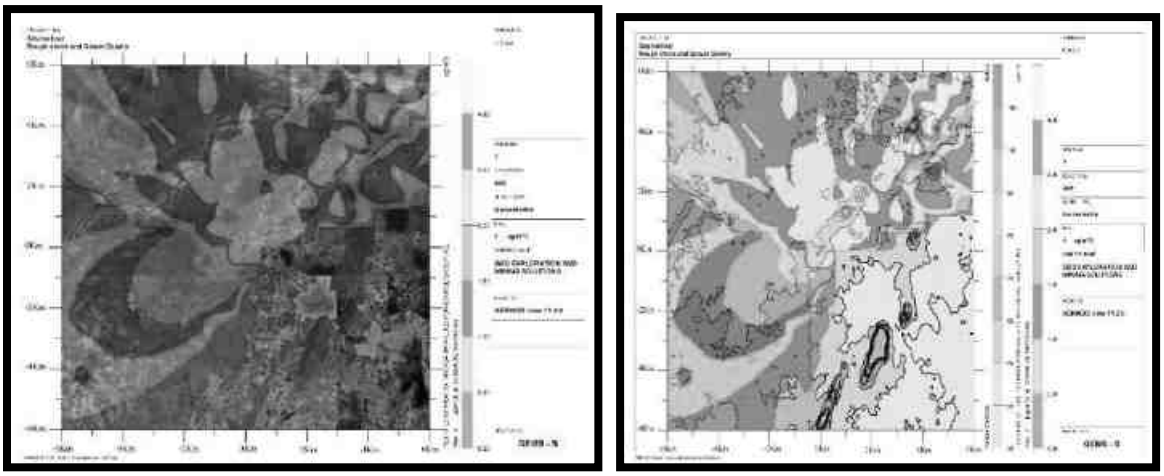


FIGURE 4.3: PREDICTED INCREMENTAL CONCENTRATION OF SO_2

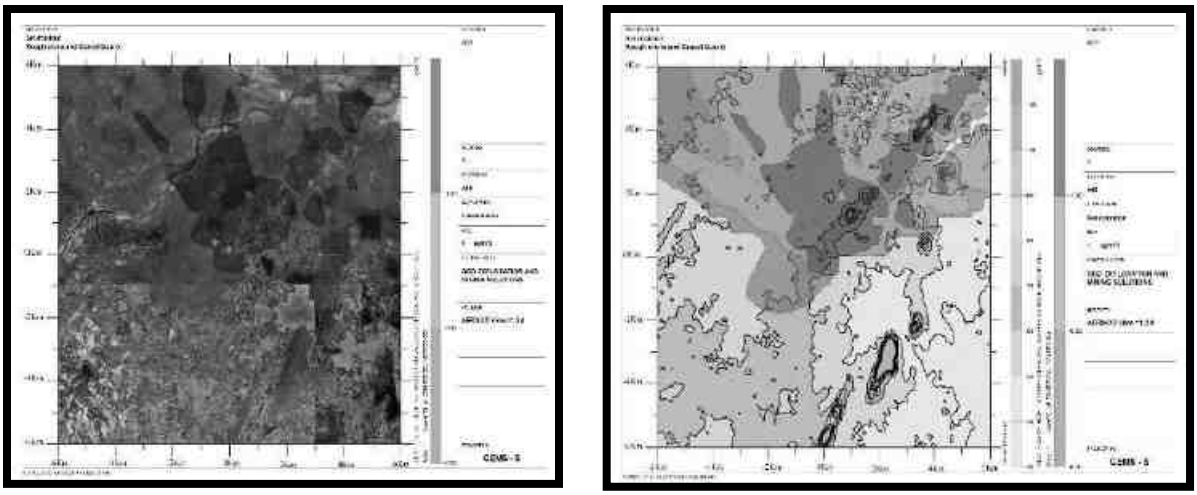


FIGURE 4.4: PREDICTED INCREMENTAL CONCENTRATION OF NO_X

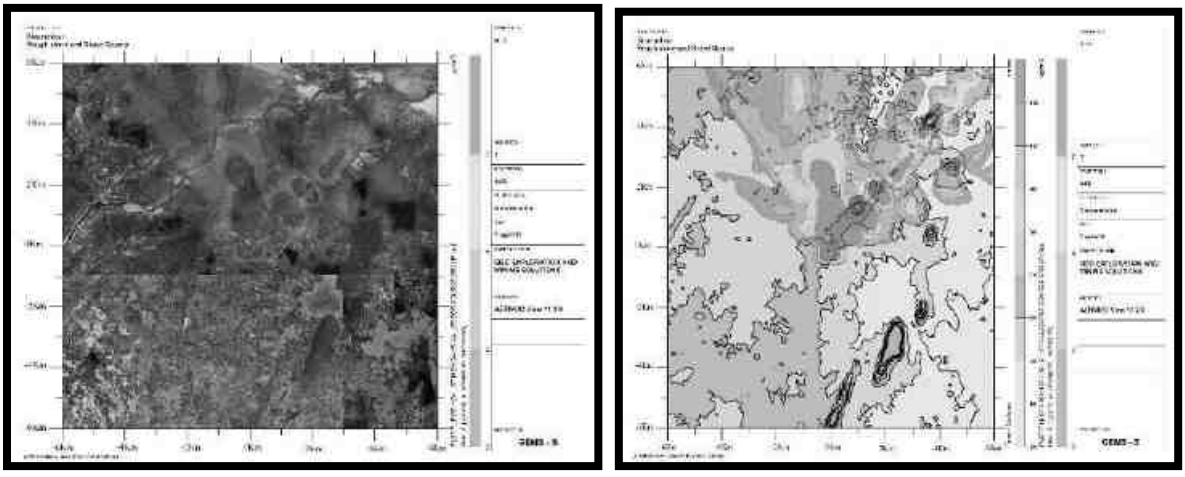
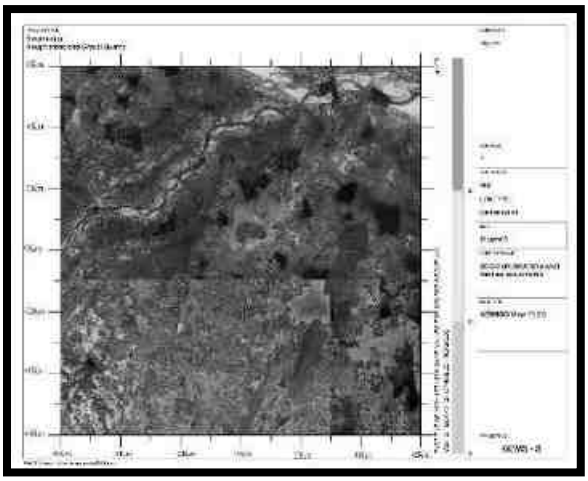
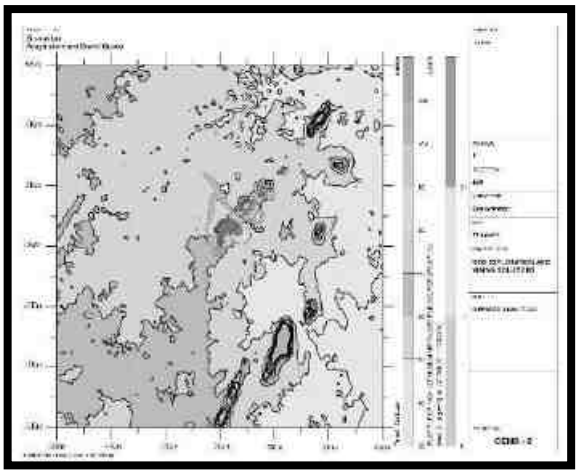


FIGURE 4.5: PREDICTED INCREMENTAL CONCENTRATION OF FUGITIVE DUST





4.3.2.1 Model Results

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

TABLE 4.3: INCREMENTAL & RESULTANT GLC OF PM_{10}

Station Code	Location	X Coordinate (m)	Y Coordinate (m)	Average Baseline PM_{10} ($\mu g/m^3$)	Incremental value of PM_{10} due to mining ($\mu g/m^3$)	Total PM_{10} ($\mu g/m^3$) (5+6)
AAQ1	12°43'8.90"N 79°50'29.77"E	-39	-92	44.9	10.79	55.7
AAQ2	12°43'16.85"N 79°50'14.16"E	-512	143	45.9	9.50	55.4
AAQ3	12°45'13.36"N 79°50'26.53"E	-139	3734	43.5	8.61	52.1
AAQ4	12°42'9.86"N 79°50'40.23"E	280	-1915	42.6	0	42.6
AAQ5	12°42'0.40"N 79°48'29.43"E	-3688	-2210	43.2	3.12	46.3
AAQ6	12°43'17.14"N 79°53'36.68"E	5621	156	43.2	0	43.2
AAQ7	12°44'12.42"N 79°49'24.75"E	-2009	1858	44.1	6.67	50.8
AAQ8	12°44'17.93"N 79°52'4.48"E	2830	2027	41.2	4.90	46.1

TABLE 4.4: 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 $PM_{2.5}$ ($\mu g/m^3$) (5+6)
AAQ1	12°43'8.90"N 79°50'29.77"E	-39	-92	23.0	4.90	27.9
AAQ2	12°43'16.85"N 79°50'14.16"E	-512	143	22.9	4.20	27.1
AAQ3	12°45'13.36"N 79°50'26.53"E	-139	3734	22.2	3.85	26.1
AAQ4	12°42'9.86"N 79°50'40.23"E	280	-1915	20.8	0.10	20.9
AAQ5	12°42'0.40"N 79°48'29.43"E	-3688	-2210	43.2	1.39	44.6
AAQ6	12°43'17.14"N 79°53'36.68"E	5621	156	42.3	0	42.3
AAQ7	12°44'12.42"N 79°49'24.75"E	-2009	1858	24.0	2.80	26.8
AAQ8	12°44'17.93"N 79°52'4.48"E	2830	2027	22.4	1.76	24.2

TABLE 4.5: INCREMENTAL & RESULTANT GLC OF SO_2

Station Code	Location	X Coordinate (m)	Y Coordinate (m)	Average Baseline So_2 ($\mu g/m^3$)	Incremental value of So_2 due to mining ($\mu g/m^3$)	Total So_2 ($\mu g/m^3$) (5+6)
AAQ1	12°43'8.90"N 79°50'29.77"E	-39	-92	8.4	1.48	9.9
AAQ2	12°43'16.85"N 79°50'14.16"E	-512	143	7.4	1.21	8.7
AAQ3	12°45'13.36"N 79°50'26.53"E	-139	3734	6.6	1.02	7.6
AAQ4	12°42'9.86"N 79°50'40.23"E	280	-1915	6.4	0	6.4

AAQ5	12°42'0.40"N 79°48'29.43"E	-3688	-2210	6.4	0	6.4
AAQ6	12°43'17.14"N 79°53'36.68"E	5621	156	7.7	0	7.7
AAQ7	12°44'12.42"N 79°49'24.75"E	-2009	1858	8.5	0.82	9.3
AAQ8	12°44'17.93"N 79°52'4.48"E	2830	2027	6.0	0.11	6.1

TABLE 4.6: INCREMENTAL & RESULTANT GLC OF NO_X

Station Code	Location	X Coordinate (m)	Y Coordinate (m)	Average Baseline Nox (µg/m³)	Incremental value of Nox due to mining (µg/m³)	Total Nox (µg/m³) (5+6)
AAQ1	12°43'8.90"N 79°50'29.77"E	-39	-92	22.7	7.69	30.4
AAQ2	12°43'16.85"N 79°50'14.16"E	-512	143	21.2	6.45	27.6
AAQ3	12°45'13.36"N 79°50'26.53"E	-139	3734	19.4	3.81	23.3
AAQ4	12°42'9.86"N 79°50'40.23"E	280	-1915	20.5	0	20.5
AAQ5	12°42'0.40"N 79°48'29.43"E	-3688	-2210	19.4	0	19.4
AAQ6	12°43'17.14"N 79°53'36.68"E	5621	156	19.1	0	19.1
AAQ7	12°44'12.42"N 79°49'24.75"E	-2009	1858	21.2	0.19	21.4
AAQ8	12°44'17.93"N 79°52'4.48"E	2830	2027	20.2	0	20.2

TABLE 4.7: INCREMENTAL & RESULTANT GLC OF FUGITIVE DUST

Station Code	Location	X Coordinate (m)	Y Coordinate (m)	Average Baseline Fugitive (µg/m³)	Incremental value of Fugitive due to mining (µg/m³)	Total Fugitive (µg/m³) (5+6)
AAQ1	12°43'8.90"N 79°50'29.77"E	-39	-92	66.78	21	87.8
AAQ2	12°43'16.85"N 79°50'14.16"E	-512	143	67.97	0	68.0
AAQ3	12°45'13.36"N 79°50'26.53"E	-139	3734	62.64	0	62.6
AAQ4	12°42'9.86"N 79°50'40.23"E	280	-1915	63.25	0	63.2
AAQ5	12°42'0.40"N 79°48'29.43"E	-3688	-2210	64.51	0	64.5
AAQ6	12°43'17.14"N 79°53'36.68"E	5621	156	66.44	0	66.4
AAQ7	12°44'12.42"N 79°49'24.75"E	-2009	1858	64.37	0	64.4
AAQ8	12°44'17.93"N 79°52'4.48"E	2830	2027	66.78	0	61.4

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 PM_{10}, SO_2 & NO_X respectively. By adopting suitable mitigation measures, the pollutant levels in the atmosphere can be further being controlled.

