DRAFT ENVIRONMENTAL IMPACT ASSESSMENT

&

ENVIRONMENT MANAGEMENT PLAN

FOR OBTAINING

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

"B1" CATEGORY – MINOR MINERAL – CLUSTER – NON-FOREST LAND

THIRU.S. SADHASIVAM ROUGH STONE AND GRAVEL QUARRY

(Consisting of 4 Proposed Quarries +1 Expired Quarry)

CLUSTER EXTENT = 7.83.5 ha

Complied as per ToR obtained and MoEF & CC Standard ToR Notification – S.O. 751(E) Dated: 17th February 2020, for the Projects in Cluster Situation – Cluster area is calculated as per MoEF & CC Notification – S.O. 2269 (E) Dated: 01.07.2016

NAME OF PROPOSED PROJECT PROPONENTS APPLYING IN CLUSTER

Sl. No.	Name	Village	Extent of Mining Applied
1	Thiru.S.Sadhasivam,	Kuppam	1.54.0 ha

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 & 38 Category 'A'
Certificate No: NABET/EIA/2225/RA 0276
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Baseline Monitoring Period - October to December 2022

Environmental Lab

Chennai Mettex Lab Pvt Ltd

(Approved by AAI, AGMARK, APEDA, BIS, EIC, FSSAI, GAFTA, IOPEPC, MOEF & TEA BOARD)
Jothi Complex, 83, M.K.N, Road, Guindy, Chennai – 600 032, Tamil Nadu, INDIA

JANUARY 2023

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

PROPOSED QUARRIES				
CODE	**Name of the Owner**	**S.F. Nos**	**Extent**	**Status**
P1	**Thiru.S. Sadhasivam,** S/o.K.Subramaniyam, Door No.4/188, Velliampalayam, Punna chatram Post, Pugalur Taluk,Karur District - 639136	211/1, 211/2	1.54.0 ha	TOR Obtained: Lr. No. SEIAA-TN/F.No.8566/ToR-1280/2022 Dated:08.10.2022
P2	**Thiru.G. Prabhakar,** S/o.Govindasamy, 5/187, Samynathapuram, Kattumunnur Post, K.Paramathi Taluk, Karur District	361/2 (P)	1.21.5 ha	-
P3	**Thiru.K. Nallasamy** S/o.Krishnan Punnamchatram Post, Aravakurichi Taluk, Karur District.	226/1(P)	2.89.0 ha	-
P4	**Tvl.NTC Blue Metals LLP,** Prop.of. Mr.S.Muthusamy, Rasampalayam Keelasathambur Village, Namakkal -637 207	362/2(P)	2.19.0	-
TOTAL			**7.83.5 ha**	
EXPIRED QUARRIES				
CODE	**Name of the Owner**	**S.F. No**	**Extent**	**Status**
EX1	**Tvl.Venkatachalapathi** Blue Metals. S.F.No.233/1, Puthurpatti, Kuppam Post, Aravakurichi Taluk, Karur District.	213/1, 214/2A,214/2B, 214/2C,220/3P,221/P	4.05.0 ha	23.6.2017 To 22.6.2022 Last permit obtained on 24.05.2022
	TOTAL		**4.05.0 ha**	
	ABANDONED QUARRIES			
CODE	**Name of the Owner**	**S.F. No**	**Extent**	**Status**
A1	**N.Saraswathi** W/o.Nachimuthu Thalaiyeethupatti Kuppam Aravakurichi	**362/1**	**1.51.5 ha**	5.5.2006 to 4.5.2011
	TOTAL		**1.51.5 Ha**	
TOTAL CLUSTER EXTENT			**7.83.5 ha**	

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

TERMS OF REFERENCE (TOR) COMPLIANCE

THIRU.S. SADHASIVAM,

"TOR Obtained:

"Lr. No. SEIAA-TN/F.No.8566/ToR-1280/2022 Dated:08.10.2022"

SPECIFIC CONDITIONS		
1	In the case of proposed lease in an existing (or old) quarry where the benches are not formed (or) partially formed as per the approved Mining Plan, the Project Proponent (PP) shall prepare and submit an 'Action Plan' for carrying out the realignment of the benches in the proposed quarry lease after it is approved by the concerned Asst. Director of Geology and Mining during the time of appraisal for obtaining the EC.	It is a fresh lease. (Proposal)
2	The PP shall fumish 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, I/I1 Class mines manager appointed by the proponent'	It is a fresh lease (Proposal)
3	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 controllcd as wcll as no fly rock travcl beyond 30 m from the blast site.	It is a fresh lease (Proposal)
4	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.	No evidence, it is a Fresh Lease
5	lf the proponent has already carried out the mining activity in the proposed mining lease arca after 15.01.2016, then the proponent shall fumish the following details from AD/DD,mines, a. What was the period of the operation and stoppage of the earlier mines with last work permit issued by the AD/DD mines? b. Quantity of minerals mined out. c. Highest production achieved in any one year d. Detail of approved dcpth of mining. e. Actual depth of the mining achieved earlier. f. Name of the person already mined in that leases	it is a Fresh Lease

	arca. g. If EC and CTO already obtained, the copy of the same shall be submitted. h. Whether the mining was carried out as per the approved mine plan (or EC if issued) with stipulated benches.	
6	All comer coordinates of the mine lease area. superimposed on a High-Resolution imagery/Topo shee1. 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 factures of the study area (core and buffer zone).	Chapter 1 showed that superimposed on a High-Resolution imagery/Topo shee1. topographic sheet Chapter 2 All comer coordinates of the mine lease area with Google map, Geomorphology, lithology etc., Chapter 3. land use and other ecological factures of the study area (core and buffer zone).
7	The PP shall carry out Drone video survey covering the cluster, green belt. fencing etc..	To be Furnished
8	The proponent shall fumish photographs of adequate f-encing, grccn belt along the periphery including replantation of existing trees & safety distance between the adjacent quarries & water bodices nearby provided as per the approved mining plan.	Yes, provided approved mining plan details
9	The Project Proponent shall provide the details of mineral reserves and minable reserves, planned production capacity, proposed working methodology with justifications. The anticipated impacts of' the mining operations on the surrounding environment and the remedial measures lor the same.	Chapter2 details of mineral reserves and minable reserves and Chapter 4 The anticipated impacts of' the mining operations.
10	The Project Proponent shall provide the Organization chart indicating the appointment of various statutory officials and other competent persons to be appointed as per the provisions of Mines Act' 1952 and the MMR. I961 for carrying out the quarrying operations scientifically' and systematically in order to ensure safety and to protect the environment.	Chapter6 6.1 Methodology Of Monitoring Mechanism Organization chart indicating in the chapter.
11	The Project proponent shall conduct the hydro-geological studty 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 ctc. within I 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	Chapter 2 & 3 details of Hydrogeological studies and Contour map of water level map with season.

	to mining active'. 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.	
12	The proponent shall fumish 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.	Chapter 3 fumished the baseline data for the environmental and ecological parameters
13	The Proponent shall carry out the Cumulative impact study due to mining operations carried out in the quarry specifically with refence 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 mine.	Chapter3 and Chapter4 details furnished specific environment in terms of soil health. biodiversity-. air pollution, water pollution. climate change and flood control & health impacts.
14	Rain water harvesting management with recharging details along with water balance (bothmonsoon & non-monsoon) be submitted.	Total Water Requirement: 2.0 KLD Discussed under Chapter 2, Table No 2.15.
15	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 leasc 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.	Chapter3 and Chapter 4 Land use of the study area with high resolution satellite details with maps and also impact studies of land environment.
16	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 uses. R&R issues. il any, should be provided.	No R&R issues, there is no storage /overburden in the mines. It is a fresh/proposal mine.
17	Proximity to areas declared as 'Critically Polluted' (or) the Project areas which attracts the court restrictions for mining operations. should also be indicated and where so required. clearance certifications from the prescribed Authorities. such as the TNPCB (or) Dept of Geology and Mining should be secured and furnished to the effect that the proposed mining activities could be considered.	Chapter 1 & 2 Buffer area with 500m radius showed tha maps. There is no 'Critically Polluted' (or) the Project areas. This is cluster mines above 4 proposal mines one existing and abandoned quarry. With enclosed AD letter wide.
18	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.	
19	Impact on local transport infrastructure due to the Project should be indicated.	There is no impact local transport. traffic survey locations, transport volume, transportation route map inclosed. Chapter 2.
20	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.	Chapter 3 furnishes flora and fauna details study.
21	A detailed mine closure plan for the proposed project shall be included in EIA/EMP report which should be site-specific.	Yes, included in EIA/EMP Report.
22	Public Hearing points raised and commitments of the Project Proponent on the same along with time bound Action Plan with budgetary provisions to implement the same should be provided and also incorporated in the final EIA/EMP Report of the Project and to be submitted to SEIAA/SIIAC with regard to the Office Memorandum of MoEF & CC accordingly.	To be furnish. after submitting Draft EIA report to conduct PH.
23	The Public hearing advertisement shall be published in one major National daily and one most circulated vernacular daily.	To be furnish.
24	The PP shall produce/display the EIA report. Executive summary and other related information with respect to public hearing in Tamil Language also.	Yes, enclosed, English and Local language (Tamil).
25	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.	To be furnish.
26	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 DI.O. State Agriculture University and local school/college authorities. The plant species with dense/moderate canopy of native origin should be chosen. Species of small/medium/tall trees alternating with shrubs should be planted in a mixed manner.	To be furnish.
27	Taller/one year old Saplings raised in appropriate size of bags, preferably eco-friendly bags should be planted as per the advice of local forest	Chapter3 details of Fauna and flora and chapter4 incorporated.

	authorities/botanist/Horticulturist with regard to site specific choices. 'The proponent shall earmark the greenbelt arca with GPS coordinates all along the boundary of the project site with at least 3 meters wide and in bctwccn blocks in an organized manner.	
28	A Disaster management Plan shall be prepared and included in the EIA/EMP, Report for thc complete life of the proposed quarry (or) till the end of the lease period.	A Disaster management Plan in the EIA report chapter 7 -Additional studies covered.
29	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 leasc period.	Risk Assessment and management plan in the EIA report chapter 7 -Additional studies covered.
30	occupational Health impacts of the project should be anticipated and the proposed preventive measures spelt out in details. 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.	Chapter-4 incorporated occupational Health impacts of the project should be anticipated and the proposed preventive measures spelt out in details. Details of pre-placement medical examination.
31	Public health implications of the Project and related activities for the population in the impact zone should be systematically evaluated and the proposed remedial measures should be detailed along with budgetary allocations.	No Public Health Implications anticipated due to this project. Details of CER and CSR are discussed under Chapter 8.
32	The Socio-economic studies should be carried out within a 5 km buffer zone fiom the mining acclivity. Mcasures 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 lor implementation.	Details of Socio-economic studies are discussed chapter -3
33	Details of litigation pending against the project. if any. with direction /order passed by any Court of Law against the Project should be given.	No litigation is pending in any court against this project.
34	Benefits of the Project if the Project is implemented should be spelt out. The benefits of the Project shalI clearly indicate environmental, social. economic, employment potential, etc.	Details in Chapter 8.
35	If any quarrying operations were carried out in the proposed quarrying site for which now. The EC is sought' the Project Proponent shall fumish 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	It is a fesh lease quarry.

	Chennai (or) the concemed DEE/TNPCB	
36	The PP shall prepare the EMP for the entire life of mine and also furnish the sworn affidavit stating to abide the EMP for thc entire life of mine.	Yes , chapter 10, details and prepare the EMP of the mines.
37	Concealing any factual information or submission of false/fabricated data and failure to comply with any of thc conditions besides above may result in withdrawal of this terms of Conditions besides attracting penal provisions in thc Environment (Protection) Act. 1986.	No, agreed. terms of Conditions besides attracting penal provisions in thc Environment (Protection) Act. 1986.
	Annexure-B	
1	Cluster Management Committee, which must include all the proponents in the cluster as members including thc existing as well as proposed quarry.	Noted
2	The members must coordinate among themselves for thc effective implementation of EMP as committed including green belt development, Water sprinkling. tree plantation, blasting, etc,	Chapter 6 details of Methodology Of Monitoring Mechanism
3	The List of members of thc committees formed shall be submitted to AD/Mines before the execution of mining lease and thc same shall be updated every year to the AD/ Mines.	Noted
4	detailed Operational Plan must be submitted which must include the blasting frequency with respect to thc nearby quarry situated in the cluster, thc usage of haul roads by thc individual quarry in thc form of route map and network.	Noted
5	The committee shall deliberate on risk management plan pertaining to the cluster in a holistic manncr especially during natural calamities like intense rain and thc mitigation measures considering the inundation of the cluster and evacuation plan	Chaper 7, 7.2 risk assessment and management plan furnished.
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 thc committee in implementing thc environmental policy devised shall be given in detail.	To be furnish
7	The committee shall furnish action plan regarding the restoration strategy with respect to thc individual quarry falling under the cluster in a holistic manner.	Proposal quarry (Fresh lease)
8	The committee shall furnish the Emergency Management plan within the cluster.	Noted, to be furnish.

9	The committee shall deliberate on the health of the workers/staff involved in the mining as well as the health of the public.	No Public Health Implications anticipated due to this project. Details of CER and CSR are discussed under Chapter 8.
10	Detailed study shall be carried out in regard to impact of mining around the proposed mine lease area covering the entire mine lease period as per precise area communication order issued from reputed research institutions on the fallowing a) Soil health & bio-diversity. b) Climate change leading to droughts, floods etc. c) Pollution leading to release of Greenhouse gases (GHG), rise in Temperature, & Livelihood of the local People. d) Possibilities of water contamination and impact on aquatic ecosystem health. e) Agriculture, Forestry & Traditional practices f) Bio-geochemical processes and its foot prints including environmental stress. g) Sediment geochemistry in the surface streams h) Hydrothermal/Geothermal effect due to destruction in the environment.	The study will be conducted and submit along with the Final EIA/EMP report.
11	The committee shall furnish an action plan to achieve sustainable development goals with reference to water. sanitation & safety.	Noted and agreed
12	The committcc shall furnish thc fire safety and evacuation plan in thc case of fire accidents.	Noted and agreed
13	The measures taken to control Noise, Air, water. Dust Control and steps adopted to efficiently utilise the energy shall be furnished.	Noted and agreed
14	Details of type of vegetations including no. of trees & shrubs within thc proposed mining area and. If so. transplantation of such vegetations all along thc boundary of the proposed mining area shall committed mentioned in EMP.	Chapter 3 details of Fauna and flora diversification and impacts of Environment (Chapter 4)
15	Impact on surrounding agricultural fields around the proposed mining Area.	There is no impact agriculture field. Chapter 3, Land environment details of Landuse/Landcover.
16	Erosion Control measures.	
17	Impact on soil flora & vegetation around the project sitc.	Chapter 3 details of Fauna and flora diversification and impacts of Environment (Chapter 4)

18	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.	There is Cauvery river and Noyyal River in the buffer zone.
19	The project proponent shall fumish 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.	AD Letter 500m Cluster certificate.
20	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.	To be furnished
21	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
22	The Environmental Impact Assessment should study the biodiversity, the natural ecosystem the soil micro flora, fauna and so seed banks and suggest measures to maintain the natural Ecosystem.	Chapter 3, details of Ecology and Biodiversity
23	Action should specifically suggest for sustainable management of the area and restoration of ecosystem for flow of goods and services.	Chapter 3,4 details of Ecology and Biodiversity, Impacts of sustainable management of the area.
24	The project proponent shall study impact on fish habitats and the rood web/ food chain in the water body and Reservoir.	There is Cauvery River and Noyyal River in the buffer zone. no impacts on fish habitats.
25	The terms of Reference should specifically study impact on soil health, soil erosion. the soil physical. chemical components and microbial components.	Yes, included chapter -3 soil and physical components.
26	The Environmental Impact assessment should study impact on forest, vegetation, endemic vulnerable and endangered indigenous flora and fauna.	There is no forest/wildlife within 10km radius, chapter 3 details of Ecology and Biodiversity, and 4 endemic vulnerable and endangered indigenous flora and fauna.
27	The Environmental Impact Assessment should study impact on standing trees and the existing trees should be numbered and action suggested for protection.	Chapter 3 details of Flora and Fauna

28	The Environmental Impact Assessment should study on wetlands, water bodies. Rivers streams. lakes and farmer sites.	There is Cauvery River and Noyyal River in the buffer zone.
29	The Environmcntal Impact Assessment should hold detailed study on EMP with budget for Green belt development and mine closure plan including disaster management plan.	Table 2.15: Water Requirement for The Project. And chapter 10, detailed study on EMP.
30	The Environmental impact Assessment should study impact on climatic change. Temperature rise, pollution and above soil & below soil carbon stock.	Yes, chapter 3 and 4 incorporated details of Climate parameters and soil chemical components.
31	The Environmental Impact Assessment should study impact on protected areas' Reserve Forests. National Parks, Corridors and Wildlife pathways, near project site.	There is no RF and wildlife nearby project site.
32	The project proponent shall study and furnish the impact of project on plantations in adjoing patta lands, Horticulture, Agriculture and livestock.	cha
33	The project proponent shall study and furnish the details on potential fragmentation impact of natural environment, by the activities.	Chapter 3 details of Ecology and Bio diversity.
34	The project proponent shall study and fumish 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.	Chapter 3 details of Ecology and Bio diversity. There is no impact landscape.
35	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.	Chapter 3 details of Ecology and Bio diversity.
36	The project proponent shall detail study on impact of mining on Reserve forests free ranging wildlife.	There is no RF and wildlife.
37	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.	Chapter3, details of Water Environment with Ground water and surface water details etc.

38	To fumish 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 10 the proposed method or mining activity, & its related activities covering the entire mine lease period as per precise arca communication order issued.	Chaper 7, 7.3 disaster management plan furnished.
39	To furnish risk assessment and management plan including anticipated vulnerabilities during operational and post operational phases of Mining.	Chaper 7, 7.2 risk assessment and management plan furnished.
40	detailed Mine Closure plan covering the entire mine lease period as per precise area communication order issued.	Chapter2, detailed Mine Closure plan Closure Plan and Sections
41	Detailed Environment Management plan along with adaptation, mitigation & remedial strategies covering the entire mine lease period as per precise area communication order issued.	Detailed Environment Management Plan for the project to mitigate the anticipated impacts described under Chapter 4 is discussed under Chapter 10.
STANDARD TERMS OF REFERENCE		
1	Year-wise production details since 1994 should be given, clearly stating the highest production achieved in any one year prior to 1994. It may also be categorically informed whether there had been any increase in production after the EIA Notification 1994 came into force, w.r.t. the highest production achieved prior to 1994.	Not applicable. This is Not a violation category project. This proposal falls under B1 Category (Cluster Condition).
2	A copy of the document in support of the fact that the Proponent is the rightful lessee of the mine should be given.	The applied land for quarrying is a Patta Land. Document is enclosed along with Approved Mining Plan as Annexure Volume 1.
3	All documents including approved mine plan, EIA and Public Hearing should be compatible with one another in terms of the mine lease area, production levels, waste generation and its management, mining technology etc. and should be in the name of the lessee.	Noted & agreed.
4	All corner coordinates of the mine lease area, superimposed on a High-Resolution Imagery/ toposheet, topographic sheet, geomorphology and geology of the area should be provided. Such an Imagery of the proposed area should clearly show the land use and other ecological features of the study area (core and buffer zone).	Map showing – Project area is superimposed on Satellite imagery is enclosed in Figure No. 2.1 Project area boundary coordinates superimposed on Toposheet – Figure No. 1.3 Surface Features around the project area

		covering 10km radius – Figure No. 2.2 Geology map of the project area covering 10km radius - Figure No. 2.7. Geomorphology Map of the Study Area covering 10 km radius – Figure No. 2.8.
5	Information should be provided in Survey of India Toposheet in 1:50,000 scale indicating geological map of the area, geomorphology of land forms of the area, existing minerals and mining history of the area, important water bodies, streams and rivers and soil characteristics.	Map showing – Geology map of the project area covering 10km radius - Figure No. 2.7. Geomorphology Map of the Study Area covering 10 km radius – Figure No. 2.8.
6	Details about the land proposed for mining activities should be given with information as to whether mining conforms to the land use policy of the State; land diversion for mining should have approval from State land use board or the concerned authority.	The applied area was inspected by the officers of Department of Geology along with revenue officials and found that the land is fit for quarrying under the policy of State Government.
7	It should be clearly stated whether the proponent Company has a well laid down Environment Policy approved by its Board of Directors? If so, it may be spelt out in the EIA Report with description of the prescribed operating process/procedures to bring into focus any infringement/deviation/ violation of the environmental or forest norms/conditions? The hierarchical system or administrative order of the Company to deal with the environmental issues and for ensuring compliance with the EC conditions may also be given. The system of reporting of non-compliances / violations of environmental norms to the Board of Directors of the Company and/or shareholders or stakeholders at large, may also be detailed in the EIA Report.	The proponent has framed their Environmental Policy and the same is discussed in the Chapter No 10.1.
8	Issues relating to Mine Safety, including subsidence study in case of underground mining and slope study in case of open cast mining, blasting study etc. should be detailed. The proposed safeguard measures in each case should also be provided.	It is an opencast quarrying operation proposed to operate in Mechanized method. The rough stone formation is a hard, compact and homogeneous body. The height and width of the bench will be maintained as 5m with 90^0 bench angles. Quarrying activities will be carried out under the supervision of Competent Persons like Mines Manager, Mines Foreman and Mining Mate. Necessary permissions will be obtained from DGMS after obtaining Environmental Clearance.

9	The study area will comprise of 10 km zone around the mine lease from lease periphery and the data contained in the EIA such as waste generation etc., should be for the life of the mine / lease period.	Noted & agreed. The study area considered for this study is 10 km radius and all data contained in the EIA report such as waste generation etc., is for the Life of the Mine / lease period.
10	Land use of the study area delineating forest area, agricultural land, grazing land, wildlife sanctuary, national park, migratory routes of fauna, water bodies, human settlements and other ecological features should be indicated. Land use plan of the mine lease area should be prepared to encompass preoperational, operational and post operational phases and submitted. Impact, if any, of change of land use should be given.	Land use and land cover of the study area is discussed in Chapter No. 3. Land use plan of the project area showing pre-operational, operational and post-operational phases are discussed in Chapter No. 2, Table No 2.3.
11	Details of the land for any Over Burden Dumps outside the mine lease, such as extent of land area, distance from mine lease, its land use, R&R issues, if any, should be given	Not Applicable. There is no waste anticipated during this quarry operation. The entire quarried out rough stone will be transported to the needy customers. No Dumps is proposed outside the lease area.
12	Certificate from the Competent Authority in the State Forest Department should be provided, confirming the involvement of forest land, if any, in the project area. In the event of any contrary claim by the Project Proponent regarding the status of forests, the site may be inspected by the State Forest Department along with the Regional Office of the Ministry to ascertain the status of forests, based on which, the Certificate in this regard as mentioned above be issued. In all such cases, it would be desirable for representative of the State Forest Department to assist the Expert Appraisal Committees.	Not Applicable. There is no Forest Land involved in the proposed project area. The proposed project area is a patta land. Approved Mining Plan is enclosed as Annexure Volume 1.
13	Status of forestry clearance for the broken-up area and virgin forestland involved in the Project including deposition of net present value (NPV) and compensatory afforestation (CA) should be indicated. A copy of the forestry clearance should also be furnished.	Not Applicable. The proposed project area does not involve any Forest Land.
14	Implementation status of recognition of forest rights under the Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 should be indicated.	Not Applicable. The project doesn't attract Recognition of Forest Rights Act, 2006.
15	The vegetation in the RF / PF areas in the study area,	No Reserve Forest within the Study

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

	Mining Projects falling under CRZ would also need to obtain approval of the concerned Coastal Zone Management Authority).	
21	R&R Plan/compensation details for the Project Affected People (PAP) should be furnished. While preparing the R&R Plan, the relevant State/National Rehabilitation & Resettlement Policy should be kept in view. In respect of SCs /STs and other weaker sections of the society in the study area, a need-based sample survey, family-wise, should be undertaken to assess their requirements, and action programmes prepared and submitted accordingly, integrating the sectoral programmes of line departments of the State Government. It may be clearly brought out whether the village(s) located in the mine lease area will be shifted or not. The issues relating to shifting of village(s) including their R&R and socio-economic aspects should be discussed in the Report.	Not Applicable. There are no approved habitations within a radius of 300 meters. Therefore, R&R Plan / Compensation details for the Project Affected People (PAP) is not anticipated and Not Applicable for this project.
22	One season (non-monsoon) [i.e., March-May (Summer Season); October-December (post monsoon season); December-February (winter season)] primary baseline data on ambient air quality as per CPCB Notification of 2009, water quality, noise level, soil and flora and fauna shall be collected and the AAQ and other data so compiled presented date-wise in the EIA and EMP Report. Site-specific meteorological data should also be collected. The location of the monitoring stations should be such as to represent whole of the study area and justified keeping in view the pre-dominant downwind direction and location of sensitive receptors. There should be at least one monitoring station within 500 m of the mine lease in the pre-dominant downwind direction. The mineralogical composition of PM10, particularly for free silica, should be given.	Baseline Data were collected for One Season (Summer) October - December 2022 as per CPCB Notification and MoEF & CC Guidelines. Details in Chapter No. 3.
23	Air quality modelling should be carried out for prediction of impact of the project on the air quality of the area. It should also take into account the impact of movement of vehicles for transportation of mineral. The details of the model used and input parameters used for modelling should be provided. The air quality contours may be shown on a location map clearly indicating the location of the site, location of sensitive receptors, if any, and the habitation. The wind roses showing pre-dominant wind direction may also be indicated on the map.	Air Quality Modelling for prediction of incremental GLC's of pollutant was carried out using AERMOD view 9.6.1 Model. Details in Chapter No. 4.

24	The water requirement for the Project, its availability and source should be furnished. A detailed water balance should also be provided. Fresh water requirement for the Project should be indicated.	Total Water Requirement: 2.0 KLD Discussed under Chapter 2, Table No 2.15.
25	Necessary clearance from the Competent Authority for drawl of requisite quantity of water for the Project should be provided.	Not Applicable. Water for dust suppression, greenbelt development and domestic use will be sourced from accumulated rainwater/seepage water in mine pits and purchased from local water vendors through water tankers on daily requirement basis. Drinking water will be sourced from the approved water vendors.
26	Description of water conservation measures proposed to be adopted in the Project should be given. Details of rainwater harvesting proposed in the Project, if any, should be provided.	Part of the working pit will be allowed to collect rain water during the spell of rain will be used for greenbelt development and dust suppression. The Mine Closure Plan is prepared for converting the excavated pit into rain water harvesting structure and serve as water reservoir for the project village during draught season.
27	Impact of the Project on the water quality, both surface and groundwater, should be assessed and necessary safeguard measures, if any required, should be provided.	Impact Studies and Mitigation Measures of Water Environment including Surface Water and Ground Water are discussed in Chapter 4.
28	Based on actual monitored data, it may clearly be shown whether working will intersect groundwater. Necessary data and documentation in this regard may be provided. In case the working will intersect groundwater table, a detailed Hydro Geological Study should be undertaken and Report furnished. The Report inter-alia, shall include details of the aquifers present and impact of mining activities on these aquifers. Necessary permission from Central Ground Water Authority for working below ground water and for pumping of ground water should also be obtained and copy furnished.	Not Applicable. The ground water table inferred 60-65m below ground level. The ultimate depth of quarry is 39m. This proposal of 34m below ground level will not intersect the ground water table, which is inferred from the hydro-geological carried out at the project site. Discussed under Chapter 3.
29	Details of any stream, seasonal or otherwise, passing through the lease area and modification / diversion proposed, if any, and the impact of the same on the hydrology should be brought out.	Not Applicable. There is no stream, seasonal or other water bodies passing within the project area. Therefore, no modification/ diversion of water bodies is anticipated.
30	Information on site elevation, working depth, groundwater table etc. Should be provided both in	Highest elevation of the project area is

	AMSL and Bgl. A schematic diagram may also be provided for the same.	110m AMSL. Ultimate depth of the mine is 39m BGL Water level of the area is 60-65m BGL
31	A time bound Progressive Greenbelt Development Plan shall be prepared in a tabular form (indicating the linear and quantitative coverage, plant species and time frame) and submitted, keeping in mind, the same will have to be executed up front on commencement of the Project. Phase-wise plan of plantation and compensatory afforestation should be charted clearly indicating the area to be covered under plantation and the species to be planted. The details of plantation already done should be given. The plant species selected for green belt should have greater ecological value and should be of good utility value to the local population with emphasis on local and native species and the species which are tolerant to pollution.	Greenbelt Development Plan is discussed under Chapter 4.
32	Impact on local transport infrastructure due to the Project should be indicated. Projected increase in truck traffic as a result of the Project in the present road network (including those outside the Project area) should be worked out, indicating whether it is capable of handling the incremental load. Arrangement for improving the infrastructure, if contemplated (including action to be taken by other agencies such as State Government) should be covered. Project Proponent shall conduct Impact of Transportation study as per Indian Road Congress Guidelines.	Traffic density survey was carried out to analyse the impact of Transportation in the study area as per IRC guidelines 1961 and it is inferred that there is no significant impact due to the proposed transportation from the project area. Details in Chapter 2.
33	Details of the onsite shelter and facilities to be provided to the mine workers should be included in the EIA Report.	Infrastructure & other facilities will be provided to the Mine Workers after the grant of quarry lease and the same has been discussed in the Chapter No.2.
34	Conceptual post mining land use and Reclamation and Restoration of mined out areas (with plans and with adequate number of sections) should be given in the EIA report.	Discussed under Chapter 2. Mine Closure Plan is a part of Approved Mining Plan enclosed as Annexure Volume – 1.
35	Occupational Health impacts of the Project should be anticipated and the proposed preventive measures spelt out in detail. Details of pre-placement medical examination and periodical medical examination schedules should be incorporated in the EMP. The project specific occupational health mitigation measures with required facilities proposed in the mining area may be detailed.	Occupational Health Impacts of the project and preventive measures are detailed under Chapter 4.

36	Public health implications of the Project and related activities for the population in the impact zone should be systematically evaluated and the proposed remedial measures should be detailed along with budgetary allocations.	No Public Health Implications anticipated due to this project. Details of CER and CSR are discussed under Chapter 8.
37	Measures of socio-economic significance and influence to the local community proposed to be provided by the Project Proponent should be indicated. As far as possible, quantitative dimensions may be given with time frames for implementation.	No Negative Impact on Socio Economic Environment on the Study Area is anticipated and this project shall benefit the Socio-Economic Environment by ways of employment for 19 people directly and 10 people indirectly. Details in Chapter 2.
38	Detailed environmental management plan (EMP) to mitigate the environmental impacts which, should inter-alia include the impacts of change of land use, loss of agricultural and grazing land, if any, occupational health impacts besides other impacts specific to the proposed Project.	Detailed Environment Management Plan for the project to mitigate the anticipated impacts described under Chapter 4 is discussed under Chapter 10.
39	Public Hearing points raised and commitment of the Project Proponent on the same along with time bound Action Plan with budgetary provisions to implement the same should be provided and also incorporated in the final EIA/EMP Report of the Project.	The outcome of public hearing will be updated in the final EIA/AMP report
40	Details of litigation pending against the project, if any, with direction /order passed by any Court of Law against the Project should be given.	No litigation is pending in any court against this project.
41	The cost of the Project (capital cost and recurring cost) as well as the cost towards implementation of EMP should be clearly spelt out.	Project Cost is Rs.35,87,000/- CER Cost is Rs 5,00,000/-
42	A Disaster management Plan shall be prepared and included in the EIA/EMP Report.	Details in Chapter 7.
43	Benefits of the Project if the Project is implemented should be spelt out. The benefits of the Project shall clearly indicate environmental, social, economic, employment potential, etc.	Details in Chapter 8.
44	Besides the above, the below mentioned general points are also to be followed: -	
a	Executive Summary of the EIA/EMP Report	Enclosed as separate booklet.
b	All documents to be properly referenced with index and continuous page numbering.	All the documents are properly referenced with index and continuous page numbering.
c	Where data are presented in the Report especially in Tables, the period in which the data were collected	List of Tables and source of the data collected are indicated.

	and the sources should be indicated.	
d	Project Proponent shall enclose all the analysis/testing reports of water, air, soil, noise etc. using the MoEF & CC/NABL accredited laboratories. All the original analysis/testing reports should be available during appraisal of the Project	Baseline monitoring reports are enclosed with This report in Chapter 3. Original Baseline monitoring reports will be submitted in the final EIA report during appraisal.
e	Where the documents provided are in a language other than English, an English translation should be provided.	Not Applicable.
f	The Questionnaire for environmental appraisal of mining projects as devised earlier by the Ministry shall also be filled and submitted.	Will be enclosed along with Final EIA EMP Report.
g	While preparing the EIA report, the instructions for the Proponents and instructions for the Consultants issued by MoEF&CC vide O.M. No. J-11013/41/2006-IA. II(I) Dated: 4th August, 2009, which are available on the website of this Ministry, should be followed.	Noted & agreed. Instructions issued by MoEF & CC O.M. No. J-11013/41/2006-IA. II (I) Dated: 4th August, 2009 are followed.
h	Changes, if any made in the basic scope and project parameters (as submitted in Form-I and the PFR for securing the TOR) should be brought to the attention of MoEF&CC with reasons for such changes and permission should be sought, as the TOR may also have to be altered. Post Public Hearing changes in structure and content of the draft EIA/EMP (other than modifications arising out of the P.H. process) will entail conducting the PH again with the revised documentation	Noted & agreed.
i	As per the circular no. J-11011/618/2010-IA. II(I) Dated: 30.5.2012, certified report of the status of compliance of the conditions stipulated in the environment clearance for the existing operations of the project, should be obtained from the Regional Office of Ministry of Environment, Forest and Climate Change, as may be applicable.	Not Applicable.
j	The EIA report should also include (i) surface plan of the area indicating contours of main topographic features, drainage and mining area, (ii) geological maps and sections and (iii) sections of the mine pit and external dumps, if any, clearly showing the land features of the adjoining area.	Surface Plan – Figure No. 2.2. Geological Plan – Figure No 2.9. Working Plan – Figure No 2.9. Closure Plan – Figure No.2.10.

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1. INTRODUCTION

1.0 PREAMBLE

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

Rough Stone & Gravel is the major requirements for construction industry. This EIA report is prepared by considering Cumulative load of all proposed & existing quarries of Thiru.S. Sadhasivam Rough Stone & Gravel Quarries Cluster consisting of 4 Proposed and one Expired Quarries, one abandoned with total extent of Cluster of 7.835 ha in Kuppam Village, Pugalur Taluk, Karur District, Tamil Nadu, cluster area calculated as per MoEF & CC Notification S.O. 2269(E) Dated 1st July 2016.

This EIA Report is prepared in compliance with ToR obtained vide –

- **Lr. No. SEIAA-TN/F.No.8566/ToR-1280/2022 Dated:08.10.2022** for Proposed Lease area;

The Baseline Monitoring study has been carried out during the period of **Oct - Dec 2022** and this EIA and EMP report is prepared for considering cumulative impacts arising out of these projects, the Cumulative Environmental Impact Assessment study is undertaken, which is followed by preparation of a detailed Environmental Management Plan (EMP) individually to minimize those adverse impacts.

1.1 PURPOSE OF THE REPORT

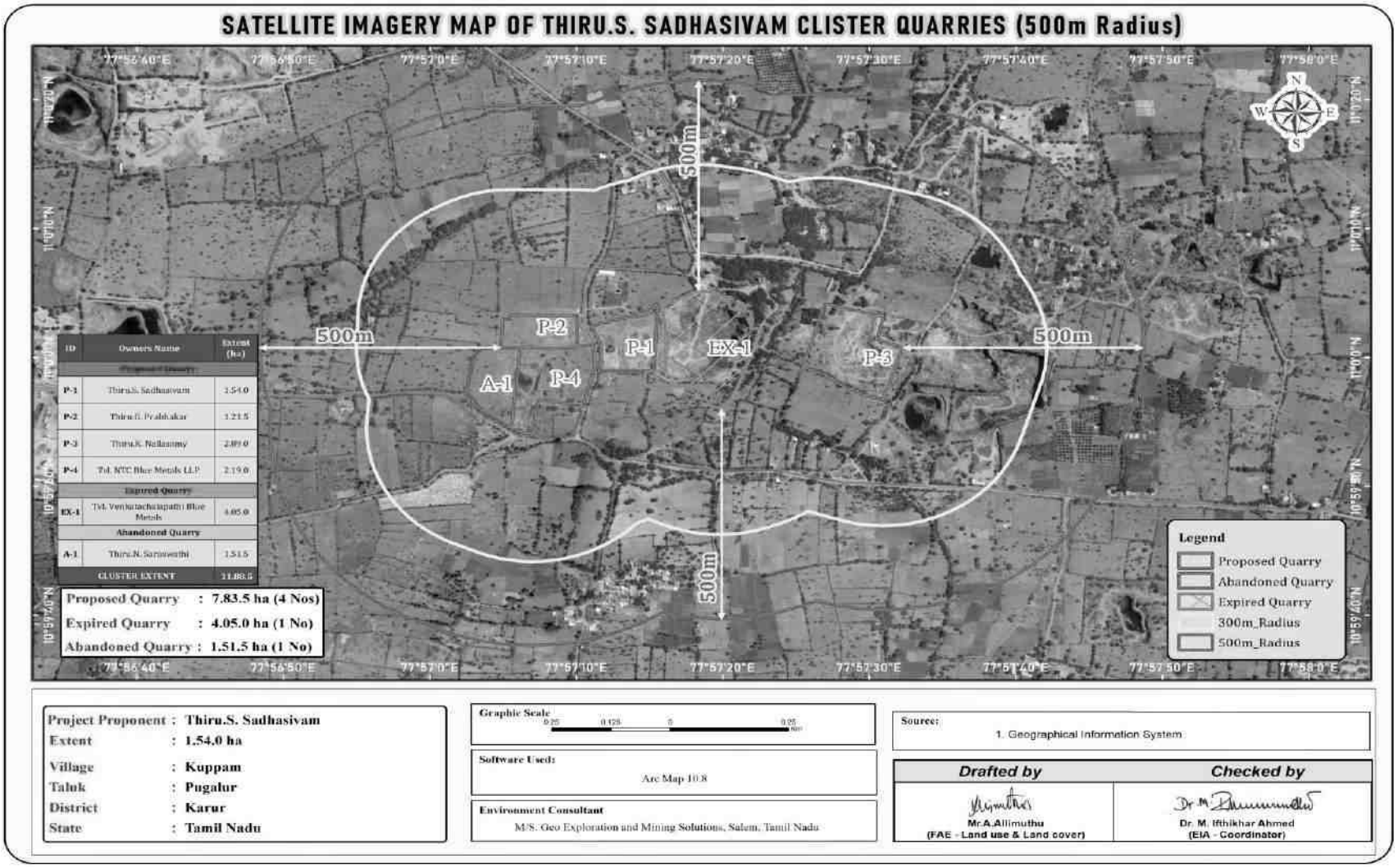
The Ministry of Environment and Forests, Govt. of India, through its EIA notification S.O. 1533(E) of 14thSeptember 2006 and its subsequent amendments as per Gazette Notification S.O. 3977 (E) of 14thAugust 2018, Mining Projects are classified under two categories i.e., A (> 100 Ha) and B (≤ 100 Ha),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

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

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

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

FIGURE1.1: SATELLITE IMAGERY CLUSTER QUARRIES



1.2 IDENTIFICATION OF PROJECT AND PROJECT PROPONENT

1.2.1 Identification of Project

TABLE 1.1: SALIENT FEATURES OF THE PROPOSED PROJECT

PROPOSAL	
Name of the Project	**Thiru.S. Sadhasivam**, Rough stone and Gravel Quarry
S.F. No.	211/1 & 211/2
Extent	1.54.0 ha
Land Type	Patta Land
Village Taluk and District	Kuppam Village, Pugalur Taluk, Karur District, Tamil Nadu State.