4.4.4. Common Mitigation

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-metalled haul roads will be compacted weekly before being put into use.
- Over loading of tippers will be avoided to prevent spillage.
- It will be ensured that all transportation vehicles carry a valid PUC certificate
- Grading of haul roads and service roads to clear accumulation of loose materials

Green Belt –

- 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

Climatic Changes:

- In general, the main findings regarding the potential impacts of climate change are Land Use Type, Energy Use, Water use & Dust emission and Biodiversity & rehabilitation.
- Whereas, this proposed mining activity is restricted to a small scale mining the proposals falls in a cluster situation where the surrounding environment is already subjected to mining activities and based on the past weather data its inferred that there is no much of change in the climate data of the region and the district profile has no records or past history of climate change leading to Droughts and floods.
- The project area's proposed with land use type of patta land for mining with 5 m height bench with 5 m width bench and Pollution Under Control Certified Machineries is proposed for wining of mineral by opencast mechanized mining method and water consumption are proposed with water tankers from nearby areas and the mine pit itself shall act as a rain water harvesting structure and formation of garland drains along the mine lease boundary to divert the surface runoff and collecting the runoff water for greenbelt development and dust suppression activities shall prove beneficial.
- The greenbelt development plan, all along the mine lease boundary @ 4,700 Nos of trees, along with the budget allocation for the proposed mitigation measures shall prove beneficial to surrounding environment.
- Therefore, the implementation of proposed mitigation measures for winning of mineral may not have much of impact on the surrounding Climate Change leading Droughts and Floods etc.,

4.5 Noise Environment (Impact & Mitigation Measures)

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.

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

4.5.1 Anticipated Impact

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

- Source data
- Receptor data
- Attenuation factor

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

TABLE 4.8: 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 4.9: PREDICTED NOISE INCREMENTAL VALUES

Location ID	**N1**	**N2**	**N3**	**N4**	**N5**	**N6**	**N7**	**N8**
Maximum Monitored Value (Day) dB(A)	51.7	57	56.2	49.1	48.2	47.2	52	51
Incremental Value dB(A)	47.30	46.48	28.74	34.99	27.64	25.29	31.80	29.47
Total Predicted Noise level dB(A)	46.30	50.68	45.98	47.08	48.54	46.24	47.71	51.23
NAAQ Standards	**Industrial** **Day Time- 75 dB (A)** **Night Time- 70 dB (A)** **Residential** **Day Time– 55 dB (A)** **Night Time- 45 dB (A)**							

4.5.2 Common Mitigation Measures

The following noise mitigation measures are proposed for control of Noise.

- Time intervals for each quarry during blasting.
- Use of personal protective devices i.e., earmuffs and earplugs by workers, who are working in high noise generating areas.
- Limiting time exposure of workers to excessive noise.
- Proper and regular maintenance of vehicles, machinery and other equipment's.
- The noise generated by the machinery will be reduced by proper lubrication of the machinery and other equipment's.
- Speed of trucks entering or leaving the quarry will be limited to moderate speed to prevent undue noise from empty vehicles.
- Noise levels will be controlled by using optimum explosive charge, proper delay detonators and proper stemming to prevent blow out of holes (occasionally).

- Providing proper noise proof enclosure for the workers separated from the noise source and noise prone equipment.
- Provision of Quiet areas, where employees can get relief from workplace noise.
- The development of green belts around the periphery of the quarry site to attenuate noise.
- Regular medical check–up and proper training to personnel to create awareness about adverse noise level effects.

4.5.3 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 project area is located 1km Southeast in Karacheri village. The ground vibrations due to the blasting in proposed mine are calculated using the empirical equation.

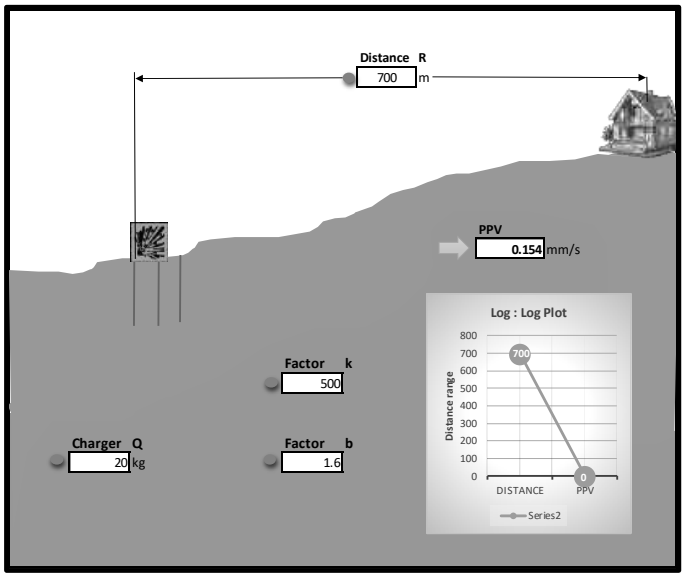
The empirical equation for assessment of peak particle velocity (PPV) is:

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

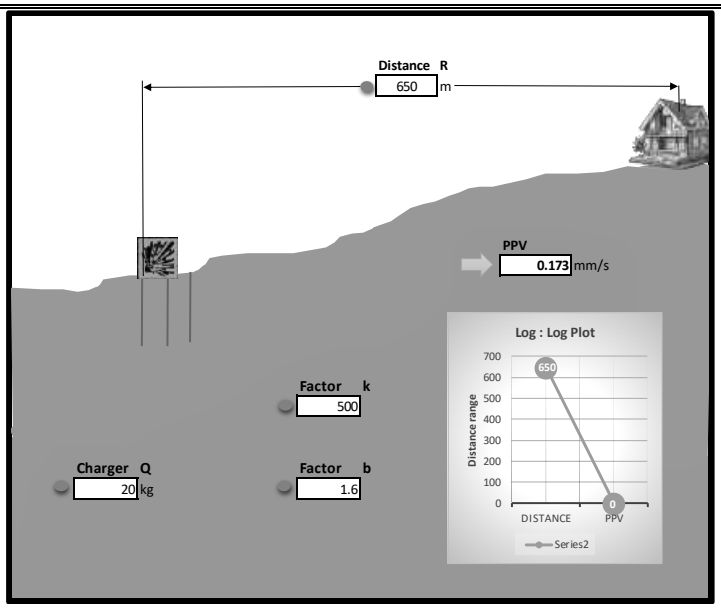
Where –
V = peak particle velocity (mm/s)
K = site and rock factor constant
Q = maximum instantaneous charge (kg)
B = constant related to the rock and site (usually 1.6)
R = distance from charge (m)

TABLE 4.10: PREDICTED PPV VALUES DUE TO BLASTING

Location ID	Maximum Charge in kgs	Nearest Habitation in m	PPV in m/ms
P1	20	700m- S	0.154
P2	20	650m- SW	0.173



P1



P2

From the above graph, the Maximum charge per blast of 20 Kg is well below the Peak Particle Velocity of 8 mm/s as per Directorate General of Mines Safety for safe level criteria through Circular No.7 dated 29/8/1997. It is proposed to carry out blasting not exceeding 2kg of Explosives per one blasting round. However, as per statutory requirement control measures will be adopted to avoid the impacts due to ground vibrations and fly rocks due to blasting.

4.5.3.1 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 Hz.
- Vibration monitoring will be carried out every 6 months to check the efficacy of blasting practices

4.6 Impact on Biological Environment

Environmental impact studies are required for systematic identification, qualification, and interpretation of the anticipated changes. The main environmental problems associated with mining activities are deforestation, land degradation (change in topography, soil erosion), visual intrusion, disturbance to the hydrological system, and water, air, and noise pollution which ultimately impact the floral and faunal status of the project area. However, the occurrence and magnitude of these impacts entirely depend on project location, mode of operation, and adoption of the latest technologies.

4.6.1. Impact Identification and Evaluation

In general, impact prediction methods argue that the foremost step in impact appraisal must consider and identify project actions that are likely to bring significant changes in the project environment. The present study determined to predict the likely impacts of the Proposed Rough and Gravel quarry Mining Project in the surrounding environment with a specific focus on biological attributes covering habitats/ecosystems and associated biodiversity. Likely impacts identified were categorized into different levels like, direct or primary and indirect or secondary impacts based on the influence of sources of impacts.

There is no National Park or Wildlife Sanctuary in the study area. In addition, No Biosphere Reserves, Wildlife corridors, or, Tiger / Elephant reserves within 10 km of the project area. No Schedule- I species were found in the buffer zone of the proposed project area during the biodiversity assessment.

4.6.2. Impact on Flora

The proposed mine lease exhibits plain topography and it is Patta land which is not fit for cultivation. It is mostly devoid of any considerable vegetation. The proposed mine lease area (core zone) not encompasses any designated forest land within it. The vegetation is very sparse and scanty. So, there will be no impact on flora from the mining operation. There will not be much contamination of soil or any other materials from the mining operation. No threatened plant species were reported in the core and buffer study area during the field survey.

4.6.2.1. Anticipated Impact on agricultural land associated with flora

1. There are no impacts on the nearby agricultural land due to this mining activity.
2. None of the plants will be cut during the operational phase of the mine.
3. 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.

Most of the land in the buffer area is undulating terrain with croplands, grass patches, and small shrubs. Hence, there will be no effect on the flora of the region.

4.7 Mitigation Measures

4.7.1. General Guidelines for Green Belt Development

In selecting plant species for green belt and plantation purposes in and around the proposed mine lease area native species, fruit-bearing trees, medicinal plants, and dense canopy trees should be selected. These species should be tolerant to pollution levels as per Bio- Geography zones of India.

After the operation of mining production capacity, green belt, and plantation species should be in accordance with the Terms and Conditions of the Environmental Clearance Green belt is created not only for the purpose of protecting sensitive areas or maintaining the ecological balance but because they also act as efficient biological filters or sinks for particulate and gaseous emissions, generated by vehicular movements and various industrial and mining activities.

a. Characteristic features of plants to be used for Absorption of pollutant gases

- Plant species should be perennial and evergreen with thick canopy cover.

- The crown of the tree (mass of foliage/leaves and branches growing outward from the trunk of the tree) should be either Oblong, Round or Spreading for effective absorption of pollutant gases.
- Plant should have foliage of longer duration.
- The foliage should be freely exposed through adequate height of the crown, Openness of foliage/leaves in the canopy, big leaves (long and broad laminar surfaces).

The project site should have land to develop a greenbelt in and around the limits of the mine, along roads, and another vacant area. The main objective of the green belt is to provide a barrier between the source of pollution and the surrounding areas. Although the project will not lead to any tree cutting, it is proposed to improve the greenery of the locality through plantation services. To avoid dust emissions, the mined materials will be covered with tarpaulin during transportation.

Table No. 4.11. List of plant species proposed for Greenbelt development

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

Table No. 4.12. Species suitable for abatement of noise and dust pollution

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

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

4.7.2. Anticipated Impact on Fauna

- Since the terrestrial fauna in the study area is distributed away from the mine site, the impacts of the project are likely to be much low on the terrestrial fauna of the region. The proposed mining lease area is devoid of any significant vegetation, it is not suitable for permanent habitat for any specific wildlife.
- Habitat degradation and disturbance to faunal group due to ground vibration and increase in noise level will be minimize or resolved by modern technologies. So, from above facts it is revealed that there will be no impact on fauna. No threatened fauna species reported in the core and buffer study area.

4.7.3 Measures for protection and conservation of wildlife species

- Topsoil has a large number of seeds of native plant species in the mining area.
- Checks and controls the movement of vehicles in and out of the mine.
- Undertaking mitigative measures for a conducive environment to the flora and fauna in consultation with Forest Department.
- Plantation around the mine area will help in creating habitats for small faunal species and create a better environment for various fauna. Creating and developing awareness for nature and wildlife in the adjoining villages.

4.8. Impact on Aquatic Biodiversity

Mining activities will not disturb the aquatic ecology as there is no effluent discharge proposed from the Rough Stone and Gravel quarry. There is no natural perennial surface water body within the mine lease area, like wetlands, rivers streams, lakes, and farmer sites. There is no impact on fish habitats and the food WEB/ food chain in the water body and Reservoir. Aquatic biodiversity is observed in the study area. The project is not likely to affect the aquatic ecology.

Table No: 4.13. General Impacts vs. Mitigation Matrix

Particulars	Issues	Reason/Status in relation to the mine site	Reference/Method	Suggestions
Species	Rare/ Endangered/ Threatened species	Not reported	Field observation, interviews of local people	**Nil**
	Endemic Species	No endemic species of any flora, fauna or wildlife are present in the study area.	Field survey, Literature review	**Nil**
Important Natural Habitats	Protected Areas	No National Park, Wildlife Sanctuary, Tiger reserve, and Biosphere Reserve falls in the 10-km radius study area	ENVIS, Government of Tamil Nadu protected area website, Google Earth, Project Maps, etc.	**Nil**
	Important Bird Areas	No Important Bird Areas are falling in the 10-km radius area for Migratory Bird Habitat	ENVIS Centre on Wildlife & Protected Areas, Important Bird Area in India, IBA Book (Birdlife International)	**Nil**
	Ramsar site	No Ramsar sites present in the surrounding area region	Ramsar Web site	**Nil**
	Wetlands of National Importance	Nil	ENVIS Centre on Wildlife & Protected Areas, Wetlands directory of Government of India	**Nil**
	Wetlands of International Importance	Nil	Nil	**Nil**
	Wildlife Corridors	No Wildlife Corridor is falling in 10 km radius project study area	Protected Areas, Consultation with local	**Nil**

			naturalists & authenticated location map.	
	Eco-sensitive zone identified by the government	No Eco-sensitive zone is falling 10 km radius project study area	ENVIS, Consultation with local naturalists & authenticated location map	**Nil**
	Forest Areas	No Reserve Forest is falling in 10 km radius project study area	ENVIS, Government of Tamil Nadu protected area website, Google Earth, Project Maps, etc.	NIL, Applicant will create the green belt plantation on the periphery of mine sites.
	Water bodies	Nil	Project Map and local maps, Google Earth	Ensure minimum destruction during in operation phase.
	Breeding/nesting areas	No breeding/Nesting's site are falling in the study area	Literature Survey Project Map and local maps, Google Earth	NIL

TABLE 4.14: GREENBELT DEVELOPMENT PLAN FOR P1&P2

Code	No. of tress proposed to be planted	Area to be covered in m^2	Name of the species
P1	2200	The safety zone along the boundary barrier has been identified to be utilized for Greenbelt development.	Vilvam, Panai-maram, Vengai, Santhana Vembu etc.,
P2	900	The safety zone along the boundary barrier has been identified to be utilized for Greenbelt development.	Vilvam, Panai-maram, Vengai, Santhana Vembu etc.,

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.

4.8.1Anticipated 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.

4.8.2 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.

4.8.3. 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.

4.9. Impact on Aquatic Biodiversity

Mining activities will not disturb the existing aquatic ecology as there is no effluent discharge proposed from the rough stone and gravel 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.

4.9.1. Impact Assessment on Biological Environment

A detail of impact and assessments was mentioned in Table No 4.15.

TABLE 4.16: ECOLOGICAL IMPACT ASSESSMENTS

SI.No	Attributes	Assessment
1	Proximity to national park/wildlife sanctuary/reserve forest /mangroves/ coastline/estuary/sea	Vedanthangal Bird sanctuary-7km-N Karikili Bird Santuary-13km-N.
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 has been suggested Upgrade the vehicles with alternative fuel such biodiesel, methanol and biofuel around the mining area.

4.10 Socio Economic Impact

4.10.1 Construction Phase

Anticipated Impacts:

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

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

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

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

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

Mitigation measures:

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

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

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

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

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

4.10.2 Operation Phase:

Anticipated Impacts:

♣ Long term exposure to the pollutants such as PM, SO_2 and NO_2 Cement dust have a potential to create health impacts such as risk of cardiovascular and respiratory disease, eye irritation, bronchitis, lung damage, increased heart ailments, etc.

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

Mitigation Measures:

♣ In order to mitigate the long-term health impacts, efficient Air Pollution Control Equipment (APCE) like Bag House / Bag Filter / ESP will be installed at all major stacks to keep the emissions within the permissible limits. To reduce the gaseous emission, Pyro-process itself acts as a long SO_2 scrubber and De - NOx system will be installed for fuel burning along with calciner for low NO_x formation. To reduce fugitive emission from vehicles and machineries will be regularly monitored and maintained.

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

4.10.3 Impact Evaluation:

Table 4.18.1 Impact Evaluation Impact evaluation *is given in table below.*

<table>
<tr><td>Impact Evaluation Element</td><td colspan="4">Impact on socio economics due to the applied for rough stone and Gravel quarry over an extent of 1.76.50ha of Patta lands in S.F.Nos. 331/4A, 331/4B,331/5A, 331/5B, 331/6, 331/7A, 331/7B, 331/8A and 331/8B of Siruthamur Village, Uthiramerur Taluk Kancheepuram District, Tamil Nadu State.
Impact on socio economics due to the applied for rough stone and Gravel quarry over an extent of 4.37.50ha of Patta lands in S.F.Nos. 3/1A, 3/1B, 3/2 & 5/2 – Sirumailur Village, 86/1, 86/2, 87/1 (P) Sithalapakkam Village Uthiramerur Taluk Kancheepuram District, Tamil Nadu State.</td></tr>
<tr><td>Potential Effect/ Concern</td><td colspan="4">Proposed project will provide direct & indirect employment opportunities to the local residents, which will help to increase their earning and better living standard as well as further up-liftment of socio-economic status of the area.</td></tr>
<tr><td colspan="5">Characteristics of Impacts</td></tr>
<tr><td rowspan="2">Nature</td><td colspan="2">Positive</td><td>Nagative</td><td>Netural</td></tr>
<tr><td colspan="2">✓</td><td></td><td></td></tr>
<tr><td rowspan="2">Type</td><td>Direct</td><td>Indirect</td><td colspan="2">Cumulative</td></tr>
<tr><td></td><td></td><td colspan="2">✓</td></tr>
<tr><td rowspan="2">Extent</td><td>Project area</td><td>Local</td><td>Zonal</td><td>Regional</td></tr>
<tr><td>✓</td><td></td><td></td><td></td></tr>
<tr><td rowspan="2">Duration</td><td colspan="2">Short time</td><td colspan="2">Long term</td></tr>
<tr><td colspan="2"></td><td colspan="2">✓</td></tr>
<tr><td rowspan="2">Intensity</td><td colspan="2">Low</td><td>Medium</td><td>High</td></tr>
<tr><td colspan="2"></td><td>✓</td><td></td></tr>
</table>

Frequency	Remote (R)	Occasional (O)	Periodic (P)	Continuous (C)
			✓	
Significance of Impact				
Significance	Insignificant	Minor	Moderate	Major
			✓	

4.10.4 Common Mitigation Measures for Respective Individual Proposed Projects

- 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
- No villages in the proposed mineral transportation route
- Mineral loaded Vehicles will not allow during school hours (Morning 8AM to 10AM & Evening 4.30PM to 5.30PM)

4.11 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

4.11.1 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

4.11.2 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.

4.11.3 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

4.11.4 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.

4.12 Mine Waste Management

No waste is anticipated from any of the proposed quarries.

4.13 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 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.

4.13.1 Mine Closure Criteria

The criteria involved in mine closure are discussed below:

4.13.1.1 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.,

4.13.1.2 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.

4.13.1.3 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 mining 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 SUMMARY OF ADVERSE IMPACTS OF EACH ALTERNATIVE

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

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

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

5.2 ANALYSIS OF ALTERNATIVE SITE

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

5.3 MITIGATION MEASURES PROPOSED FOR EACH ALTERNATIVE

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

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

5.4 SELECTION OF ALTERNATIVE

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

6. ENVIRONMENTAL MONITORING PROGRAMME

6.0 GENERAL

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

6.1 METHODOLOGY OF MONITORING MECHANISM

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

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

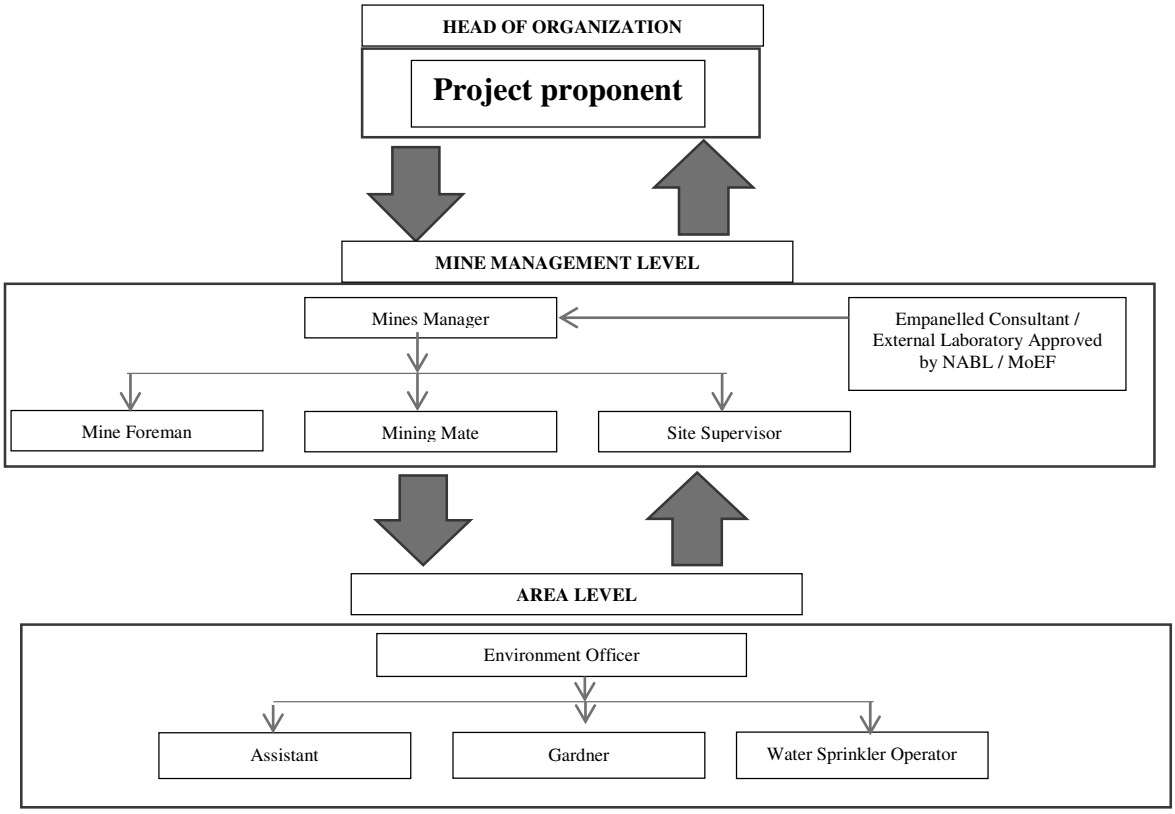
The responsibilities of this cell will be:

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

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

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

FIGURE 6.1: PROPOSED ENVIRONMENTAL MONITORING CELL P1 &P2



6.2 IMPLEMENTATION SCHEDULE OF MITIGATION MEASURES FOR P1&P2

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

TABLE 6.1 IMPLEMENTATION SCHEDULE

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

6.3 MONITORING SCHEDULE AND FREQUENCY

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

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

The details of monitoring are detailed in Table 6.2

TABLE 6.2: PROPOSED MONITORING SCHEDULE POST EC FOR P1 &P2

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 PROGRAM BUDGET FOR P1&P2

Sl.No.	Parameter	EMP Cost
1	Air Quality	Rs. 7,60,000/-
2	Meteorology	
3	Water Quality	
4	Hydrology	

5	Soil Quality	
6	Noise Quality	
7	Vibration Study	
Total		**Rs 7,60,000/-**

Source: Approved Mining Plan

6.5 REPORTING SCHEDULES OF MONITORED DATA

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

Periodical reports to be submitted to: -

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

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

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

7. ADDITIONAL STUDIES

7.0 GENERAL

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

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

7.1. PUBLIC CONSULTATION

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

7.2 RISK ASSESSMENT

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

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

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

TABLE 7.1 RISK ASSESSMENT& CONTROL MEASURES

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

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

		Operator of truck leaving his cabin when it is loaded.	
6	Natural calamities	Unexpected happenings	Escape Routes will be provided to prevent inundation of storm water Fire Extinguishers & Sand Buckets
7	Failure of Mine Benches and Pit Slope	Slope geometry, Geological structure	Ultimate or over all pit slope shall be below 60° and each bench height shall be 5m height.

Source: Analysed and Proposed by FAE & EC

7.3 DISASTER MANAGEMENT PLAN

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

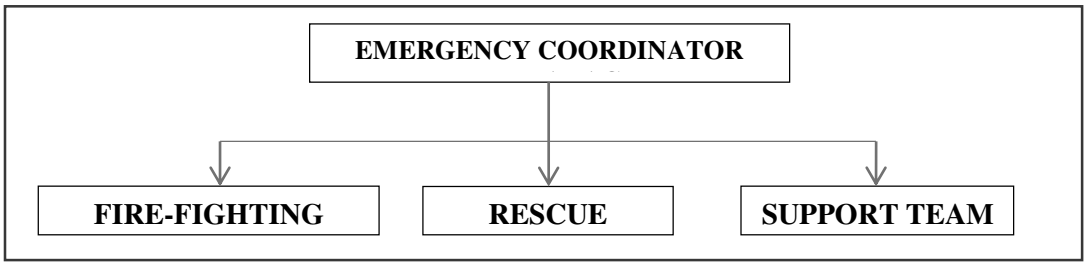
The Disaster Management Plan is aimed to ensure safety of life, protection of environment, protection of installation, restoration of production and salvage operations in this same order of priorities.