Source: Approved Mining Plan of respective proposal.

1.2.2 Identification of Project Proponent

TABLE 1.2: DETAILS OF PROJECT PROPONENT

PROPOSAL	
Name of the Company	**Thiru.S. Sadhasivam**, Rough Stone & Gravel Quarry Project
Address	**S/o. K.Subramaniyam,** Door No.4/188, Velliampalayam, Punnam Chatram Post, Pugalur Taluk, Karur District.
Mobile	99767 92213 & 97879 11811
Status	Proprietor

Source: Approved Mining Plan of respective proposal.

1.3 BRIEF DESCRIPTION OF THE PROJECT

1.3.1 Nature and Size of the Project

The quarrying operation is proposed to be carried out by Opencast Mechanized Mining method with 5.0m bench height and 5.0m bench width by Handy Hammer, Chisel and mild explosive. Tippers are used for transportation. Handy Hammer and chisel to avoid secondary blasting.

TABLE 1.3: BRIEF DESCRIPTION OF THE PROJECT

Name of the Quarry	**Thiru.S.Sadhasivam,** Rough Stone & Gravel Quarry Project	
Toposheet No	58 - E/16	
Latitude between	10°59'58.89" N to 11°00'04.13" N	
Longitude between	77°57'11.01" E to 77°57'15.51" E	
Highest Elevation	172m AMSL	
Proposed Depth of Mining	The Ultimate depth of Mining up to a depth of **7m (2m Gravel + 5m Rough Stone)** below ground level.	
Geological Resources	Rough Stone in m^3	Gravel m^3
	77,000	30,800
Mineable Reserves	Rough Stone in m^3	Gravel m^3
	35,230	16,270
Yearwise Production	Rough Stone in m^3	Gravel m^3
	28,430	16,270
Ultimate Pit Dimension	121m (L) * 76m (W) * 7m Bgl (D)	
Water Level in the surrounds area	The Water Table in the area is 60m in summer season and 55m in Rainy season	
Method of Mining	Opencast Manual Method, the quarry operation involves equipments like hammer and chisel and mild blasting like expanding chemicals (Calcium carbide)	

Topography	The lease applied area is exhibits plain topography. The area has gentle sloping towards Southeastern side and altitude of the area is 172m above from Mean Sea level. The area is covered by 2m thickness of Gravel and followed by Massive Charnockite which is clearly inferred from the nearby existing quarry pits.	
Machinery proposed	Splitting of rock mass of considerable volume from the parent rock mass by hand hammer, chisel and mild explosives	
	Tippers	1Nos
Blasting Method	Mild explosives like expanding chemical to loosen the Rough Stone, No deep hole drilling and blasting	
Proposed Manpower Deployment	23 Nos	
Project Cost	Rs.25,78,000/-	
CER Cost of Project	Rs.5,00,000	
Nearby Water Bodies	Kaveri River -7.0km-N	
Greenbelt Development Plan	Proposed to plant 920 trees in Approach Road and nearby periphery of the village Road after consulting the local Panchayat authority and Agriculture Experts area 7.5 m Safety Zone	
Proposed Water Requirement	2.0 KLD	
Nearest Habitation	230m-North	

Source: Approved Mining Plan

1.3.2 Location of the Project

- Proposed quarry projects fall in Kuppam Village, Pugalur Taluk, Karur District, Tamil Nadu State.
- The entire quarry lease area falls in the Patta land, the lease applied area is exhibits Plain Topography
- The Altitude of the area is **172m (**Maximum) above MSL
- The area is mentioned in GSI Topo sheet No. 58 - E/16
- The Latitude between of **10°59'58.89" N to 11°00'04.13" N**
- The Longitude between of **77°57'11.01" E to 77°57'15.51" E** on WGS 1984datum

FIGURE1.2: KEY MAP SHOWING THE LOCATION KEY MAP

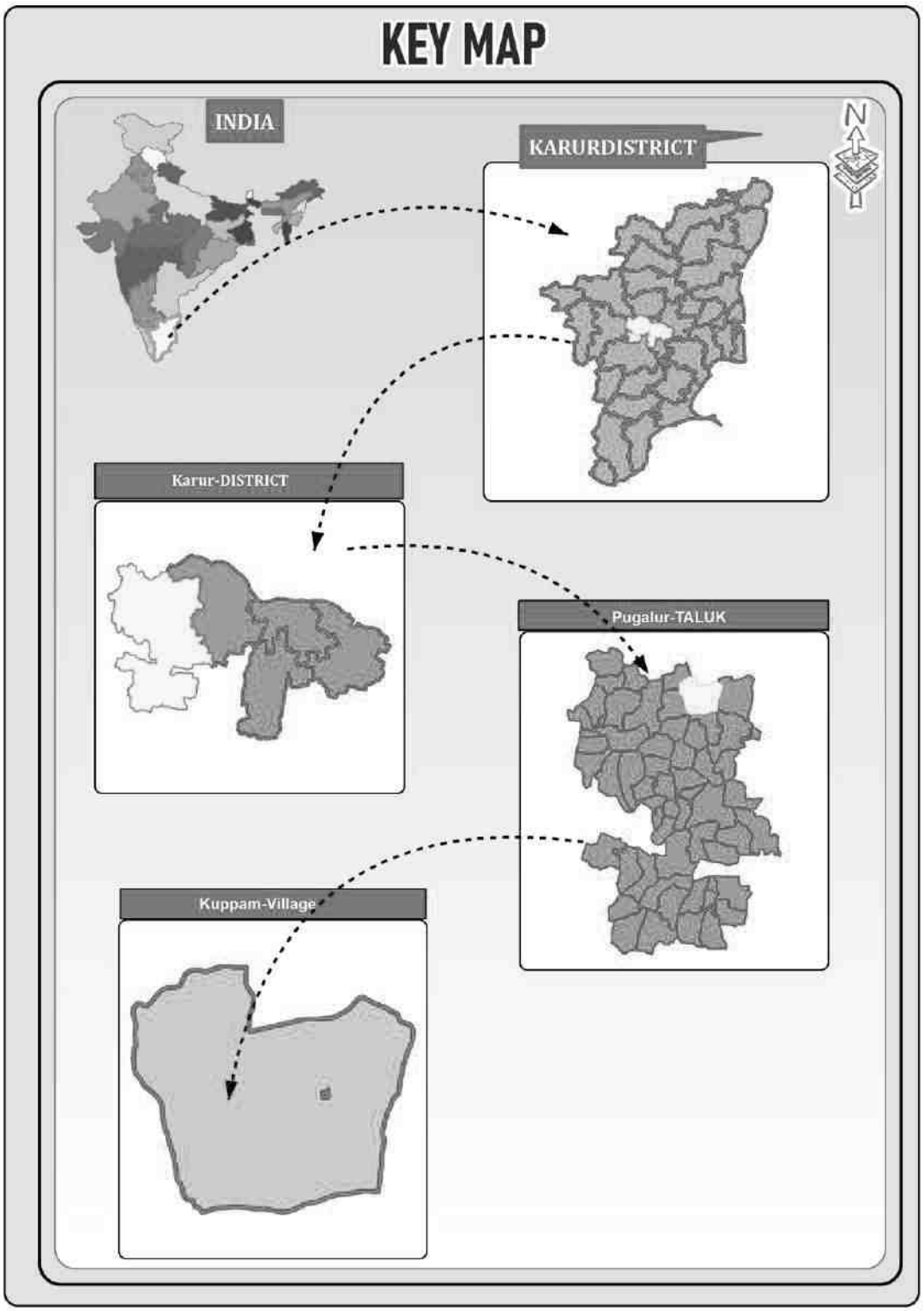


FIGURE 1.3: TOPOSHEET MAP OF THE STUDY AREA 10 KM RADIUS

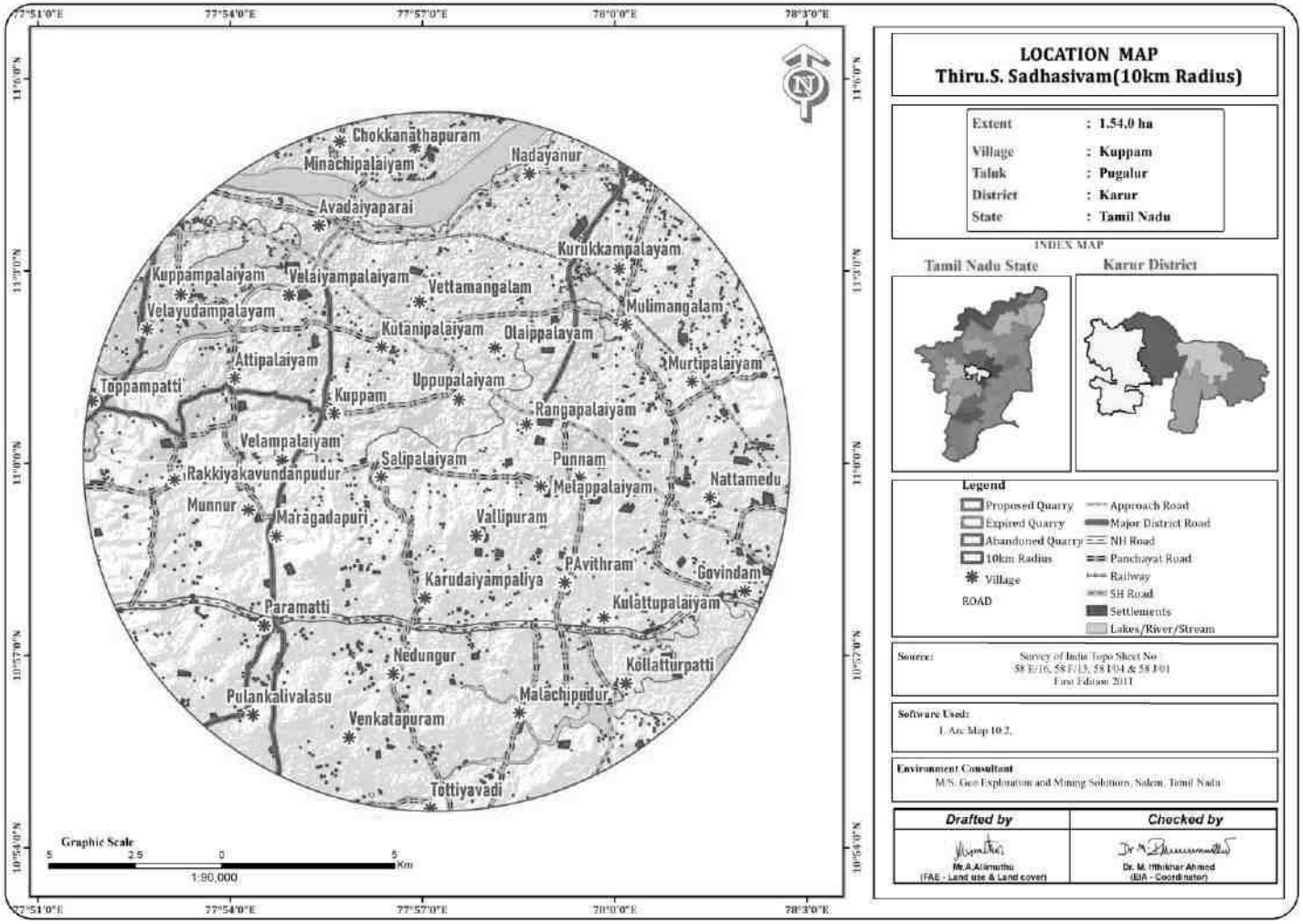
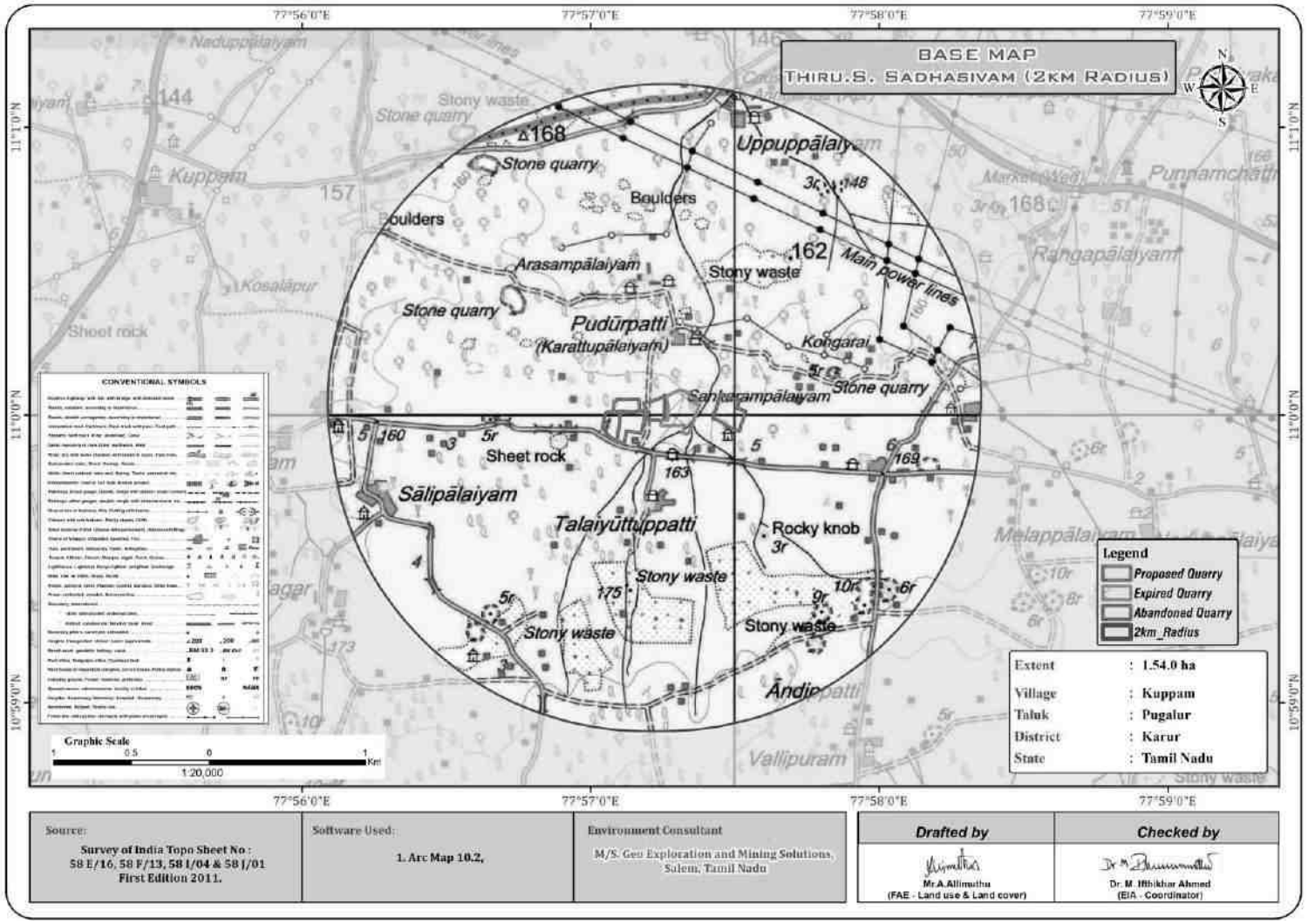


FIGURE 1.4: TOPOSHEET MAP OF THE STUDY AREA 2 km



1.4 ENVIRONMENTAL CLEARANCE

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

1. Screening,
2. Scoping
3. Public consultation &
4. Appraisal

SCREENING –

PROPOSAL

- The proponent applied for Rough Stone and Gravel Quarry Lease Dated: **22.07.2019**
- Precise Area Communication Letter was issued by the District Collector, Karur **Rc.No.428/Mines/2019, Dated: 19.06.2020.**
- The Mining Plan was prepared by Recognized Qualified Person and approved by Assistant Director, Geology and Mining, Karur District, vide **R.c.No.428/Mines/2019, Dated: 23.09.2020.**
- The proposed project falls under "B1" Category as per Order Dated: 04.09.2018 & 13.09.2018 passed by Hon'ble National Green tribunal, New Delhi in O.A. No. 173 of 2018 & O.A. No, 186 of 2016 and MoEF & CC Office Memorandum F. No. L-11011/175/2018-IA-II (M) Dated: 12.12.2018
- Proponent applied for ToR for Environmental Clearance vides online Proposal No. SIA/TN/MIN/62991/2021

PUBLIC CONSULTATION –

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

APPRAISAL

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

The report has been prepared using the following references:

- Guidance Manual of Environmental Impact Assessment for Mining of Minerals, Ministry of Environment and Forests, February, 2010
- EIA Notification, 14thSeptember, 2006
- Letter No SEIAA-TN/F.No.8566/ToR-1280/2022 Dated: 08.10.2022 for Proposal.
- Approved Mining Plan of Respective Proposed Projects.

1.5 TERMS OF REFERENCE (ToR)

Compliance to ToR issued vide –

- Letter No SEIAA-TN/F.No.8566/ToR-1280/2022 Dated: 08.10.2022 for Proposal.

Are detailed in Page No. I – XLIX.

1.6 POST ENVIRONMENT CLEARANCE MONITORING

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

1.7 GENERIC STRUCTURE OF EIA DOCUMENT

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

1.8 THE SCOPE OF THE STUDY

The main scope of the EIA study is to quantify the cumulative impact in the study area due to cluster quarries and formulate the effective mitigation measures for 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 Pre monsoon season (Oct-Dec 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 1.4: 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 8 locations (2 Core & 6 Buffer)
2	Meteorology	Wind speed and direction, temperature, relative humidity and rainfall	Near project site continuous for three months with hourly recording and from secondary sources of IMD station
3	Water quality	Physical, Chemical and Bacteriological parameters	Grab samples were collected at 7 locations – 5 Ground water and 2 Surface 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)	8 locations (2 Core & 6 Buffer) – data monitored once for 24 hours during EIA study
6	Soil Characteristics	Physical and Chemical Parameters	Once at 6 locations during study period
7	Land use	Existing land use for different categories	Based on Survey of India topographical sheet and satellite imagery and primary survey.
8	Socio-Economic Aspects	Socio-economic and demographic characteristics, worker characteristics	Based on primary survey and secondary sources data like census of India 2011.
9	Hydrology	Drainage pattern of the area, nature of streams, aquifer characteristics, recharge and discharge areas	Based on data collected from secondary sources as well as hydro-geology study report prepared.
10	Risk assessment and Disaster Management Plan	Identify areas where disaster can occur by fires and explosions and release of toxic substances	Based on the findings of Risk analysis done for the risk associated with mining.

Source: Onsite Monitoring Data/Sampling by Laboratories, the data has been collected as per the requirement of the ToR issued by SEIAA – TN.

1.8.1 Regulatory Compliance & Applicable Laws/Regulations for 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
- Letter No SEIAA-TN/F.No.8566/ToR-1280/2022 Dated: 08.10.2022 for Proposal.

2. PROJECT DESCRIPTION

2.0 GENERAL

The Proposed Rough Stone and Gravel Quarry required Environmental Clearance. There are four (4) proposed, (1)Expired and (1) Abandoned Quarries forming a cluster; calculated as per MoEF & CC Notification S.O. 2269(E) Dated 1st July 2016 and the total extent of cluster is 7.83.5 ha.

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

2.1 DESCRIPTION OF THE PROJECT

The proposed project is site specific and there is no additional area required for the project. There is no effluent generation/discharge from the proposed quarries, Rough Stone and gravel is proposed to be excavated by Conventional opencast Manual method involving splitting of rock mass of considerable volume from the parent rock mass by using hammer, chisel and Mild blasting like expandable chemicals will be used for loading the Rough Stone in to the tippers from pit head to the needy Customers

2.2 LOCATION OF THE PROJECT

- The area is located in **S.F.No's.211/1 & 211/2 of Kuppam Village, Pugalur Taluk, Karur District, Tamil Nadu State.**
- The entire quarry lease area falls in the Patta land, the lease applied area is exhibits Plain topography.
- The Altitude of the area is **172m (**Maximum) above MSL
- The area is mentioned in GSI Topo sheet No. 58 - E/16
- The Latitude between of **10°59'58.89" N to 11°00'04.13" N**
- The Longitude between of **77°57'11.01" E to 77°57'15.51" E** on WGS 1984datum

TABLE 2.1: SITE CONNECTIVITY

Nearest Roadway	NH-81- Karur-Kangeyam- 5.0km-SW SH-84 - Erode – Karur – 2.5 km-NE MDR– 332 – Paramathy – Noyyal Road – 3.5 km – NW
Nearest Village	Kuppam – 2.0Km - W
Nearest Town	Pugalur - 9 Km – NE
Nearest Railway	Karur Junction - 14 Km – SE
Nearest Airport	Trichy – 85km-SE
Seaport	Kochin Port-220km – SW
Interstate Boundary	Tamilnadu-Kerala-126km-W

Source: Survey of India Toposheet

TABLE 2.2: BOUNDARY CO-ORDINATES OF PROPOSED PROJECT

Geocoordinates of Boundary Pillar		
Boundary Pillar No.	**Latitude**	**Longitude**
1	**10°59'58.89"N**	**77°57'11.60"E**
2	**11° 00'00.95"N**	**77°57'11.66"E**
3	**11° 00'02.41"N**	**77°57'11.01"E**
4	**11° 00'03.18"N**	**77°57'13.69"E**
5	**11° 00'03.63"N**	**77°57'14.78"E**
6	**11° 00'04.13"N**	**77°57'15.51"E**
7	**10°59'58.93"N**	**77°57'15.31"E**
8	**10°59'58.91"N**	**77°57'14.99"E**