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

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

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

FIGURE 7.1: DISASTER MANAGEMENT TEAM LAYOUT



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

TABLE 7.2: PROPOSED TEAMS TO DEAL WITH EMERGENCY SITUATION

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

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

Roles and responsibilities of emergency team –

(a) Emergency coordinator (EC)

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

(b) Incident controller (IC)

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

(c) Communication and advisory team

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

(d) Roll call coordinator

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

(e) Search and rescue team

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

(f) Emergency security controller

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

Emergency control procedure –

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

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

Proposed fire extinguishers at different locations –

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

TABLE 7.3: PROPOSED FIRE EXTINGUISHERS AT DIFFERENT LOCATIONS

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

Alarm system to be followed during disaster –

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

7.4 CUMULATIVE IMPACT STUDY

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

TABLE 7.4: LIST OF QUARRIES WITHIN 500 METER RADIUS

PROPOSED QUARRIES					
CODE	**Name of the Owner**	**Village**	**S.F. Nos**	**Extent in Ha**	**Status**
P1	Thiru. M.R.Govindan	Sirudhamur	331/4, 331/4B, 331/5A, 331/5B, 331/6, 331/7A, 331/7B, 331/8A & 331/8B	1.76.50	File No.11001 TO24B0108TN5296358N Dated: 29.07.2024-
P2	Thiru. M.R.Govindan	Sirumailur & Sithalapakkam	.3/1A, 3/1B, 3/2 & 5/2, 86/1, 86/2, 87/1(P)	4.37.5	File No.11247 TO24B0108TN5553717N Dated: 22.10.2024
P3	M/s. Murugappa Blue Metals	Sirumailur	15/1, 16/1 etc	1.39.81	Lr No. SEIAA-TN/F.No.9806/ToR- 1456/2023 Dated: 10.05.2023
			TOTAL EXTENT	**7.53.81**	
EXISTING QUARRIES					
CODE	**Name of the Owner**	**Village**	**S.F. Nos**	**Extent in Ha**	**Status**
E-1	Thiru.S.Murugesan	Sirudhamur	324/4A, 4B1	3.11.00	07.02.2023 to 06.02.2028
E-2	Thiru.D.Arunkumar	Sirudhamur	338/1(P)	4.95.00	19.05.2023 to 18.05.2028
E-3	Thiru.M.Ganesan	Sirudhamur	324/1A, 1B etc.,	2.40.00	17.11.2023 to 16.11.2033
E-4	Thiru.M.Ganesan	Sirudhamur	323/3, 323/4 etc.,	2.13.00	28.11.2023 to 27.11.20233
E-5	Thiru.N.Kanniyappan	Sirudhamur	319/1, 319/2 etc.,	1.62.00	22.11.2023 to 21.11.2033
E-6	Thiru.K.Prabakaran	Sirudhamur	320/5	2.15.30	17.05.2023 – 16.05.2033
			TOTAL EXTENT	**16.36.30**	
EXPIRED QUARRIES					
Nil					
ABANDONED QUARRIES					
A-1	Thiru.D.Nandakumar	Sirumailur	11/1, 11/2A, 11/2B, 12/1, 12/2, 12/3, 12/4, 12/5	3.92.50	08.12.2017 to 07.12.2022
A-2	RCS Infrastructure Pvt Ltd	Sirudhamur	323/1A, 323/2A, 324/10B, 324/7B, 327/3B, 327/4	1.80.0	23.02.2015 to 22.02.2020
A-3	RCS Infrastructure Pvt Ltd	Sirudhamur	327/6	2.39.0	20.12.2011 to 19.12.2016

A-4	Thiru.S.Jayachandran	Sirudhamur	326(P)	2.00.0	16.02.2007 to 15.02.2012
A-5	Thiru.S.Krishnakumar	Sirudhamur	106	0.79.50	16.02.2007 to 15.02.2012
			TOTAL EXTENT	**10.91.0**	
			TOTAL CLUSTER EXTENT	**23.90.11**	

- **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.M.R.Govindan Rough Stone and Gravel Quarry	
S.F. No.	331/4A, 331/4B,331/5A, 331/5B, 331/6, 331/7A, 331/7B, 331/8A and 331/8B	
Extent	1.76.50 ha	
Village, Taluk and District	Siruthamur Village, Uthiramerur Taluk & Kancheepuram District	
Land Type	It is an Own Patta land – Patta No. 1204	
Existing quarry operation	It is a Fresh quarry proposal	
Toposheet No	57- P/14	
Latitude between	**12° 43' 10.06"N to 12° 43' 14.35"N**	
Longitude between	**79° 50' 50.24"E to 79° 50' 57.80"E**	
Elevation of the area	78m AMSL	
Lease period	10 Years	
Mining Plan period	10 years	
Proposed Depth of Mining as per ToR	32m BGL (2m Gravel + 30m Rough Stone)	
	Rough Stone in m^3	Gravel m^3
Geological Resources	5,29,500	35,300
Mineable Reserves	1,80,355	24,120
Year wise Production for First Five Year as per Mining Plan	92,005	24,120
Year wise Production for Second Five Year as per Mining Plan	88,350	-
Peak Production	18,925	-
Ultimate Pit Dimension	189m(L) x 72m(B) x 32m(D)(BGL)	
Water Level in the region	55m -60m bgl	
Method of Mining	Opencast Mechanized Mining Method involving small drilling and Controlled blasting using Slurry Explosives	
Topography	The lease applied area is exhibiting plain terrain. The area has gentle sloping towards Eastern side and altitude of the area is 78m above from Mean Sea Level. The area is covered by 2m thickness of Gravel and followed by Massive Charnockite which is clearly inferred from the nearby Existing quarries	
Machinery proposed	Jack Hammer	4Nos
	Compressor	1Nos
	Excavator with Bucket and Rock Breaker	1Nos
	Trucks	2Nos
	Water Sprinkling Tanker	1Nos

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.	
Proposed Manpower Deployment	26 Nos	
Project Cost	Rs.87,77,00/-	
Half year Compliance Monitoring Cost	Rs.7,60,000/-	
Total Project cost	Rs.95,35,000/-	
CER Cost	Rs. 5,00,000/-	
Nearby Water Bodies	Odai	240m SW
	Odai	270m NE
	Periya Eri	300m East
	Kuttai	750m NW
	Pond	860m NE
	Kuttai	980m West
	Siruthamur Lake	1km SE
	Chithalapakkam Eri	1.2km NW
	Edaimichi Eri	1.6km SE
	Cheyyar River	3.2km NW
	Palar River	5km NE
Greenbelt Development Plan	Proposed to plant 1000 Nos of trees considering 500 Nos of trees/ Ha criteria The plantation will be developed around the project site and nearby village roads	
Proposed Water Requirement	2.1 KLD	
Nearest Habitation	700m – South	
Nearest Reserve Forest	Kavanipakkam R.F. – 2.44 km – South East	
Nearest Wild Life Sanctuary	Karikili Bird Sanctuary- 18.8 km – South Vedanthangal Bird Sanctuary – 19 km South	

TABLE 7.6: SALIENT FEATURES OF PROPOSAL "P2"

Name of the Quarry	Thiru.M.R.Govindan Rough Stone and Gravel Quarry	
	3/1A, 3/1B, 3/2 & 5/2 – Sirumailur Village, 86/1, 86/2, 87/1 (P) Sithalapakkam Village	
Toposheet No	57- P/14	
Latitude between	**12° 43' 20.11"N to 12° 43' 29.94"N**	
Longitude between	**79° 50' 34.60"E to 79° 50' 42.37"E**	
Elevation	72m AMSL	
Proposed Depth of Mining	37m BGL (2m Dumped Gravel + 35m Rough Stone)	
Geological Resources	Rough Stone in m^3	Gravel m^3
	13,87,850	87,500
Mineable Reserves	1,00,919	12,464
Yearwise Production	97,319	-
Ultimate Pit Dimension	263m(L) x 178m(B) x 37m(D)(BGL)	
Water Level in the surrounds area	53m -58m bgl	
Method of Mining	Opencast Mechanized Mining Method involving drilling and blasting	
Topography	The lease applied area is exhibiting plain terrain. The area has gentle sloping towards North-eastern side and altitude of the area is 72m above from Mean Sea Level. The area is covered by 2m thickness of Gravel and followed by Massive Charnockite which is clearly inferred from the nearby Existing quarries.	
Machinery proposed	Jack Hammer	4Nos

	Compressor	1Nos
	Excavator with bucket and rock breaker	1Nos
	Tippers	3Nos
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	29 Nos	
Project Cost	Rs.48,30,000/-	
CER Cost @ 2% of Project Cost	Rs 5,00,000/-	

Source: Approved Mining Plan

TABLE 7.7: SALIENT FEATURES OF PROPOSAL "P3"

Name of the Quarry	Tvl. Murugappa Blue Metals Rough Stone & Gravel Quarry	
Toposheet No	57-P/14	
Latitude between	12° 43' 08.62"N to 12° 43' 15.19"N	
Longitude between	79° 50' 28.58"E to 79° 50' 33.18"E	
Geological Resources	Rough Stone in m^3	Gravel m^3
	4,61,373m^3	27,962m^3
Mineable Reserves	Rough Stone in m^3	Gravel m^3
	1,20,776m^3	19,332m^3
Ultimate Pit Dimension	Pit-1 164m (L) x 76m (W) x 35m bgl	
Method of Mining	Opencast Mechanized Mining Method involving drilling and blasting	
Machinery proposed	Jack Hammer	2 No
	Compressor	1 No
	Hydraulic Excavator	1 No
	Tipper	1 Nos
Proposed Manpower Deployment	15	
Project Cost	Rs.34,47,000/-	
EMP Cost	Rs. 7,60,000/-	
Total	Rs.42,07,000/-	
CER Cost @ 2% of Project Cost	Rs 5,00,000/-	
Nearby Water Bodies	Odai	10m Safety
	Kuttai	290m South
	Kuttai	380m West
	Kalthangal Eri	670m South
	Eri Near Chitalapakkam	820m NW
	Periya Eri	1km East
	Sirudhamur Lake	1.3km SE
	Pond	1.5km East
	Edaimachi Eri	2.2km SE
	Cheyyar River	2.8km NW
	Palar River	5km NE
Greenbelt Development Plan	Proposed to plant 700 trees	
Proposed Water Requirement	1.1 KLD	
Nearest Habitation	320m-W	

Source: Approved Mining Plan

TABLE 7.8: SALIENT FEATURES OF PROPOSAL "E1"

Name of the Mine	Thiru. S.Murugesan Rough stone and Gravel quarry	
Land Type	It is a Patta land. The lands registered in the name of the Thiru.S. Ramachandran, Managing Partner of M/s. S.R. Blue Metals, vide Patta No.4207.	
S.F. No.	324/4A, 324/4B1, 324/4B2, 324/5, 324/6, 324/7A, 324/8B, 324/10A, 324/10C, 324/11, 327/2 & 327/3A	
Extent	3.11.0 Ha	
Previous quarry details	It is a Fresh lease,	
Proposed depth of mining (as per scheme of Mining)	42m below ground level	
Geological Reserves	Rough Stone	Gravel
	4,50,182m^3	3,302 m^3
Mineable Reserves	Rough Stone	Gravel
	1,23,108 m^3	-
Proposed production for this five-year mining plan period	Rough Stone	Gravel
	1,23,108 m^3	-
Scheme Period	Five years (09.05.2023 to 08.05.2028)	
Existing Pit Dimension	Pit-1 80m (L) X 30m (W) X 20m (D) Pit-II 192m (L) X 95m (W) X 32m (D) Pit-III 78m (L) X 108m (W) X 24m (D)	
Ultimate Pit Dimension	Pit-1 80m (L) X 30m (W) X 27m (D) Pit-II 192m (L) X 95m (W) X 42m (D) Pit-II 78m (L) X 108m (W) X 42m (D)	
Toposheet No	57-P/15	
Latitude	12°43'27.88"N to 12°43'34.22"N	
Longitude	79°50'54.94"E to 79°51'08.09"E	
Highest Elevation	100m (max) above Mean Sea level	
Water Level	53 to 48m BGL	
Machinery	Jack Hammer	4
	Compressor	1
	Excavator with Bucket and Rock Breaker	1
	Tipper	2
Blasting	Usage of Slurry Explosive with MSD detonators	
Manpower Deployment	20Nos	
Total Project Cost	Project Cost	Rs. 51,12,000/-
	EMP Cost	Rs.3,80,000/-
	Total	Rs.54,92,000/-
CER cost	Rs. 5,00,000	
Greenbelt Development Plan	Proposed to plant 90Number of tree saplings during ten years in 4000 Sq.m area in the 7.5m & 10m safety distance of the lease boundary was identified for Greenbelt purpose, total number of trees planted during the approved mining plan period is 200 numbers around the quarry with the survival rate of 80%.	
Nearest Habitation	930m-SE	

TABLE 7.9: SALIENT FEATURES OF PROPOSAL "E2"

Name of the Quarry	**Thiru. D. Arunkumar Rough stone quarry**
Toposheet No	57- P/14

Latitude between	12° 42'55"07 N to 12°43'07"84N	
Longitude between	79°50'56"27 E to 79°51'08"58 E	
Highest Elevation	98m AMSL	
Proposed Depth of Mining five years period	57m BGL	
Geological Resources	Rough Stone in m^3	Top Soil in m3
	2770376	49471
Minable Reserves	749746	16724
Five-year Production	749746	16724
Existing Pit Dimension	PIT-I 99m (L) x 38m (W) x 40m (D) PIT-II 112m (L) x 37m (W) x 40m (D)	
Ultimate Pit Dimension	421m (L) x 97m (W) x 57m (D)	
Water Level in the surrounding area	65-68m BGL	
Method of Mining	Opencast Semi Mechanized Mining involving drilling and blasting	
Topography	The applied lease area is exhibits plain with altitude of 98m maximum from the MSL. The area is sloping towards North eastern side covered Top soil with Rough Stone which does not sustain any type of vegetation.	
Machinery proposed	Jack Hammer	2
	Compressor	1
	Excavator	1
	Tippers	5
Blasting Method	Controlled blasting method by shot hole drilling and small dia. of 25mm slurry explosives are proposed to be used for shattering and heaping effect for removal and winning of Rough Stone. No deep hole drilling is proposed.	
Project Cost	Rs. 6,95,80,000/-	
CER Cost @ 2% of Project Cost	Rs. 13,91,600/-	
Proposed Water Requirement	4.0 KLD	

TABLE 7.10: SALIENT FEATURES OF PROPOSAL "E3"

Name of the quarry	**Thiru. M. Ganesan Rough Stone and Gravel Quarry**	
Toposheet No	57- P/14	
Latitude	12°43'30.90"N to 12°43'37.05"N	
Longitude	79°51'00.54"E to 79°51'10.04"E	
Highest elevation	62m AMSL	
Proposed depth of mining for ten years	47m BGL (2 m Gravel +45 m rough stone)	
Geological resources	**Rough stone in m^3**	**Gravel m^3**
	10,80,000	48,000

Minable reserves	2,82,475	33,312
First Five-year production	1,59,350	33,312
Next Five-Year Production	1,23,125	-
Existing pit dimension	It is New Quarry	
Ultimate pit dimension	167m (L) x 125m (W) x 47m (D)	
Water level in the surrounding area	53-58 m BGL	
Method of mining	Opencast semi mechanized mining involving drilling and blasting	
Topography	The applied lease area is exhibits plain with altitude of 62m maximum from the MSL. The area is sloping towards Southeastern side covered clayey soil with rough stone which does not sustain any type of vegetation.	
Machinery proposed	Jack hammer	4
	Compressor	1
	Excavator	1
	Tippers	2
Blasting method	Controlled blasting method by shot hole drilling and small dia. of 25 mm slurry explosives are proposed to be used for shattering and heaping effect for removal and winning of rough stone. No deep hole drilling is proposed.	
Project cost	Rs. 68,99,000/-	
CER cost @ 2% of project cost	Rs. 1,38,000/-	
Proposed water requirement	4.2 KLD	
Nearest habitation	950m Southeast	

TABLE 7.11: SALIENT FEATURES OF PROPOSAL "E4"

Name of the quarry	**Thiru.M.Ganesan Rough Stone and Gravel Quarry**	
Toposheet No	57- P/14	
Latitude	12°43'22.38"N to 12°43'28.94"N	
Longitude	79°50'58.58"E to 79°51'05.50"E	
Highest elevation	56m AMSL	
Proposed depth of mining for ten years as per ToR	42m BGL (2 m Gravel +40 m rough stone)	
Geological resources	**Rough stone in m^3**	**Gravel m^3**
	9,58,500	42,600
Minable reserves	2,57,455	21,366
First Five-year production (As per TOR)	1,80,940	21,366
Next Five-Year Production	79,515	-
Existing pit dimension	It is New Quarry	
Ultimate pit dimension	149m (L) x 117m (W) x 42m (D)	
Water level in the surrounding area	53-58 m BGL	
Method of mining	Opencast semi mechanized mining involving drilling and blasting	
Topography	The applied lease area is exhibits plain with altitude of 56m maximum from the MSL. The area is sloping towards Southeastern side covered clayey soil with rough stone	
Machinery proposed	Jack hammer	3
	Compressor	1
	Excavator	1
	Tippers	2
Blasting method	Controlled blasting method by shot hole drilling and small dia. of 25 mm slurry explosives are proposed to be used for shattering and heaping effect for removal and winning of rough stone. No deep hole drilling is proposed.	
Project cost	Rs. 65,24,000/-	

CER cost @ 2% of project cost	Rs 5,00,000
Proposed water requirement	2.5 KLD
Nearest habitation	950m Southeast

TABLE 7.12: SALIENT FEATURES OF PROPOSAL "E5"

Name of the quarry	**Thiru. N. Kanniyappan roughstone & gravel quarry**	
Toposheet No	57- P/14	
Latitude	12°43'04.71"N to 12°43'09.69"N	
Longitude	79°51'00.49"E to 79°51'07.15"E	
Highest elevation	53 m AMSL	
Proposed depth of mining five years period	20 m BGL (3 m Gravel +17 m roughstone	
Geological resources	**Rough stone in m^3**	**Gravel m^3**
	517376	48504
Minable reserves	141596	27084
Five-year production	98276	27084
Existing pit dimension	-	
Ultimate pit dimension	122 m (L) x 74 m (W) x 20 m (D)	
Water level in the surrounding area	40-45 m BGL	
Method of mining	Opencast semi mechanized mining involving drilling and blasting	
Topography	The applied lease area is exhibits plain with altitude of 53m maximum and minimum of 52m from the MSL. The area is sloping towards Southwestern side covered clayey soil with rough stone which does not sustain any type of vegetation.	
Machinery proposed	Jack hammer	2
	Compressor	1
	Excavator	1
	Tippers	4
Blasting method	Controlled blasting method by shot hole drilling and small dia. of 25 mm slurry explosives are proposed to be used for shattering and heaping effect for removal and winning of rough stone. No deep hole drilling is proposed.	
Project cost	Rs. 60,96,000/-	
CER cost @ 2% of project cost	Rs. 1,21,920/-	
Proposed water requirement	3.8 KLD	
Nearest habitation	0.720 km South	

TABLE 7.13: SALIENT FEATURES OF PROPOSAL "E6"

Name of the quarry	**Thiru. K.Prabakaran roughstone & gravel quarry**
Toposheet No	57- P/14

Latitude	12°43'08.55"N to 12°43'14.57"N	
Longitude	79°51'0.64"E to 79°51'07.08"E	
Highest elevation	53 m AMSL	
Proposed depth of mining five years period	20 m BGL (2 m Gravel +18 m roughstone	
Geological resources	**Rough stone in m^3**	**Gravel m^3**
	8,45,754	43,376
Minable reserves	3,79,434	34,176
Five-year production	51,264	-
Water level in the surrounding area	55-65 m BGL	
Method of mining	Opencast semi mechanized mining involving drilling and blasting	
Topography	The applied lease area is exhibits plain with altitude of 53m maximum and minimum of 52m from the MSL. The area is sloping towards Southwestern side covered clayey soil with rough stone which does not sustain any type of vegetation.	
Machinery proposed	Jack hammer	3
	Compressor	1
	Excavator	1
	Tippers	3
Blasting method	Controlled blasting method by shot hole drilling and small dia. of 25 mm slurry explosives are proposed to be used for shattering and heaping effect for removal and winning of rough stone. No deep hole drilling is proposed.	
Project cost	Rs. 5,41,45,000/-	
CER cost @ 2% of project cost	Rs. 5,00,000/-	
Proposed water requirement	4.3 KLD	

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 7.5 & 7.9.

TABLE 7.14: 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	1,80,355	18036	60	5
P2	1,00,919	33640	112	9
P3	1,20,776	24,155	81	7
E1	1,23,108	24,622	83	7
E2	7,49,746	149950	500	42

E3	2,82,475	56,495	189	16
E4	2,57,455	51,491	172	14
E5	1,41,596	28,320	94	8
E6	3,79,434	75,886	253	21
Grand Total	**23,35,864**	**4,62,595**	**1544**	**129**

TABLE 7.15: CUMULATIVE PRODUCTION LOAD OF GRAVEL

Quarry	Production for Three-year plan period	Per Year Production in m^3	Per Day Production in m^3	Number of Lorry Load Per Day
P1	24,120	8,040	27	2
P2	12,464	4,155	14	1
P3	19,332	6,444	21	2
E1	-	-	-	-
E2	16,724	5,575	19	2
E3	33,312	11,104	37	3
E4	21,366	7,122	24	2
E5	27,084	9,028	30	2
E6	34,176	11,392	38	3
Grand Total	**1,88,578**	**62,860**	**210**	**17**

On a cumulative basis considering the proposed quarries, it can be seen that the overall production of Rough Stone is 1,544m^3 per day and overall production of Gravel is 210 m^3 per day with a capacity of 129 trips of Rough Stone per day and 17 Trips per day of Gravel and from the cluster.

Note: Per day production of Rough Stone is calculated for 5 Years Lease Period and for Gravel production with 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 5 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 7.16: EMISSION ESTIMATION FROM QUARRIES WITHIN 500 METER RADIUS

EMISSION ESTIMATION FOR QUARRY "P1"				
	Activity	**Source type**	**Value**	**Unit**
Estimated Emission Rate for PM_{10}	Drilling	Point Source	0.095883154	g/s
	Blasting	Point Source	0.001960316	g/s
	Mineral Loading	Point Source	0.043426568	g/s
	Haul Road	Line Source	0.002494635	g/s/m
	Overall Mine	Area Source	0.057432133	g/s
Estimated Emission Rate for SO_2	Overall Mine	Area Source	0.000876938	g/s
Estimated Emission Rate for NOx	Overall Mine	Area Source	0.000048776	g/s
EMISSION ESTIMATION FOR QUARRY "P2"				
	Activity	**Source type**	**Value**	**Unit**
Estimated Emission Rate for PM_{10}	Drilling	Point Source	0.095883154	g/s
	Blasting	Point Source	0.001960316	g/s
	Mineral Loading	Point Source	0.043426568	g/s
	Haul Road	Line Source	0.002494635	g/s/m
	Overall Mine	Area Source	0.057432133	g/s
Estimated Emission Rate for SO_2	Overall Mine	Area Source	0.000876938	g/s

Estimated Emission Rate for NOx	Overall Mine	Area Source	0.000048776	g/s
EMISSION ESTIMATION FOR QUARRY "P3"				
Estimated Emission Rate for PM_{10}	**Activity**	**Source type**	**Value**	**Unit**
	Drilling	Point Source	0.119151634	g/s
	Blasting	Point Source	0.005809175	g/s
	Mineral Loading	Point Source	0.047587306	g/s
	Haul Road	Line Source	0.002513307	g/s/m
	Overall Mine	Area Source	0.080190394	g/s
Estimated Emission Rate for SO_2	Overall Mine	Area Source	0.002166584	g/s
Estimated Emission Rate for NOx	Overall Mine	Area Source	0.000230377	g/s
EMISSION ESTIMATION FOR QUARRY "E1"				
Estimated Emission Rate for PM_{10}	**Activity**	**Source type**	**Value**	**Unit**
	Drilling	Point Source	0.059894921	g/s
	Blasting	Point Source	0.000186451	g/s
	Mineral Loading	Point Source	0.037541649	g/s
	Haul Road	Line Source	0.002485068	g/s/m
	Overall Mine	Area Source	0.048177586	g/s
Estimated Emission Rate for SO_2	Overall Mine	Area Source	0.000198174	g/s
Estimated Emission Rate for NOx	Overall Mine	Area Source	0.000007880	g/s
EMISSION ESTIMATION FOR QUARRY "E2"				
Estimated Emission Rate for PM_{10}	**Activity**	**Source type**	**Value**	**Unit**
	Drilling	Point Source	0.069747199	g/s
	Blasting	Point Source	0.000399253	g/s
	Mineral Loading	Point Source	0.039879117	g/s
	Haul Road	Line Source	0.00248748	g/s/m
	Overall Mine	Area Source	0.042168919	g/s
Estimated Emission Rate for SO_2	Overall Mine	Area Source	0.000342164	g/s
Estimated Emission Rate for NOx	Overall Mine	Area Source	0.000009938	g/s
EMISSION ESTIMATION FOR QUARRY "E3"				
Estimated Emission Rate for PM_{10}	**Activity**	**Source type**	**Value**	**Unit**
	Drilling	Point Source	0.095883154	g/s
	Blasting	Point Source	0.001960316	g/s
	Mineral Loading	Point Source	0.043426568	g/s
	Haul Road	Line Source	0.002494635	g/s/m
	Overall Mine	Area Source	0.057432133	g/s
Estimated Emission Rate for SO_2	Overall Mine	Area Source	0.000876938	g/s
Estimated Emission Rate for NOx	Overall Mine	Area Source	0.000048776	g/s
EMISSION ESTIMATION FOR QUARRY "E4"				
Estimated Emission Rate for PM_{10}	**Activity**	**Source type**	**Value**	**Unit**
	Drilling	Point Source	0.095883154	g/s
	Blasting	Point Source	0.001960316	g/s
	Mineral Loading	Point Source	0.043426568	g/s
	Haul Road	Line Source	0.002494635	g/s/m
	Overall Mine	Area Source	0.057432133	g/s
Estimated Emission Rate for SO_2	Overall Mine	Area Source	0.000876938	g/s
Estimated Emission Rate for NOx	Overall Mine	Area Source	0.000048776	g/s
EMISSION ESTIMATION FOR QUARRY "E5"				
Estimated Emission Rate for PM_{10}	**Activity**	**Source type**	**Value**	**Unit**

	Drilling	Point Source	0.119151634	g/s
	Blasting	Point Source	0.005809175	g/s
	Mineral Loading	Point Source	0.047587306	g/s
	Haul Road	Line Source	0.002513307	g/s/m
	Overall Mine	Area Source	0.080190394	g/s
Estimated Emission Rate for SO_2	Overall Mine	Area Source	0.002166584	g/s
Estimated Emission Rate for NOx	Overall Mine	Area Source	0.000230377	g/s
EMISSION ESTIMATION FOR QUARRY "E6"				
	Activity	**Source type**	**Value**	**Unit**
Estimated Emission Rate for PM_{10}	Drilling	Point Source	0.059894921	g/s
	Blasting	Point Source	0.000186451	g/s
	Mineral Loading	Point Source	0.037541649	g/s
	Haul Road	Line Source	0.002485068	g/s/m
	Overall Mine	Area Source	0.048177586	g/s
Estimated Emission Rate for SO_2	Overall Mine	Area Source	0.000198174	g/s
Estimated Emission Rate for NOx	Overall Mine	Area Source	0.000007880	g/s

Source: Emission Calculation

TABLE 7.17: INCREMENTAL & RESULTANT GLC WITHIN CLUSTER

PM_{10} in $\mu g/m^3$	
Location	**AAQ1 – CORE**
Background (average)	44.9
Anticipated Incremental due to the proposals	10.79
Resultant	55.7
NAAQ Norms	100 $\mu g/m^3$
$PM_{2.5}$ in $\mu g/m^3$	
Location	**AAQ1 – CORE**
Background (average)	23.0
Highest Incremental	4.9
Resultant	27.9
NAAQ Norms	60 $\mu g/m^3$
SO_2 in $\mu g/m^3$	
Location	**AAQ1 – CORE**
Background (average)	8.4
Anticipated Incremental due to the proposals	1.48
Resultant	9.9
NAAQ Norms	80 $\mu g/m^3$
NO_x in $\mu g/m^3$	
Location	**AAQ1 – CORE**
Background (average)	22.7
Anticipated Incremental due to the proposals	7.69
Resultant	30.4
NAAQ Norms	80 $\mu g/m^3$

Noise Environment –

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

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

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

Where:

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

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

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

Attenuation due to Green Belt has been taken to be 4.9 dB (A). The inputs required for the model are:
Source data has been computed taking into account of all the machinery and activities used in the mining process.