Source:ApprovedMiningPlans Datum: UTM-WGS84

FIGURE 2.1: GOOGLE IMAGE OF THE PROJECT AREA – PROPOSAL

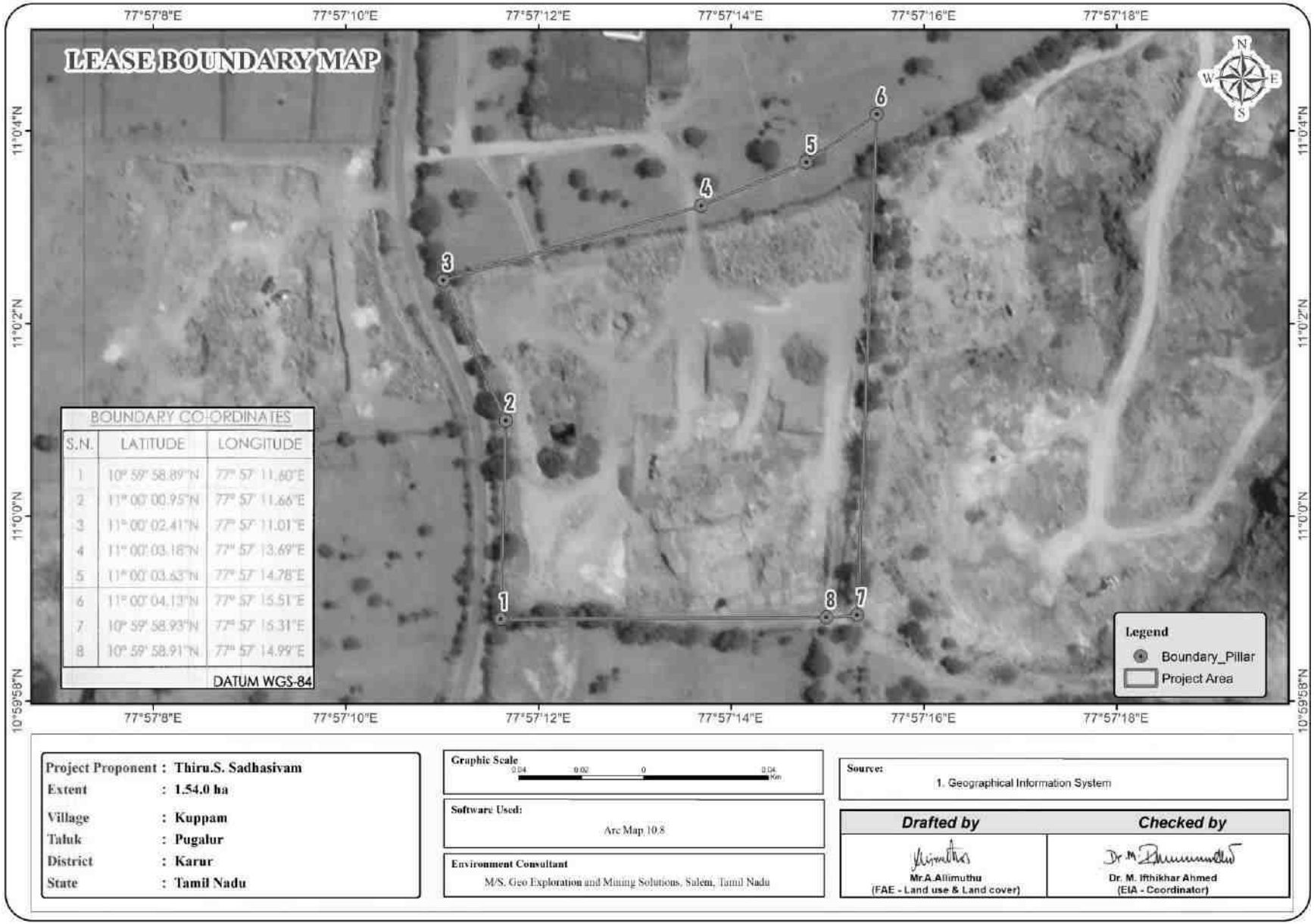


FIGURE 2.2: QUARRY LEASE PLAN / SURFACE PLAN

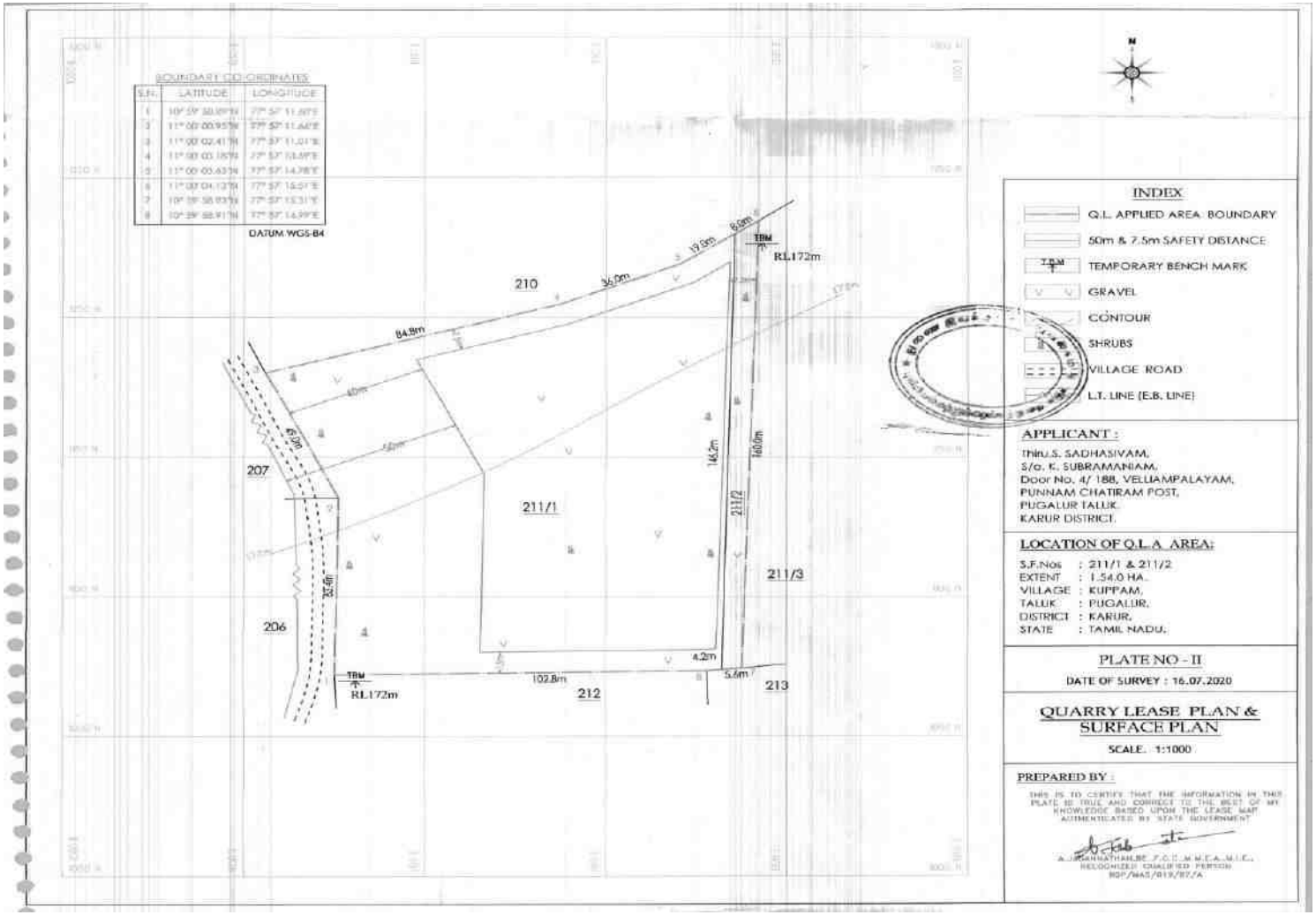


FIGURE 2.3: GOOGLE EARTH IMAGE SHOWING OVERLAY OF CADASTRAL MAP AROUND 500M RADIUS

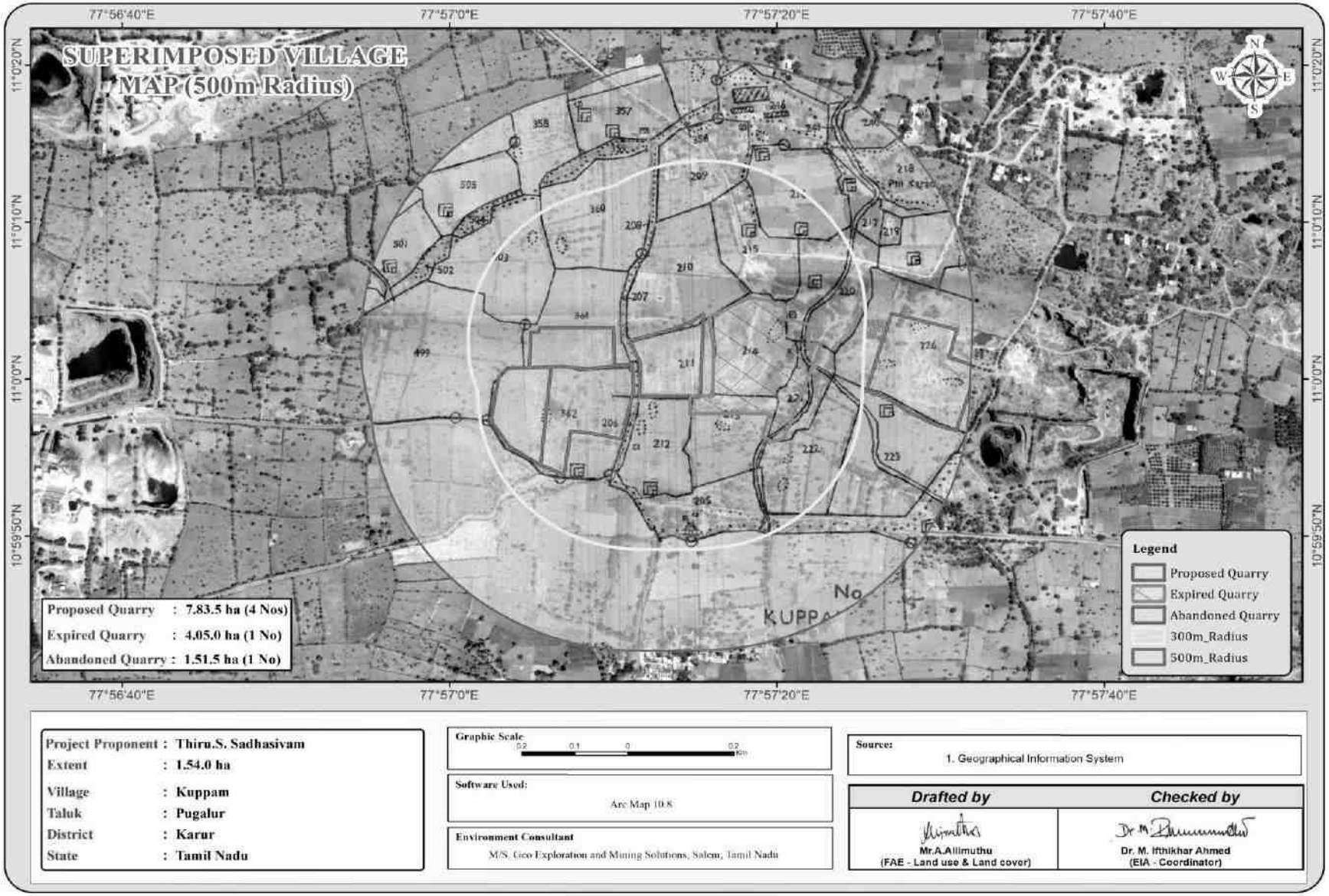


FIGURE 2.4: IMAGE SHOWING SURFACE FEATURES AROUND 10 KM RADIUS

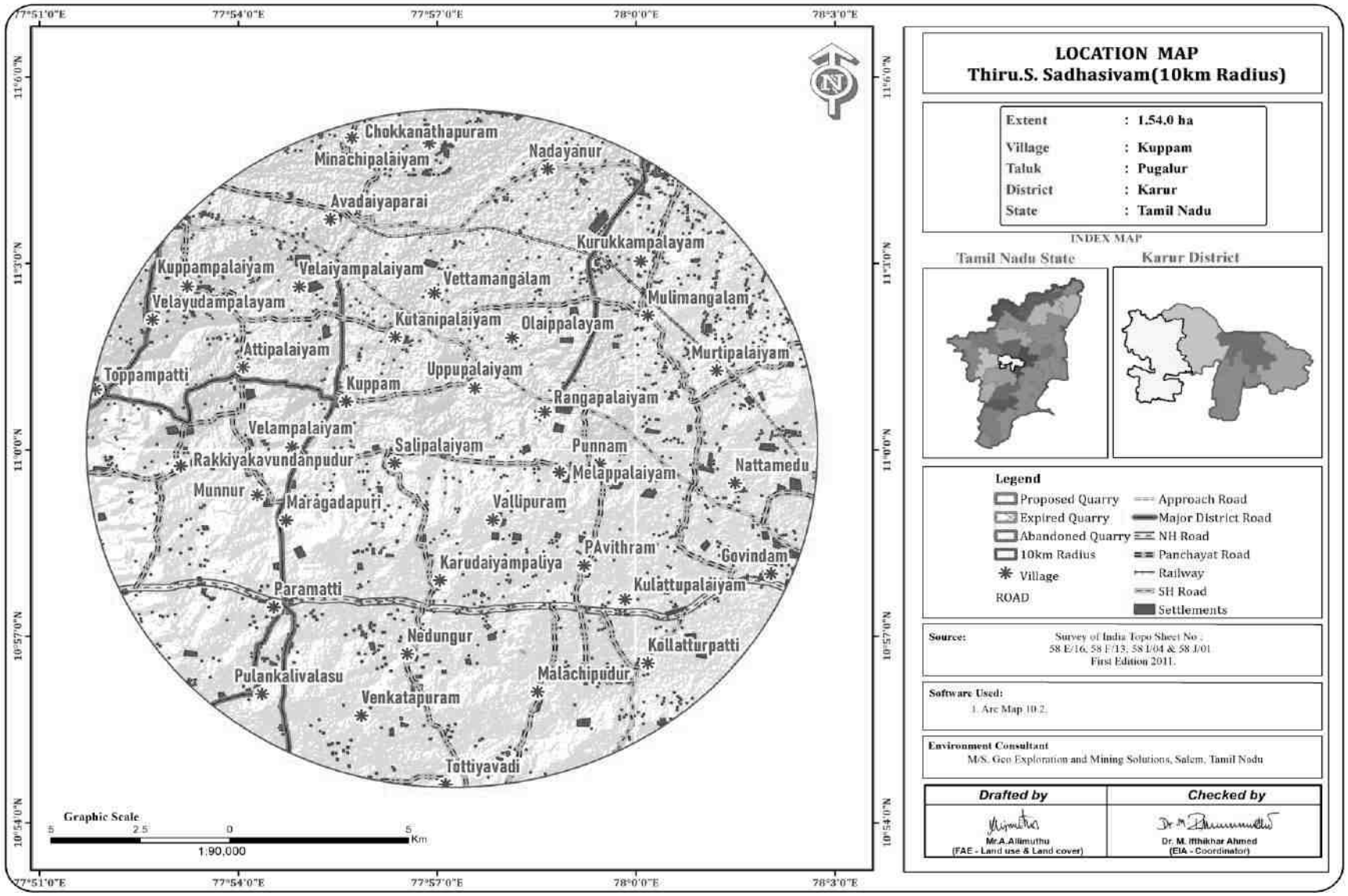


FIGURE 2.5: IMAGE SHOWING SURFACE FEATURES AROUND 5KM RADIUS

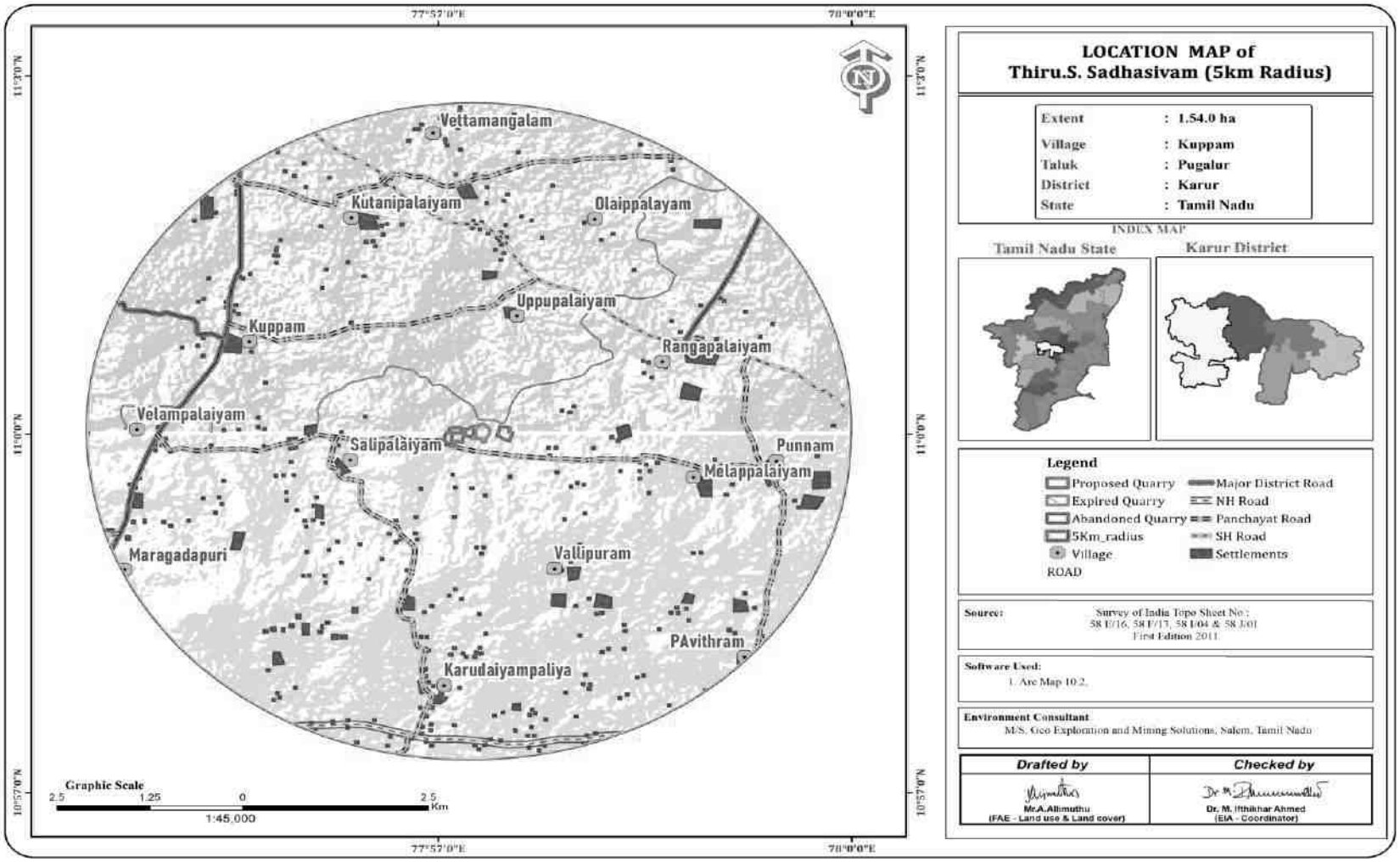
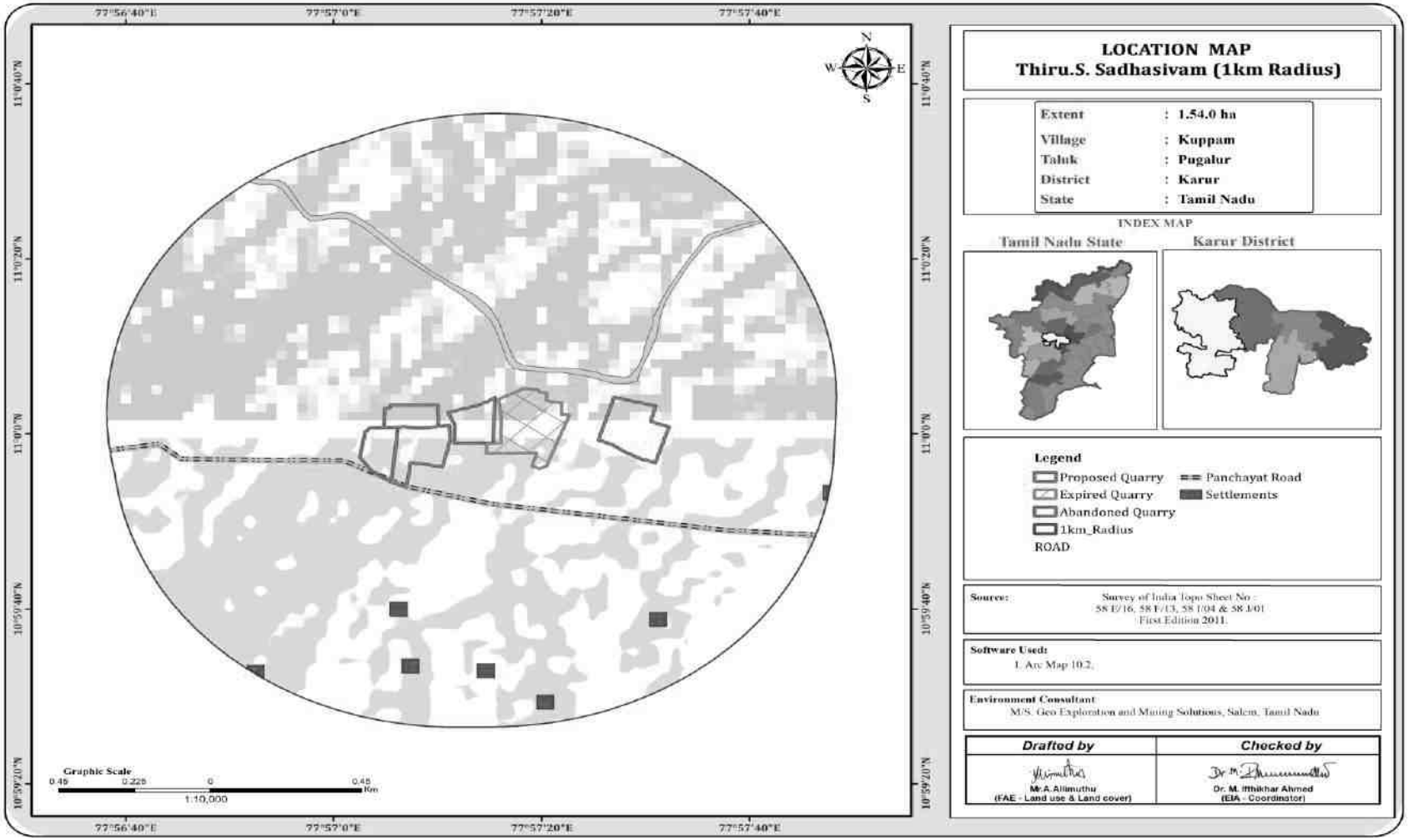


FIGURE 2.6: IMAGE SHOWING SURFACE FEATURES AROUND 1 KM RADIUS



2.2.1 Project Area

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

TABLE 2.3: LAND USE PATTERN OF THE PROPOSED PROJECTS

Description	***Present area (Ha)***	***Area at the end of this quarrying period (Ha)***
Area under quarrying	Nil	0.84.0
Infrastructure	Nil	0.01.0
Roads	Nil	0.02.0
Green Belt	Nil	0.08.0
Unutilized Area	1.54.0	0.59.0
Grand Total	**1.54.0**	**1.54.0**

Source: Approved Mining Plans of respective Proposals

2.2.2 Size or Magnitude of Operation

TABLE 2.4: OPERATIONAL DETAILS FOR PROPOSED PROJECTS

PROPOSAL		
PARTICULARS	**DETAILS**	
	Rough Stone (5Year Plan period)	**Gravel (3 Years Plan period)**
Geological Resources in m^3	77,000	30,800
Mineable Reserves in m^3	35,230	16,270
Yearwise Production in m^3	28,430	16,270
Mining Plan Period	5 Years	
Number of Working Days	300 Days	
Production per day in m^3	**19**	**18**
No of Lorry loads ($6m^3$ per load)	**3**	**3**
Total Depth of Mining	Depth of 7m (2m Gravel + 5m Rough Stone)	

Source:ApprovedMiningPlans

2.3 GEOLOGY

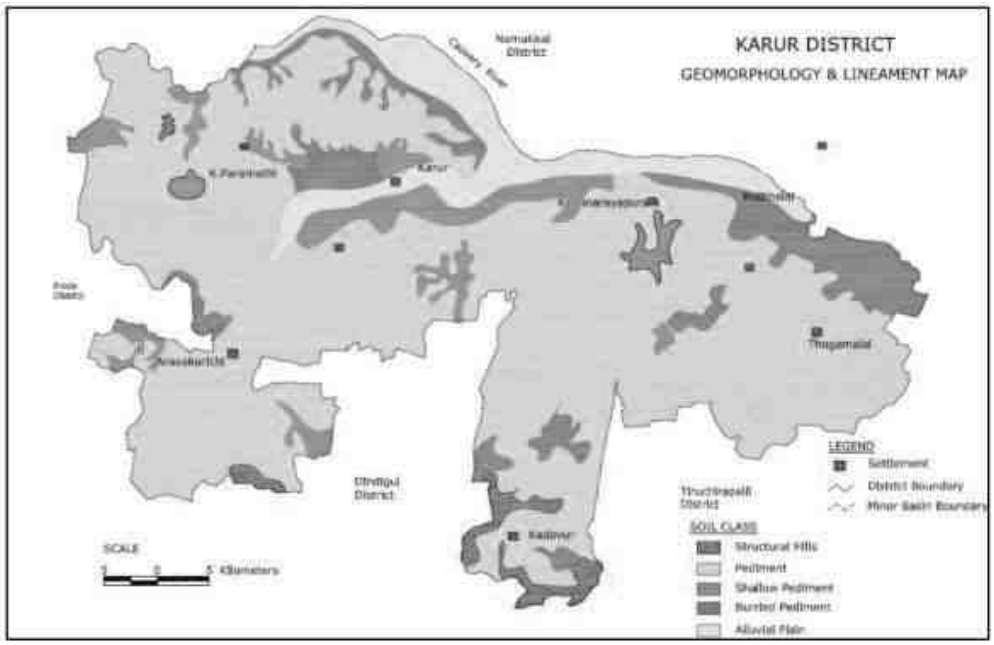
2.3.1 Peninsular gneiss forms the oldest rock formations, in which the massive formation of Charnockite lies over with rich accumulation of recent quaternary formation. On the regional scale of the Charnockite body is N70°E – S70°W with dipping towards SE60º.

Regional stratigraphic sequence:

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

Geomorphology

The entire area of the district is a pediplain. The Rangamalai hills and Kadavurhills occurring in the southern side of the district constitutes the remnants of the much-denuded Eastern Ghats and rise to heights of over 1031m above mean sea level. There are numerous small residual hills represented by Ayyarmalai, Thanthonimalai and Velayuthampalayam hills. The generalelevation of the area is ranging between 100 m and 200m above mean sealevel. The prominent geomorphic units identified in the districtthroughinterpretation of Satellite imagery are 1) Structural hill, 2) Pediments, 3) Shallow Pediments, 4) Buried Pediments and 5) Alluvial plain. An overall appraisal of groundwater occurrence in each geomorphic unit and the significance of its hydro geological characters are given, geomorphology and lineament details are given.

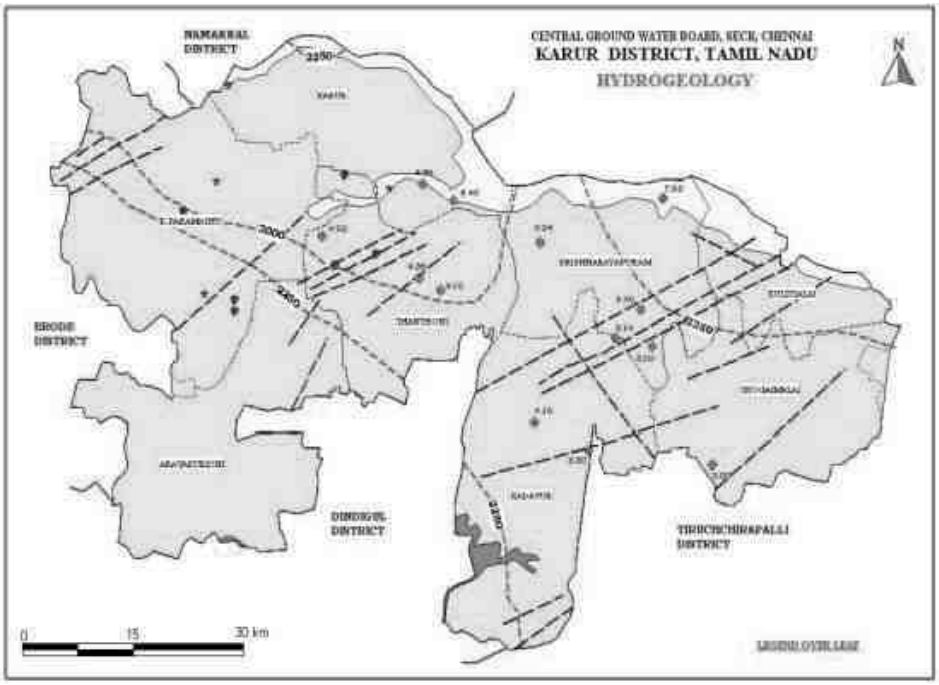


2.3.2 Local Geology:-

Geologically, the entire district can be classified into hard rock and sedimentary formations. Hard rock Formation: - More than 90 percent of thedistrict is underlain by hard rock of Archaean age. The gneissic type of Formation is the major formation among the various types of hard rocks. Charnockite occurs in this district as pockets in Karur and Aravakurichitaluks.Quartzites which are resistant to weathering are also seen as patches inCharnockite and gneissic varieties and theabove rock types are shown inFigure 3.5. Sedimentary Formation: - Recent alluvial deposits such as sand,silt, clay, gravel etc. which are transported sediments by river are found one other side of Cauvery river in Karur,KrishnarayapuramandKulithalaiblocks.These formations are overlying the hard rock.

2.3.3 Hydrogeology

Karur district is underlain entirely by Archaean Crystalline formations with Recent alluvial deposits occurring along the river and streams courses. Weathered, fissured andfracturedcrystallinerocksandtherecentalluvialdepositsconstitutethe important aquifer systems in thedistrict. The hard consolidated crystalline rocks of Archaean age represent weathered, fissured and fractured formations of gneisses, granites, charnockites and other associated rocks. The Specific capacity of large diameter wells tested in crystalline rocks from 31 to 200 lpm / m. of drawdown. The yield characteristics of wells vary considerably depending on the topographic set-up, lithology and the degree of weathering..Source: https://karur.nic.in/departments/geology-mining/



Aquifer Systems:

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

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

Aquifer Parameters

More or less, 90 percent of Karur district is covered by crystalline formation of Archaean age. The thickness of aquifer in hard rock formation varies from 15 to 35 m. The inter granular porosity is essentially depend upon the intensity and degree of weathering and fracture development in the bed rock. Deep weathering is developed in gneissic formations and moderate weathering in charnockite formation. The alluvial formation stretches mainly along the rivcer course of Cauvery. The aquifer parameters of the formations hard rock and alluvium are furnished in the table below.

TABLE 2.5: RANGE OF AQUIFER PARAMETERS

Name	Specific Yield (%)	T (m^2 /d)	Permeability K (m/day)	Yield of wells (lps)
Alluvium	**6.8**	**45-205**	**2-4.5**	**8.3 to 16.66**
Hard Rock	**0.7-2.3**	**28-75**	**5-9**	**1.66 to 2.5**

FIGURE 2.7: REGIONAL GEOLOGY MAP

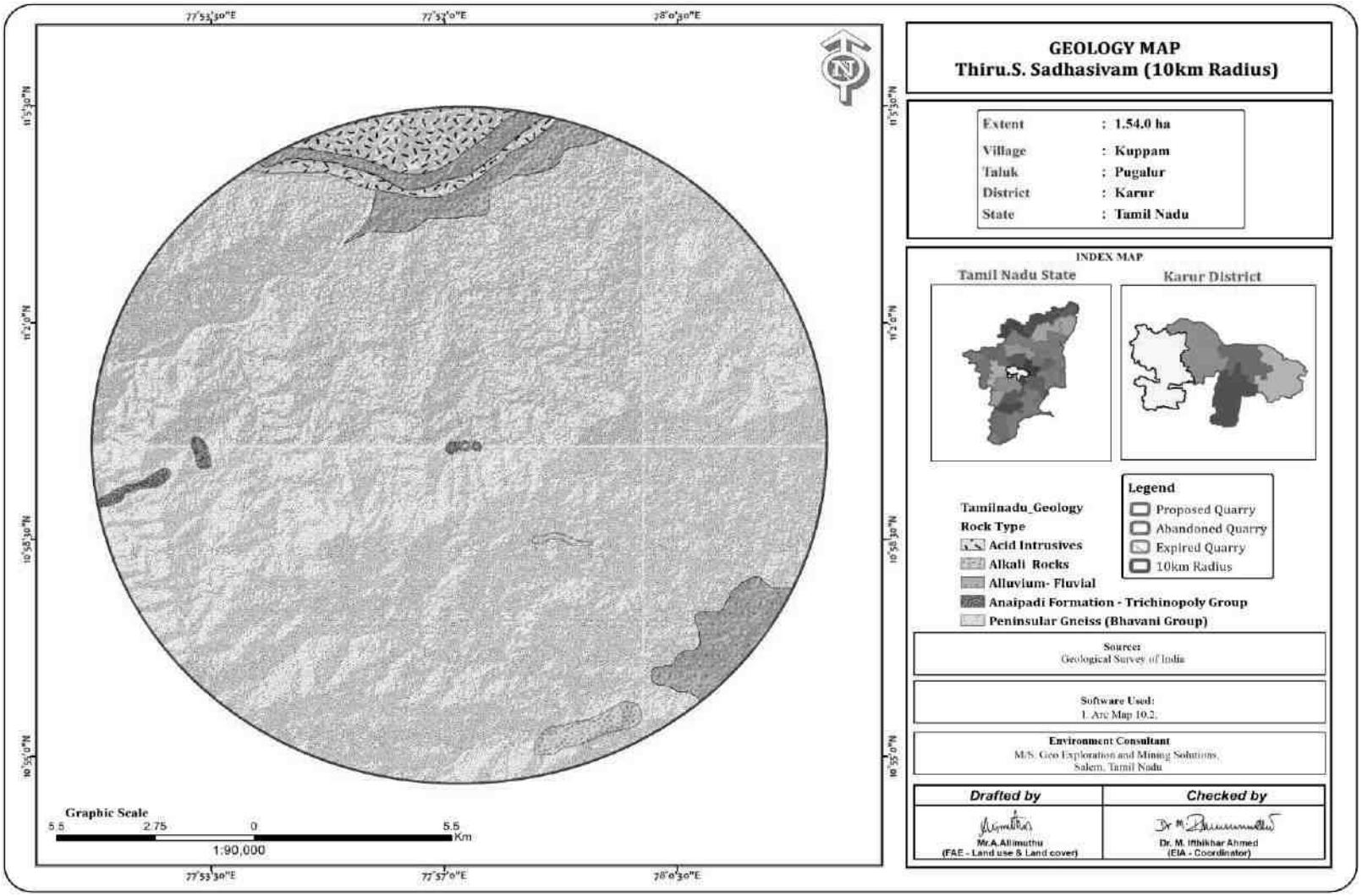


FIGURE 2.8: GEOMORPHOLOGY MAP

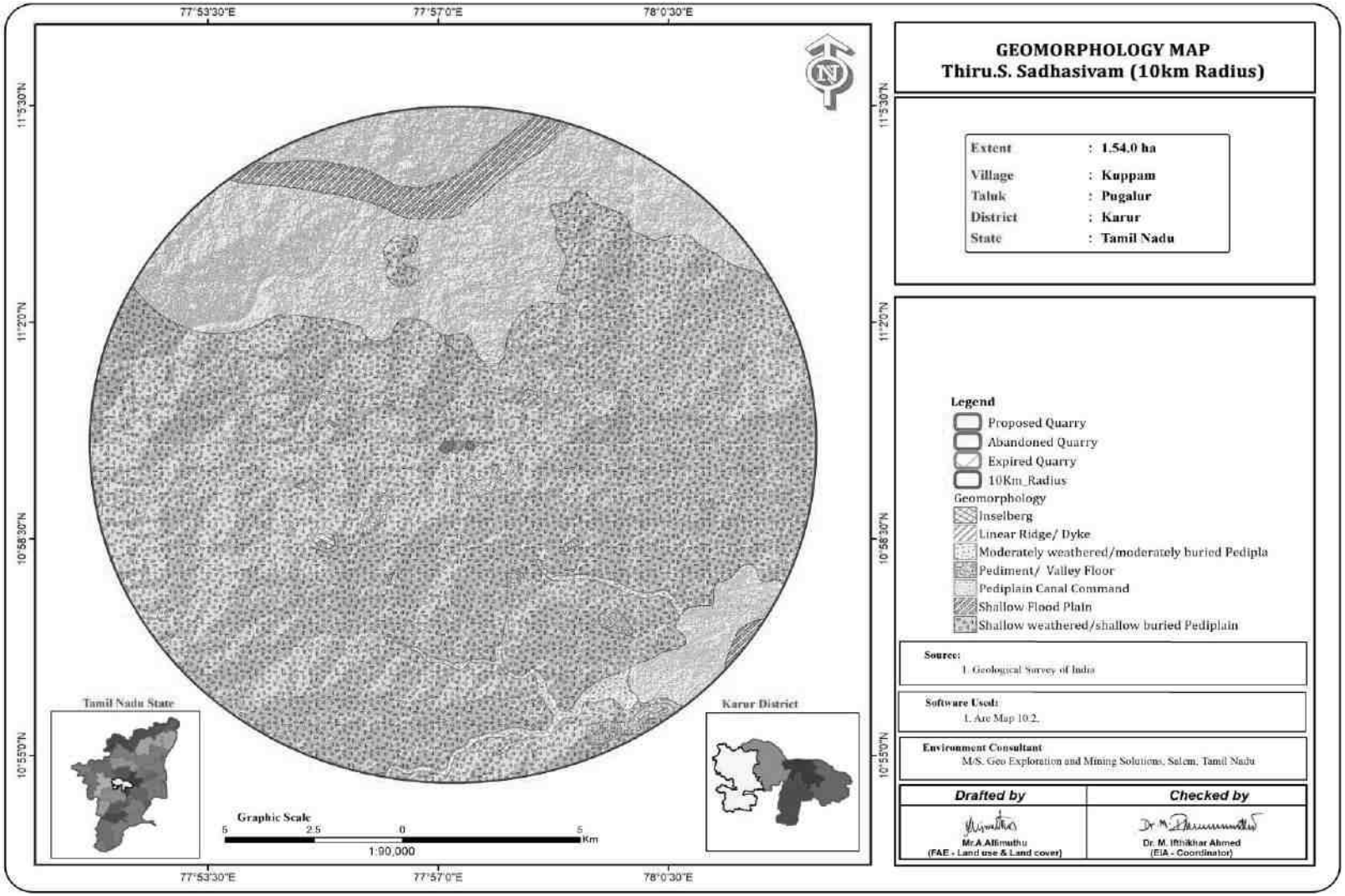


FIGURE 2.9: TOPOGRAPHY, GEOLOGICAL, YEAR-WISE DEVELOPMENT PRODUCTION PLAN AND SECTIONS – PROPOSAL

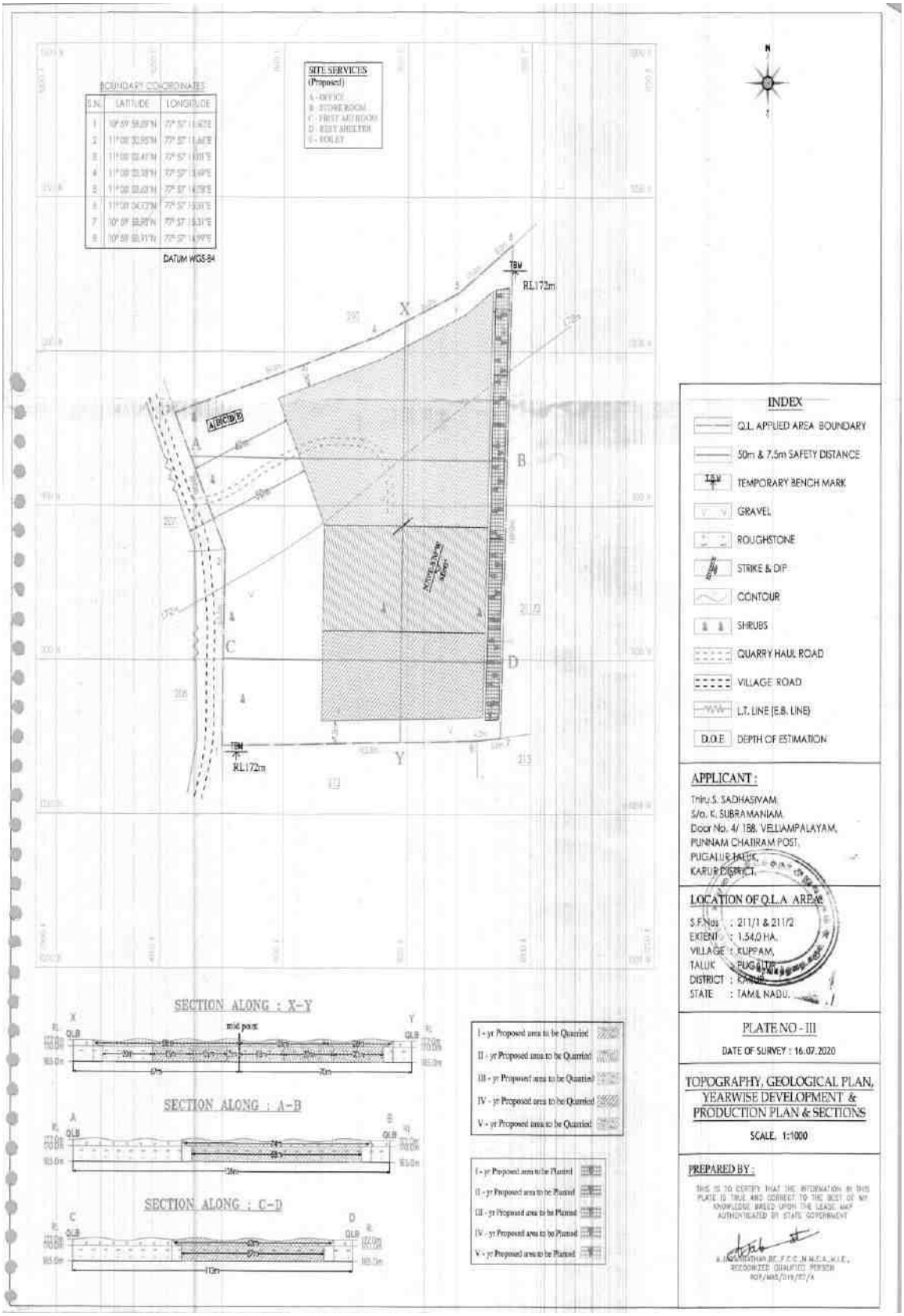
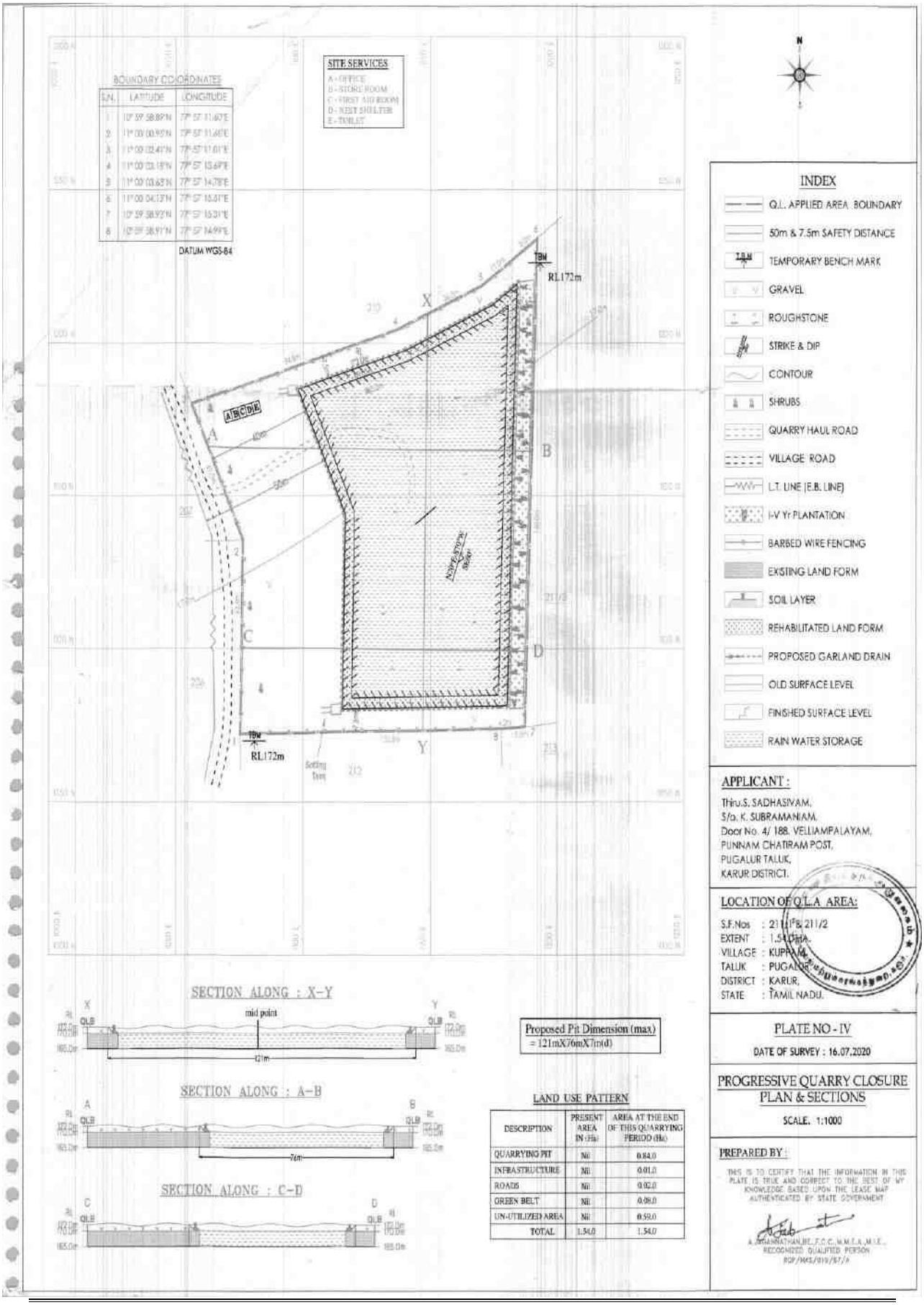


FIGURE 2.10: CLOSURE PLAN AND SECTIONS – PROPOSAL



2.4 RESOURCES AND RESERVES

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

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

TABLE 2.6: AVAILABLE GEOLOGICAL RESOURCES OF PROPOSED PROJECT

PROPOSAL		
	Rough Stone	**Gravel**
Geological Resource in m^3	77,300	30,800
Mineable Resource in m^3	35,230	16,270

Source: Approved Mining Plan

TABLE 2.7: YEAR-WISE PRODUCTION PLAN

Year	***Rough Stone In M^3***	***Gravel In M^3***
1st	5700	3276
2nd	5700	4410
3rd	6830	8584
4th	5100	-
5th	5100	-
Total	**28430**	**16270**

Source: Approved Mining Plan

Disposal of Waste

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

Conceptual Mining Plan/ Final Mine Closure Plan

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

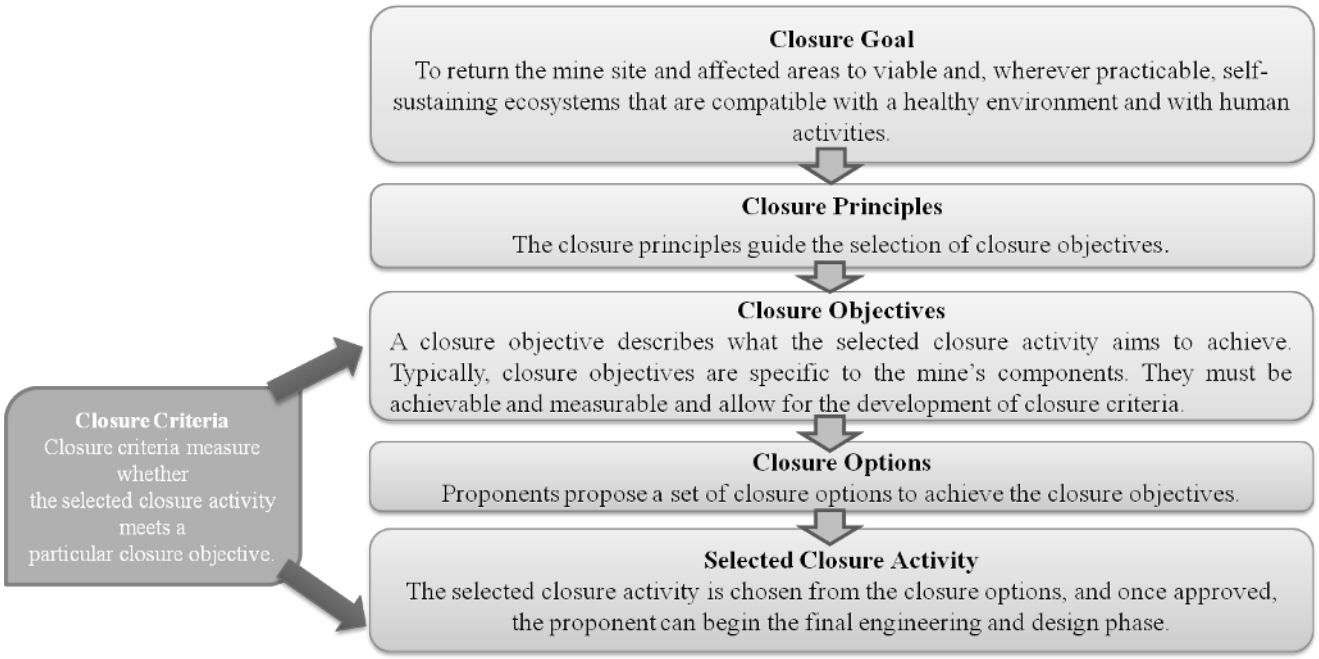
TABLE 2.8: EXISTING PIT DIMENSION

PROPOSAL			
Pit	**Length (Max) (m)**	**Width (Max) (m)**	**Depth (Max)**
I	121	76	7m bgl

Source: Approved Mining Plan

- At the end of life of mine, the excavated mine pit / void will act as artificial reservoir for collecting rain water and helps to meet out the demand or crises during drought season.