TABLE 7.18: PREDICTED NOISE INCREMENTAL VALUES FROM CLUSTER

Location ID	Background Value (Day) dB(A)	Incremental Value dB(A)	Total Predicted dB(A)	Residential Area Standards dB(A)
Habitation Near P1	48.2	47.3	46.3	55
Habitation Near P2	34.6	46.5	46.7	
Habitation Near P3	41.2	43.6	47.1	
Habitation Near E1	39.5	47.4	48.7	
Habitation Near E2	34.6	46.5	46.7	
Habitation Near E3	41.2	43.6	47.1	
Habitation Near E4	48.2	47.3	46.3	
Habitation Near E5	34.6	46.5	46.7	
Habitation Near E6	36.5	48.1	48.4	

Source: Lab Monitoring Data

The incremental noise level is found within the range of 43.6 – 48.1 dB (A) in Buffer zone. The noise level at different receptors in buffer zone is lower due to the distance involved and other topographical features adding to the noise attenuation. The resultant Noise level due to monitored values and calculated values at the receptors are based on the mathematical formula considering attenuation due to Green Belt as 4.9 dB (A)the barrier effect. From the above table, it can be seen that the ambient noise levels at all the locations 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 9 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 9 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 9 mines respectively are as in below Table 7.17.

TABLE 7.19: NEAREST HABITATION FROM EACH MINE

Location ID	Distance & Direction
Habitation Near P1	700-S
Habitation Near P2	650-SW

Habitation Near P3	830m- SE
Habitation Near E1	1.3km- S
Habitation Near E2	600m-SW
Habitation Near E3	1.4km- S
Habitation Near E4	1km- S
Habitation Near E5	700m- SW
Habitation Near E6	750m- SW

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 7.20: GROUND VIBRATIONS AT 9 MINES

Location ID	Maximum Charge in kgs	Nearest Habitation in m	PPV in m/ms
P1	20	700-S	0.154
P2	20	650-SW	0.173
P3	20	830m- SE	0.117
E1	20	1.3km- S	0.057
E2	20	600m-SW	0.197
E3	20	1.4km- S	0.051
E4	20	1km- S	0.087
E5	20	700m- SW	0.154
E6	20	750m- SW	0.138

Source: Blasting Calculations

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

Socio Economic Environment –

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

TABLE 7.21: SOCIO ECONOMIC BENEFITS FROM 9 MINES

Location ID	Project Cost	CER
P1	Rs.95,35,000/-	Rs.5,00,000/-
P2	Rs.48,30,000/-	Rs.5,00,000/-
P3	Rs.42,07,000/-	Rs.5,00,000/-
E1	Rs.54,92,000/-	Rs.5,00,000/-
E2	Rs. 6,95,80,000/-	Rs.5,00,000/-
E3	Rs. 68,99,000/-	Rs.5,00,000/-
E4	Rs. 65,24,000/-	Rs.5,00,000/-

E5	Rs. 60,96,000/-	Rs.5,00,000/-
E6	Rs. 5,41,45,000/-	Rs.5,00,000/-
Total	**16,73,08,000**	**Rs.45,00,000/-**

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

- Proposed Projects shall fund towards CER – **Rs 15,00,000/-**

TABLE 7.22: EMPLOYMENT BENEFITS FROM 9 MINES

Description	Employment
P1	26
P2	29
P3	15
Total	**70**
E1	20
E2	29
E3	21
E4	18
E5	26
E6	30
Total	**144**
Grand Total	**214**

A total of 70 people will get employment due to 3 proposed mines in cluster and 144 people are already employed at 6 existing mines.

TABLE 7.21: GREEN BELT DEVELOPMENT FROM 9 MINES

Code	No. of tress proposed to be planted	Area to be covered in m^2	Name of the species
P1	900	The safety zone along the boundary barrier has been identified to be utilized for Greenbelt development.	Vilvam, Panai-maram, Vengai, Santhana Vembu etc.,
P2	2200	The safety zone along the boundary barrier has been identified to be utilized for Greenbelt development.	Vilvam, Panai-maram, Vengai, Santhana Vembu etc.,
P3	700	The safety zone along the boundary barrier has been identified to be utilized for Greenbelt development.	Vilvam, Panai-maram, Vengai, Santhana Vembu etc.,
E1	1560	The safety zone along the boundary barrier has been identified to be utilized for Greenbelt development.	Vilvam, Panai-maram, Vengai, Santhana Vembu etc.,
E2	2475	The safety zone along the boundary barrier has been identified to be utilized for Greenbelt development.	Vilvam, Panai-maram, Vengai, Santhana Vembu etc.,

E3	1200	The safety zone along the boundary barrier has been identified to be utilized for Greenbelt development.	Vilvam, Panai-maram, Vengai, Santhana Vembu etc.,
E4	1065	The safety zone along the boundary barrier has been identified to be utilized for Greenbelt development.	Vilvam, Panai-maram, Vengai, Santhana Vembu etc.,
E5	810	The safety zone along the boundary barrier has been identified to be utilized for Greenbelt development.	Vilvam, Panai-maram, Vengai, Santhana Vembu etc.,
E6	1080	The safety zone along the boundary barrier has been identified to be utilized for Greenbelt development.	Vilvam, Panai-maram, Vengai, Santhana Vembu etc.,
TOTAL	**11990**		

Based on the Proposed Mining Plans it's anticipated that there shall growth of native species of Neem, Pinnata et., in the Cluster at a rate of 11990 Trees Planted over a period of 5 Years with Survival Rate of 80%.

7.5 PLASTIC WASTE MANAGEMENT PLAN

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

Objective –

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

TABLE 7.23: ACTION PLAN TO MANAGE PLASTIC WASTE

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

9	Surprise checking's of littering, open burning of plastic waste or committing any other acts of public nuisance	Mine Owner

Source: Proposed by FAE's and EC

8.PROJECT BENEFITS

8.0 GENERAL

The Proposed Project for Quarrying Rough Stone and gravel at Siruthamur & Sithalapakkam Villages aims to produce **23,35,864** m^3 Rough Stone over a period of 5 Years & Gravel **1,88,578** m^3 for period of 3 years. This will enhance the socio-economic activities in the adjoining areas and will result in the following benefits.

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

8.1 EMPLOYMENT POTENTIAL

It is proposed to provide employment to about 214 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 Siruthamur & SithalapakkamVillages , Uthiramerur Taluk and Kancheepuram District of Tamil Nadu and the area have communications, roads and other facilities already well established. The following physical infrastructure facilities will further improve due to proposed mine.

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

8.4 IMPROVEMENT IN SOCIAL INFRASTRUCTURE

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

8.5 OTHER TANGIBLE BENEFITS

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

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

CORPORATE SOCIAL RESPONSIBILITY

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

CSR Cost Estimation

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

CORPORATE ENVIRONMENT RESPONSIBILITY

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

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

TABLE 8.1 CER – ACTION PLAN FOR P1& P2

Activity	CER
• Renovation/ Construction of Existing Toilet • Providing Environmental Related books to the school Library • Carrying out plantation and maintenance in the school Ground • Any other requirements in consultation with the school Head master	Rs 10,00,000/-

9. ENVIRONMENTAL COST BENEFIT ANALYSIS

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

10. ENVIRONMENTAL MANAGEMENT PLAN FOR 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. M.R. Govindan will –

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

Description of the Administration and Technical Setup –

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

The said team will be responsible for:

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

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

10.2. LAND ENVIRONMENT MANAGEMENT –

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

TABLE 10.1. PROPOSED CONTROLS FOR LAND ENVIRONMENT FOR 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 overburden in the form of Gravel which will directly loaded into Trucks for the filling and levelling of low-lying areas.

TABLE 10.2. PROPOSED CONTROLS FOR SOIL MANAGEMENT

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

Source: Proposed by FAE's & EIA Coordinator

10.4. WATER MANAGEMENT

In the proposed quarrying project, no process is involved for the effluent generation, only oil & grease from the machinery wash is anticipated and domestic sewage from mines office. The quarrying operation is proposed upto a depth of 32 m BGL, the water table in the area is 55 m – 60 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

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

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 900 nos. of saplings is proposed to be planted for the Mining plan period in safety barrier of applied mine lease area with survival rate 80%. The greenbelt development plan has been prepared keeping in view the land use changes that will occur due to mining operation in the area.

TABLE 10.7: PROPOSED GREENBELT ACTIVITIES

No. of tress proposed to be planted	Area to be covered in m^2	Name of the species
900	The safety zone along the boundary barrier has been identified to be utilized for Greenbelt development.	Vilvam, Panai-maram, Vengai, Santhana Vembu etc.,

Source: Approved Mining plan

The objectives of the greenbelt development plan are –

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

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

10.8.2. Species Recommended for Plantation

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

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

TABLE 10.8. RECOMMENDED SPECIES FOR THE PLANTSAITON

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

Source: Proposed by FAE's & EIA Coordinator

10.9. OCCUPATIONAL SAFETY & HEALTH MANAGEMENT

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

10.9.1. Medical Surveillance and Examinations –

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

- General Physical Examination and Blood Pressure
- X-ray Chest and ECG
- Sputum test
- Detailed Routine Blood and Urine examination

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

TABLE 10.9. MEDICAL EXAMINATION SCHEDULE

Sl.No	Activities	1st Year	2nd Year	3rd Year	4th Year	5th Year
1	Initial Medical Examination (Mine Workers)					
A	Physical Check-up					
B	Psychological Test					
C	Audiometric Test					

D	Respiratory Test					
2	Periodical Medical Examination (Mine Workers)					
A	Physical Check – up					
B	Audiometric Test					
C	Eye Check – up					
D	Respiratory Test					
3	Medical Camp (Mine Workers & Nearby Villagers)					
4	Training (Mine Workers)					

10.9.2 Proposed Occupational Health and Safety Measures –

- The mine site will have adequate drinking water supply so that workers do not get dehydrated.
- Lightweight and loose-fitting clothes having light colours will be preferred to wear.
- Noise exposure measurements will be taken to determine the need for noise control strategies.
- The personal protective equipment will be provided for mine workers.
- At noisy working activity, exposure time will be minimized.
- Dust generating sources will be identified and proper control measure will be adopted.
- Periodic medical examinations will be provided for all workers.
- In respect of contract work, safety code for contractors and workers will be implemented. They will be allowed to work under strict supervision of statutory person/officials only after they will impart training at vocational training centres. All personal protective equipment's will be provided to them.
- A safety committee meeting every month will be organized to discuss the safety of the mines and the persons employed.
- Celebration of annual mines safety week and environmental week in order to develop safety awareness and harmony amongst employees and co quarry owners.

FIGURE 10.1.: PERSONAL PROTECTIVE EQUIPMENT TO THE MINE WORKERS

10.9.3: Health and Safety Training Programme

The Proponent will provide special induction program along with machinery manufacturers for the operators and co-operators to run and maintain the machinery effectively and efficiently. The training program for the supervisors and office staffs will be arranged in the Group Vocational Training Centres in the State and engage Environmental Consultants to provide periodical training to all the employees to carry out the mining operation in and eco-friendly manner as per Metalliferous Mines Regulation, 1961.