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

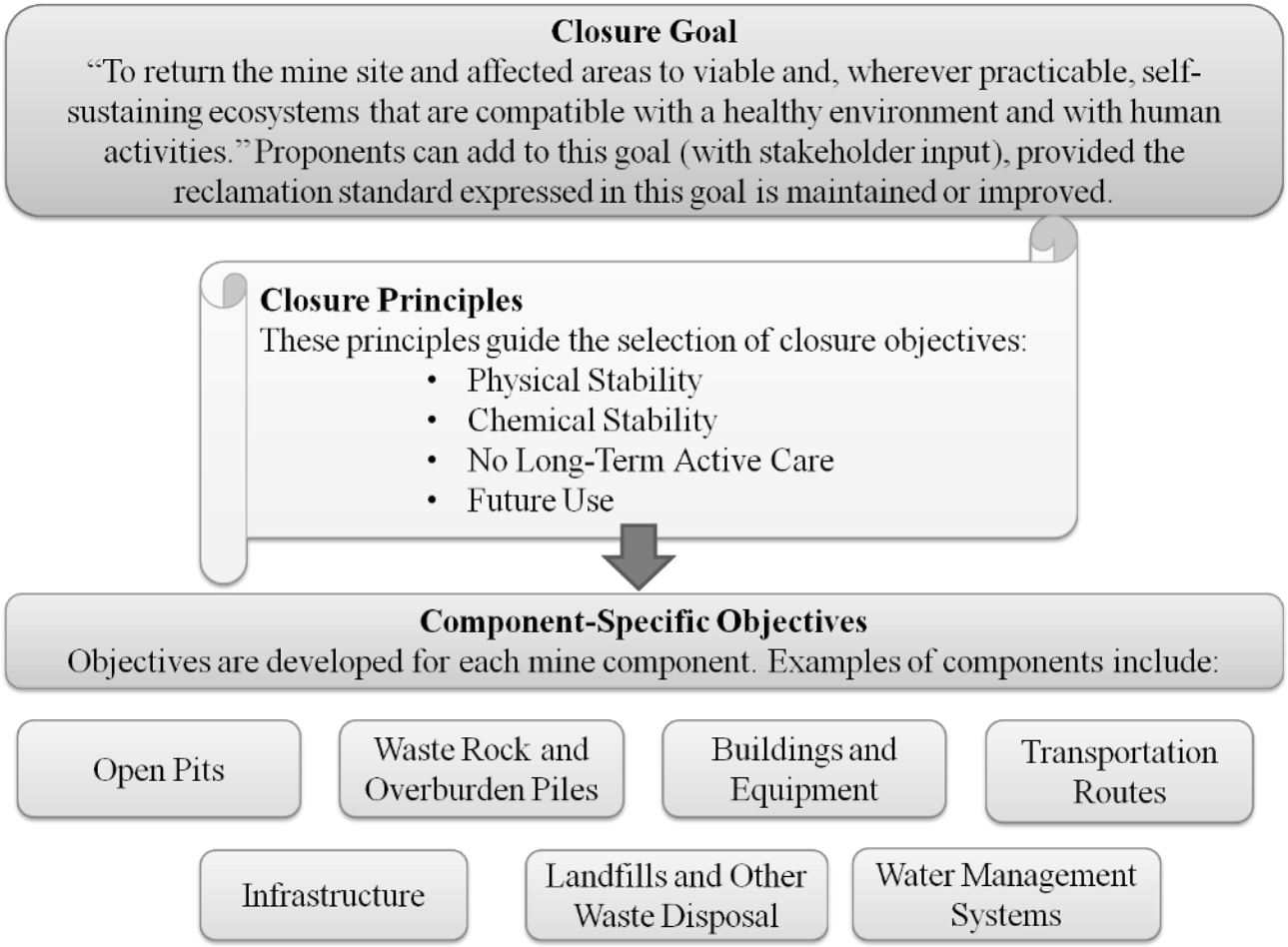


Closure Objectives –

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

Closure Planning & Options Considerations in Mine Design –

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



Post-Closure Monitoring –

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

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

TABLE 2.9: MINE CLOSURE BUDGET

ACTIVITY	YEAR					RATE	AMOUNT (INR)
	I	II	III	IV	V		
Plantation (In Nos.)	20	20	20	20	20	@100 Rs Per sapling Including Maintenance	Rs.10,000/-
Plantation & Maintenance Cost	2000	2000	2000	2000	2000		
Wire Fencing for 530 Mtrs length	159000					@300 Rs Per Meter	Rs.1,59,000/-
Garland Drain with settling traps for 410 Mtrs length	123000					@300 Rs Per Meter	Rs.1,23,000/-
Cost for Plantation in worked out benches	-	-	-	-	35000	@100 Rs Per sapling Including Maintenance	Rs.35,000/-
TOTAL							**Rs.3,27,000/-**

Source: Proposed by FAE's and EC

2.5 METHOD OF MINING

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

The top layer of Gravel will be Excavate directly by Hydraulic Excavators and facilitate to the needy customers. The Rough Stone is a batholith formation and the splitting of rock mass of considerable volume from the parent rock mass is proposed to be excavated by Conventional opencast Manual method involving splitting of rock mass of considerable volume from the parent rock mass by using hammer, chisel and Mild blasting like expandable chemicals will be used for loading the Rough Stone in to the tippers from pit head to the needy Customers.

2.5.1 Drilling & Blasting Parameters

There is no drilling and blasting in this quarry.

2.5.2 Extent of Mechanization

TABLE 2.10 PROPOSED MACHINERY DEPLOYMENT

PROPOSAL				
S.NO.	**TYPE**	**NOS**	**SIZE/CAPACITY**	**MOTIVE POWER**
1	Tippers / Dumpers	1	10 Tonnes	Diesel Drive

Source: Approved Mining Plans

2.6 GENERAL FEATURES

2.6.1 Existing Infrastructures

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

2.6.2 Drainage Pattern

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

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

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

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

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 National Highway Road – 1. Coimbatore – Chidambaram on Southern Side of the Cluster and State Highway Connecting to 2. Erode – Karur on North Side.

Traffic density measurements were performed at two locations

1. Pullaiyampalayam- Andisangliapuram -East Side
2. Paramathi-Kuppam Road -NW

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

simultaneously at each station during each shift- one person on either direction for counting the traffic. At the end of each hour, fresh counting and recording was undertaken.

TABLE.2.11: TRAFFIC SURVEY LOCATIONS

Station Code	Road Name	Distance and Direction	Type of Road
TS1	Punnam Panchayat Road	2.5km West	Panchayat Road
TS2	Noyyal Major District Road	4.5km NW	District road (two Lane)

Source: On-site monitoring by GEMS FAE & TM

TABLE 2.12: EXISTING TRAFFIC VOLUME

Station code	HMV		LMV		2/3 Wheelers		Total PCU
	No	PCU	No	PCU	No	PCU	
TS1	166	498	135	135	350	350	983
TS2	145	435	110	110	400	400	945

Source: On-site monitoring by GEMS FAE & TM

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

TABLE 2.13: ROUGH STONE & GRAVEL HOURLY TRANSPORTATION REQUIREMENT

Transportation of Rough Stone & Gravel per day		
Capacity of trucks	No. of Trips per day Cumulatively	Volume in PCU
10 tonnes	65	195

Source: Data analysed from Approved Mining Plan

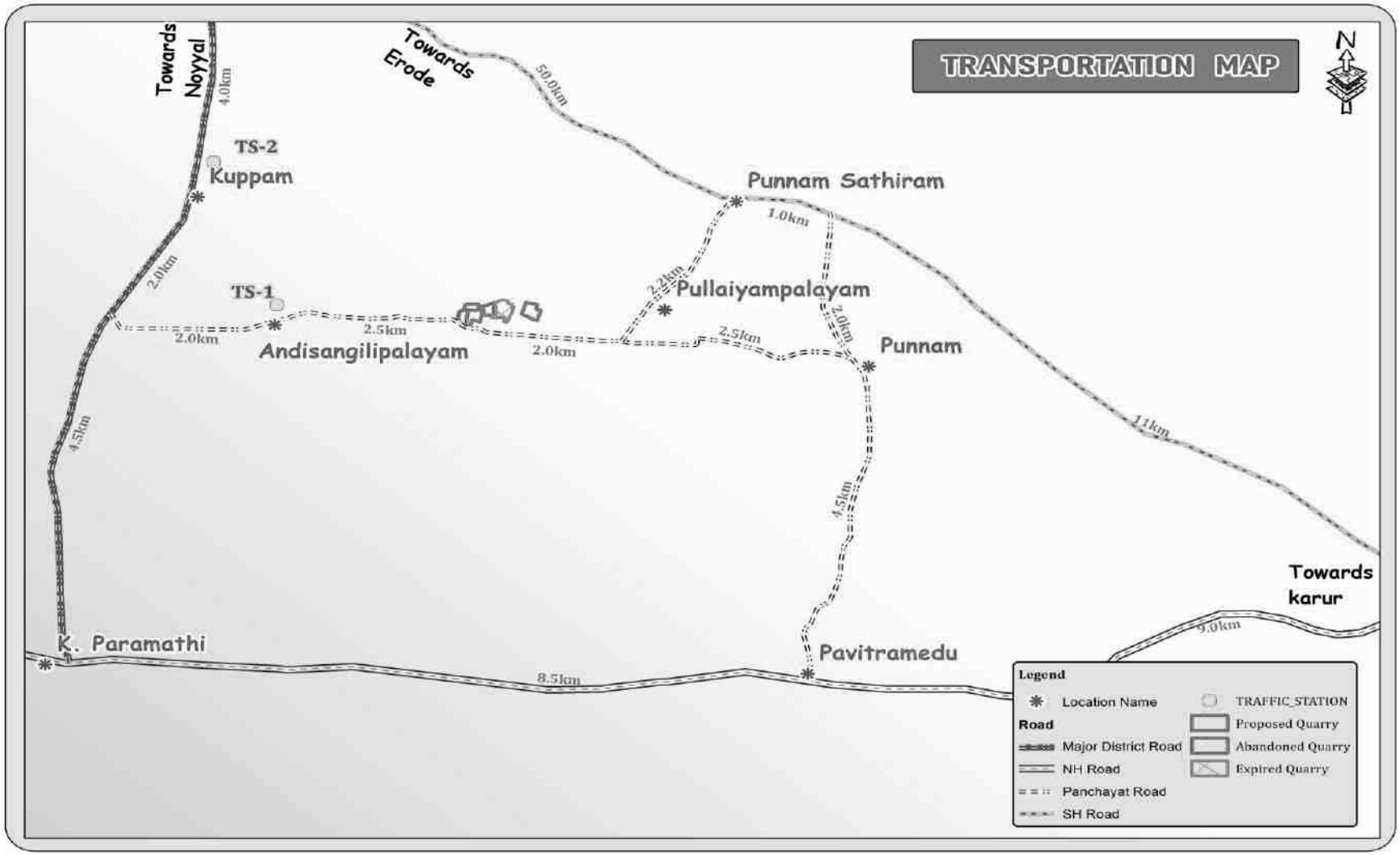
TABLE 2.14: SUMMARY OF TRAFFIC VOLUME

Route	Existing Traffic volume in PCU	Incremental traffic due to the project	Total traffic volume	Hourly Capacity in PCU as per (IRC – 1960 Guidelines)
Pullaiyampalayam- Andisangliapuram	983	195	1178	1500
Paramathi-Kuppam Road	945	195	1140	1200

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

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

FIGURE.2.11: MINERAL TRANSPORTATION ROUTE MAP



2.6.4 Mineral Beneficiation and Processing

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

2.7 PROJECT REQUIREMENT

2.7.1 Water Source & Requirement

Detail of water requirements in KLD as given below:

TABLE 2.15: WATER REQUIREMENT FOR THE PROJECT

PROPOSAL		
***Purpose**	**Quantity**	**Source**
Dust Suppression	1.0 KLD	From Existing bore wells from nearby area
Green Belt development	0.5 KLD	From Existing bore wells from nearby area
Domestic purpose	0.5 KLD	From existing, bore wells and drinking water will be sourced from Approved water vendors.
Total	**2.0 KLD**	

Source: Prefeasibility report

* Drinking water will be sourced from Approved Water Vendors

2.7.2 Power and Other Infrastructure Requirement

No proposed projects require power supply for the mining operations. The quarrying activity is proposed during day time only (General Shift 8 AM – 5 PM, Lunch Break 1 PM – 2 PM). Electricity for use in office and other internal infrastructure will be obtained from SEB by respective project proponent.

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

2.7.3 Fuel Requirement

High speed Diesel (HSD) will be used for quarrying machineries. Diesel will be brought from nearby Fuel Stations.

1. Gravel:

Per hour Excavator will consume = 10 liters / hour
Per hour Excavator will excavate = 60$m^3$of Gravel
Gravel quantity = 16,270/60 = 272hours
Diesel consume = 272hours x 10 liters
Total diesel consumption = **2,720** Liters of HSD will be utilized for Gravel

2. Rough stone:

Per hour Excavator will consume = 16 liters / hour
Per hour Excavator will excavate = 20$m^3$of Rough stone
Rough stone quantity = 28430/20 = 1422hours
Diesel consume = 1422 hours x 16 liters
Total diesel consumption = **22,752** Liters of HSD will be utilized for Rough stone

Total diesel consumption = **25,472** Liters of HSD will be utilized for entire project life

2.7.4 Project Cost

TABLE 2.16: PROJECT COST OF PROPOSED PROJECTS

PROPOSAL	
Project Cost	**Rs 25,78,000/-**

Source: Approved Mining Plan &Prefeasibility Report

2.8 EMPLOYMENT REQUIREMENT:

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

TABLE 2.17: PROPOSED MANPOWER DEPLOYMENT

Designation	No's
Mine official & Competent Persons	
Mate/Blaster	1
Man Power for Quarry operation and Loading	
Quarry operation and Loading	15
Chisel man	3
Tippers Driver	1
Ordinary Employee	
Helper	1
Cleaner	1
Security	1
Total	**23**

Source: Approved Mining Plans of respective Project

2.9 PROJECT IMPLEMENTATION SCHEDULE

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

TABLE 2.18: EXPECTED TIME SCHEDULE

Sl.No.	Particulars	Time Schedule (In Month)					Remarks if any
		1st	2nd	3rd	4th	5th	
1	Environmental Clearance						
2	Consent to Establish						Project Establishment Period
3	Consent to Operate						Production Start Period
Time line may vary; subjected to rules and regulations /& other unforeseen circumstances							

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

3. DESCRIPTION OF ENVIRONMENT

3.0 GENERAL

This chapter presents a regional background to the baseline data at the very onset, which will help in better appreciation of micro-level field data, generated on several environmental and ecological attributes of the study area. The baseline status of the project environment is described section wise for better understanding of the broad-spectrum conditions. The baseline environment quality represents the background environmental scenario of various environmental components such as Land, Water, Air, Noise, Biological and Socio-economic status of the study area. Field monitoring studies to evaluate the base line status of the project site were carried out covering **October, November and December 2022** with CPCB guidelines. Environmental data has been collected with reference to cluster quarries by Chennai Mettex Lab Pvt Ltd (Approved by AAI, AGMARK, APEDA, BIS, EIC, FSSAI, GAFTA, IOPEPC, MOEF & TEA BOARD) Jothi Complex, 83, M.K.N, Road, Guindy, Chennai – 600 032, Tamil Nadu, INDIALand

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

Study Area

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

Study Period

The baseline study was conducted during the Pre-monsoon season i.e., Oct to Dec 2022

Study Methodology

- The project area was surveyed in detail with the help of Total Station and the boundary pillars were picked up with the help of GPS. The boundary coordinates were superimposed on the satellite imagery to understand the relief of the area, besides Land use pattern of the area was studied through the Landsat8-9 OLI/TIRS C2- L2 - USGS-Earth Explorer2022
- Soil samples were collected and analysed for relevant physio-chemical characteristics, exchangeable Cations, nutrients & micro nutrients etc., in order to assess the impact due to mining activities and to recommend saplings for Greenbelt development
- Ground water samples were collected during the study period from the existing bore wells, while surface water was collected from ponds in the buffer zone. The samples were analysed for parameters necessary to determine water quality (based on IS: 10500:2012 criteria) and

those which are relevant from the point of view of environmental impact of the proposed mines

- A onsite meteorological station was setup in cluster area, to collect data about wind speed, wind direction, temperature, relative humidity, rainfall and general weather conditions were recorded throughout the study period
- In order to assess the Ambient Air Quality (AAQ), samples of ambient air were collected by installation of Respiratory Dust Samplers (RDS) for Fugitive dust, PM_{10} and SO_2, NO_X with gaseous attachments & Fine Dust Samplers (FDS) for $PM_{2.5}$ and other parameters as per NAAQ norms and analysed for primary air pollutants to work out the existing status of air quality.
- The Noise level measurements were also made at various locations in different intervals of time with the help of sound level meter to establish the baseline noise levels in the impact zone.
- Baseline biological studies were carried out to assess the ecology of the study area to study the existing flora and fauna pattern of the area.
- Socio-Economic survey was conducted at village and household level in the study area to understand the present socio-economic conditions and assess the extent of impact due to the proposed mining project.

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

TABLE 3.1: MONITORING ATTRIBUTES AND FREQUENCY OF MONITORING

Attribute	Parameters	Frequency of Monitoring	No. of Locations	Protocol
Land-use Land cover	Land-use Pattern within 10 km radius of the study area	Data's from census handbook 2011 and from the satellite imagery	Study Area	Satellite Imagery Primary Survey
*Soil	Physio-Chemical Characteristics	Once during the study period	6 (2 core & 4 buffer zone)	IS 2720 Agriculture Handbook - Indian Council of Agriculture Research, New Delhi
*Water Quality	Physical, Chemical and Bacteriological Parameters	Once during the study period	7 (2 surface water & 5 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 Fugitive Dust	24 hourly twice a week (March – May 2021)	8 (2 core & 6 buffer)	IS 5182 Part 1-23 National Ambient Air Quality Standards, CPCB

*Noise Levels	Ambient Noise	Hourly observation for 24 Hours per location	8 (2 core & 6 buffer zone)	IS 9989 As per CPCB Guidelines
Ecology	Existing Flora and Fauna	Through field visit during the study period	Study Area	Primary Survey by Quadrate & Transect Study Secondary Data – Forest Working Plan
Socio Economic Aspects	Socio–Economic Characteristics, Population Statistics and Existing Infrastructure in the study area	Site Visit & Census Handbook, 2011	Study Area	Primary Survey, census handbook & need based assessments.

Source: On-site monitoring/sampling by Chennai Mettex Lab Pvt Ltd in association with GEMS

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

3.1 LAND ENVIRONMENT

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

3.1.1 LAND USE/ LAND COVER

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 **Generic ToR point no. 4 (ix) and ToR Point no. 4 Stating**:

Point No. 4(ix)."A list of major industries with name and type within the study area (10 km radius) shall be incorporated. Land use details of the study area".

Point No. 4. "Present land use shall be prepared based on satellite imagery. High-resolution satellite image data having 1m - 5m spatial resolution like a quick bird, Ikonos, IRS P-6 pan-sharpened, etc. for the 10 km radius area from the proposed site. The same should be used for land used / land-cover mapping of the area.

3.1.2 OBJECTIVE

The objectives of the LULC study are as follow:

- Preparation of land use and land cover map using the extent of the project and study area.
- Identification and marking of important basic features according to primary and secondary data.
- Evaluation of the impact on existing land use of the project area.
- Mitigative measures for conservation and sustainable use of land

Technical specification of Satellite imagery Data Used:

- Satellite Image - Landsat8-9-C2-Level1-OLI-TIRS sensor- spatial resolution - 30m
- Satellite Data Source - USGS-Earth Explorer
- Satellite Vintage - 14th March 2022, Path/Row: 143/052
- SOI Toposheet No - 58E/16
- Software Used - ArcGIS 10.8

The satellite image (Natural color 4,3,2) 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. Landsat8-9 data offers a spatial resolution of 30m and a 185 km wide swath of the earth in 15-30m resolution covering wide areas the data is collected in 11 visible bands namely band number and Resolution.

TABLE 3.2: LANDSAT-8-9-C2-L1 OPERATIONAL LAND IMAGER & THERMAL INFRARED SENSOR

Band Number	Description	Wavelength	Resolution
Band 1	Coastal / Aerosol	0.433 to 0.453 µm	30 meter
Band 2	Visible blue	0.450 to 0.515 µm	30 meter
Band 3	Visible green	0.525 to 0.600 µm	30 meter
Band 4	Visible red	0.630 to 0.680 µm	30 meter
Band 5	Near-infrared	0.845 to 0.885 µm	30 meter
Band 6	Short wavelength infrared	1.56 to 1.66 µm	30 meter
Band 7	Short wavelength infrared	2.10 to 2.30 µm	60 meter
Band 8	Panchromatic	0.50 to 0.68 µm	15 meter
Band 9	Cirrus	1.36 to 1.39 µm	30 meter
Band 10	Long wavelength infrared	10.3 to 11.3 µm	100 meter
Band 11	Long wavelength infrared	11.5 to 12.5 µm	100 meter

Source: USGS-Earth Explorer 2022

3.1.3 METHODOLOGY

- Preliminary/primary data collection of the study area
- Satellite data procurement from USGS-Earth Explorer
- 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 - 3.2

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

Sno	Landuse/Landcover	Area (Hect's)	Area in %
1	Existing quarries	1315.02	4.11
2	Waterbodies	204.91	0.64
3	River sand	189.39	0.59
4	Agriculture Land	4901.43	15.32
5	Dry Agriculture Land	432.64	1.35
6	Builtup Land	7364.68	23.01
7	Industry Land	1319.36	4.12
8	Non-agriculture Land	16273.00	50.85
	Total	**32000.44**	**100**

Source: USGS-Earth Explorer, LU/LC Map for Buffer Zone.

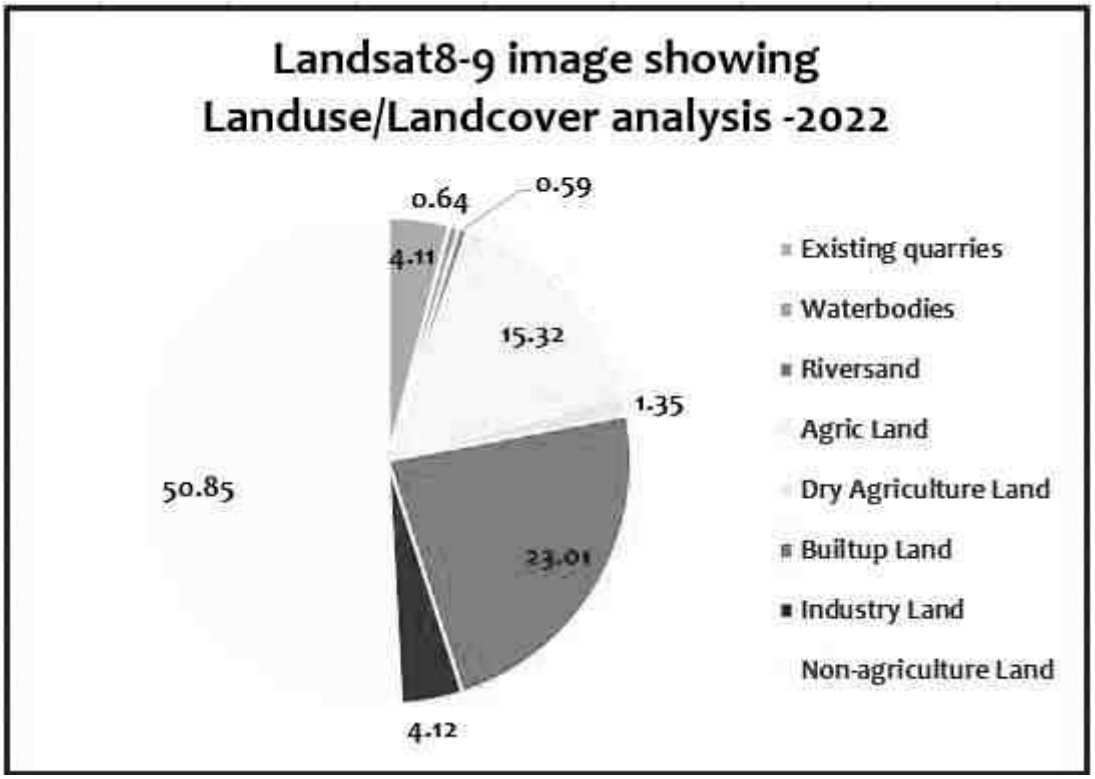


FIGURE 3.1: CHART SHOWING LANDUSE/LANDCOVER ANALYSIS USING LANDSAT8-9 DATA.

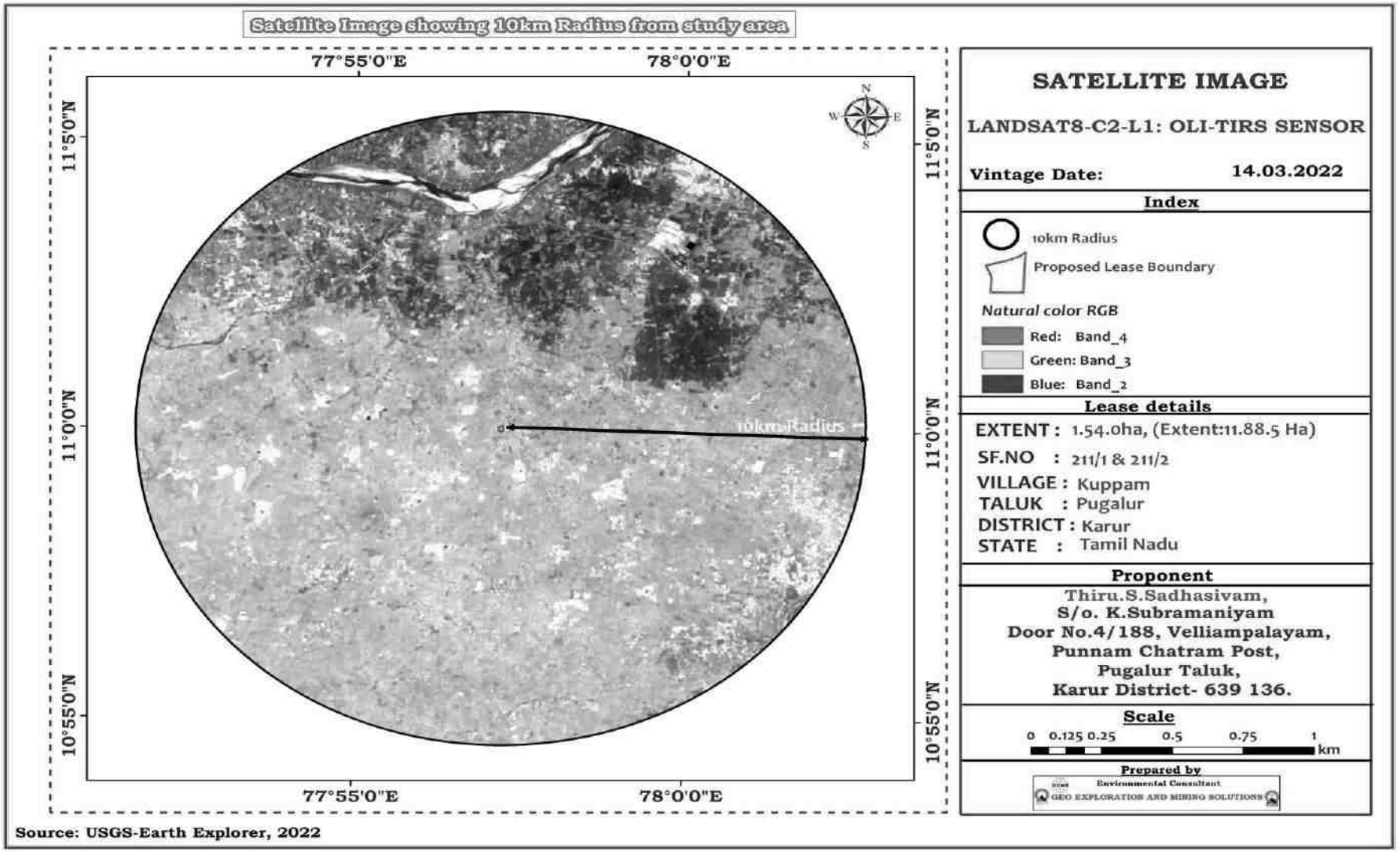


FIGURE 3.2: MAP SHOWING NATURAL COLOUR COMPOSITE (4,3,2) SATELLITE IMAGERY OF THE STUDY AREA

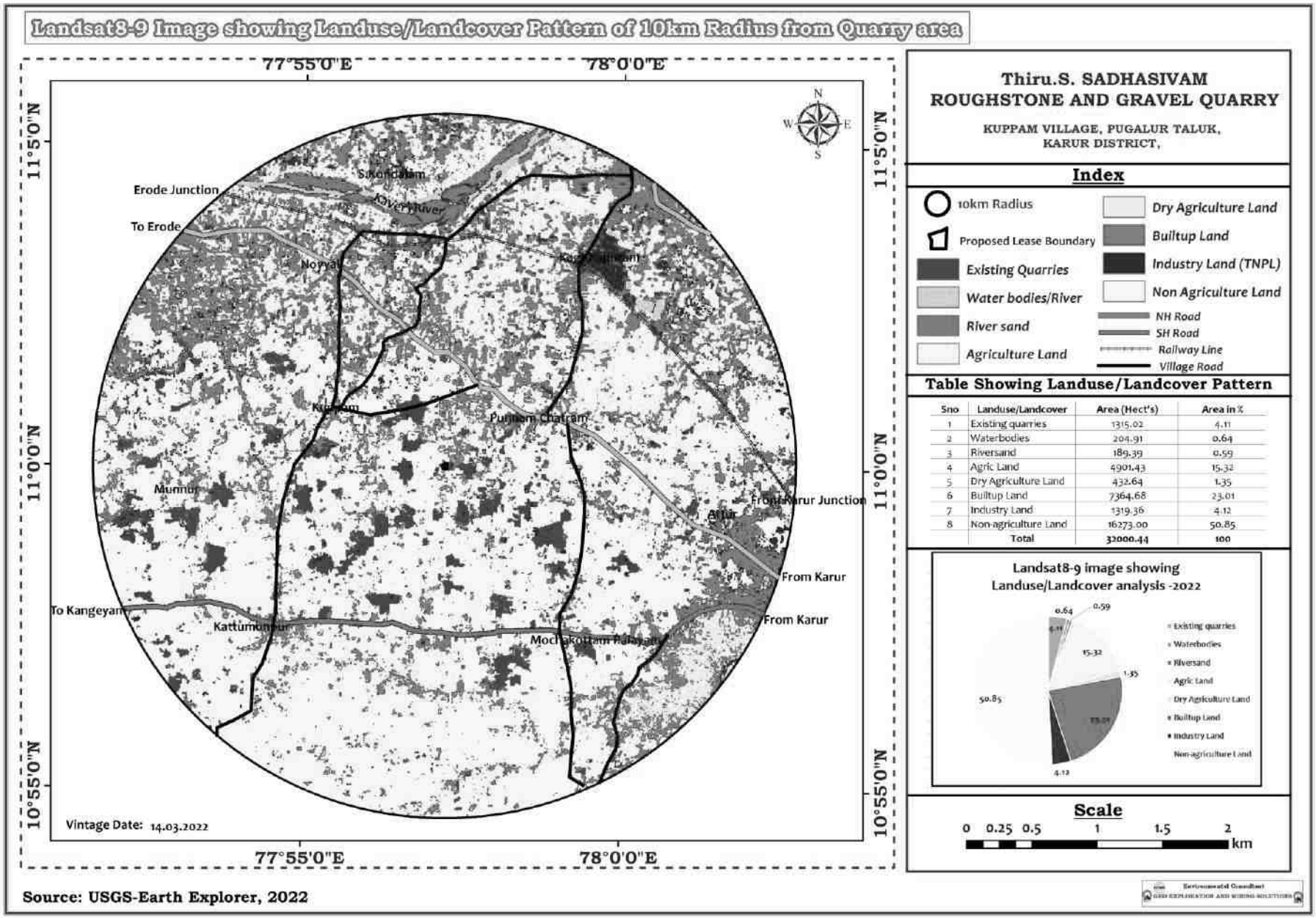


FIGURE 3.3: LAND USE LAND COVER MAP 10KM RADIUS

3.1.4 INTERPRETATION

- The 10 km radius study area mainly comprises Agricultural land accounting for 15.32% of the total study area.

The cropping pattern of the Buffer Zone:

The entire buffer zone has plain surface. Agriculture is the most dominant occupation of the Kuppam Village, Pugalur Taluk, Karur District, Tamil Nadu. Within the 10 km radius of the buffer area, most of the area is occupied by agriculture and Non-Agriculture Land.

In view, Karur District has specifically known for Moringa and Banana cultivation and other prominent crops under cultivation are Tapioca, Gloriosa, Betelvine, Jasmine, Ixora, Coconut and other vegetable crops. Thanthoni, Aravakurichi, Kadavur and K. Paramathy were major vegetable growing region. The livestock and poultry sector provide ample opportunity and have to be developed in this district as the agricultural labourers population can earn income from this sector during the off season or non-cropping periods

Source: https://karur.nic.in/departments/department-of-horticulture-and-plantation-crops/

- Water Bodies such as Kaveri River, Ponds and Lakes with a water channel locally called comprise 0.64% of the total buffer area SOI Toposheet, there is total one major water bodies exist Amaravathi River the agriculture fields of the buffer area. This is the main source of irrigation. The farmers use water conservation techniques such as canal irrigation technology to water the fields.
- The buffer zone studied has no ecologically sensitive area (National Park, Wildlife Sanctuary, Biosphere Reserve/ Protect Forest/ Reserve Forest, etc.).
- The buffer zone area covered by barren or non-Agriculture land is 50.85 %.
- The core and buffer zone covered Existing mine or old mine out area occupies about 4.11%.
- The Builtup area has about 23.01% of the area covered core and buffer zone. The nearest village within the 1km radius of the project site boundary is observed to be villages Kuppam Punnam chatram, etc.,

  There are TNPL industries, Private Institution within buffer zone

3.1.5 CONCLUSION

Thiru.S. Sadhaivam, Roughstone and Gravel Quarry is proposed extent of 1.54.0 Ha (Total extent of 7.83.5 ha) at Kuppam Village, Pugalur Taluk, Karur District, Tamil Nadu State. The total project land is non-Agriculture land/Open scrub land and will be converted for Mining purpose. Currently, it is devoid of any habitation/villages which require replacement/resettlements thus no

major impact is envisaged due to the change in the land use property of the core zone. Within the buffer zone, various social, cultural, and economic impacts can be foreseen on the major land use category of the area i.e. agriculture, river, and nearby habitation. Detail of the same has been incorporated in chapter 4 of the Draft EIA/EMP report.

From the above table, pie diagram and land use map it is inferred that the majority of the land in the study area is Agriculture land (includes crop with Horticulture land) 15.32%, Builtup Land is about 23.01% Non-Agriculture land is 50.85% and Existing quarries is about – 4.11%.

The total Existing quarries within the study area is 1315.02 ha i.e., 4.11%. The cluster area has 7.83.5 ha within the study area. This small percentage of Mining Activities shall not have any significant impact on the environment.

3.1.6TOPOGRAPHY

The lease applied area is exhibits flat terrain. The area has gentle sloping towards Southern side. The altitude of the area is 160-165m above Mean Sea level. The area is covered by 2m thickness of Gravel formation. Massive Charnockite which is clearly inferred from the existing quarry pits.

3.1.7 DIGITAL ELEVATION MODEL

Digital Elevation Model (DEM) has been prepared for the project at Village: Kuppam, Pugalur Taluk, district, Karur for a 10 km radius study area.

Data Used

- DEM Data : SRTM (DEM) -1ArcSecond-90m Resolution
- Data Source : https://urs.earthdata.nasa.gov/
- Software Used : Arc GIS 10.8

Methodology

SRTM (DEM) data has been used for the creation of the Digital Elevation Model of the study area. IRS Satellite-derived DEM with 30m or coarser posting shall be made available as a free download. IRS Satellite-derived DEM less than 30m and more than 10m postings may be made available at par with the base price for all categories of users.

Source: https://urs.earthdata.nasa.gov/

1st Stage:

The first processing stage involves importing and merging the 7.5’ x 7.5’ tiles into continuous elevation surfaces in DEM format.

2nd Stage:

Re-sampling the data at 15 m is done and a contour interval of 10 m through the usual process of interpolation is created.

3rd Stage:

DEM data is converted in grid format through Arc GIS 10.8 to obtain elevation information of the study area. Contours are then generated at 10 m intervals through spatial analysis of Arc GIS and with SRTM DEM data.

4th Stage:

Integration of DEM with contour map showing spatial analyst is done.

The Digital Elevation Model (DEM) of the Study Area with Contour Map DEM is given in Figure - 3.3.

Slope

The slope map was derived from SRTM DEM data of the study area. The slope of the study area was classified into four classes: less than 1Percent/degree Flat to almost flat, and no meaningful denudation process. Slope zone 0-0.74º, 0.75-1.3º, 1.4-3.8º and 3.8-9.9º are more gentle the same as above but with a higher magnitude, and above 3.8-9.9º Slightly steep a lot of ground movement and erosion especially landslides that are flat. (Fig.3.4)

Slope Class	Nature, Process and Natural Conditions
0^0-2^0 (0-2%)	Flat to almost flat, no meaningful denudation process
2^0 - 4^0 (2-7%)	Gentle, low-speed ground motion, sheet erosion and soil erosion (sheet & rill erosion), erosion swamps.
4^0 - 8^0 (7-15%)	More Gentle, the same as above, but with a higher magnitude.
8^0 - 16^0 (15-30%)	Slightly steep, a lot of ground movement and erosion, especially landslides that are flat.
16^0 - 35^0 (30-70%)	Steep, intensive denudation processes and ground movements are common.
35^0 - 55^0 (70-140%)	Very steep, rocks generally begin to unfold, a very intensive denudational process, have begun to produce rework material.
> 55^0 >140%	Very steep, exposed rocks, a very strong denudational process and prone to falling rocks, rarely grown plants (limited)

Source: Calculation of this slope using van zuidam classification, 1985

Interpretation *& Conclusion*

It is very clear from the DEM that the elevation varies from 237 m to 117m in the whole study area, thus having an elevation difference of 120 m. The areas in the Northern and Southwestern portion have higher elevation which is covered by plain land while the low-lying areas are generally used for River and agricultural purpose with builtup land. The contour over the DEM shows that the project site is in the elevation range of 10 m present on the flat land.

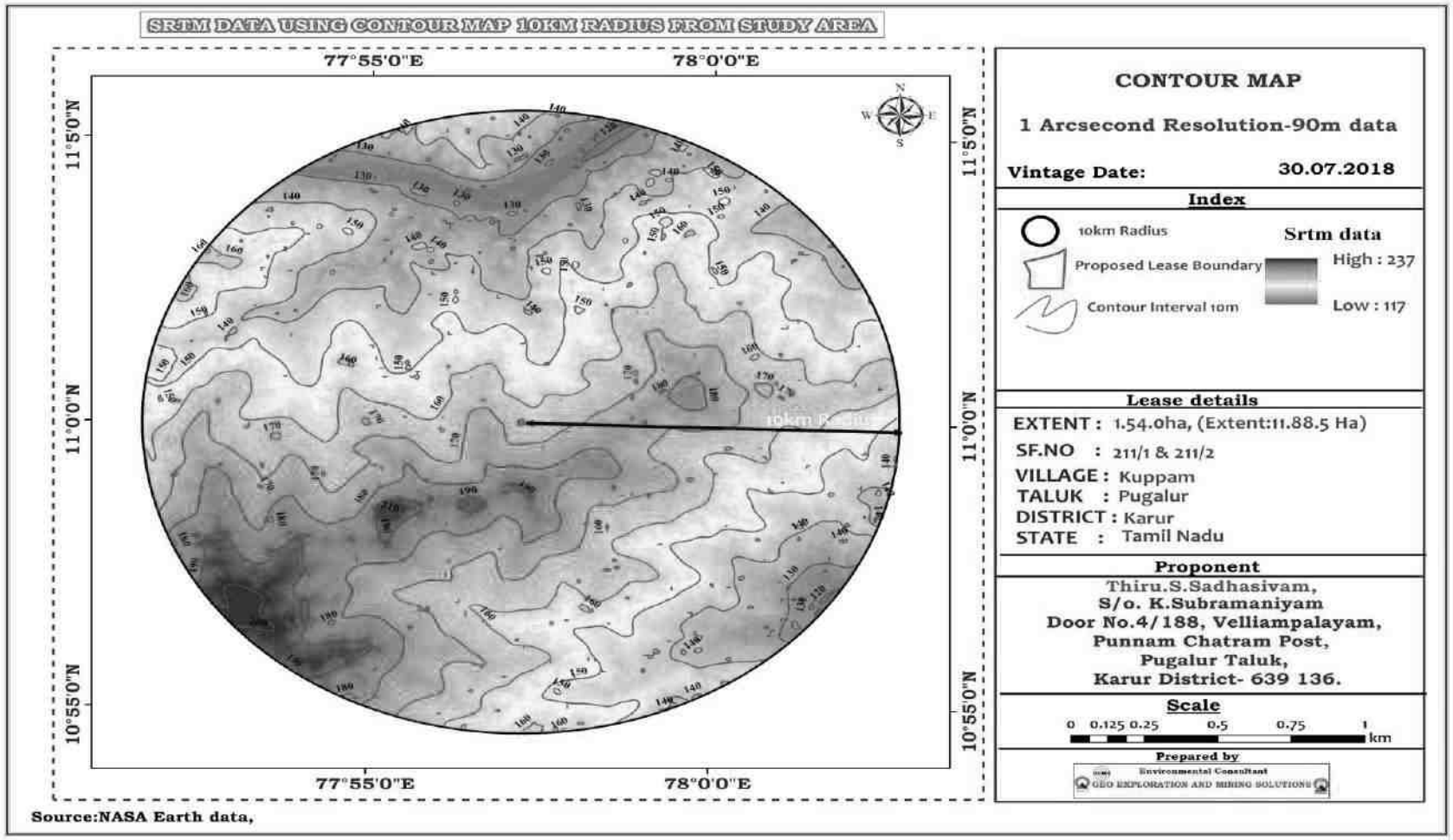


FIGURE 3.4: DIGITAL ELEVATION MODEL OF THE STUDY AREA WITH CONTOUR MAP

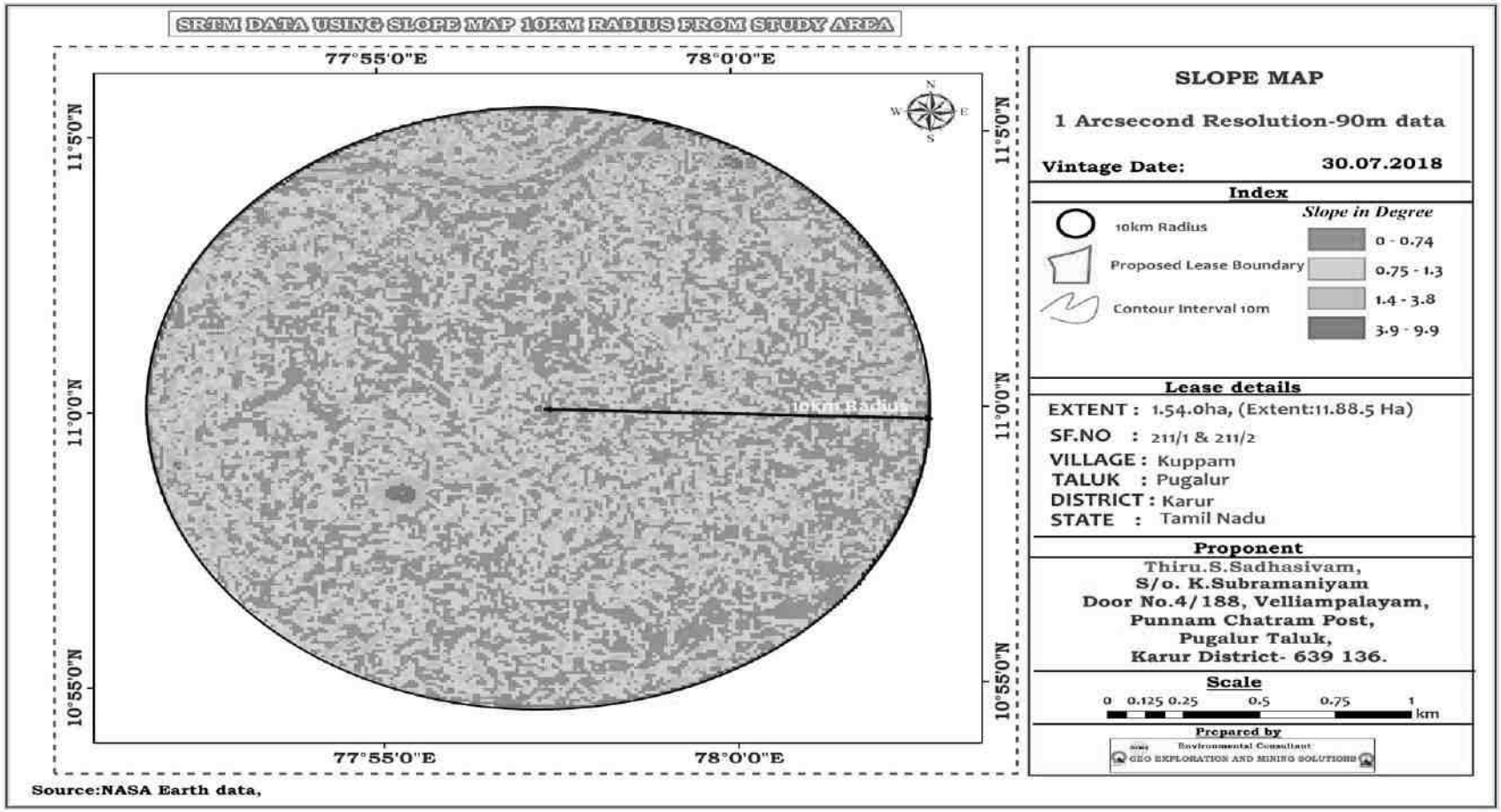


FIGURE 3.5: SLOPE MAP AROUND 10KM RADIUS

3.1.8DRAINAGE PATTERN OF THE AREA

Major part of Karur district is drained by Cauvery River. Amaravathi, Kodavanar and Pungar are the important rivers draining the western part of the district and the river Pungar drains in eastern part of the district. The drainage pattern, in general, is dendritic. All the rivers are seasonal and carry substantial flows during monsoon period. The district is divided in to three Minor basins, namely Kulithalai, Amaravathi and Thiruchi minor basin.

3.1.9SEISMIC SENSITIVITY

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

3.1.10 ENVIRONMENTAL FEATURES IN THE STUDY AREA

There is no Wildlife Sanctuaries, National Park and Archaeological monuments within project area. The details related to the environment sensitivity around the proposed quarry lease area i.e., 10 km radius, are given in the below Table 3.4.

TABLE 3.4: DETAILS OF ENVIRONMENT SENSITIVITY AROUND THE CLUSTER

Sl.No	Sensitive Ecological Features	Name	Arial Distance in km from Cluster
1	National Park / Wild life Sanctuaries	None	Nil within 10km Radius
2	Reserved Forest	None	Nil within 10km Radius
3	Lakes/Reservoir/ Dams/Stream/Rivers	Cauveri River & Noyyal River	7.0km-N & 6.0km-NW
4	Tiger Reserve/ Elephant Reserve/ Biosphere Reserve	None	Nil within 10KM Radius
5	Critically Polluted Areas	None	Nil within 10KM Radius
6	Mangroves	None	Nil within 10km Radius
7	Mountains/Hills	None	Nil within 10km Radius
8	Notified Archaeological Sites	None	Nil within 10km Radius
9	Industries/ Thermal Power Plants	None	Nil within 10km Radius
10	Defence Installation	None	Nil within 10km Radius

Source: Survey of India Toposheet

TABLE 3.5: NEARBY WATER BODIES FROM THE PROPOSED PROJECT SITE

PROPOSAL		
Sl.No	**NAME**	**DISTANCE & DIRECTION**
1	Vaikkal	150m NE
2	Amaravathi River	9.5km SE
3	Cauvery River	6.5km North
4	Noyyal River	6.2km NW
5	Thathampalayam Lake	8.2km SE

Source: Village Cadastral Map and Field Survey

3.2 SOIL ENVIRONMENT

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

The objective of the soil sampling is -

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

TABLE 3.6: SOIL SAMPLING LOCATIONS

S. No	Location Code	Monitoring Locations	Distance & Direction	Coordinates
1	**S-1**	Core Zone	Project Area	11° 0'2.15"N 77°57'11.85"E
2	**S-2**	Punnam Sathiram	2.5km NE	11° 0'37.96"N 77°58'29.58"E
3	**S-3**	Punnam	4.5km SE	10°59'28.80"N 77°59'37.25"E
4	**S-4**	Karudayampalayam	4km South	10°57'52.22"N 77°56'58.88"E
5	**S-5**	Kuppam	3.3km NW	11° 0'48.51"N 77°55'32.37"E
6	**S-6**	Pavithram	5km SE	10°58'1.58"N 77°59'8.23"E

Source: On-site monitoring/sampling by Laboratories in association with GEMS

Methodology –

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

TABLE 3.7: 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 Laboratories 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, Nitrogen, Phosphorous and Potassium. The standard classifications of soil and physico-chemical characteristics of the soils are presented below in Table 3.6 & Test Results in Table 3.7.

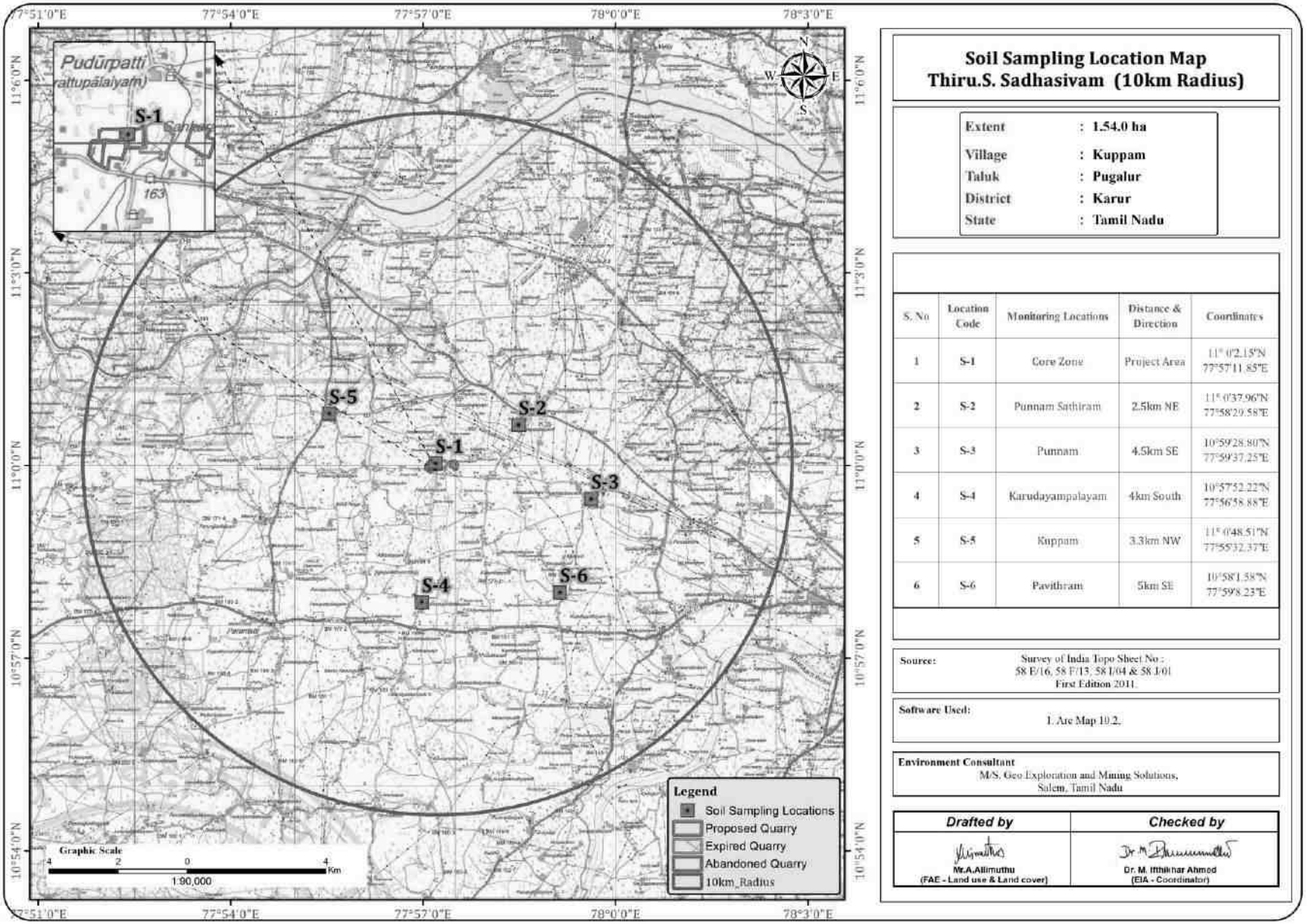


FIGURE 3.6: SOIL SAMPLING LOCATIONS AROUND 10 KM RADIUS

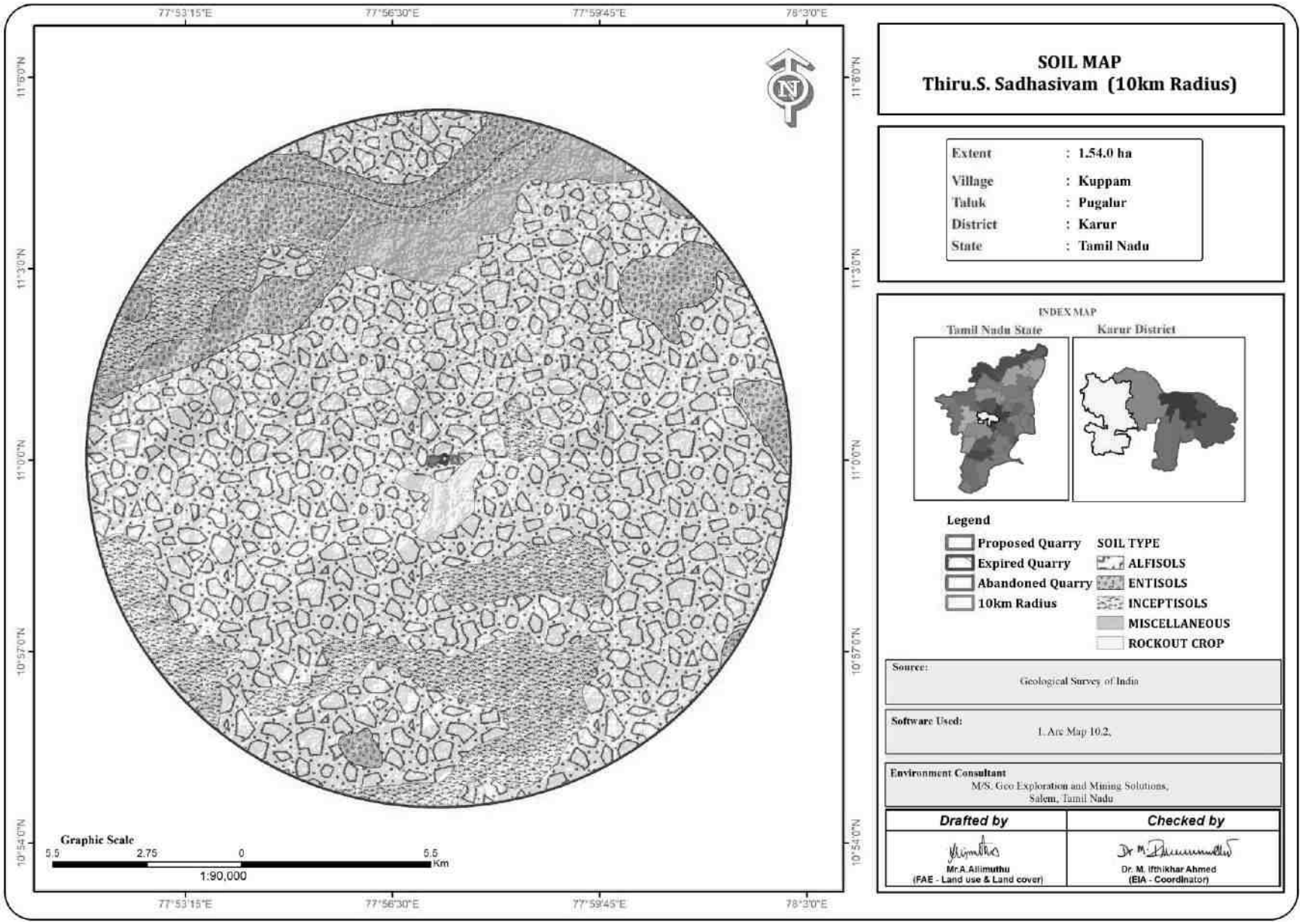


FIGURE 3.7: SOIL MAP

TABLE 3.8: SOIL QUALITY OF THE STUDY AREA

Sno	Test Parameters	Protocols	Soil1_Core zone Results	Soil – 2 – Punnam Sathiram	Soil – 3 – Punnam	Soil – 4 – Karudayampalayam	Soil – 5 – Kuppam	Soil – 6 – Pavithram
1	pH @ 25°C	IS 2720 Part 26 - 1987 (Reaff:2016)	8.59	8.02	8.44	7.69	7.81	8.1
2	Conductivity @ 25°C	IS 14767 - 2000 (Reaff : 2016)	310 µmhos/cm	430 µmhos/cm	510 µmhos/cm	480 µmhos/cm	552 µmhos/cm	391 µmhos/cm
3	**Texture**							
	Clay	Gravimetric Method	37.90%	43.10%	44.10%	39.00%	30.50%	40.50%
	Sand		31.90%	32.70%	18.30%	31.80%	35.80%	30.90%
	Silt		30.20%	24.20%	37.60%	29.20%	33.70%	28.60%
4	Water Holding Capacity	By Gravimetric Method	40.60%	39.50%	42.40%	39.00%	41.20%	40.10%
5	Bulk Density	By Cylindrical Method	1.02 g/cm^3	1.10 g/cm^3	1.04 g/cm^3	1.16 g/cm^3	1.22 g/cm^3	0.96 g/cm^3
6	Porosity	By Gravimetric Method	33.60%	29%	31.80%	30.80%	36.50%	31.10%
7	Calcium as Ca	USEPA 3050 B – 1996 &	166 mg/kg	149 mg/kg	154 mg/kg	174 mg/kg	135 mg/kg	170 mg/kg
8	Magnesium as Mg	USEPA 6010 C - 2000	23.6 mg/kg	21.2 mg/kg	27.0 mg/kg	23.4 mg/kg	30.6 mg/kg	24.3 mg/kg
9	Manganese as Mn		24.2 mg/kg	18.3 mg/kg	30 mg/kg	23.0 mg/kg	26.8 mg/kg	23.3 mg/kg
10	Zinc as Zn		0.21 mg/kg	0.54 mg/kg	1.06 mg/kg	0.54 mg/kg	0.99 mg/kg	0.22 mg/kg
11	Boron as B		0.46 mg/kg	0.32 mg/kg	0.51 mg/kg	0.43 mg/kg	0.82 mg/kg	0.40 mg/kg
12	Chloride as Cl	APHA 23rd Edn 2019 4500 Cl B	146 mg/kg	122 mg/kg	136 mg/kg	140 mg/kg	111 mg/kg	133 mg/kg
13	Total Soluble Sulphate as SO_4	IS 2720 Part 27 : 1977 (Reaff:2015)	0.02%	0.03%	0.02%	0.02%	0.02%	0.03%
14	Potassium as K	USEPA 3050 B – 1996 & USEPA 6010 C - 2000	30.6 mg/kg	31.7 mg/kg	40 mg/kg	31 mg/kg	35.9 mg/kg	27.4 mg/kg
15	Total Phosphorus as P	IS 10158 : 1982 (Reaff: 2019)	0.86 mg/kg	1.16 mg/kg	0.98 mg/kg	0.88 mg/kg	1.32 mg/kg	0.83 mg/kg
16	Total Nitrogen as N	IS 14684 : 1999 (Reaff:2019)	253 mg/kg	388 mg/kg	310 mg/kg	251 mg/kg	344 mg/kg	210 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	1.22 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		0.58 mg/kg	0.84 mg/kg	0.94 mg/kg	0.93 mg/kg	0.91 mg/kg	0.60 mg/kg
21	Iron as Fe		1.20 mg/kg	1.34 mg/kg	1.22 mg/kg	1.23 mg/kg	1.76 mg/kg	1.22 mg/kg
22	Organic Matter	IS : 2720 Part 22: 1972 (Reaff: 2015)	1.40%	2.87%	2.94%	2.08%	2.07%	1.71%
23	Organic Carbon	IS : 2720 Part 22: 1972 (Reaff: 2015)	0.81%	1.67%	1.71%	1.21%	1.20%	0.99%
24	Cation Exchange Capacity	USEPA 9080 – 1986	32.8 meq/100g of soil	30.2 meq/100g of soil	4.9 meq/100g of soil	33.1 meq/100g of soil	40.6 meq/100g of soil	31.5 meq/100g of soil

Source: Sampling Results by Laboratories

Interpretation & Conclusion

Physical Characteristics –

The physical properties of the soil samples were examined for texture, bulk density, porosity and water holding capacity. The soil texture found in the study area is Clay Loam Soil and Bulk Density of Soils in the study area varied between 0.96 – 1.22 g/cc. The Water Holding Capacity and Porosity of the soil samples is found to be medium i.e. ranging from 39.0 – 42.4 %.

Chemical Characteristics –

- The nature of soil is slightly alkaline to strongly alkaline with pH range 7.69 to 8.59
- The available Nitrogen content range between 251to 388 kg/ha
- The available Phosphorus content range between 0.86 to 1.32 kg/ha
- The available Potassium range between 30.6 to 35.9 mg/kg

3.3 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.

3.3.1 Surface Water Resources

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

3.3.2 Ground Water Resources

In view of the comparatively high level of ground water development in the major part of the district and the quality problems due to lithogenic and anthropogenic factors, it is necessary to exercise caution while planning further development of available ground water resources in the district. The development of ground water for irrigation in the district is mainly through dug wells tapping the weathered residuum. The yields of dug wells are improved at favorable locations by construction of extension bores, which are 50 to 100m. deep. Bore wells have also become popular as the source for irrigation in the district in recent years. Dug wells with extension bores wherever necessary is ideal for hard rock areas whereas large diameter dug wells with radial well is suitable for alluvial areas.

3.3.3 Methodology

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

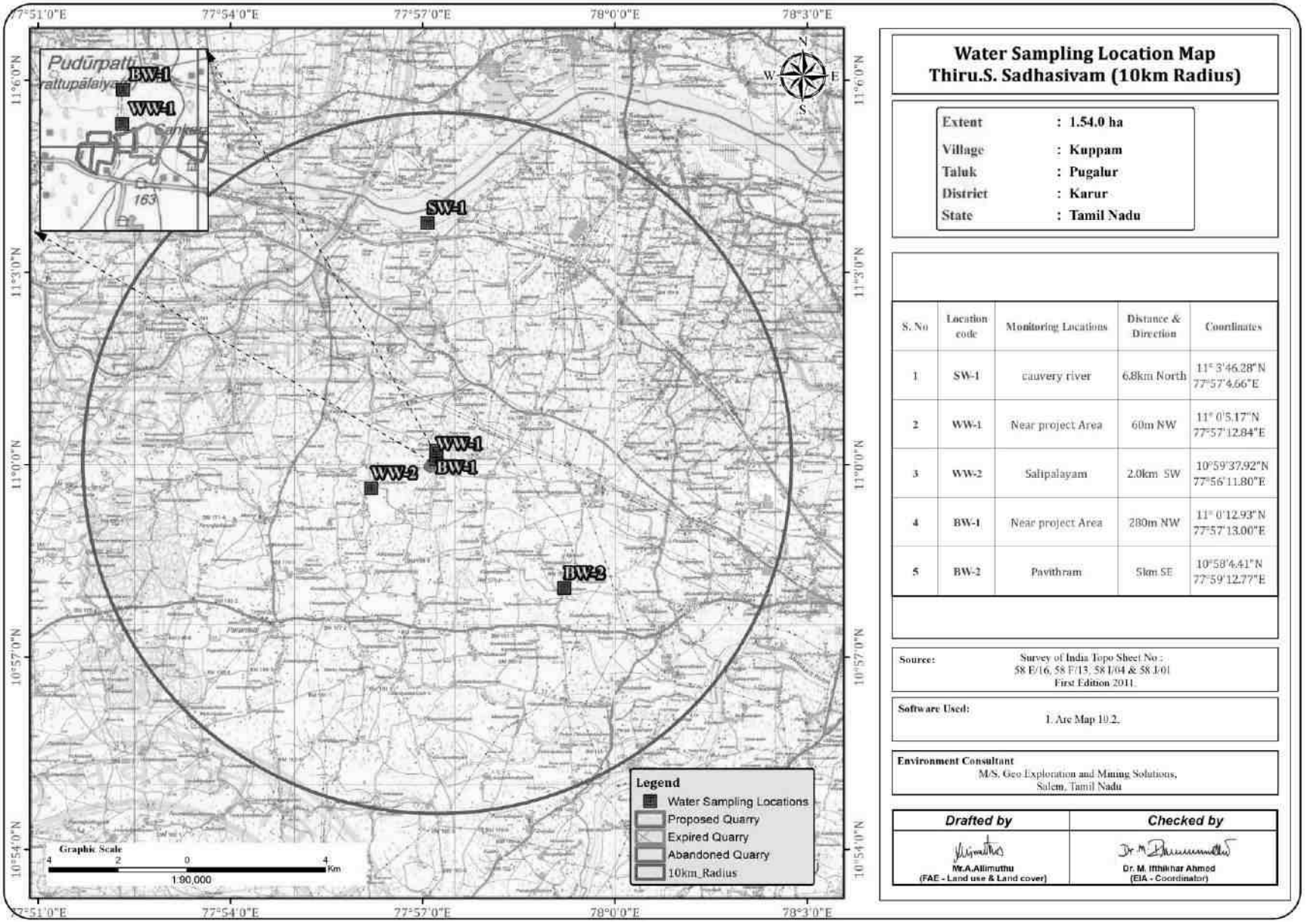
- Drainage pattern;
- Location of Residential areas representing different activities/likely impact areas; and
- Likely areas, which can represent baseline conditions

One (1) surface water and Five (4) ground water samples were collected from the study area and were analysed for physio-chemical, heavy metals and bacteriological parameters in order to assess the effect of mining and other activities on surface and ground water. The samples were analysed as per the procedures specified by CPCB, IS-10500:2012 and 'Standard methods for the Examination of Water and Wastewater' published by American Public Health Association (APHA). The water sampling locations are given in Table 3.9 and shown as Figure 3.6.

TABLE 3.9: WATER SAMPLING LOCATIONS

S. No	Location code	Monitoring Locations	Distance & Direction	Coordinates
1	**SW-1**	cauvery river	6.8km North	11° 3'46.28"N 77°57'4.66"E
2	**WW-1**	Near project Area	60m NW	11° 0'5.17"N 77°57'12.84"E
3	**WW-2**	Salipalayam	2.0km SW	10°59'37.92"N 77°56'11.80"E
4	**BW-1**	Near project Area	280m NW	11° 0'12.93"N 77°57'13.00"E
5	**BW-2**	Pavithram	5km SE	10°58'4.41"N 77°59'12.77"E

Source: On-site monitoring/sampling by Laboratories in association with GEMS



S. No	Location code	Monitoring Locations	Distance & Direction	Coordinates
1	SW-1	cauvery river	6.8km North	11° 3'46.28"N 77°57'4.66"E
2	WW-1	Near project Area	60m NW	11° 0'5.17"N 77°57'12.84"E
3	WW-2	Salipalayam	2.0km SW	10°59'37.92"N 77°56'11.80"E
4	BW-1	Near project Area	280m NW	11° 0'12.93"N 77°57'13.00"E
5	BW-2	Pavithram	5km SE	10°58'4.41"N 77°59'12.77"E

FIGURE 3.8: WATER SAMPLING LOCATIONS AROUND 10 KM RADIUS

TABLE 3.10: GROUND WATER SAMPLING RESULTS

Test	Protocol	Surface Water (SW-1) – Cauvery River.	Ground Water (WW-1) – Near Project Area	Ground Water (WW-2) – Salipalayam.	Ground Water (BW-1) – Near Project Area.	Ground Water (BW-2) – Pavithram
Colour	IS 3025 Part 4:1983 (Reaff:2017)	5 Hazen	5 Hazen	Hazen	Hazen	Hazen
Odour	IS 3025 Part 5:2018	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
pH at 25°C	IS 3025 Part 11:1983 (Reaff:2017)	7.7	7.01	7.19	7.59	6.92
Conductivity @ 25°C	IS 3025 Part 14:2013 (Reaff:2019)	721 µmhos/cm	702 µmhos/cm	667 µmhos/cm	616 µmhos/cm	607 µmhos/cm
Turbidity	IS 3025 Part 10:1984 (Reaff:2017)	5.5 NTU	0.8 NTU	1.2 NTU	0.81 NTU	1.8 NTU
Total Dissolved Solids	IS 3025 Part 16:1984 (Reaff:2017)	425 mg/l	414 mg/l	393 mg/l	364 mg/l	357 mg/l
Total Hardness as $CaCO_3$	IS 3025 Part 21:2009 (Reaff:2019)	133.3 mg/l	115.05 mg/l	153.57 mg/l	135.02 mg/l	118.73 mg/l
Calcium as Ca	IS 3025 Part 40:1991 (Reaff:2019)	24.6 mg/l	20.9 mg/l	28.1 mg/l	23.3 mg/l	23.2 mg/l
Magnesium as Mg	IS 3025 Part 46:1994 (Reaff:2019)	17.5 mg/l	15.3 mg/l	20.3 mg/l	18.7 mg/l	14.8 mg/l
Total Alkalinity as $CaCO_3$	IS 3025 Part 23:1986 (Reaff:2019)	155 mg/l	173 mg/l	160 mg/l	144 mg/l	116 mg/l
Chloride as Cl	IS 3025 Part 32:1988 (Reaff:2019)	98.4 mg/l	86.5 mg/l	88.4 mg/l	71.3 mg/l	88.3 mg/l
Sulphate as SO_4	IS 3025 Part 24:1986 (Reaff:2019)	28.3 mg/l	23.3 mg/l	21 mg/l	21.0 mg/l	19.1 mg/l
Iron as Fe	IS 3025 Part 53:2003 (Reaff:2019)	0.19 mg/l	0.16 mg/l	0.14 mg/l	BDL(DL : 0.01 mg/l)	0.22 mg/l
Residual Free Chlorine	IS 3025 Part 26:2021	BDL (DL:0.1 mg/l)	BDL (DL:0.1 mg/l)	BDL (DL:0.1 mg/l)	BDL (DL:0.1 mg/l)	BDL (DL:0.1 mg/l)
Fluoride as F	APHA 23rd Edn. 2017:4500 F,D	0.11 mg/l	0.11 mg/l	0.26 mg/l	0.16 mg/l	0.28 mg/l
Nitrate as NO_3	IS 3025 Part 34:1988 (Reaff:2019)	5.1 mg/l	4.9 mg/l	6.4 mg/l	9.1 mg/l	14.2 mg/l
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)	BDL (DL:0.01 mg/l)
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)	BDL (DL:0.02 mg/l)
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)	BDL (DL:0.0005 mg/l)
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)	BDL (DL:0.001 mg/l)

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)	BDL (DL:0.005 mg/l)
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)	BDL (DL:0.005 mg/l)
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)	BDL (DL:0.005 mg/l)
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)	BDL(DL : 0.05 mg/l)
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)	BDL(DL : 0.02 mg/l)
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)	BDL(DL : 0.05 mg/l)
Mineral Oil	IS 3025 Part 39-2021	BDL(DL : 0.01 mg/l)	BDL(DL : 0.01 mg/l)	BDL(DL : 0.01 mg/l)	BDL(DL : 0.01 mg/l)	BDL(DL : 0.01 mg/l)
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)	BDL (DL:0.0005 mg/l)
Anionic Detergents (as MBAS)	IS 13428 – 2005 (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)	BDL (DL:0.01 mg/l)
Cyanide as CN	(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)	BDL (DL:0.01 mg/l)
BOD @ 27°C for 3 days	IS 3025 Part 27/Sec 1-2021	8.4 mg/l				
Chemical Oxygen Demand	IS 3025 Part 44:1993 (Reaff:2019)	32 mg/l				
Dissolved Oxygen	IS 3025 Part 58:2006 (Reaff:2017)	5.6 mg/l				
Barium as Ba	IS 3025 Part 38:1989 (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)	BDL(DL:0.05 mg/l)
Ammonia (as total ammonia-N)	IS 3025 Part 65:2014 (Reaff:2019)	2.1 mg/l	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)
Sulphide as H_2S	IS 3025 Part 34-1988 (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)	BDL (DL:0.01 mg/l)
Molybdenum as Mo	IS 3025 Part 29-1986 (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)	BDL (DL:0.02 mg/l)
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)	BDL (DL:0.005 mg/l)
Total Suspended Solids	IS 3025 Part 65:2014 (Reaff:2019)	9.0 mg/l	BDL (DL:1.0 mg/l)	BDL (DL:1.0 mg/l)	BDL (DL:1.0 mg/l)	BDL (DL:1.0 mg/l)
Biological						
Total Coliform	APHA 23rd Edn. 2017:9221B	1600 MPN/100ml	< 1.8 MPN/100ml	< 1.8 MPN/100ml	< 1.8 MPN/100ml	< 1.8 MPN/100ml
Escherichia coli	APHA 23rd Edn. 2017:9221F	350 MPN/100ml	< 1.8 MPN/100ml	< 1.8 MPN/100ml	< 1.8 MPN/100ml	< 1.8 MPN/100ml

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

3.3.4 Interpretation& Conclusion

Surface Water

Ph:

The pH varied from 6.92 to 7.70 while turbidity found within the standards (Optimal pH range for sustainable aquatic life is 6.5 to 8.5 pH).

Total Dissolved Solids:

Total Dissolved Solids varied from 357 to 425 mg/l, the TDS mainly composed of carbonates, bicarbonates, Chlorides, phosphates and nitrates of calcium, magnesium, sodium and other organic matter.

Other parameters:

Chloride content is 71.3 - 98 mg/l. Nitrates varied from 4.9 to 9.7 mg/l, while sulphates varied from 19.1 to 28.3 mg/l.

Ground Water

The pH of the water samples collected ranged from 6.92 to 7.70 and within the acceptable limit of 6.5 to 8.5. PH, Sulphates and Chlorides of water samples from all the sources are within the limits as per the Standard. On Turbidity, the water samples meet the requirement. The Total Dissolved Solids were found in the range of 357 - 425 mg/l in all samples. Total hardness varied between 115 – 152 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.

3.3.5 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 58-62m. The maximum depth proposed out of proposed projects is 15 m to 57 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. There is no necessity of stream, channel diversion due to these proposed projects.