10.9.4.: Budgetary Provision for Environmental Management –

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

TABLE 10.10: EMP BUDGET FOR PROPOSED PROJECT –P1

Activities	Mitigation Measure	Provision for Implementation	Capital	Recurring
Air Environment	Compaction, gradation and drainage on both sides for Haulage Road	Rental Dozer & drainage construction on haul road @ Rs. 10,000/- per hectare; and yearly maintenance @ Rs. 10,000/- per hectare	17650	17650
	Fixed Water Sprinkling Arrangements + Water sprinkling by own water tankers	Fixed Sprinkler Installation and New Water Tanker Cost for Capital; and Water Sprinkling (thrice a day) Cost for recurring	800000	50000
	Muffle blasting – To control fly rocks during blasting	Blasting face will be covered with sand bags / steel mesh / old tyres / used conveyor belts	0	5000
	Wet drilling procedure / latest eco-friendly drill machine with separate dust extractor unit	Dust extractor @ Rs. 25,000/- per unit deployed as capital & @ Rs. 2500 per unit recurring cost for maintenance - 4 Units	100000	10000
	No overloading of trucks/tippers/tractors	Manual Monitoring through Security guard	0	5000
	Stone carrying trucks will be covered by tarpaulin	Monitoring if trucks will be covered by tarpaulin	0	10000
	Enforcing speed limits of 20 km/hr within ML area	Installation of Speed Governers @ Rs. 5000/- per Tipper/Dumper deployed - 2 Units	10000	500
	Regular monitoring of exhaust fumes as per RTO norms	Monitoring of Exhaust Fumes by Manual Labour	0	5000
	Regular sweeping and maintenance of approach roads for at least about 200 m from ML Area	Provision for 2 labours @ Rs.10,000/labour (Contractual) per Hectare	0	35300

	Installing wheel wash system near gate of quarry	Installation + Maintenance + Supervision	50000	20000
Noise Environment	Source of noise will be during operation of transportation vehicles, HEMM for this proper maintenance will be done at regular intervals.	Provision made in Operating Cost	0	0
	Oiling & greasing of Transport vehicles and HEMM at regular interval will be done	Provision made in Operating Cost	0	0
	Adequate silencers will be provided in all the diesel engines of vehicles.	Provision made in Operating Cost	0	0
	It will be ensured that all transportation vehicles carry a fitness certificate.	Provision made in Operating Cost	0	0
	Safety tools and implements that are required will be kept adequately near blasting site at the time of charging.	Provision made in OHS part	0	0
	Line Drilling all along the boundary to reduce the PPV from blasting activity and implementing controlled blasting.	Provision made in Operating Cost	0	0
	Proper warning system before blasting will be adopted and clearance of the area before blasting will be ensured.	Blowing Whistle by Mining Mate / Blaster / Compentent Person	0	0
	Provision for Portable blaster shed	Installation of Portable blasting shelter	50000	2000
	NONEL Blasting will be practiced to control Ground vibration and fly rocks	Rs. 30/- per 6 Tonnes of Blasted Material	0	468923
Waste Management	Waste management (Spent Oil, Grease etc.,)	Provision for domestic waste collection and disposal through authorized agency	5000	20000
		Installation of dust bins	5000	2000
	Bio toilets will be made available outside mine lease on the land of owner itself	Provision made in Operating Cost	0	0

Mine Closure	1. Progressive Closure Activity - Surface Runoff managent	Provision for garland drain @ Rs. 10,000/- per Hectare with maintenance of Rs. 5,000/- per annum	17650	5000
	2. Progressive Closure Activity Barbed Wire Fencing to quarry area will be provisioned.	Per Hectare fencing Cost @ Rs. 2,00,000/- with Maintenance of Rs 10,000/- per annum	353000	10000
	3. Progressive Closure Activity Green belt development - 500 trees per one hectare - Proposal for 900 Trees - 530 Inside Lease Area & 370 Outside Lease Area)	Site clearance, preparation of land, digging of pits / trenches, soil amendments, transplantation of saplings @ 200 per plant (capital) for plantation inside the lease area and @ 30 per plant maintenance (recurring)	106000	15900
		Avenue Plantation @ 300 per plant (capital) for plantation outside the lease area and @ 30 per plant maintenance (recurring)	111000	11100
	4. Implementation of Final Mine Closure Actity as per Approved Mining Plan on Last Year	Few activities already covered as progressive closure activities as greenbelt development, wire fencing, garland drain. *For Final Closure Activities 15% of the proposed closure cost will be spent during the final mine closure stage - Last Year	96300	0
	5. Contribution towards Green Fund. As per TNMMCR 1959, Rule 35 A	The Contribution towards Green Funds @ 10% of Seigniorage fee are indicated as part of EMP Budge and not necessarily implemented in the Project Site	1623195	0

Implementation of EC, Mining Plan & DGMS Condition	Size 6' X 5' with blue background and white letters as mentioned in MoM Appendix II by the SEAC TN	Fixed Display Board at the Quarry Entrance as permanent structure mentioning Environmental Conditions	10000	1000
	Air, Water, Noise and Soil Quality Sampling every 6 Months for Compliance Report of EC Conditions	Submission of 2 Half Yearly Compliance - Lab Monitoring Report as per CPCB norms	0	50000
	Workers will be provided with Personal Protective Equipment's	Provision of PPE @ Rs. 4000/- per employee with recurring based on wear and tear (say, @ Rs. 1000/- per employee) - 26 Employees	104000	26000
	Health check up for workers will be provisioned	IME & PME Health check up @ Rs. 1000/- per employee	0	26000
	First aid facility will be provided	Provision of 2 Kits per Hectare @ Rs. 2000/-	0	3530
	Mine will have safety precaution signages, boards.	Provision for signages and boards made	10000	2000
	No parking will be provided on the transport routes. Separate provision on the south side of the hill will be made for vehicles /HEMMs. Flaggers will be deployed for traffic management	Parking area with shelter and flags @ Rs. 50,000/- per hectare project and Rs. 10,000/- as maintenance cost	88250	10000
	Installation of CCTV cameras in the mines and mine entrance	Camera 4 Nos, DVR, Monitor with internet facility	30000	5000
	Implementation as per Mining Plan and ensure safe quarry working	Mines Manager (1^{st} Class / 2^{nd} Class / Mine Foreman) under regulation 34 / 34 (6) of MMR, 1961 and Mining Mate under regulation 116 of MMR,1961 @ 40,000/- for Manager & @ 25,000/- for Foreman / Mate	0	780000

CER	As per MoEF &CC OM 22-65/2017-IA.III Dated 25.02.2021	Detailed Description in following slides and Budget allocation is included as per MoeEF & CC OM	500000	0
TOTAL			**2367550**	**1596903**

*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. The EMP has been prepared for the **lease period of 5 years**.

Year	Total Cost
I	₹ 39,64,453
II	₹ 16,76,748
III	₹ 17,60,586
IV	₹ 18,48,615
V	₹ 19,41,046
VI	₹ 32,21,872
VII	₹ 21,99,191
VIII	₹ 23,09,151
IX	₹ 24,24,608
X	₹ 26,42,139
Total	₹ **240 lakhs**

Cost inflation 5% per annum

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

10.10.: CONCLUSION –

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

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10. ENVIRONMENTAL MANAGEMENT PLAN FOR P2

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. M.R. Govindan will –

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

Description of the Administration and Technical Setup –

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

The said team will be responsible for:

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

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

10.2. LAND ENVIRONMENT MANAGEMENT –

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

TABLE 10.1. PROPOSED CONTROLS FOR LAND ENVIRONMENT FOR P2

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

Source: Proposed by FAE's & EIA Coordinator

10.3. SOIL MANAGEMENT

There overburden in the form of Gravel which will directly loaded into Trucks for the filling and levelling of low-lying areas.

TABLE 10.2. PROPOSED CONTROLS FOR SOIL MANAGEMENT

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

Source: Proposed by FAE's & EIA Coordinator

10.4. WATER MANAGEMENT

In the proposed quarrying project, no process is involved for the effluent generation, only oil & grease from the machinery wash is anticipated and domestic sewage from mines office. The quarrying operation is proposed upto a depth of 37 m BGL, the water table in the area is 53 m – 58 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 –P2

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

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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

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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 –P2

CONTROL	RESPONSIBILITY
Development of thick greenbelt all along the Buffer Zone (7.5 Meters) of the project area to attenuate the noise and the same will be maintained	Mines Manager
Preventive maintenance of mining machinery and replacement of worn-out accessories to control noise generation	Mines Foreman
Deployment of mining equipment with an inbuilt mechanism to reduce noise	Mines Manager
Provision of earmuff / ear plugs to workers working in noise prone zones in the mines	Mining Mate
Provision of effective silencers for mining machinery and transport vehicles	Mines Manager
Provision of sound proof AC operator cabins to HEMM	Mines Manager
Sharp drill bits are used to minimize noise from drilling	Mines Foreman
Controlled blasting technologies are adopted by using delay detonators to minimize noise from blasting	Mines Manager
Annual ambient noise level monitoring are carried out in the project area and in surrounding villages to access the impact due to the mining activities and the efficacy of the adopted noise control measures. Additional noise control measures will be adopted if required as per the observations during monitoring	Mines Manager
Reduce maximum instantaneous charge using delays while blasting	Mining Mate
Change the burden and spacing by altering the drilling pattern and/or delay layout, or altering the hole inclination	Mines Manager
Undertake noise or vibration monitoring	Mines Manager

Source: Proposed by FAE's & EIA Coordinator

10.7. GROUND VIBRATION AND FLY ROCK CONTROL

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

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

CONTROL	RESPONSIBILITY
Controlled blasting using delay detonators will be carried out to maintain the PPV value (below 8Hz) well within the prescribed standards of DGMS	Mines Manager
Drilling and blasting will be carried under the supervision of qualified persons	Mines Manager
Proper stemming of holes should be carried out with statutory competent qualified blaster under the supervision of statutory mines manager to avoid any anomalies during blasting	Mines Manager
Suitable spacing and burden will be maintained to avoid misfire / fly rocks	Manager Mines
Number of blast holes will be restricted to control ground vibrations	Manager Mines
Blasting will be carried out only during noon time	Mining Mate
Undertake noise or vibration monitoring	Mines Manager
ensure blast holes are adequately stemmed for the depth of the hole and stemmed with suitable angular material	Mines Foreman

Source: Proposed by FAE's & EIA Coordinator

10.8. BIOLOGICAL ENVIRONMENT MANAGEMENT

The proponent will take all necessary steps to avoid the impact on the ecology of the area by adopting suitable management measures in the planning and implementation stage. During mining, thick plantation will be carried out around the project periphery, on safety barrier zone, on top benches of quarried out area etc.,

Following control measures are proposed for its management and will be the responsibility of the Mines Manager.

- Greenbelt development all along the safety barrier of the project area
- It is also proposed to implement the greenbelt development programme and post plantation status will be regularly checked for every season.
- The main attributes that retard the survival of sapling is fugitive dust, this fugitive dust can be controlled by water sprinkling on the haul roads and installing a sprinkler unit near the newly planted area.
- Year wise greenbelt development will be recorded and monitored
    - Based on the area of plantation.
    - Period of plantation
    - Type of plantation
    - Spacing between the plants
    - Type of manuring and fertilizers and its periods
    - Lopping period, interval of watering
    - Survival rate
    - Density of plantation
- The ultimate reclamation planned leaves a congenial environment for development of flora & immigration of small fauna through green belt and water reservoir. The green belt and water reservoir developed within the Project at the end of mine life will attract the birds and animals towards the project area in the post mining period.

10.8.1. Green Belt Development Plan

About 900 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-P2

No. of tress proposed to be planted	Area to be covered in m^2	Name of the species
2200	The safety zone along the boundary barrier has been identified to be utilized for Greenbelt development.	Vilvam, Panai-maram, Vengai, Santhana Vembu etc.,

Source: Approved Mining plan

The objectives of the greenbelt development plan are –

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

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

10.8.2. Species Recommended for Plantation

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

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

TABLE 10.8. RECOMMENDED SPECIES FOR THE PLANTSAITON

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

Source: Proposed by FAE's & EIA Coordinator

10.9. OCCUPATIONAL SAFETY & HEALTH MANAGEMENT

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

10.9.1. Medical Surveillance and Examinations –

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

- General Physical Examination and Blood Pressure
- X-ray Chest and ECG
- Sputum test
- Detailed Routine Blood and Urine examination

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

TABLE 10.9. MEDICAL EXAMINATION SCHEDULE-P2

Sl.No	Activities	1st Year	2nd Year	3rd Year	4th Year	5th Year
1	Initial Medical Examination (Mine Workers)					
A	Physical Check-up					
B	Psychological Test					
C	Audiometric Test					

D	Respiratory Test					
2	Periodical Medical Examination (Mine Workers)					
A	Physical Check – up					
B	Audiometric Test					
C	Eye Check – up					
D	Respiratory Test					
3	Medical Camp (Mine Workers & Nearby Villagers)					
4	Training (Mine Workers)					

10.9.2 Proposed Occupational Health and Safety Measures –

- The mine site will have adequate drinking water supply so that workers do not get dehydrated.
- Lightweight and loose-fitting clothes having light colours will be preferred to wear.
- Noise exposure measurements will be taken to determine the need for noise control strategies.
- The personal protective equipment will be provided for mine workers.
- At noisy working activity, exposure time will be minimized.
- Dust generating sources will be identified and proper control measure will be adopted.
- Periodic medical examinations will be provided for all workers.
- In respect of contract work, safety code for contractors and workers will be implemented. They will be allowed to work under strict supervision of statutory person/officials only after they will impart training at vocational training centres. All personal protective equipment's will be provided to them.
- A safety committee meeting every month will be organized to discuss the safety of the mines and the persons employed.
- Celebration of annual mines safety week and environmental week in order to develop safety awareness and harmony amongst employees and co quarry owners.

FIGURE 10.1.: PERSONAL PROTECTIVE EQUIPMENT TO THE MINE WORKERS –P2

10.9.3: Health and Safety Training Programme

The Proponent will provide special induction program along with machinery manufacturers for the operators and co-operators to run and maintain the machinery effectively and efficiently. The training program for the supervisors and office staffs will be arranged in the Group Vocational Training Centres in the State and engage Environmental Consultants to provide periodical training to all the employees to carry out the mining operation in and eco-friendly manner as per Metalliferous Mines Regulation, 1961.