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

TABLE 3.11: WATER LEVEL OF OPEN WELLS 1 KM RADIUS

S.No	LABEL	LONGITUDE	LATITUDE	Oct	Nov	Dec
1	OW-1	77° 57' 12.93"E	11° 00' 05.21"N	12.5	13.1	13.7
2	OW-2	77° 57' 11.21"E	11° 00' 15.59"N	12.8	13.4	14
3	OW-3	77° 56' 57.05"E	11° 00' 33.07"N	12	12.6	13.2
4	OW-4	77° 57' 24.27"E	11° 00' 24.38"N	12.2	12.8	13.4
5	OW-5	77° 57' 45.65"E	10° 59' 54.74"N	11.8	12.4	13
6	OW-6	77° 57' 44.62"E	10° 59' 50.80"N	11.5	12.1	12.7
7	OW-7	77° 57' 26.02"E	10° 59' 49.75"N	13	13.6	14.2
8	OW-8	77° 57' 21.97"E	10° 59' 37.56"N	12.6	13.2	13.8
9	OW-9	77° 57' 11.49"E	10° 59' 31.79"N	11.6	12.2	12.8
10	OW-10	77° 56' 36.83"E	10° 59' 35.82"N	11.8	12.4	13
11	OW-11	77° 56' 56.00"E	11° 00' 06.94"N	12.3	12.9	13.5

Source: Onsite monitoring data

TABLE 3.12: WATER LEVEL OF BOREWELLS 1 KM RADIUS

S.No	Name	LONGITUDE	LATITUDE	Oct	Nov	Dec
1	BW-1	77° 57' 12.91"E	11° 00' 12.98"N	58.5	59.1	59.7
2	BW-2	77° 57' 06.45"E	11° 00' 26.41"N	57.8	58.4	59
3	BW-3	77° 57' 13.11"E	11° 00' 35.96"N	58.2	58.8	59.4
4	BW-4	77° 57' 44.25"E	11° 00' 06.35"N	58.6	59.2	59.8
5	BW-5	77° 57' 23.57"E	10° 59' 50.46"N	58	58.6	59.2
6	BW-6	77° 57' 13.70"E	10° 59' 43.64"N	57.5	58.1	58.7
7	BW-7	77° 57' 41.44"E	10° 59' 36.41"N	57.4	58	58.6
8	BW-8	77° 56' 34.62"E	10° 59' 50.26"N	57.8	58.4	59
9	BW-9	77° 56' 39.27"E	11° 00' 14.44"N	58.5	59.1	59.7

Source: Onsite monitoring data

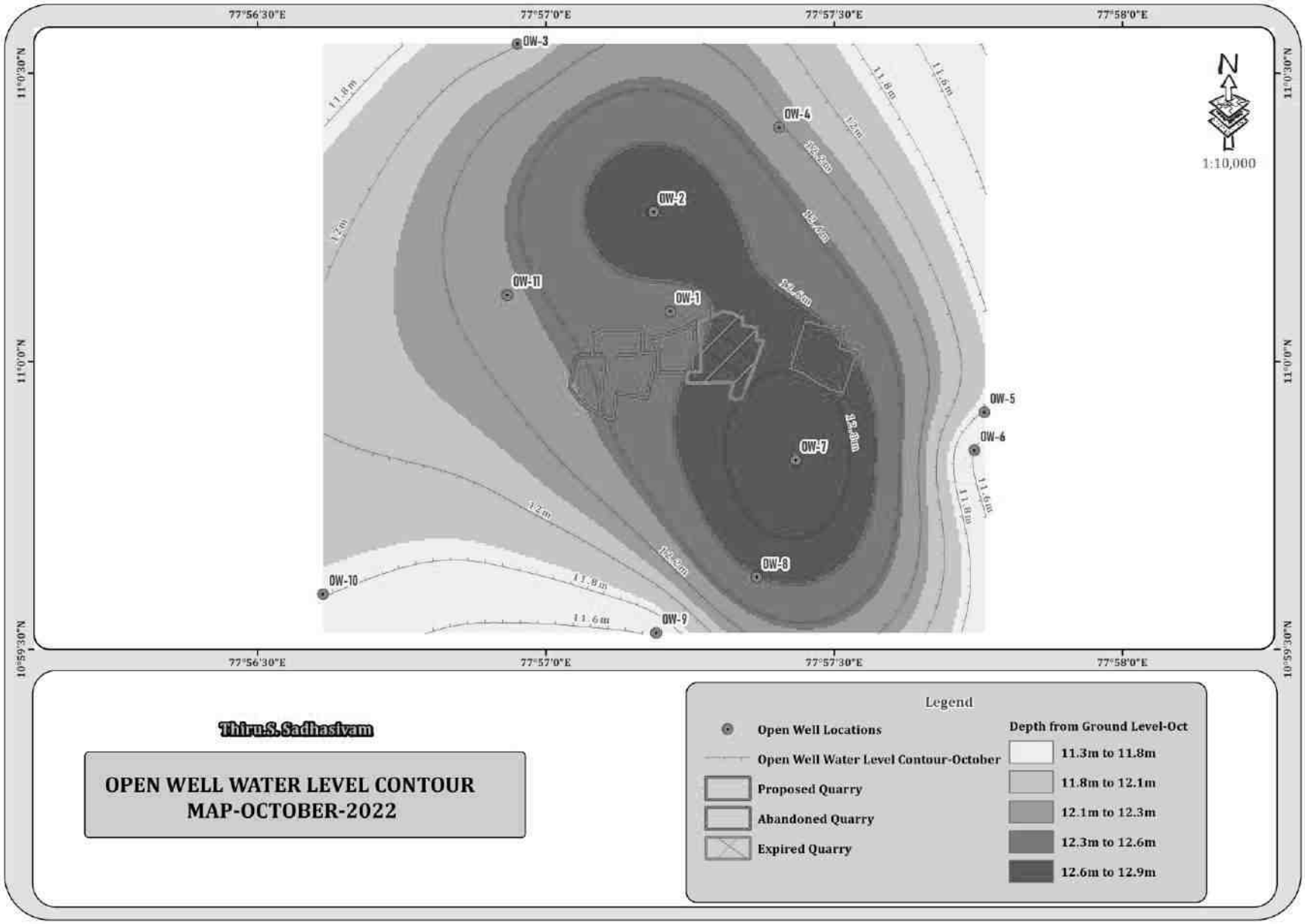


FIGURE 3.9: WATER LEVEL CONTOUR MAP OF OPEN WELLS 1 KM RADIUS – OCTOBER 2022

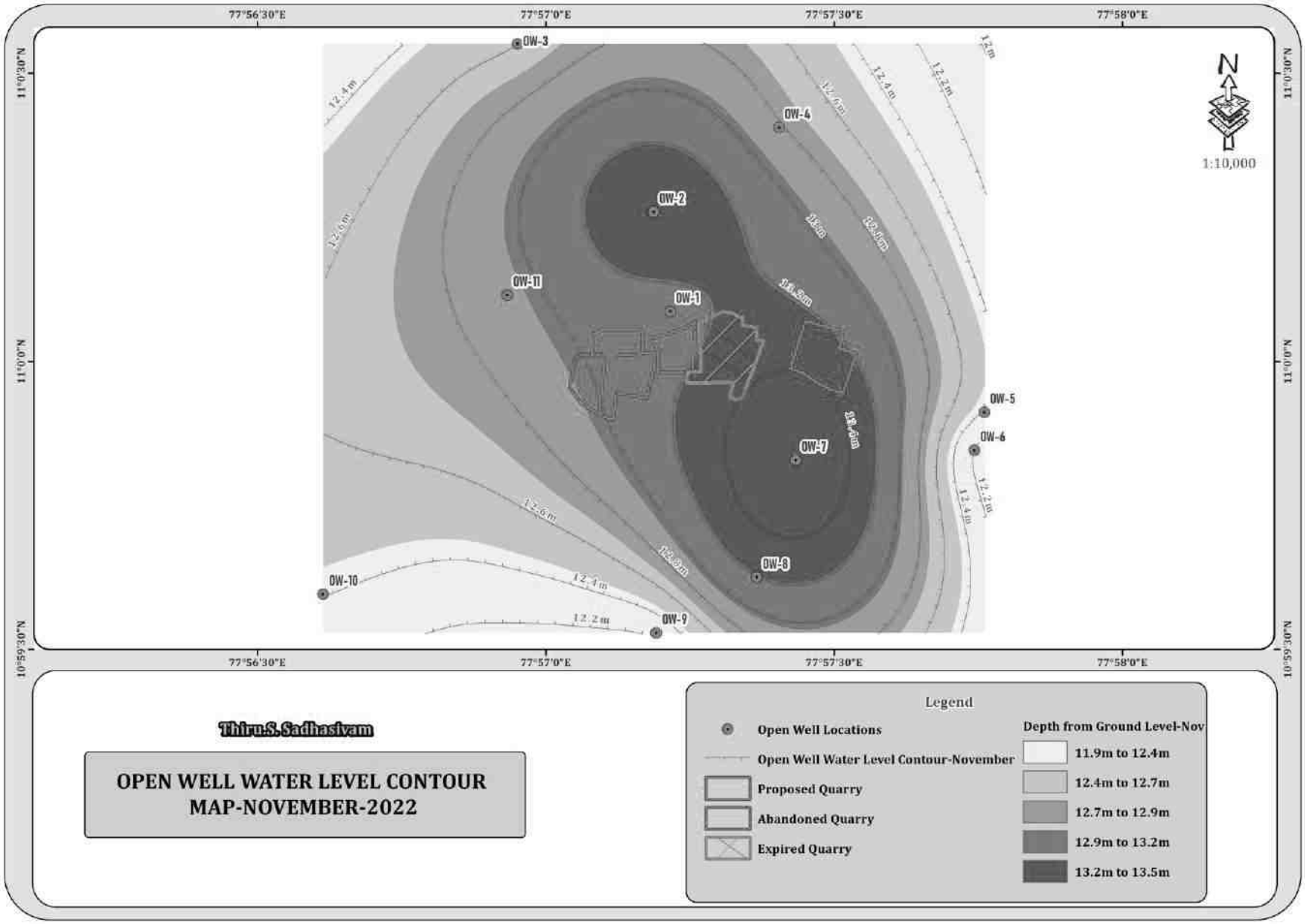


FIGURE 3.10: WATER LEVEL CONTOUR MAP OF OPEN WELLS 1 KM RADIUS – NOVEMBER 2022

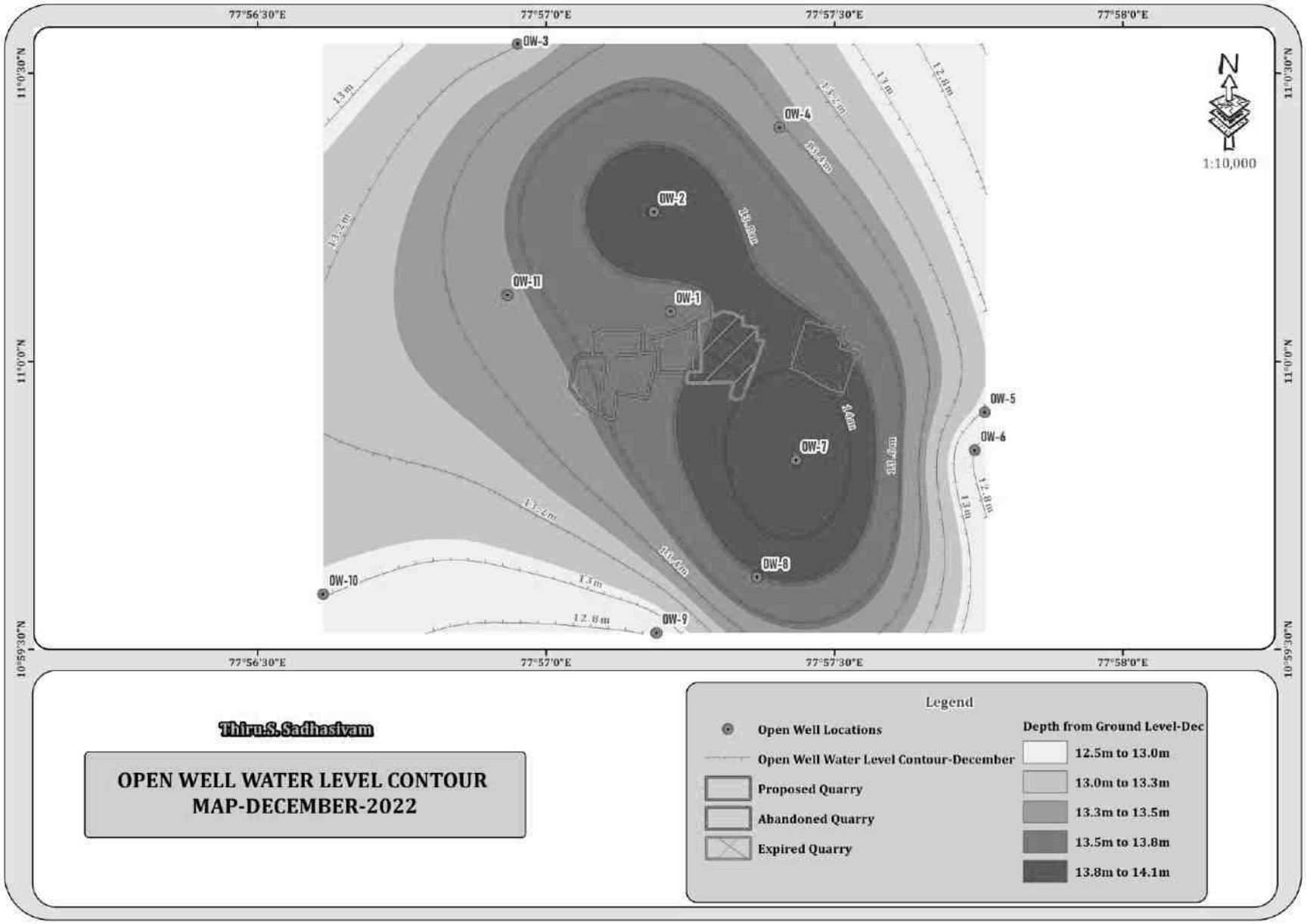


FIGURE 3.11: WATER LEVEL CONTOUR MAP OF OPEN WELLS 1 KM RADIUS – DECEMBER 2022

FIGURE 3.12: DRAINAGE MAP AROUND 10 KM RADIUS FROM PROJECT SITE

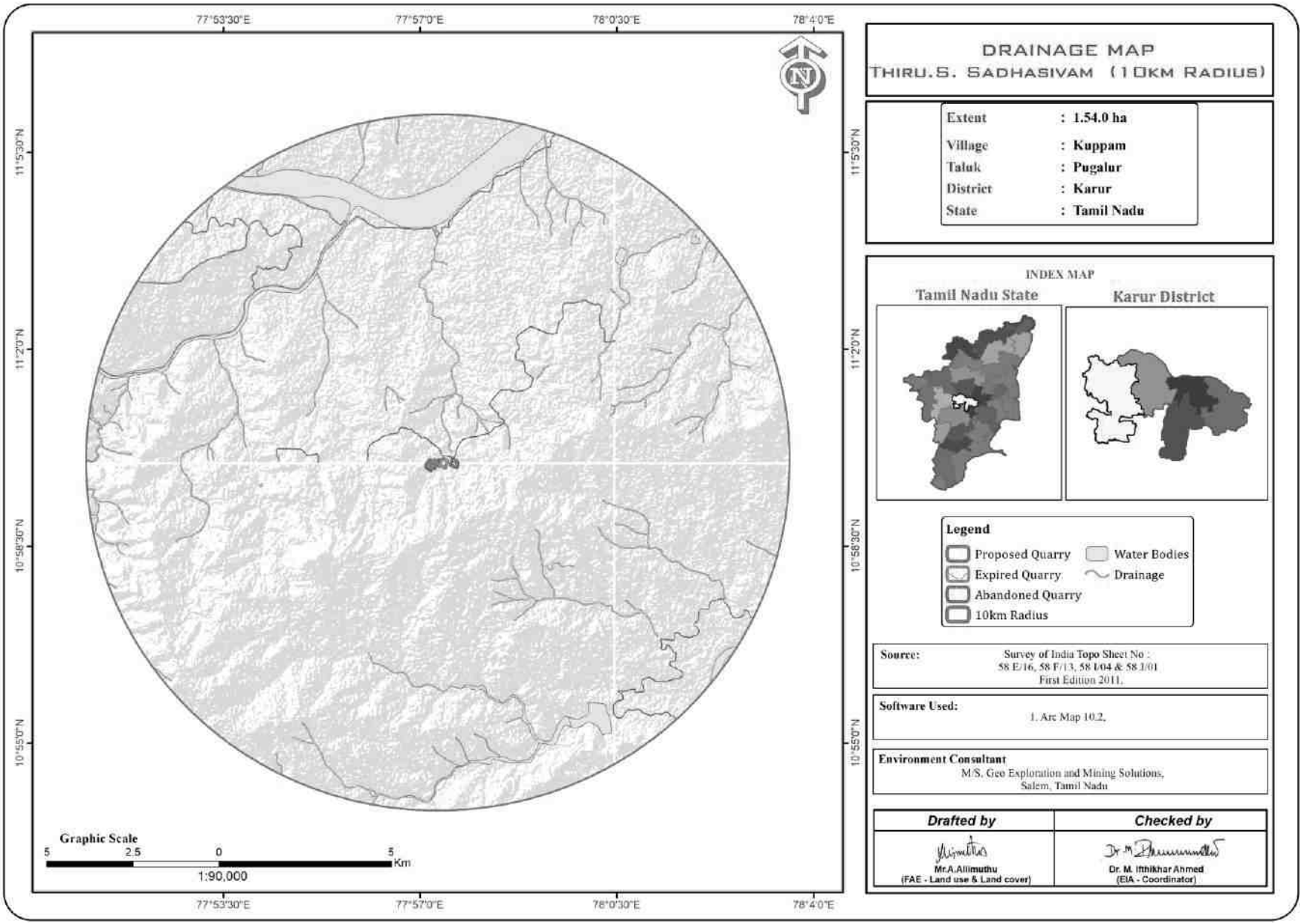
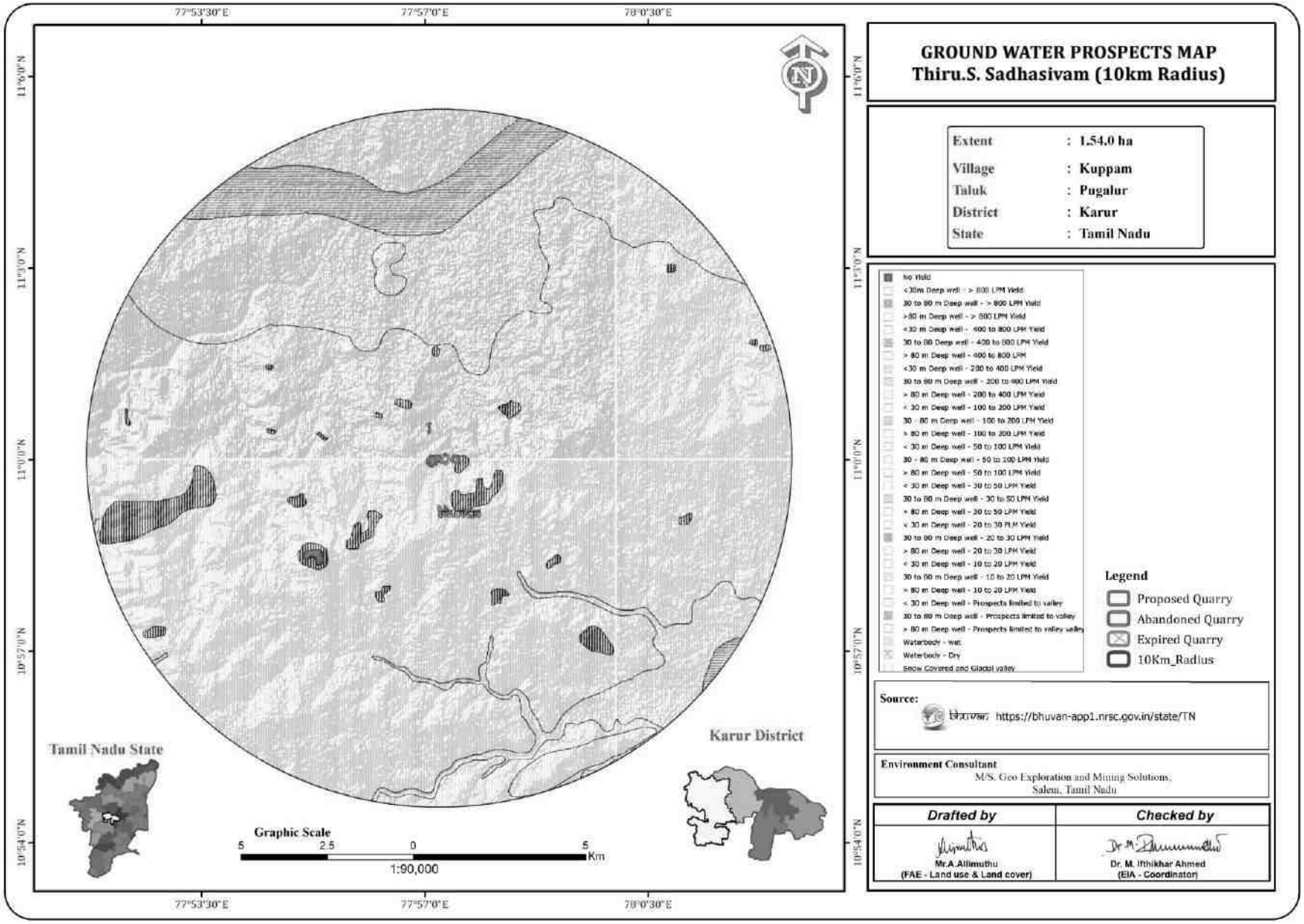


FIGURE 3.13: GROUND WATER PROSPECT MAP



3.3.5.1 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

Ø = Fractional pore volume

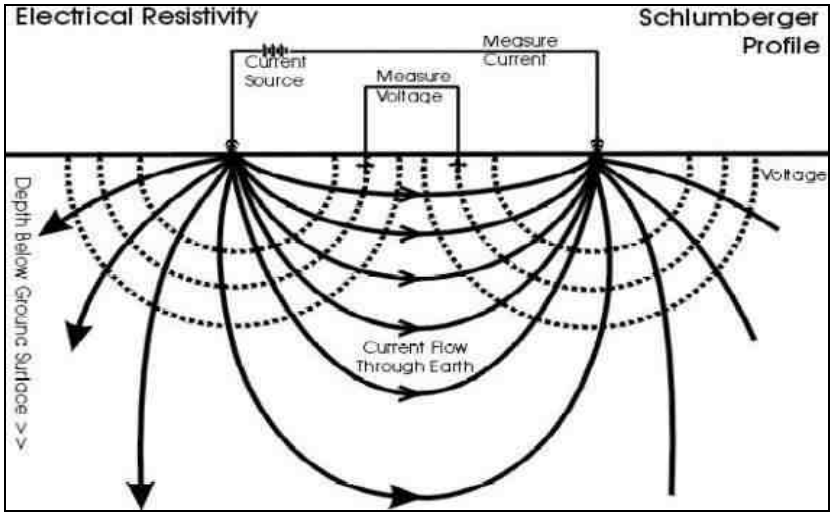
A = Constants with values ranging from 0.5 to 2.5

3.3.5.2 Survey Layout

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

The field equipment deployed for the study is in a deep resistivity meter with a model of SSR – MP – AT. This Signal stacking Resistivity meter is a high-quality data acquisition system incorporating several innovation features for Earth resistivity. In the presence of random earth Noises the signal to nose ration can be enhanced by √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.

3.3.5.3 Data Presentation

It was inferred that the low resistance encountered at the depth between 58-62m. The maximum depth proposed out of proposed projects is 15 m to 57 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.

3.3.5.4 Geophysical Data Interpretation

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

3.4 AIR ENVIRONMENT

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

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

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

3.4.1Meteorology & Climate

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

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

3.4.2 Climate

- Karur has a tropical climate. The summers here have a good deal of rainfall, while the winters have very little. The climate here is classified as Aw by the Köppen-Geiger system.
- The temperature here averages 28.2 °C | 82.7 °F. Precipitation here is about 724 mm | 28.5 inch. per year.
- The Karur is situated close to the equator, making summers difficult to define. The most popular time to visit is January, February, October, November, December..
- The driest month is January. There is 8 mm | 0.3 inch of precipitation in January. Most precipitation falls in October, with an average of 168 mm | 6.6 inch.
- The warmest month of the year is April, with an average temperature of 31.5 °C | 88.7 °F,. August is the coldest month, with temperatures averaging 24.9 °C | 76.7 °F

  https://en.climate-data.org/asia/india/tamil-nadu/karur-24030/

3.4.3 RAINFALL

TABLE 3.13: RAINFALL DATA

Actual Rainfall in mm					Normal Rainfall in mm
2013	2014	2015	2016	2017	
460.8	655.0	784.1	328.8	715.3	655.0

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

TABLE 3.14: METEOROLOGICAL DATA RECORDED AT SITE

S.No	Parameters		Oct – 2022	Nov – 2022	Dec – 2022
1	Temperature (^{0}C)	Max	27.06	24.98	24.9
		Min	24.06	21.92	21.87
		Avg	25.56	23.45	23.385
2	Relative Humidity (%)	Avg	81.03	85.31	85.22
3	Wind Speed (m/s)	Max	4.16	3.79	4.66
		Min	0.8	1.42	1.09
		Avg	2.48	2.605	2.875
4	Cloud Cover (OKTAS)		0-8	0-8	0-8
5	Wind Direction		W,SE	NE,ENE	ENE,NE

Source: On-site monitoring/sampling by Chennai mettex lab Pvt Ltd in association with GEMS

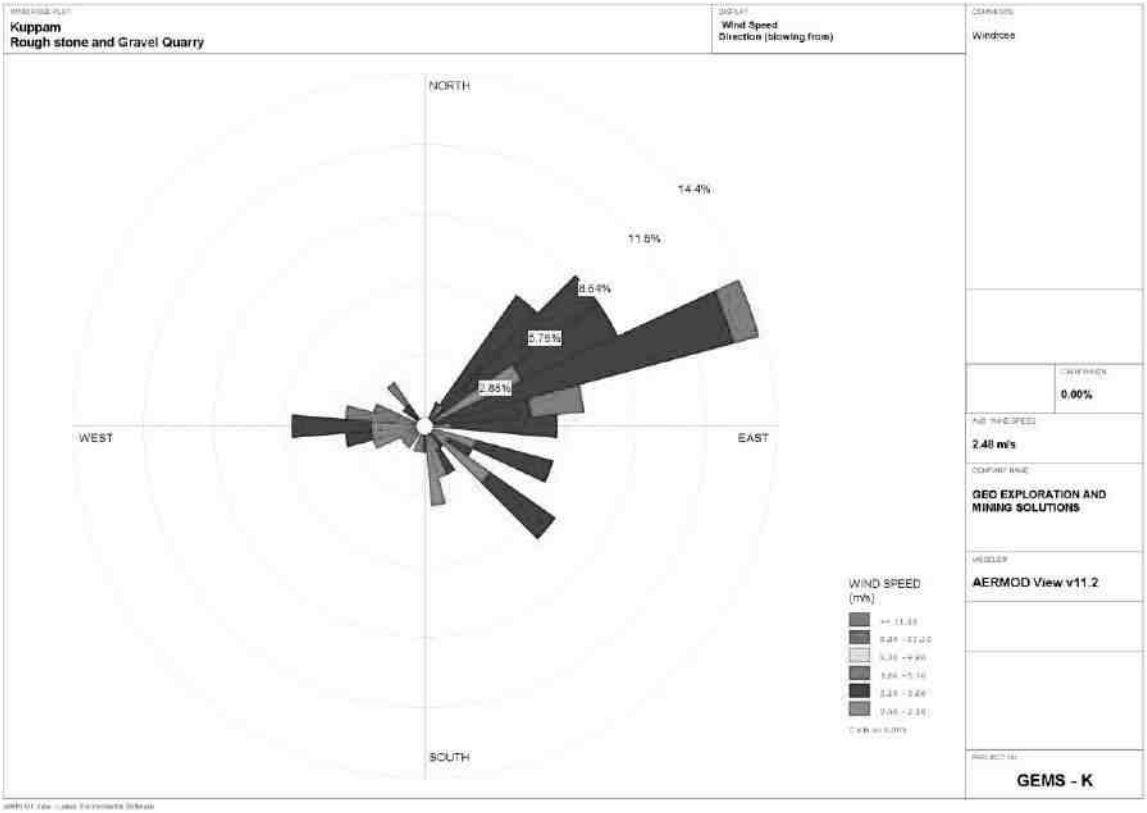
Correlation between Secondary and Primary Data

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

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

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

FIGURE: 3.14 WINDROSE DIAGRAM



Source: Wind Rose plot view, Lake Environmental Software

3.4.4METHODOLOGY 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.,

3.4.5 SAMPLING AND ANALYTICAL TECHNIQUES

TABLE 3.15: METHODOLOGY AND INSTRUMENT USED FOR AAQ MONITORING

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 modifiedmethod)	Respirable Dust Sampler with gaseous attachment
Free Silica	NIOSH – 7601	Visible Spectrophotometry

Source: Sampling Methodology followed by Laboratories & CPCB Notification

TABLE 3.16: NATIONAL AMBIENT AIR QUALITY STANDARDS

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

3.4.6FREQUENCY & PARAMETERS FOR SAMPLING

Ambient air quality monitoring has been carried out with a frequency of two samples per week at eight (8) locations, adopting a continuous 24 hourly (3 shift of 8-hour) schedule for the period October to December, 2020. The baseline data of ambient air has been generated for PM_{10}, $PM_{2.5}$, Sulphur Dioxide (SO_2) & Nitrogen Dioxide (NO_2) Monitoring has been carried out as per the CPCB, MoEF guidelines and notifications.

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

3.4.7AMBIENT AIR QUALITY MONITORING STATIONS

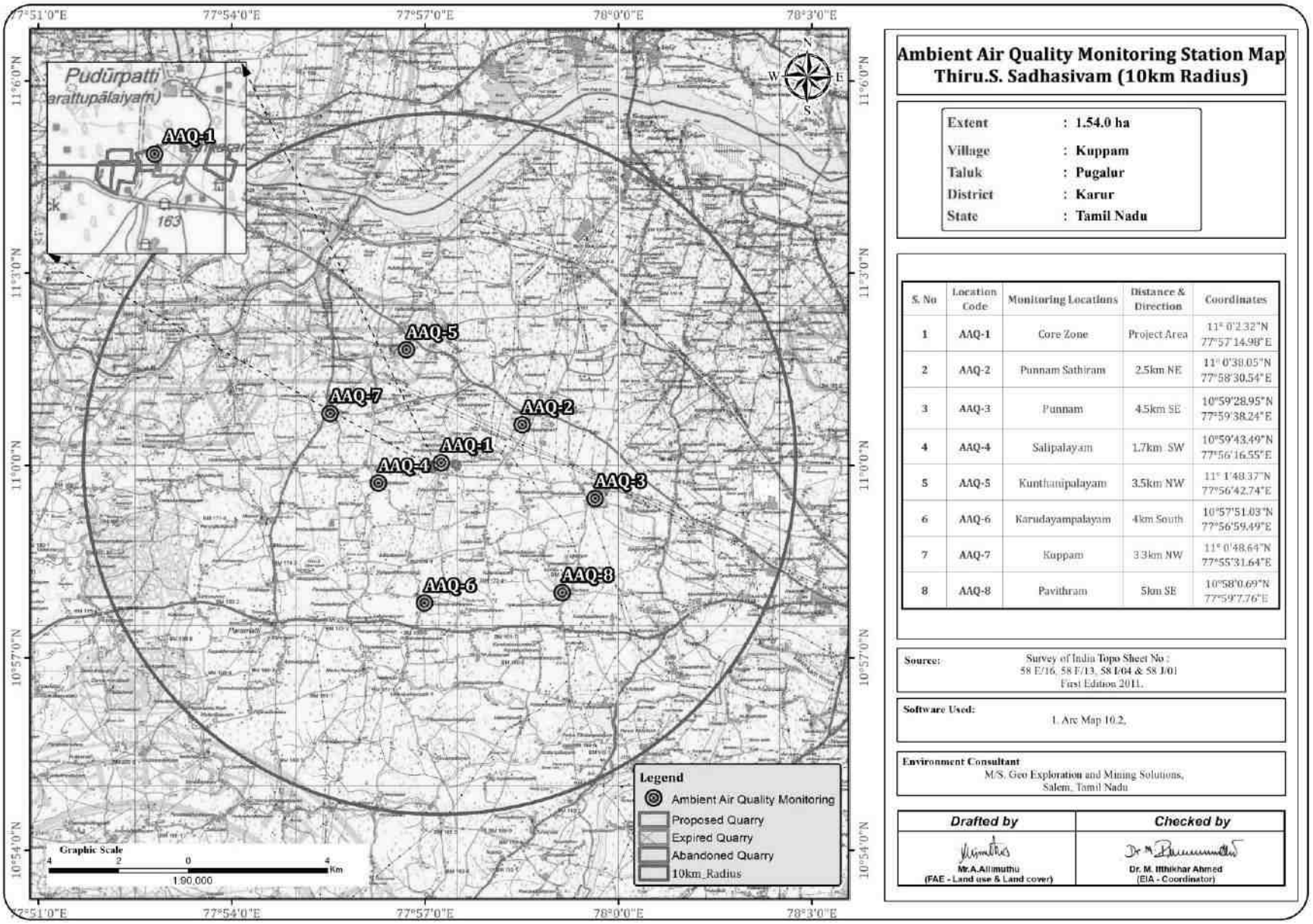
Eight (8) monitoring stations were set up in the study area as depicted in Figure 3.15 for assessment of the existing ambient air quality. Details of the sampling locations are as per given below.

TABLE 3.17: AMBIENT AIR QUALITY (AAQ) MONITORING LOCATIONS

S. No	Location Code	Monitoring Locations	Distance & Direction	Coordinates
1	**AAQ-1**	Core Zone	Project Area	11° 0'2.32"N 77°57'14.98"E
2	**AAQ-2**	Punnam Sathiram	2.5km NE	11° 0'38.05"N 77°58'30.54"E
3	**AAQ-3**	Punnam	4.5km SE	10°59'28.95"N 77°59'38.24"E
4	**AAQ-4**	Salipalayam	1.7km SW	10°59'43.49"N 77°56'16.55"E
5	**AAQ-5**	Kunthanipalayam	3.5km NW	11° 1'48.37"N 77°56'42.74"E
6	**AAQ-6**	Karudayampalayam	4km South	10°57'51.03"N 77°56'59.49"E
7	**AAQ-7**	Kuppam	3.3km NW	11° 0'48.64"N 77°55'31.64"E
8	**AAQ-8**	Pavithram	5km SE	10°58'0.69"N 77°59'7.76"E

Source: On-site monitoring/sampling by Laboratories in association with GEMS

FIGURE 3.15: AMBIENT AIR QUALITY LOCATIONS AROUND 10 KM RADIUS



Ambient Air Quality Monitoring Station Map
Thiru.S. Sadhasivam (10km Radius)

Extent	: 1.54.0 ha
Village	: Kuppam
Taluk	: Pugalur
District	: Karur
State	: Tamil Nadu

S. No	Location Code	Monitoring Locations	Distance & Direction	Coordinates
1	AAQ-1	Core Zone	Project Area	11° 0'2.32"N 77°57'14.98"E
2	AAQ-2	Punnam Sathiram	2.5km NE	11° 0'38.05"N 77°58'30.54"E
3	AAQ-3	Punnam	4.5km SE	10°59'28.95"N 77°59'38.24"E
4	AAQ-4	Salipalayam	1.7km SW	10°59'43.49"N 77°56'16.55"E
5	AAQ-5	Kunthanipalayam	3.5km NW	11° 1'48.37"N 77°56'42.74"E
6	AAQ-6	Karudayampalayam	4km South	10°57'51.03"N 77°56'59.49"E
7	AAQ-7	Kuppam	3.3km NW	11° 0'48.64"N 77°55'31.64"E
8	AAQ-8	Pavithram	5km SE	10°58'0.69"N 77°59'7.76"E

Source: Survey of India Topo Sheet No : 58 E/16, 58 F/13, 58 I/04 & 58 J/01 First Edition 2011.

Software Used: 1. Arc Map 10.2.

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

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

TABLE 3.18: AMBIENT AIR QUALITY DATA LOCATION AAQ1

Ambient Air Monitoring Details		Particulate Pollutant			Gaseous Pollutant					Metals Pollutant			Organic Pollutant	
Parameters		SPM	PM_{10}	$PM_{2.5}$	SO_2	NO_2	NH_3	O_3	CO	Pb	Ni	As	C_6H_6	BaP
NAAQ Norms		200	100	60	80	80	400	180	4	1	20	6	5	1
Unit		$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	mg/m^3	$\mu g/m^3$	ng/m^3	ng/m^3	$\mu g/m^3$	ng/m^3
Date	Period.hrs	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
03.10.2022	7:00-7:00	129	53.7	36.9	7.5	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04.10.2022	7:15-7:15	102	66.5	39.6	10.3	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07.10.2022	7:00-7:00	111	55.4	26.3	8.4	21.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.10.2022	7:15-7:15	136	69.6	39.5	9.3	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10.10.2022	7:00-7:00	109	55.9	25.2	8.4	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11.10.2022	7:15-7:15	128	54.3	38.1	7.5	23.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.10.2022	7:00-7:00	115	65	27.5	10.3	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.10.2022	7:15-7:15	100	62.2	34.8	8.4	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17.10.2022	7:00-7:00	121	56.1	32.9	9.3	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18.10.2022	7:15-7:15	108	55.5	31.6	8.4	21.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24.10.2022	7:00-7:00	106	62.8	26.5	8.4	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25.10.2022	7:15-7:15	123	60.4	29.2	7.5	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
31.10.2022	7:00-7:00	135	61.5	25.4	10.3	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01.11.2022	7:15-7:15	122	54.9	33.8	10.3	23.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07.11.2022	7:00-7:00	118	58.8	32.5	7.5	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.11.2022	7:15-7:15	104	55.5	35.4	10.3	21.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.11.2022	7:00-7:00	126	66.6	28.2	8.4	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.11.2022	7:15-7:15	102	52.5	34.6	9.3	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21.11.2022	7:00-7:00	131	60.4	20.3	8.4	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22.11.2022	7:15-7:15	128	53.2	35.5	7.5	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28.11.2022	7:00-7:00	105	65.1	28.2	10.3	23.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.11.2022	7:15-7:15	120	58	35.1	8.4	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
05.12.2022	7:00-7:00	111	64.2	24.5	9.3	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
06.12.2022	7:15-7:15	105	55.8	38.4	8.4	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
12.12.2022	7:00-7:00	124	50.7	39.8	7.5	21.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13.12.2022	7:15-7:15	138	53.4	23.9	10.3	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
19.12.2022	7:00-7:00	125	66.5	20.8	9.3	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20.12.2022	7:15-7:15	102	69.5	37.5	8.4	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Note: BDL: Below Detection Limit ;DL: Detection Limit ; NH3: BDL (DL:20); O3: BDL (DL:20); CO: BDL (DL:1.0); Pb: BDL (DL:0.1); Ni: BDL (DL:1.0); As: BDL (DL:1.0); C6H6: BDL (DL:1.0); BaP: BDL (DL:0.1)														
Remarks: The values observed for the pollutants given above are within the CPCB standards.														

TABLE 3.19: AMBIENT AIR QUALITY DATA LOCATION AAQ2

Ambient Air Monitoring Details		Particulate Pollutant			Gaseous Pollutant					Metals Pollutant			Organic Pollutant	
Parameters		SPM	PM_{10}	$PM_{2.5}$	SO_2	NO_2	NH_3	O_3	CO	Pb	Ni	As	C_6H_6	BaP
NAAQ Norms		200	100	60	80	80	400	180	4	1	20	6	5	1
Unit		$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	mg/m^3	$\mu g/m^3$	ng/m^3	ng/m^3	$\mu g/m^3$	ng/m^3
Date	Period.hrs	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
03.10.2022	7:00-7:00	132	63.4	23.3	7.5	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04.10.2022	7:15-7:15	105	66.6	27.6	8.4	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07.10.2022	7:00-7:00	121	65.8	29.2	9.3	21.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.10.2022	7:15-7:15	114	52.2	35.5	8.4	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10.10.2022	7:00-7:00	109	51.1	31.4	7.5	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11.10.2022	7:15-7:15	126	64.6	26.5	8.4	19.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.10.2022	7:00-7:00	123	55.3	33.9	7.5	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.10.2022	7:15-7:15	125	57.5	22.5	7.5	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17.10.2022	7:00-7:00	109	58.8	25.1	7.5	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18.10.2022	7:15-7:15	115	55.7	24.2	8.4	21.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24.10.2022	7:00-7:00	101	54.5	39.3	9.3	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25.10.2022	7:15-7:15	126	61.6	38.5	8.4	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
31.10.2022	7:00-7:00	109	52.7	37.4	7.5	19.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01.11.2022	7:15-7:15	128	66.4	25.6	8.4	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07.11.2022	7:00-7:00	115	55.2	22.8	9.3	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.11.2022	7:15-7:15	132	69.5	24.5	8.4	21.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.11.2022	7:00-7:00	123	65.4	25.2	7.5	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.11.2022	7:15-7:15	104	64.2	27.1	8.4	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21.11.2022	7:00-7:00	110	52	38.4	9.3	19.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22.11.2022	7:15-7:15	105	53.1	26.6	8.4	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28.11.2022	7:00-7:00	129	55.2	33.5	7.5	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.11.2022	7:15-7:15	112	51.3	22.4	8.4	21.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
05.12.2022	7:00-7:00	101	52.6	20.9	9.3	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
06.12.2022	7:15-7:15	122	64.5	21.5	8.4	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
12.12.2022	7:00-7:00	107	55.8	22.1	7.5	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13.12.2022	7:15-7:15	114	68.4	34.5	8.4	19.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
19.12.2022	7:00-7:00	121	54.5	35.6	8.4	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20.12.2022	7:15-7:15	125	65.8	28.8	8.4	21.5	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 3.20: AMBIENT AIR QUALITY DATA LOCATION AAQ3

Ambient Air Monitoring Details		Particulate Pollutant			Gaseous Pollutant					Metals Pollutant			Organic Pollutant	
Parameters		SPM	PM_{10}	$PM_{2.5}$	SO_2	NO_2	NH_3	O_3	CO	Pb	Ni	As	C_6H_6	BaP
NAAQ Norms		200	100	60	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
03.10.2022	7:00-7:00	106	53.2	20.6	8.4	19.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04.10.2022	7:15-7:15	122	65.8	32.3	9.3	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07.10.2022	7:00-7:00	113	51.2	21.2	7.5	21.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.10.2022	7:15-7:15	105	55.3	25.1	7.5	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10.10.2022	7:00-7:00	121	59.9	34.5	7.5	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11.10.2022	7:15-7:15	138	55.8	25.8	8.4	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.10.2022	7:00-7:00	129	64.5	27.5	9.3	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.10.2022	7:15-7:15	125	67.1	23.8	8.4	19.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17.10.2022	7:00-7:00	102	61.6	29.5	7.5	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18.10.2022	7:15-7:15	117	50	32.9	8.4	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24.10.2022	7:00-7:00	105	62.2	37.3	9.3	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25.10.2022	7:15-7:15	126	53.8	34.5	9.3	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
31.10.2022	7:00-7:00	133	65.7	28.8	9.3	21.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01.11.2022	7:15-7:15	135	52.4	27.7	8.4	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07.11.2022	7:00-7:00	124	61.5	25.5	7.5	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.11.2022	7:15-7:15	111	50.2	24.4	8.4	19.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.11.2022	7:00-7:00	102	62.4	32.5	7.5	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.11.2022	7:15-7:15	125	54	37.2	7.5	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21.11.2022	7:00-7:00	106	55.6	34.3	7.5	21.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22.11.2022	7:15-7:15	113	69.8	25.6	8.4	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28.11.2022	7:00-7:00	100	50.9	26.9	9.3	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.11.2022	7:15-7:15	122	61.2	29.7	8.4	19.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
05.12.2022	7:00-7:00	131	56.1	38.4	7.5	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
06.12.2022	7:15-7:15	125	65.6	35.2	8.4	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
12.12.2022	7:00-7:00	104	68.3	34.6	8.4	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13.12.2022	7:15-7:15	138	64.7	25.3	8.4	21.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
19.12.2022	7:00-7:00	129	59.2	33.5	9.3	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20.12.2022	7:15-7:15	105	57.9	27.8	8.4	22.3	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: AMBIENT AIR QUALITY DATA LOCATION AAQ4

Ambient Air Monitoring Details		Particulate Pollutant			Gaseous Pollutant					Metals Pollutant			Organic Pollutant	
Parameters		SPM	PM_{10}	$PM_{2.5}$	SO_2	NO_2	NH_3	O_3	CO	Pb	Ni	As	C_6H_6	BaP
NAAQ Norms		200	100	60	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
03.10.2022	7:00-7:00	102	52.3	23.1	8.4	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04.10.2022	7:15-7:15	126	56.6	25.6	9.3	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07.10.2022	7:00-7:00	139	51.2	29.3	8.4	21.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.10.2022	7:15-7:15	105	58.5	31.9	7.5	19.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10.10.2022	7:00-7:00	123	53.4	33.2	8.4	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11.10.2022	7:15-7:15	115	67.2	32.4	9.3	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.10.2022	7:00-7:00	103	61	20.3	8.4	21.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.10.2022	7:15-7:15	126	62.5	32.9	7.5	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17.10.2022	7:00-7:00	102	55	24.8	7.5	19.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18.10.2022	7:15-7:15	124	54.1	39.6	8.4	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24.10.2022	7:00-7:00	102	66.6	26.2	9.3	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25.10.2022	7:15-7:15	130	53.8	25.1	8.4	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
31.10.2022	7:00-7:00	125	59.2	22.8	7.5	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01.11.2022	7:15-7:15	106	62	30.5	8.4	21.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07.11.2022	7:00-7:00	129	64.1	31.4	9.3	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.11.2022	7:15-7:15	112	65.3	32	8.4	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.11.2022	7:00-7:00	108	56	23.2	7.5	19.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.11.2022	7:15-7:15	107	58.2	26.6	8.4	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21.11.2022	7:00-7:00	122	54.6	39.8	9.3	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22.11.2022	7:15-7:15	101	52.5	22.2	8.4	21.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28.11.2022	7:00-7:00	112	50.4	37.7	8.4	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.11.2022	7:15-7:15	105	62.8	25.3	8.4	19.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
05.12.2022	7:00-7:00	127	53.5	24.4	9.3	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
06.12.2022	7:15-7:15	132	61	28.6	9.3	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
12.12.2022	7:00-7:00	101	65.1	35.7	8.4	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13.12.2022	7:15-7:15	125	54.2	37.5	7.5	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
19.12.2022	7:00-7:00	119	68.4	29.2	7.5	19.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20.12.2022	7:15-7:15	107	53.5	35	7.5	22.3	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: AMBIENT AIR QUALITY DATA LOCATION AAQ5

Ambient Air Monitoring Details		Particulate Pollutant			Gaseous Pollutant					Metals Pollutant			Organic Pollutant	
Parameters		SPM	PM_{10}	$PM_{2.5}$	SO_2	NO_2	NH_3	O_3	CO	Pb	Ni	As	C_6H_6	BaP
NAAQ Norms		200	100	60	80	80	400	180	4	1	20	6	5	1
Unit		$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	mg/m^3	$\mu g/m^3$	ng/m^3	ng/m^3	$\mu g/m^3$	ng/m^3
Date	Period.hrs	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
03.10.2022	7:00-7:00	123	57.6	26.3	8.4	19.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04.10.2022	7:15-7:15	105	53.1	30.6	9.3	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07.10.2022	7:00-7:00	118	50.8	22.9	8.4	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.10.2022	7:15-7:15	125	61.5	25.8	8.4	21.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10.10.2022	7:00-7:00	132	59.3	24.5	8.4	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11.10.2022	7:15-7:15	104	55.4	32.4	9.3	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.10.2022	7:00-7:00	126	56.9	33.3	9.3	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.10.2022	7:15-7:15	122	62.5	26.2	8.4	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17.10.2022	7:00-7:00	110	50.2	39.1	7.5	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18.10.2022	7:15-7:15	105	52.8	25.5	7.5	21.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24.10.2022	7:00-7:00	129	51.3	31.4	7.5	19.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25.10.2022	7:15-7:15	101	69.2	32.9	8.4	19.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
31.10.2022	7:00-7:00	120	63.5	38.8	9.3	19.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01.11.2022	7:15-7:15	135	65.4	26.3	8.4	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07.11.2022	7:00-7:00	132	54.9	25.6	8.4	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.11.2022	7:15-7:15	133	51.5	24.5	8.4	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.11.2022	7:00-7:00	124	58.3	22.2	9.3	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.11.2022	7:15-7:15	108	67.7	30.4	9.3	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21.11.2022	7:00-7:00	125	52.5	22.5	9.3	21.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22.11.2022	7:15-7:15	110	56.6	33.2	8.4	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28.11.2022	7:00-7:00	122	55.5	27.1	7.5	19.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.11.2022	7:15-7:15	104	69.4	34.5	7.5	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
05.12.2022	7:00-7:00	125	58.2	25.9	8.4	21.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
06.12.2022	7:15-7:15	102	53	39.8	9.3	21.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
12.12.2022	7:00-7:00	110	57.5	28.6	8.4	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13.12.2022	7:15-7:15	111	65.4	27.3	7.5	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
19.12.2022	7:00-7:00	106	54.9	35	8.4	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20.12.2022	7:15-7:15	127	65.5	34.2	7.5	19.8	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: AMBIENT AIR QUALITY DATA LOCATION AAQ6

Ambient Air Monitoring Details		Particulate Pollutant			Gaseous Pollutant					Metals Pollutant			Organic Pollutant	
Parameters		SPM	PM_{10}	$PM_{2.5}$	SO_2	NO_2	NH_3	O_3	CO	Pb	Ni	As	C_6H_6	BaP
NAAQ Norms		200	100	60	80	80	400	180	4	1	20	6	5	1
Unit		$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	mg/m^3	$\mu g/m^3$	ng/m^3	ng/m^3	$\mu g/m^3$	ng/m^3
Date	Period.hrs	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
03.10.2022	7:00-7:00	123	53.6	23.3	7.5	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04.10.2022	7:15-7:15	106	56.3	39.2	8.4	19.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07.10.2022	7:00-7:00	125	52.5	25.6	9.3	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.10.2022	7:15-7:15	112	57.2	22.5	8.4	21.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10.10.2022	7:00-7:00	104	69.1	21.4	8.4	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11.10.2022	7:15-7:15	122	58.4	33.2	7.5	19.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.10.2022	7:00-7:00	131	65.5	25.5	7.5	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.10.2022	7:15-7:15	120	54.8	29.1	8.4	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17.10.2022	7:00-7:00	102	62.5	37.2	7.5	21.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18.10.2022	7:15-7:15	124	51.6	23.5	8.4	21.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24.10.2022	7:00-7:00	115	65.5	36.4	7.5	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25.10.2022	7:15-7:15	106	66.3	25.5	8.4	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
31.10.2022	7:00-7:00	138	63.2	34.6	9.3	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01.11.2022	7:15-7:15	125	55	27.5	8.4	21.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07.11.2022	7:00-7:00	114	64.1	25.2	7.5	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.11.2022	7:15-7:15	125	58.5	24.3	7.5	19.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.11.2022	7:00-7:00	102	68.4	35.2	7.5	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.11.2022	7:15-7:15	131	57.8	37.1	8.4	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21.11.2022	7:00-7:00	123	65.5	28.4	7.5	19.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22.11.2022	7:15-7:15	106	52.4	25.5	8.4	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28.11.2022	7:00-7:00	125	64.6	24.2	7.5	19.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.11.2022	7:15-7:15	112	57.5	21.6	8.4	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
05.12.2022	7:00-7:00	109	58.2	22.5	7.5	19.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
06.12.2022	7:15-7:15	125	65.3	33.2	9.3	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
12.12.2022	7:00-7:00	134	62.6	20.1	9.3	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13.12.2022	7:15-7:15	122	51.5	32.2	7.5	19.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
19.12.2022	7:00-7:00	101	65.4	21.3	8.4	19.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20.12.2022	7:15-7:15	116	58.8	35.5	7.5	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 3.24: AMBIENT AIR QUALITY DATA LOCATION AAQ7

Ambient Air Monitoring Details		Particulate Pollutant			Gaseous Pollutant					Metals Pollutant			Organic Pollutant	
Parameters		SPM	PM_{10}	$PM_{2.5}$	SO_2	NO_2	NH_3	O_3	CO	Pb	Ni	As	C_6H_6	BaP
NAAQ Norms		200	100	60	80	80	400	180	4	1	20	6	5	1
Unit		$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	mg/m^3	$\mu g/m^3$	ng/m^3	ng/m^3	$\mu g/m^3$	ng/m^3
Date	Period.hrs	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
03.10.2022	7:00-7:00	103	53.6	26.6	7.5	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04.10.2022	7:15-7:15	130	56.2	33.2	8.4	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07.10.2022	7:00-7:00	122	55.1	35.3	9.3	19.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.10.2022	7:15-7:15	101	52.5	32.5	8.4	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10.10.2022	7:00-7:00	112	58.4	21.4	7.5	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11.10.2022	7:15-7:15	115	65.2	22.5	8.4	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.10.2022	7:00-7:00	116	64	20.2	8.4	21.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.10.2022	7:15-7:15	102	50.7	33	8.4	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17.10.2022	7:00-7:00	121	61.8	22.5	7.5	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18.10.2022	7:15-7:15	107	52.9	36.9	9.3	19.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24.10.2022	7:00-7:00	135	64.5	25.8	8.4	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25.10.2022	7:15-7:15	120	55	29.3	7.5	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
31.10.2022	7:00-7:00	103	69.1	35.5	8.4	21.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01.11.2022	7:15-7:15	122	65.3	24.6	8.4	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07.11.2022	7:00-7:00	100	61	22.1	8.4	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.11.2022	7:15-7:15	121	60.2	30	7.5	19.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.11.2022	7:00-7:00	135	52.5	23.2	7.5	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.11.2022	7:15-7:15	124	51.4	22.8	8.4	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21.11.2022	7:00-7:00	108	54	26.5	9.3	21.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22.11.2022	7:15-7:15	119	55.2	35.2	8.4	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28.11.2022	7:00-7:00	128	59.6	34.3	7.5	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.11.2022	7:15-7:15	107	68.8	32.4	8.4	19.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
05.12.2022	7:00-7:00	133	66	20.8	9.3	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
06.12.2022	7:15-7:15	129	56.1	22.9	8.4	21.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
12.12.2022	7:00-7:00	108	53.9	23.5	7.5	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13.12.2022	7:15-7:15	117	52.5	36.2	7.5	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
19.12.2022	7:00-7:00	129	61	25	8.4	19.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20.12.2022	7:15-7:15	106	57.3	34.7	9.3	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 3.25: AMBIENT AIR QUALITY DATA LOCATION AAQ8

Ambient Air Monitoring Details		Particulate Pollutant			Gaseous Pollutant					Metals Pollutant			Organic Pollutant	
Parameters		**SPM**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**NO_2**	**NH_3**	**O_3**	**CO**	**Pb**	**Ni**	**As**	**C_6H_6**	**BaP**
NAAQ Norms		**200**	**100**	**60**	**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
03.10.2022	7:00-7:00	107	56.9	26.3	9.3	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04.10.2022	7:15-7:15	123	63.6	33.2	8.4	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07.10.2022	7:00-7:00	105	55.3	22.6	7.5	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.10.2022	7:15-7:15	119	54.5	25.5	8.4	19.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10.10.2022	7:00-7:00	126	52.4	24.4	9.3	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11.10.2022	7:15-7:15	133	61.2	22.5	8.4	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.10.2022	7:00-7:00	124	55.1	21.8	7.5	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.10.2022	7:15-7:15	102	66.5	25.4	7.5	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17.10.2022	7:00-7:00	126	59.6	24.5	8.4	21.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18.10.2022	7:15-7:15	115	65.9	38.2	7.5	21.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24.10.2022	7:00-7:00	121	52.8	37.6	8.4	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25.10.2022	7:15-7:15	102	64.5	35.9	9.3	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
31.10.2022	7:00-7:00	135	55.6	34.8	9.3	19.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01.11.2022	7:15-7:15	120	69.5	29.5	8.4	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07.11.2022	7:00-7:00	112	58.2	22.7	7.5	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.11.2022	7:15-7:15	109	66.1	20.4	8.4	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.11.2022	7:00-7:00	128	55.4	21.1	8.4	21.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.11.2022	7:15-7:15	136	64.8	22.2	9.3	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21.11.2022	7:00-7:00	123	52.5	24.5	8.4	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22.11.2022	7:15-7:15	105	63.6	35.4	7.5	19.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28.11.2022	7:00-7:00	124	56.3	39.6	8.4	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.11.2022	7:15-7:15	111	65.5	38.8	9.3	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
05.12.2022	7:00-7:00	105	54.2	34.5	8.4	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
06.12.2022	7:15-7:15	122	55.4	37.7	7.5	21.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
12.12.2022	7:00-7:00	131	58.1	25.2	8.4	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13.12.2022	7:15-7:15	120	69.2	22.4	9.3	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
19.12.2022	7:00-7:00	107	55.3	25.1	8.4	19.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20.12.2022	7:15-7:15	128	64.6	34.2	7.5	19.8	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: SUMMARY OF AAQ

PM2.5	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8
Arithmetic Mean	31.5	28.3	29.7	29.5	29.5	28.2	28.2	28.8
Minimum	20.3	20.9	20.6	20.3	22.2	20.1	20.2	20.4
Maximum	39.8	39.3	38.4	39.8	39.8	39.2	36.9	39.6
NAAQ Norms	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0

PM10	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8
Arithmetic Mean	59.4	59.7	59.1	58.3	58.2	60.1	58.4	59.7
Minimum	50.7	51.1	50.0	50.4	50.2	51.5	50.7	52.4
Maximum	69.6	69.5	69.8	68.4	69.4	69.1	69.1	69.5
NAAQ Norms	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

SO_2	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8
Arithmetic Mean	8.8	8.3	8.3	8.4	8.4	8.1	8.3	8.4
Minimum	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
Maximum	10.3	9.3	9.3	9.3	9.3	9.3	9.3	9.3
NAAQ Norms	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0

NO_2	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8
Arithmetic Mean	21.7	21.3	21.3	21.2	21.2	21.0	21.2	21.2
Minimum	20.7	19.8	19.8	19.8	19.8	19.8	19.8	19.8
Maximum	23.2	22.3	22.3	22.3	22.3	22.3	22.3	22.3
NAAQ Norms	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0

TABLE 3.27: ABSTRACT OF AMBIENT AIR QUALITY DATA

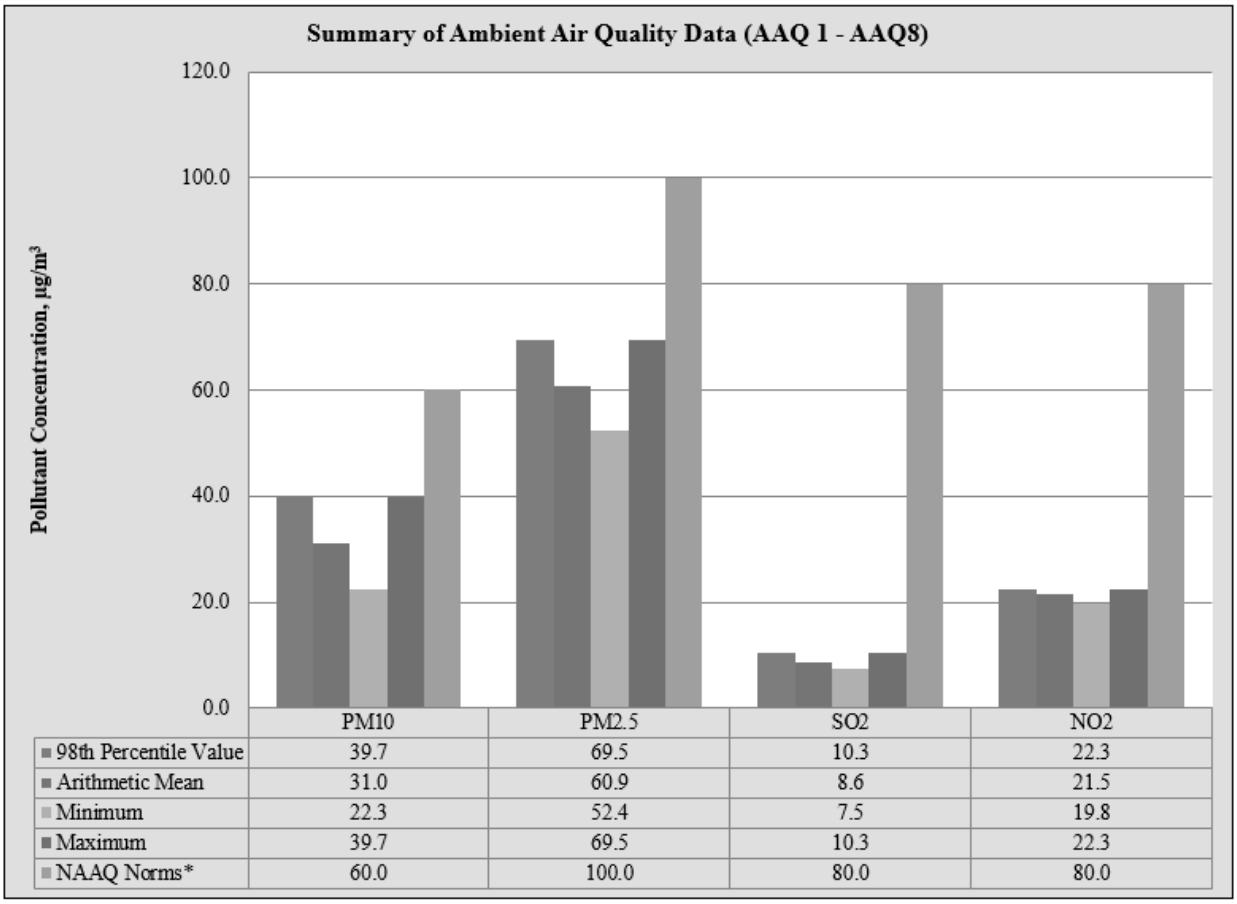
1	**Parameter**	**PM2.5**	**PM10**	**SO_2**	**NO_2**
2	No. of Observations	260	260	260	260
3	10^{th} Percentile Value	22.3	52.4	7.5	19.8
4	20^{th} Percentile Value	23.5	53.5	7.5	20.7
5	30^{th} Percentile Value	25.2	55.0	7.5	20.7
6	40^{th} Percentile Value	25.9	55.9	8.4	20.7
7	50^{th} Percentile Value	28.2	58.2	8.4	21.5
8	60^{th} Percentile Value	31.4	61.0	8.4	21.5
9	70^{th} Percentile Value	33.2	63.4	8.4	22.3
10	80^{th} Percentile Value	35.0	65.3	9.3	22.3
11	90^{th} Percentile Value	37.4	66.5	9.3	22.3
12	95^{th} Percentile Value	38.8	68.8	9.3	22.3
13	98^{th} Percentile Value	39.7	69.5	10.3	22.3
14	Arithmetic Mean	31.0	60.9	8.6	21.5
15	Geometric Mean	30.4	60.6	8.5	21.5
16	Standard Deviation	6.3	6.2	0.9	0.9
17	Minimum	22.3	52.4	7.5	19.8
18	Maximum	39.7	69.5	10.3	22.3
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_x-Oxides of Nitrogen; 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 Areas.

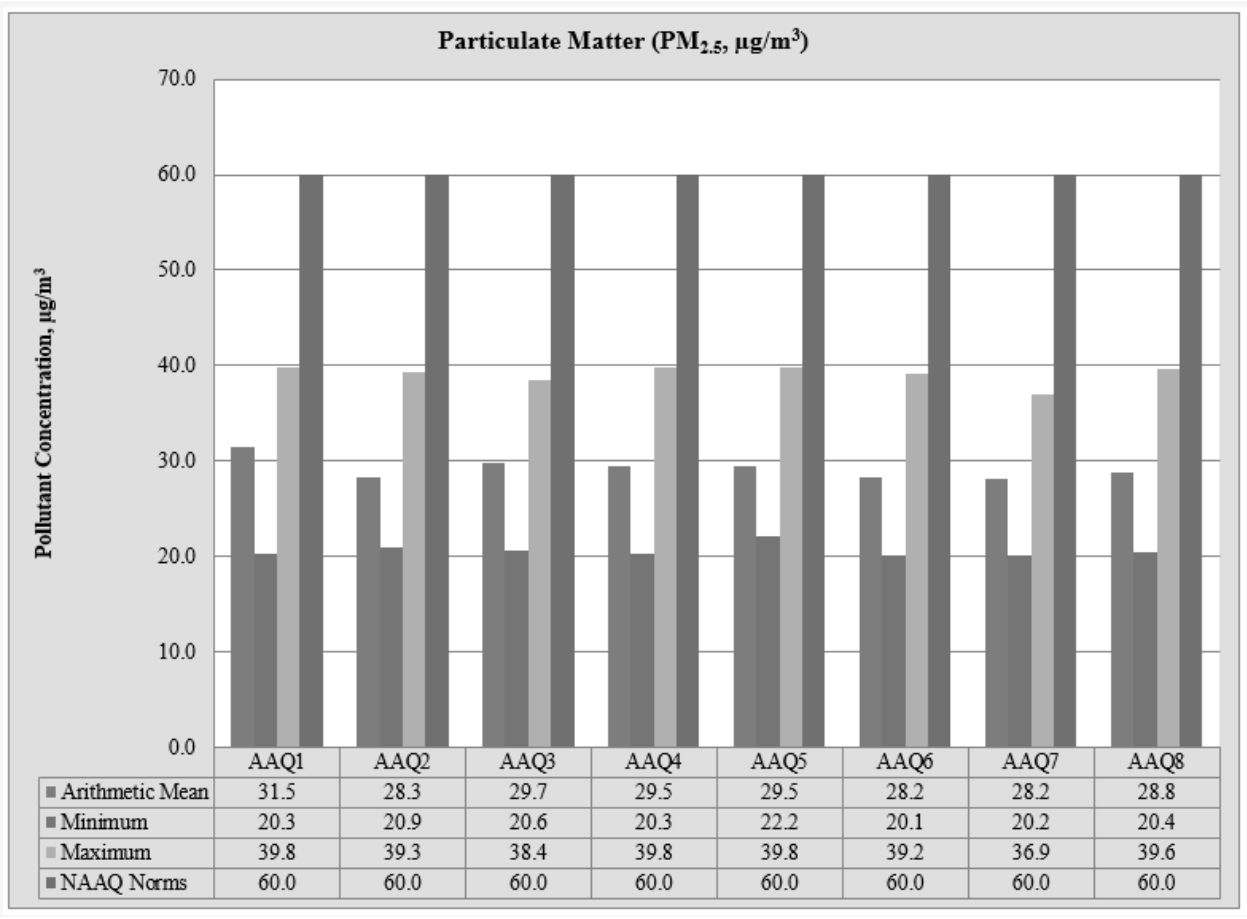
FIGURE 3.16: BAR DIAGRAM OF SUMMARY OF AAQ 1 – AAQ 8



	PM10	PM2.5	SO2	NO2
98th Percentile Value	39.7	69.5	10.3	22.3
Arithmetic Mean	31.0	60.9	8.6	21.5
Minimum	22.3	52.4	7.5	19.8
Maximum	39.7	69.5	10.3	22.3
NAAQ Norms*	60.0	100.0	80.0	80.0

Source: Table 3.17 to 3.27

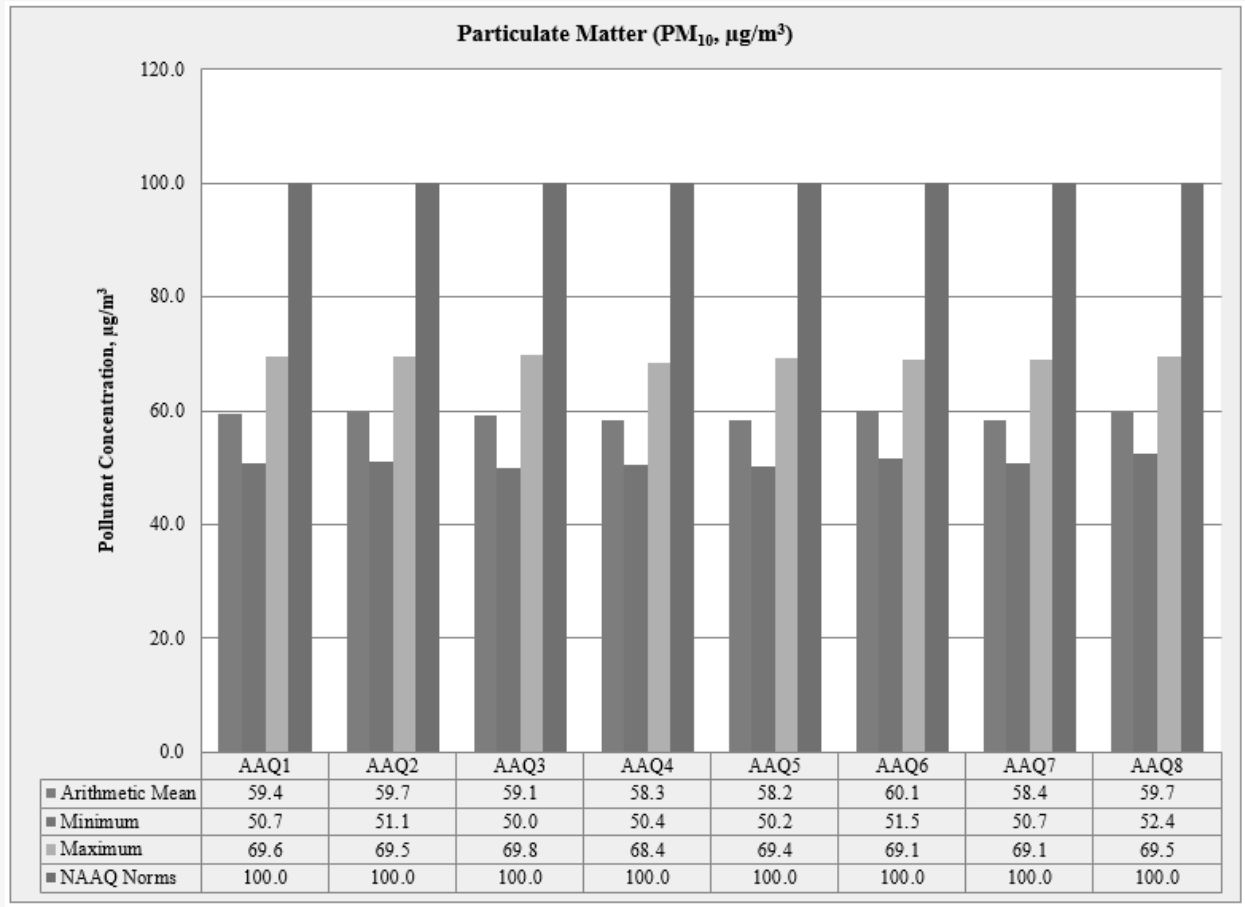
FIGURE 3.17: BAR DIAGRAM OF PARTICULATE MATTER PM2.5



	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8
Arithmetic Mean	31.5	28.3	29.7	29.5	29.5	28.2	28.2	28.8
Minimum	20.3	20.9	20.6	20.3	22.2	20.1	20.2	20.4
Maximum	39.8	39.3	38.4	39.8	39.8	39.2	36.9	39.6
NAAQ Norms	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0

Source: Table 3.17 to 3.27

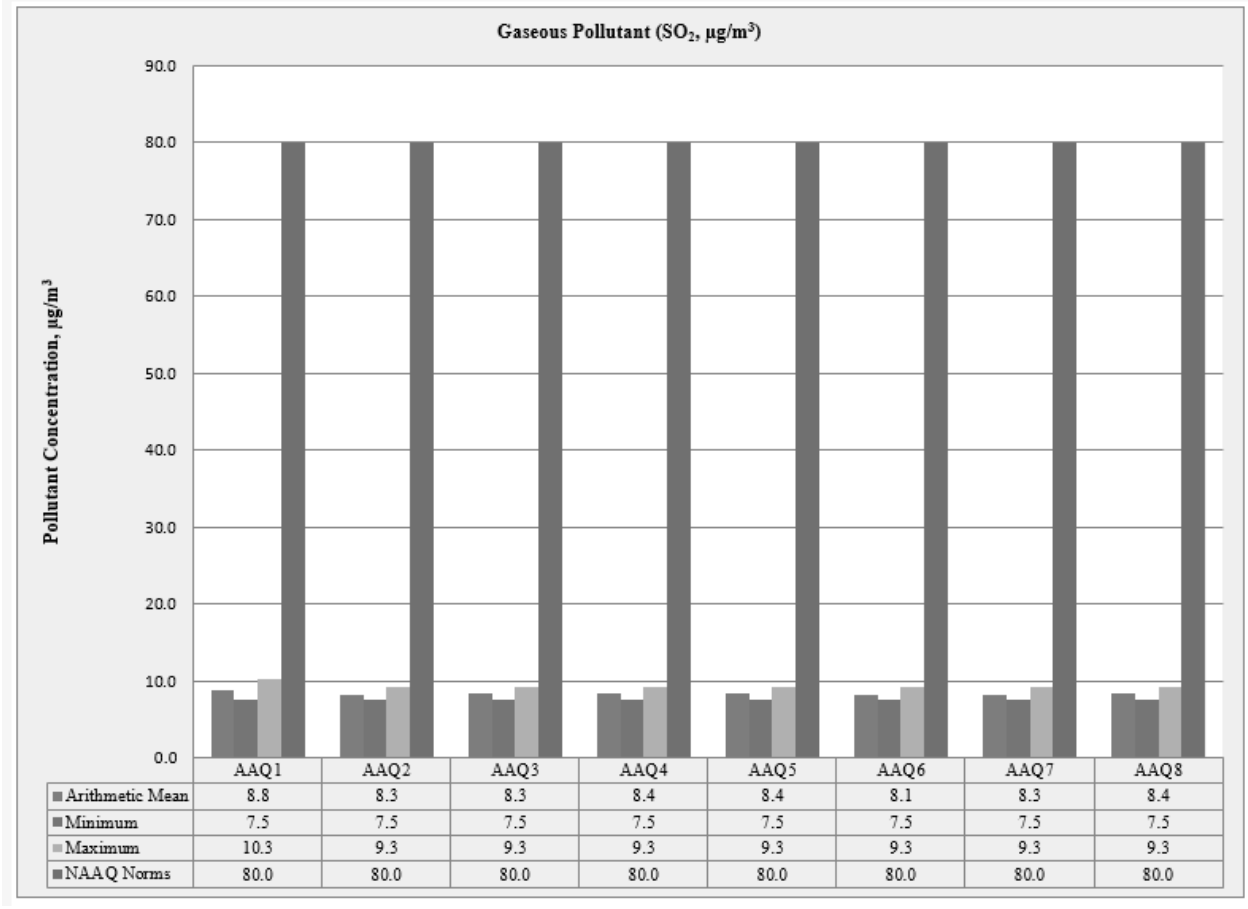
FIGURE 3.18: BAR DIAGRAM OF PARTICULATE MATTER PM_{10}



	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8
Arithmetic Mean	59.4	59.7	59.1	58.3	58.2	60.1	58.4	59.7
Minimum	50.7	51.1	50.0	50.4	50.2	51.5	50.7	52.4
Maximum	69.6	69.5	69.8	68.4	69.4	69.1	69.1	69.5
NAAQ Norms	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Table 3.17 to 3.27

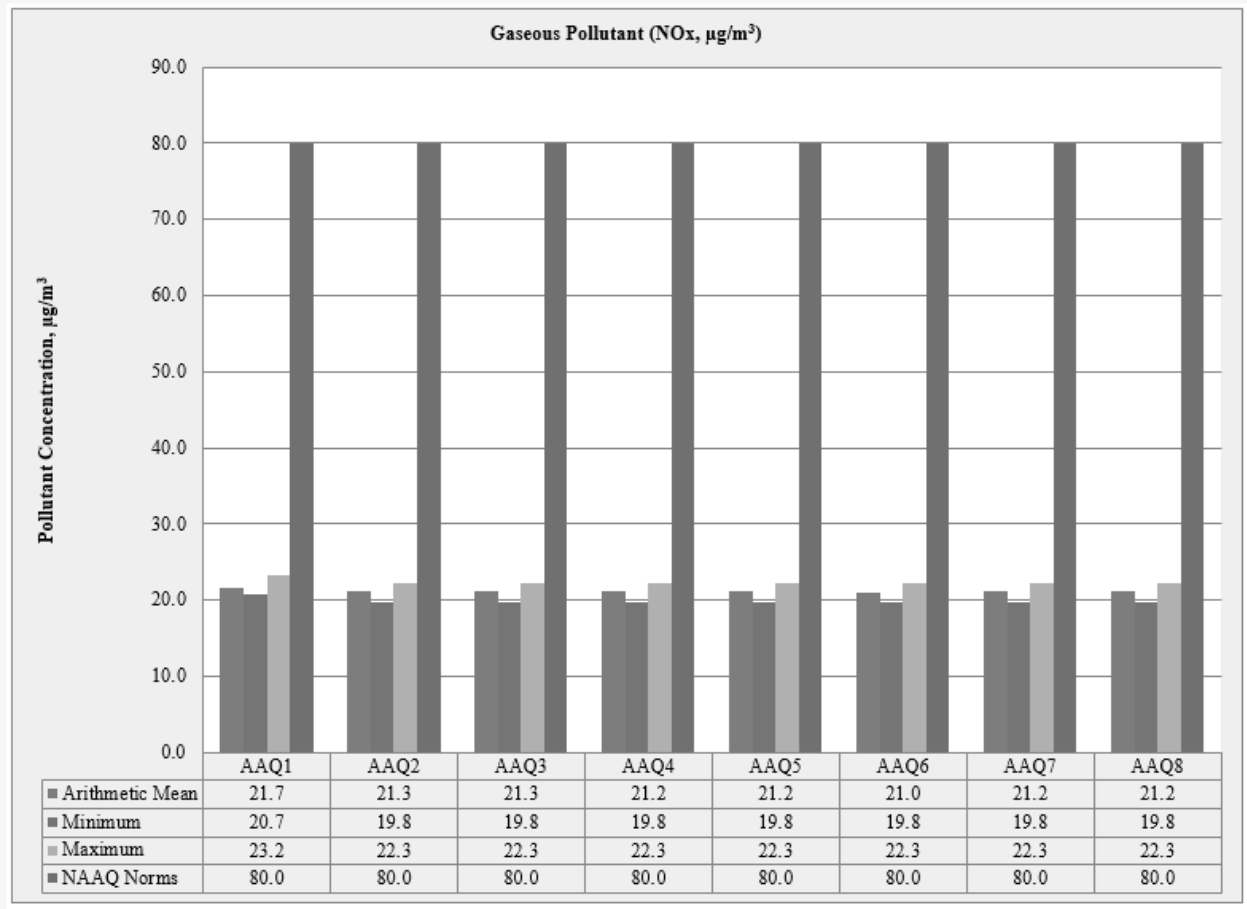
FIGURE 3.19: BAR DIAGRAM OF GASEOUS POLLUTANT SO_2



	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8
Arithmetic Mean	8.8	8.3	8.3	8.4	8.4	8.1	8.3	8.4
Minimum	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
Maximum	10.3	9.3	9.3	9.3	9.3	9.3	9.3	9.3
NAAQ Norms	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0

Source: Table 3.17 to 3.27

FIGURE 3.20: BAR DIAGRAM OF GASEOUS POLLUTANT NO_x



	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8
Arithmetic Mean	21.7	21.3	21.3	21.2	21.2	21.0	21.2	21.2
Minimum	20.7	19.8	19.8	19.8	19.8	19.8	19.8	19.8
Maximum	23.2	22.3	22.3	22.3	22.3	22.3	22.3	22.3
NAAQ Norms	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0

Source: Table 3.17 to 3.27

3.4.8INTERPRETATIONS & CONCLUSION

As per monitoring data, PM_{10} ranges from 50.7 µg/m^3 to 66.6 µg/m^3, $PM_{2.5}$ data ranges from 20.8 µg/m^3 to 39.8 µg/m^3, SO_2 ranges from 7.5 µg/m^3 to 10.3µg/m^3 and NO_2 data ranges from 20.7 µg/m^3 to 23.2 µg/m^3. The concentration levels of the above criteria pollutants were observed to be well within the limits of NAAQS prescribed by CPCB.