10.9.4.: Budgetary Provision for Environmental Management –

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

TABLE 10.10: EMP BUDGET FOR PROPOSED PROJECT –P2

Activities	Mitigation Measure	Provision for Implementation	Capital	Recurring
Air Environment	Compaction, gradation and drainage on both sides for Haulage Road	Rental Dozer & drainage construction on haul road @ Rs. 10,000/- per hectare; and yearly maintenance @ Rs. 10,000/- per hectare	43750	43750
	Fixed Water Sprinkling Arrangements + Water sprinkling by own water tankers	Fixed Sprinkler Installation and New Water Tanker Cost for Capital; and Water Sprinkling (thrice a day) Cost for recurring	800000	50000
	Muffle blasting – To control fly rocks during blasting	Blasting face will be covered with sand bags / steel mesh / old tyres / used conveyor belts	0	5000
	Wet drilling procedure / latest eco-friendly drill machine with separate dust extractor unit	Dust extractor @ Rs. 25,000/- per unit deployed as capital & @ Rs. 2500 per unit recurring cost for maintenance - 4 Units	100000	10000
	No overloading of trucks/tippers/tractors	Manual Monitoring through Security guard	0	5000
	Stone carrying trucks will be covered by tarpaulin	Monitoring if trucks will be covered by tarpaulin	0	10000
	Enforcing speed limits of 20 km/hr within ML area	Installation of Speed Governers @ Rs. 5000/- per Tipper/Dumper deployed - 3 Units	15000	750
	Regular monitoring of exhaust fumes as per RTO norms	Monitoring of Exhaust Fumes by Manual Labour	0	5000
	Regular sweeping and maintenance of approach roads for at least about 200 m from ML Area	Provision for 2 labours @ Rs.10,000/labour (Contractual) per Hectare	0	87500

	Installing wheel wash system near gate of quarry	Installation + Maintenance + Supervision	50000	20000
Noise Environment	Source of noise will be during operation of transportation vehicles, HEMM for this proper maintenance will be done at regular intervals.	Provision made in Operating Cost	0	0
	Oiling & greasing of Transport vehicles and HEMM at regular interval will be done	Provision made in Operating Cost	0	0
	Adequate silencers will be provided in all the diesel engines of vehicles.	Provision made in Operating Cost	0	0
	It will be ensured that all transportation vehicles carry a fitness certificate.	Provision made in Operating Cost	0	0
	Safety tools and implements that are required will be kept adequately near blasting site at the time of charging.	Provision made in OHS part	0	0
	Line Drilling all along the boundary to reduce the PPV from blasting activity and implementing controlled blasting.	Provision made in Operating Cost	0	0
	Proper warning system before blasting will be adopted and clearance of the area before blasting will be ensured.	Blowing Whistle by Mining Mate / Blaster / Compentent Person	0	0
	Provision for Portable blaster shed	Installation of Portable blasting shelter	50000	2000
	NONEL Blasting will be practiced to control Ground vibration and fly rocks	Rs. 30/- per 6 Tonnes of Blasted Material	0	253029
Waste Management	Waste management (Spent Oil, Grease etc.,)	Provision for domestic waste collection and disposal through authorized agency	5000	20000
		Installation of dust bins	5000	2000
	Bio toilets will be made available outside mine lease on the land of owner itself	Provision made in Operating Cost	0	0

Mine Closure	1. Progressive Closure Activity - Surface Runoff managent	Provision for garland drain @ Rs. 10,000/- per Hectare with maintenance of Rs. 5,000/- per annum	43750	5000
	2. Progressive Closure Activity Barbed Wire Fencing to quarry area will be provisioned.	Per Hectare fencing Cost @ Rs. 2,00,000/- with Maintenance of Rs 10,000/- per annum	875000	10000
	3. Progressive Closure Activity Green belt development - 500 trees per one hectare - Proposal for 2200 Trees - 950 Inside Lease Area & 1250 Outside Lease Area)	Site clearance, preparation of land, digging of pits / trenches, soil amendments, transplantation of saplings @ 200 per plant (capital) for plantation inside the lease area and @ 30 per plant maintenance (recurring)	190000	28500
		Avenue Plantation @ 300 per plant (capital) for plantation outside the lease area and @ 30 per plant maintenance (recurring)	375000	37500
	4. Implementation of Final Mine Closure Actity as per Approved Mining Plan on Last Year	Few activities already covered as progressive closure activities as greenbelt development, wire fencing, garland drain. *For Final Closure Activities 15% of the proposed closure cost will be spent during the final mine closure stage - Last Year	89550	0
	5. Contribution towards Green Fund. As per TNMMCR 1959, Rule 35 A	The Contribution towards Green Funds @ 10% of Seigniorage fee are indicated as part of EMP Budge and not necessarily implemented in the Project Site	875871	0

Implementation of EC, Mining Plan & DGMS Condition	Size 6' X 5' with blue background and white letters as mentioned in MoM Appendix II by the SEAC TN	Fixed Display Board at the Quarry Entrance as permanent structure mentioning Environmental Conditions	10000	1000
	Air, Water, Noise and Soil Quality Sampling every 6 Months for Compliance Report of EC Conditions	Submission of 2 Half Yearly Compliance - Lab Monitoring Report as per CPCB norms	0	50000
	Workers will be provided with Personal Protective Equipment's	Provision of PPE @ Rs. 4000/- per employee with recurring based on wear and tear (say, @ Rs. 1000/- per employee) - 29 Employees	116000	29000
	Health check up for workers will be provisioned	IME & PME Health check up @ Rs. 1000/- per employee	0	29000
	First aid facility will be provided	Provision of 2 Kits per Hectare @ Rs. 2000/-	0	8750
	Mine will have safety precaution signages, boards.	Provision for signages and boards made	10000	2000
	No parking will be provided on the transport routes. Separate provision on the south side of the hill will be made for vehicles /HEMMs. Flaggers will be deployed for traffic management	Parking area with shelter and flags @ Rs. 50,000/- per hectare project and Rs. 10,000/- as maintenance cost	218750	10000
	Installation of CCTV cameras in the mines and mine entrance	Camera 4 Nos, DVR, Monitor with internet facility	30000	5000
	Implementation as per Mining Plan and ensure safe quarry working	Mines Manager (1^{st} Class / 2^{nd} Class / Mine Foreman) under regulation 34 / 34 (6) of MMR, 1961 and Mining Mate under regulation 116 of MMR,1961 @ 40,000/- for Manager & @ 25,000/- for Foreman / Mate	0	780000

CER	As per MoEF &CC OM 22-65/2017-IA.III Dated 25.02.2021	Detailed Description in following slides and Budget allocation is included as per MoeEF & CC OM	500000	0
TOTAL			**3437250**	**1509779.4**

*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. The EMP has been prepared for the **lease period of 3 years**.

Year	Total Cost
I	₹ 49,47,029
II	₹ 15,85,268
III	₹ 17,54,082
Total	**₹ 83 lakhs**

Cost inflation 5% per annum

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

10.10.: CONCLUSION –

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

11. SUMMARY AND CONCLUSION

This EIA & EMP report prepared for the proposed Rough Stone and Gravel Quarry project located in S.F.Nos.331/4A, 331/4B, 331/5A, 331/5B, 331/6, 331/7A, 331/7B, 331/8A & 331/8B Siruthamur Village, S.F.Nos.3/1A, 3/1B, 3/2 & 5/2 at Sirumailur Village S.F.Nos 86/1, 86/2, 87/1(P) at Sithalapakkam Village Uthiramerur Taluk and Kancheepuram District belongs to Thiru. M.R.Govindan. the Project falls in the Cluster category consist of 3 Proposed, 6 Existing Quarries falls under "B" category as per MoEF & CC Notification S.O. 3977 (E).

Now, as per Order Dated: 04.09.2018 & 13.09.2018 passed by Hon'ble National Green Tribunal, New Delhi in O.A. No. 173 of 2018 & O.A. No, 186 of 2016 and MoEF & CC Office Memorandum F. No. L-11011/175/2018-IA-II (M) Dated: 12.12.2018 clarified the requirement for EIA, EMP and therefore, Public Consultation for all areas from 5 to 25 ha falling in Category B-1 and appraised by SEAC/ SEIAA as well as for cluster situation.

The proposed project is categorized under category "B1" Activity 1(a) (mining lease area in cluster situation) and will be considered at SEIAA – TN after conducting Public Hearing and Submission of EIA/EMP Report for Grant of Environmental Clearance. **"**Draft EIA report prepared on the basis of ToR issued for carrying out public hearing for the grant of Environmental Clearance from SEIAA, Tamil Nadu".

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

The main scope of the EIA study is to quantify the cumulative impact in the study area due to cluster quarries and formulate the effective mitigation measures for each individual leases. A detailed account of the emission sources, emissions control equipment, background Air quality levels, Meteorological measurements, Dispersion model and all other aspects of pollution like effluent discharge, Dust generation etc., have been discussed in this report. The baseline monitoring study has been carried out during the months March – May 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 214 people directly in the proposed projects and indirectly around 300 people.

As discussed, it is safe to say that the proposed quarries are not likely to cause any significant impact to the ecology of the area, as adequate preventive measures will be adopted to keep the various pollutants within the permissible limits. Green belt development around the area will also be taken up as an effective pollution mitigate technique, as well as to serve as biological indicators for the pollutants released from the Thiru. M.R.Govindan Rough Stone and Gravel Cluster Quarry (Cluster Extent – 23.90.11 ha).

12. DISCLOSURE OF CONSULTANT

M/s Geo Exploration and Mining Solutions, an Accredited Organization under Quality Council of India – National Accreditation Board for Education & Training, New Delhi, for carrying out the EIA Study as per the ToR Issued for the proposed project.

Name and address of the consultancy:

GEO EXPLORATION AND MINING SOLUTIONS
No 17, Advaitha Ashram Road,
Alagapuram, Salem – 636 004
Tamil Nadu, India
Email:infogeoexploration@gmail.com
Web: www.gemssalem.com
Phone: 0427 2431989.

The Accredited Experts and associated members who were engaged for this EIA study as given below –

Sl.No.	Name of the expert	In house/ Empanelled	EIA Coordinator		FAE	
			Sector	Category	Sector	Category
1	**Dr. M. Ifthikhar Ahmed**	**In-house**	**1**	**A**	WP GEO SC	B A A
2	Dr. P. Thangaraju	In-house	**-**	**-**	HG GEO	A A
3	Mr. A. Jagannathan	In-house	**-**	**-**	AP NV SHW	B A B
4	Mr. N. Senthilkumar	Empanelled	38 28	B B	AQ WP RH	B B A
5	Mrs. Jisha parameswaran	In-house	-	**-**	SW	B
6	Mr. Govindasamy	In-house	-	**-**	WP	B
7	Mrs. K. Anitha	In-house	-	**-**	SE	A
8	Mrs. Amirtham	In-house	-	**-**	EB	B
9	Mr. Alagappa Moses	Empanelled	-	**-**	EB	A
10	Mr. A. Allimuthu	In-house	-	**-**	LU	B
11	Mr. S. Pavel	Empanelled	-	**-**	RH	B
12	Mr. J. R. Vikram Krishna	Empanelled	-	**-**	SHW RH	A A

Abbreviations

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

DECLARATION BY EXPERTS CONTRIBUTING TO THE EIA/EMP

This EIA/EMP for Thiru. M. R.Govindan Rough Stone & Gravel Quarry over an Cluster Extent of 23.90.11 ha in Sirudhamur, Sithalapakkam & Sirumailur Village, Uthiramerur Taluk, Kancheepuram District of Tamil Nadu is prepared as per the Generic Structure of EIA Guidelines manual. It is also certified that information furnished in the above EIA study are true and correct to the best of our knowledge.

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

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

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

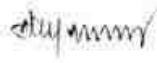
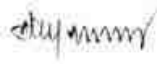
Date & Signature: 

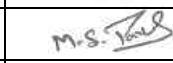
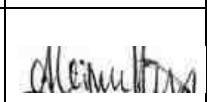
Period of Involvement: **January 2023 to till date**

Associated Team Member with EIA Coordinator:

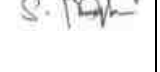
1. **Mr. S. Nagamani**
2. **Mr.P. Viswanathan**
3. **Mr. M. Santhoshkumar**
4. **Mr. S. Ilavarasan**

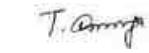
FUNCTIONAL AREA EXPERTS ENGAGED IN THE PROJECT

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

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

LIST OF TEAM MEMBERS ENGAGED IN THIS PROJECT

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

4	Mr. Umamahesvaran	GEO	▪ Site Visit with FAE ▪ Provide inputs on Geological Aspects ▪ Assist in Resources & Reserve Calculation and preparation of Production Plan & Conceptual Plan	
5	Mr. A. Allimuthu	SE	▪ Site Visit with FAE ▪ Assist FAE with collection of data's ▪ Provide inputs by analysing primary and secondary data	
6	Mr. S. Ilavarasan	LU; SC	▪ Site Visit with FAE ▪ Assisting FAE in preparation of land use maps ▪ Provide inputs & Assisting FAE with soil conservation methods and identifying impacts	
7	Mr. E. Vadivel	HG	▪ Site Visit with FAE ▪ Assist FAE & provide inputs on aquifer characteristics, ground water level/table ▪ Assist with methods of ground water recharge and conduct pump test, flow rate	
8	Mr. D. Dinesh	NV	▪ Site Visit with FAE ▪ Assist FAE and provide inputs on impacts due to proposed mine activity and suggest mitigation measures ▪ Assist FAE with prediction modelling	
9	Mr. Panneer Selvam	EB	▪ Site Visit with FAE ▪ Assist FAE with collection of baseline data ▪ Provide inputs and assist with labelling of Flora and Fauna	
10	Mrs. Nathiya	EB	▪ Site Visit with FAE ▪ Assist FAE with collection of baseline data ▪ Provide inputs and assist with labelling of Flora and Fauna	

DECLARATION BY THE HEAD OF THE ACCREDITED CONSULTANT ORGANIZATION

I, Dr. M. Ifthikhar Ahmed, Managing Partner, Geo Exploration and Mining Solutions, hereby, confirm that the above-mentioned Functional Area Experts and Team Members prepared the Cluster EIA/EMP for Thiru. M. R.Govindan Rough Stone & Gravel Quarry over an Cluster Extent of 23.90.11 ha in Sirudhamur, Sithalapakkam & Sirumailur Village, Uthiramerur Taluk, Kancheepuram 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**
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NABET Certificate No & Issue Date:	**NABET/EIA/2225/RA 0276 Dated: 20-2-2023**
Validity:	**Valid till 06.08.2025**