3.5 FUGITIVE DUST EMISSION

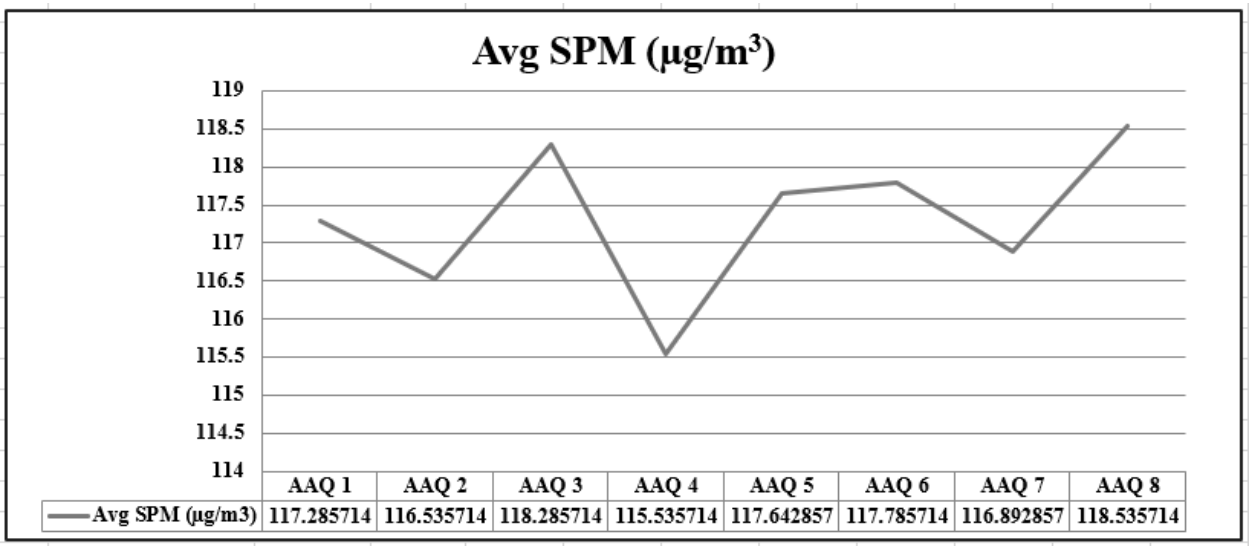
Fugitive dust was recorded at AAQ monitoring stations for 30 days average during the study period.

TABLE 3.28: AVERAGE FUGITIVE DUST SAMPLE VALUES

AAQ Locations	Avg SPM (µg/m^3)
AAQ 1	60.31
AAQ 2	61.61
AAQ 3	62.95
AAQ 4	62.89
AAQ 5	62.86
AAQ 6	63.45
AAQ7	63.91
AAQ 8	63.23

Source: Onsite monitoring/ sampling by Omega Laboratories

FIGURE 3.21: LINE DIAGRAM OF AVERAGE SPM VALUES



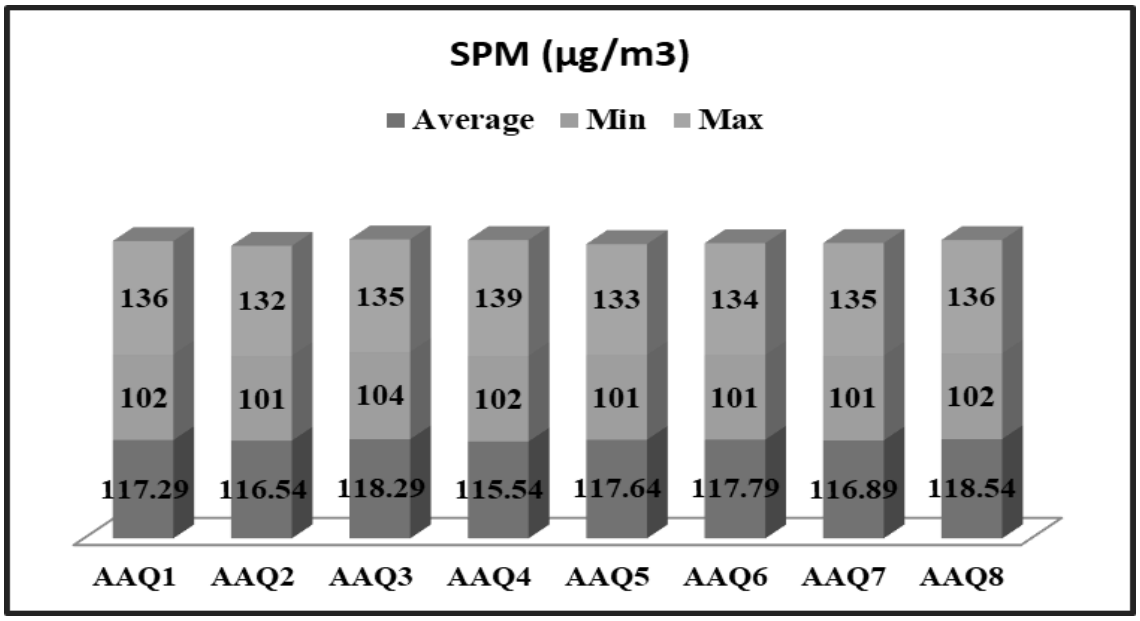
Source: Table 3.28

TABLE 3.29: FUGITIVE DUST SAMPLE VALUES IN µg/m^3

SPM (µg/m3)	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8
Average	117.29	116.54	118.29	115.54	117.64	117.79	116.89	118.54
Min	102	101	104	102	101	101	101	102
Max	136	132	135	139	133	134	135	136

Source: Calculations from Lab Analysis Reports

FIGURE 3.22: BAR DIAGRAM OF SPM VALUES



Source: Table 3.29

3.6 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.

3.6.1 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 3.30: DETAILS OF SURFACE NOISE MONITORING LOCATIONS

S. No	Location code	Monitoring Locations	Distance & Direction	Coordinates
1	**N-1**	Core Zone	Project Area	10°59'59.09"N 77°57'12.12"E
2	**N-2**	Punnam Sathiram	2.5km NE	11° 0'37.67"N 77°58'30.85"E
3	**N-3**	Punnam	4.5km SE	10°59'29.07"N 77°59'38.12"E
4	**N-4**	Salipalayam	1.7km SW	10°59'44.81"N 77°56'17.37"E
5	**N-5**	Kunthanipalayam	3.5km NW	11° 1'48.22"N 77°56'42.56"E
6	**N-6**	Karudayampalayam	4km South	10°57'51.17"N 77°56'59.87"E
7	**N-7**	Kuppam	3.3km NW	11° 0'48.76"N 77°55'31.48"E
8	**N-8**	Pavithram	5km SE	10°58'0.88"N 77°59'7.87"E

Source: On-site monitoring/sampling by Laboratories in association with GEMS

3.6.2METHOD OF MONITORING

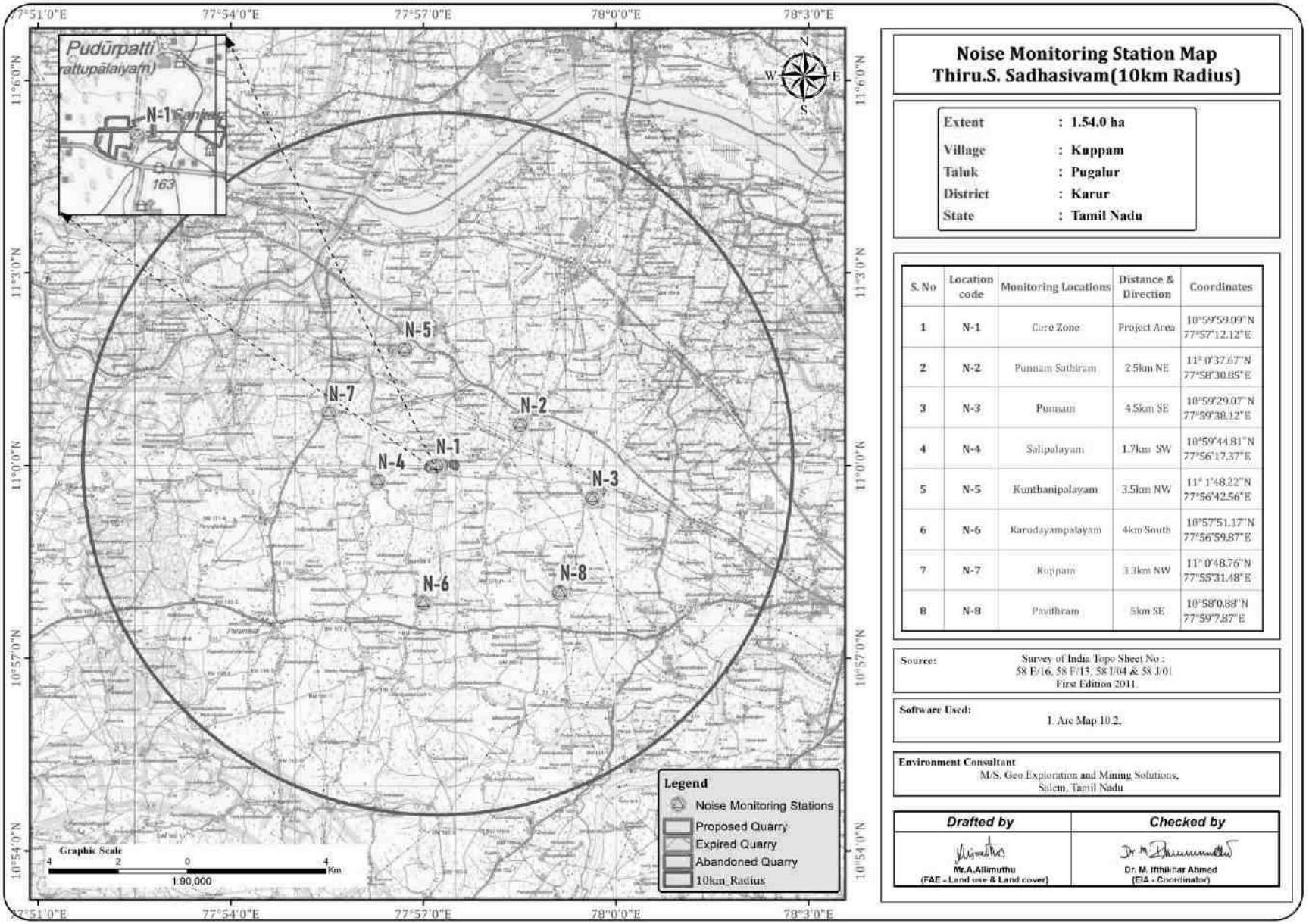
Digital Sound Level Meter was used for the study. All reading was taken on the 'A-Weighting' frequency network, at a height of 1.5 meters from ground level. The sound level meter does not give a steady and consistent reading and it is quite difficult to assess the actual sound level over the entire monitoring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

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

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

Where L = Sound pressure level at function of time dB (A) T = Time interval of observation

FIGURE 3.23: NOISE MONITORING STATIONS AROUND 10 KM RADIUS



Noise Monitoring Station Map
Thiru.S. Sadhasivam(10km Radius)

Extent	: 1.54.0 ha
Village	: Kuppam
Taluk	: Pugalur
District	: Karur
State	: Tamil Nadu

S. No	Location code	Monitoring Locations	Distance & Direction	Coordinates
1	N-1	Core Zone	Project Area	10°59'59.09"N 77°57'12.12"E
2	N-2	Punnam Sathiram	2.5km NE	11° 0'37.67"N 77°58'30.85"E
3	N-3	Punnam	4.5km SE	10°59'29.07"N 77°59'38.12"E
4	N-4	Salipalayam	1.7km SW	10°59'44.81"N 77°56'17.37"E
5	N-5	Kunthanipalayam	3.5km NW	11° 1'48.22"N 77°56'42.56"E
6	N-6	Karudayampalayam	4km South	10°57'51.17"N 77°56'59.87"E
7	N-7	Kuppam	3.3km NW	11° 0'48.76"N 77°55'31.48"E
8	N-8	Pavithram	5km SE	10°58'0.88"N 77°59'7.87"E

Source: Survey of India Topo Sheet No : 58 E/16, 58 F/13, 58 I/04 & 58 J/01 First Edition 2011

Software Used: 1. Arc Map 10.2.

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

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

3.6.3 Analysis of Ambient Noise Level in the Study Area

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

The results are presented in below Table 3.31

Day time: 6:00 hours to 22.00 hours.

Night time: 22:00 hours to 6.00 hours.

TABLE 3.31: AMBIENT NOISE QUALITY RESULT

S. No	Locations	Noise level (dB (A) Leq)		Ambient Noise Standards
		Day Time	Night Time	
1	Core Zone	47.8	37.6	**Industrial Day Time- 75 dB (A) Night Time- 70 dB (A)**
2	Punnam Sathiram	46.8	39.4	
3	Punnam	47.3	37.8	**Residential Day Time– 55 dB (A) Night Time- 45 dB (A)**
4	Salipalayam	48.1	38.2	
5	Kunthanipalayam	47.6	40.7	
6	Karudayampalayam	45.3	37.7	
7	Kuppam	40.9	37.3	
8	Pavithram	42.3	38.1	

Source: On-site monitoring/sampling by Laboratories in association with GEMS

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

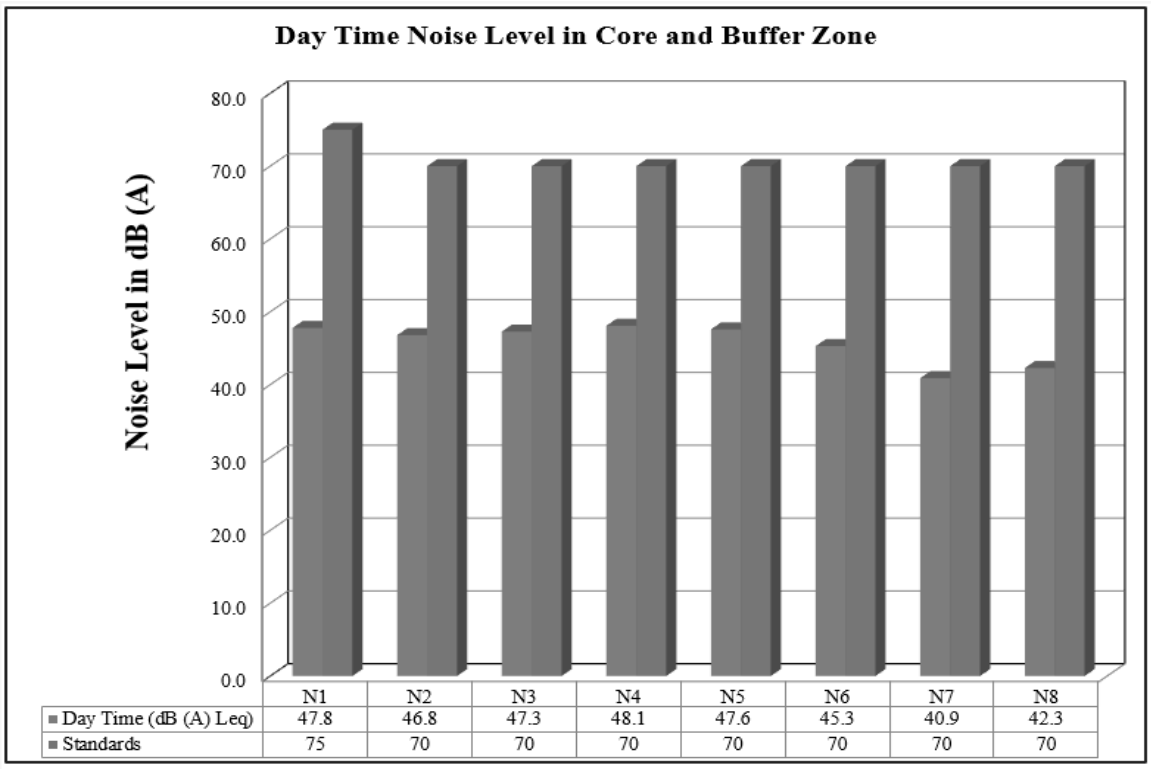
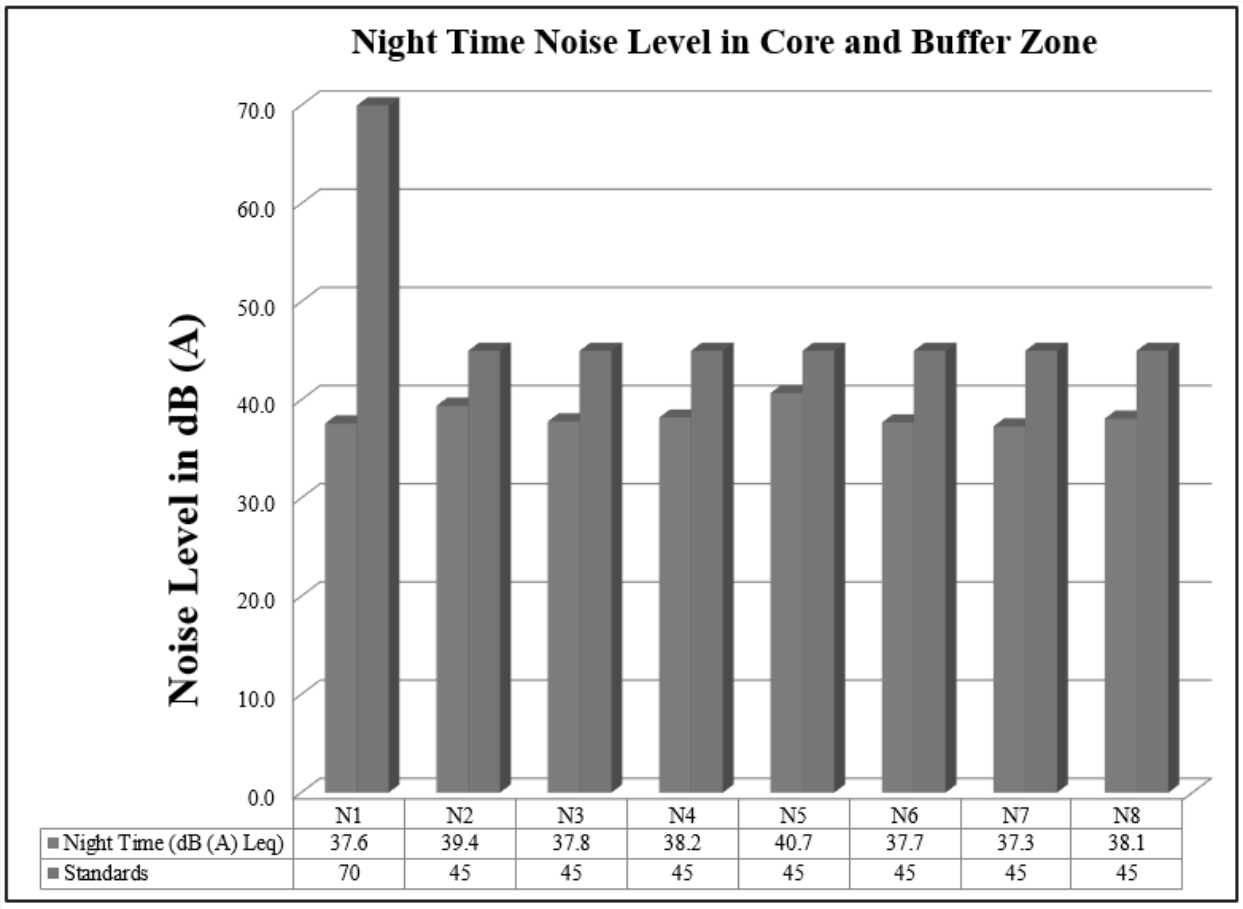


FIGURE 3.25: NIGHT TIME NOISE LEVELS IN CORE AND BUFFER ZONE



3.6.4 INTERPRETATION & CONCLUSION

Ambient noise levels were measured at 8 (Eight) locations around the proposed project area. Noise levels recorded in core zone during day time were from 47.8 dB (A) Leq and during night time were is 37.6 dB (A) Leq. Noise levels recorded in buffer zone during day time were from 47.3 to 48.1 dB (A) Leq and during night time were from 37.8 to 40.7 dB (A) Leq.

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

3.7 ECOLOGICAL ENVIRONMENT

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

3.7.1 SCOPE OF WORK

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

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

3.7.2 OBJECTIVES OF BIOLOGICAL STUDIES

The present study was undertaken with the following objectives:

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

4. Devise management & conservation measures for biodiversity.

3.7.3 METHODOLOGY OF SAMPLING

The present study was carried out in given steps

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

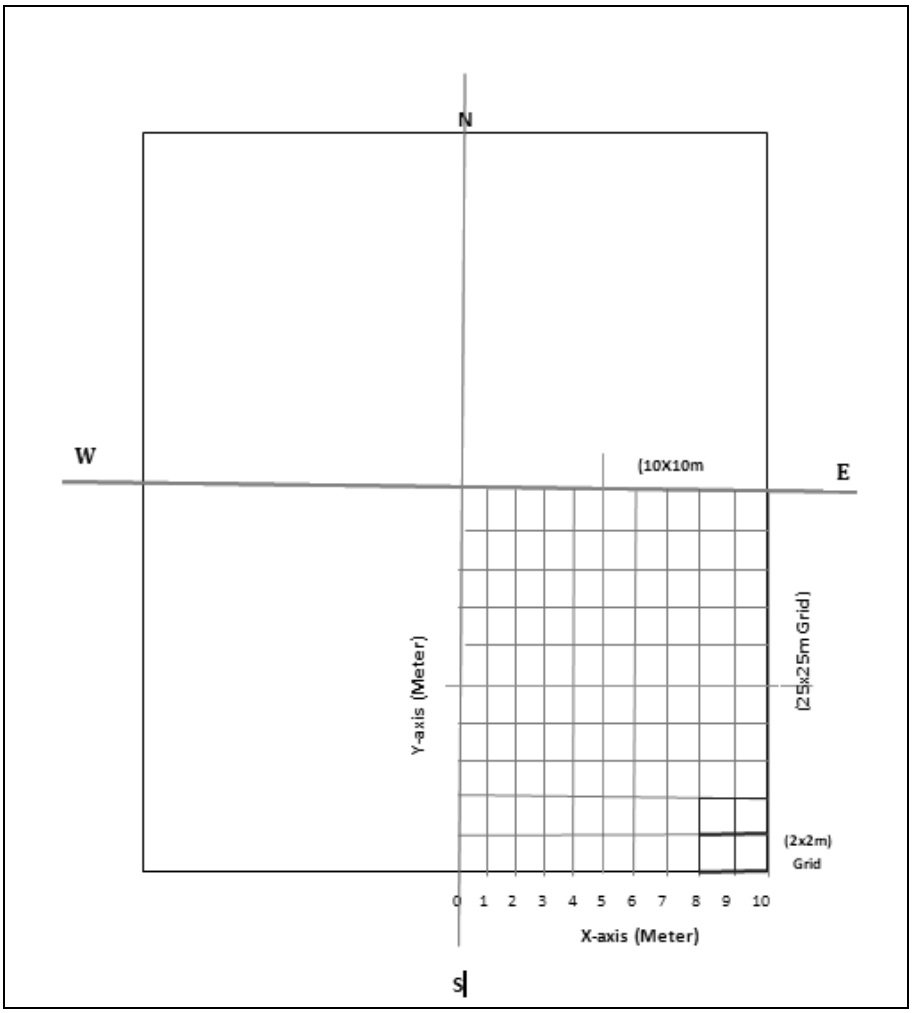
Site selection criteria: The core study area is located at Village: kuppam, Taluk: Pugalur District: Karur, Tamil Nadu. The buffer study area comprises of 10 km radius from all the proposed rough stone and Gravel quarry area.

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

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

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

FIGURE 3.26: A SCHEMATIC DIAGRAM FOR FLORAL RANDOM SAMPLING



Phyto-sociological Survey method

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

Quadrat's method

Quadrats of 25 × 25-m were laid down randomly within core and 5-km buffer area; each quadrat was laid to assess the trees (>5 cm GBH) and one, 10 × 10-m sub-quadrat nested within the quadrat for shrubs. The quadrats were laid randomly to cover the area to maximize the sampling efforts and minimize the species homogeneity, such as small stream area, trees in agricultural bunds, tank bunds, farm forestry plantations, wildlife areas, natural forest area, avenue plantations, house backyards, etc. In each quadrat individuals belonging to tree (25 × 25-m) and shrub (10 × 10-m) were recorded separately and have been identified on the field. Quadrates sampling methods is given in Fig no.3.20.

3.7.4 FLORA IN CORE ZONE

Taxonomically a total of 17 species belonging to 14 families have been recorded from the core mining lease area. It is very dry and exhibit plain topography. Based on habitat classification of the enumerated plants the majority of species were Herbs 5 (29%) followed by Trees 5 (29%), Shrubs 4 (24%) and Climbers 3 (18%). The result of core zone of flora studies shows that Fabaceae and Solanaceae are the main dominating species in the study area it mentioned in Table No.3.32 and the details of diversity of flora family's pattern are given in Fig No.3.21. No species found as threatened category (Table No. 3.32).

3.7.5 FLORA IN BUFFER ZONE

Similar type of environment also in buffer area but with more flora diversity compare than core zone area because of nearby agriculture land was found to dominate mostly in Northwest and Southeast directions. Majority of the flat landscape around project unit is occupied by agriculture fields. It contains a total of 98 species belonging to 46 families have been recorded from the buffer zone. The floral (98) varieties among them Forty-three Trees 43 (44%), eighteen Shrubs 18 (19%), seventeen Herbs 17 (17%), six Creeper 6 (6%), Climbers nine 9 (9%), four Grass 4 (4%) and one Cactus 1 (1%) were identified. Eleven numbers of Aquatic plants are given in table No. 3.3. The result of buffer zone of flora studies shows that Poaceae and Fabaceae, Euphorbiaceae are the main dominating species in the study area it mentioned in Table No.3.33

There is no Rare, Endangered and Threatened Flora species in mining area and their surrounding area. Details of flora with the scientific name were mentioned in Table No.3.33. The diversity of flora families is given in Fig No.3.22.

TABLE 3.32: FLORA IN CORE ZONE

S.No	English Name	Vernacular Name	Scientific Name	Family Name
Trees				
1	Acacia Nilotica	Karuvelam maram	*Vachellia nilotica*	Fabaceae
2	Millettia Pinnata	Pongam oiltree	*Pongamia pinnata*	Fabaceae
3	Noni	Nuna maram	*Morinda citrifolia*	Rubiaceae
4	Mesquite	Velikathan maram	*Prosopis juliflora*	Fabaceae
5	Neem	Vembu	*Azadirachta indica*	Meliaceae
Shrubs				
6	Touch-me-not	Thottalchinungi	*Mimosa pudica*	Mimosaceae
7	Milk Weed	Erukku	*Calotropis gigantea*	Apocynaceae
8	Wild sage	Unichedi	*Lantana camara*	Verbenaceae
9	Night shade plan	Sundaika	*Solanum torvum*	Solanaceae
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	Indian doab	Arugampul	*Cynodon dactylon*	Poaceae
14	Mountain knotgrass	Poolai poondu	*Aerva lanata*	Amaranthaceae
Climber				
15	Wild water lemon	Sirupunaikkali	*Passiflora foetida*	Passifloraceae
16	Stemmed vine	Perandai	*Cissus quadrangularis*	Vitaceae
17	Ivy gourd	Kovai	*Coccinia grandis*	Cucurbitaceae

TABLE 3.33: FLORA IN BUFFER ZONE

S.No	English Name	Vernacular Name	Scientific Name	Family Name	Resource use type *(E,M,EM)
Trees					
1	Banyan tree	Alamaram	*Ficus benghalensis*	Moraceae	E
2	Millettia Pinnata	Pongam oiltree	*Pongamia pinnata*	Fabaceae	E
3	Tamarind	Puliyamaram	*Tamarindus indica*	Legumes	EM
4	Acacia Nilotica	Karuvelam maram	*Vachellia nilotica*	Fabaceae	M
5	Gum arabic tree	Karuvelam	*Acacia nilotica*	Mimosaceae	NE
6	Coconut	Thennai maram	*Cocos nucifera*	Arecaceae	EM
7	Indian bael	Vilvam	*Aegle marmelos*	Rutaceae	EM
8	Creamy Peacock Flower	Vadanarayani	*Delonix elata*	Fabaceae	M
9	Beauty leaf	Punnai	*Calophyllu inophyllum*	Calophyllaceae	M
10	Indian fig tree	Athi	*Ficus recemosa*	Moraceae	EM
11	Jujube	Ilanthai	*Ziziphus jujubha*	Rhamnaceae	EM
12	Drumstick tree	Karimurungai	Moringa olefera	Moraginaceae	EM
13	Chinesh cheery	Thenpazham	*Muntingia calabura*	Tiliaceae	E
14	Chebulic myrobalan	Kadukkai	*Terminalia chebula*	Combretaceae	M
15	Indian fir tree	Nettilinkam	*Polylathia longifolia*	Annonaceae	E
16	Giant thorny bamboo	Perumungil	*Bambusa bambos*	Poaceae	M
17	Gooseberry	Arai nelli	*Phyllanthus acidus*	Euphorbiaceae	EM
18	Henna	Marudaani	*Lawsonia inermis*	Lythraceae	EM
19	Asian Palmyra palm	Panai maram	*Borassus flabellifer*	Arecaceae	E
20	Manilkara zapota	Sapota	*Manilkara zapota*	Sapotaceae	E
21	Black plum	Navalmaram	*Sygygium cumini*	Myrtaceae	EM
22	Lemon	Ezhumuchaipalam	*Citrus lemon*	Rutaceae	EM
23	Jack fruit	Palamaram	*Artocarpus heterophyllus*	Moraceae	E
24	Curry tree	Karivembu	*Murraya koenjii*	Rubiaceae	EM
25	Banana tree	Vazhaimaram	*Musa*	Musaceae	EM
26	Teak	Thekku	*Tectona grandis*	Verbenaceae	E

27	Indian gooseberry	Nelli	*Emblica officinalis*	Phyllanthaceae	EM
28	Eucalyptus	Eucalyptus	*Eucalyptus globules*	Myrtaceae	EM
29	Indian cork tree	Maramalli	*Millingtonia hortensis*	Bignoniaceae	NE
30	Chinese chaste tree	Nochi	*Vitex negundo*	Verbenaceae	E
31	Madras Thorn	Kuduka puli	*Pithecellobium dulce*	Mimosaceae	EM
32	Cutch tree	Karungali	*Acacia sundra*	Legumes	M
33	Noni	Nuna maram	*Morinda citrifolia*	Rubiaceae	M
34	Five leaf chastera	Nochi	*Vitex negundo*	Lamiaceae	M
35	Neem or Indian lilac	Vembu	*Azadirachta indica*	Meliaceae	M
36	Papaya	Pappali maram	*Carica papaya L*	Caricaceae	EM
37	Mango	Manga	*Mangifera indica*	Anacardiaceae	E
38	Peepal	Arasanmaram	*Ficus religiosa*	Moraceae	M
39	Monoon longifolium	Nettilingam	*Polyalthia longifolia*	Annonaceae	M
40	Guava	Koyya	*Psidium guajava*	Myrtaceae	EM
41	custard apple	Seethapazham	*Annona reticulata*	Annonaceae	E
42	Curry tree	Velipparuthi	*Murraya koenigii*	Asclepiadaceae	EM
43	Bamboo	Moonghil	*Bambusa bambo*	Poaceae	E
Shrubs					
44	Touch-me-not	Thottalchinungi	*Mimosa pudica*	Mimosaceae	M
45	Chrozophora tinctoria	Puramuttai	*Chrozophora rottleri*	Euphorbiaceae	M
46	Milk Weed	Erukku	*Calotropis gigantea*	Apocynaceae	M
47	Indian Oleander	Arali	*Nerium indicum*	Apocynaceae	M
48	Senna alata	Seemaiagaththi	*Cassia alata*	Caesalpinaceae	M
49	Flame of the Woods	Idlipoo	*xoracoc cinea*	Rubiaceae	M
50	Puriging nut	Kattamanakku	*Jatropha curcas*	Euphorbiaceae	EM
51	Giant reed	Naanal	*Arunudo donax*	Poaceae	NE
52	Triangular spruge	Chaturakalli	*Euphorbia antiquorum*	Euphorbiaceae	NE
53	Shoe flower	Chemparuthi	*Hibiscu rosa-sinensis*	Malvaceae	EM
54	Avaram	Avarai	*Senna auriculata*	Fabaceae	M
55	Indian mallow	Thuthi	*Abutilon indicum*	Meliaceae	M
56	Rosy Periwinkle	Nithyakalyani	*Cathranthus roseus*	Apocynaceae	M
57	Hygrophila spinosa	Neermulli	*Hydrophila auriculata*	Acanthaceae	M

58	Ipomoea carnea	Neivelikattamanaku	*Ipomoea carnea*	Convolvulaceae	E
59	Night shade plan	Sundaika	*Solanum torvum*	Solanaceae	EM
60	Ceylon Date Palm	Icham	*Phoenix pusilla*	Arecaceae	EM
61	Datura metel	Uumaththai	*Datura metel*	Solanaceae	NE
Herbs					
62	Common leucas	Thumbai	*Leucas aspera*	Lamiaceae	M
63	Indian doab	Arugampul	*Cynodon dactylon*	Poaceae	E
64	Poor land flatsedg	Kunnakora	*Cyperus compressus*	Cyperaceae	NE
65	Tridax daisy	Veetukaayapoondu	*Tridax procumbens*	Asteraceae	M
66	Punarnava	Mukkirattai	*Boerhaavia diffusa*	Nyctaginaceae	EM
67	Indian Copperleaf	Kuppaimeni	*Acalypha indica*	Euphorbiaceae	M
68	Cyperus difformis	Kudai korai	*Cyperus difformis*	Cyperaceae	NE
69	False daisy	Karisilanganni	*Eclipta prostata*	Asteraceae	EM
70	Holy basil	Thulasi	*Ocimum tenuiflorum*	Lamiaceae	M
71	Black Mustard Seed	Kaduku	*Brassica juncea*	Brassaceae	EM
72	Prickly chaff flower	Nayuruv	*Achyranthes aspera*	Amaranthaceae	M
73	Cleome viscosa	Nai kadugu	*Celome viscosa*	Capparidaceae	M
74	Carrot grass	Parttiniyam	*Parthenium hysterophorus*	Asteraceae	NE
75	Digeria muricata	Thoiya keerai	*Digeria muricata*	Amarantheceae	EM
76	Common nut sedge	Korai	*Cyperus rotundus*	Cyperaceae	NE
77	European black nightshade	Manathakkali	*Solanumnigrum*	Solanaceae	EM
78	Turmeric's	Manjal	*Curcuma longa*	Zingiberaceae	EM
Climbers					
79	Ivy gourd	Kovai	*Coccinia grandis*	Cucurbitaceae	M
80	Stemmed vine	Perandai	*Cissus quadrangularis*	Vitaceae	M
81	butterfly pea	Karkakartum	*Clitoria ternatea*	Fabaceae	M
82	Indian sarsparilla	Nannari	*Hemidesmus indicus*	Asclepiadaceae	M
83	Balloon vine	Mudakkotan	*Cardiospermum helicacabum*	Sapindaceae	M
84	Butterfly-pea	Sangupoo	*Clitoriaternatia*	Fabaceae	M
85	Pointed gourd	Kovakkai	*Trichosanthes dioica*	Cucurbitaceae	EM
86	Wild jasmine	Malli	*Jasminum augustifolium*	Oleaceae	EM

87	Bottle Guard	Sorakkai	*Lagenaria siceraria*	Cucurbitaceae	EM
Creepers					
88	Ground Spurge	Sithrapaalavi	*Euphorbia prostrata*	Euphorbiaceae	EM
89	Bitter Apple	Thumattikai	*Cucumis callosus*	Cucurbitaceae	M
90	Ipomoea reniformis chois	Elikkathilai	*Merremia gangetica*	Convolvulaceae	NE
91	Nut grass	Korai	*Cyperus rotandus*	Poaceae	M
92	Merremia	Muthiyar koontha	*Merremia tridentata*	Convolvulaceae	M
93	Frog fruit	Poduthalai	*Phyla nodifolia*	Verbenaceae	NE
Grasses					
94	Apluda	Kattu kanchippul	*Apluda mutica*	Poaceae	NE
95	Jungle rice	Kuthirai vaal Kattu arusi	*Echinochloa colona*	Poaceae	NE
96	Eragrostis	Pullu	*Eragrostis ferruginea*	Poaceae	E
97	Windmill grass	Chevvarakupul	*Chloris barbata*	Amaranthaceae	NE
Cactus					
98	Opuntia stricta	Nagathali	*Opuntia dillenii*	Cactaceae	M

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

3.7.6 AQUATIC VEGETATION

The field survey for assessing the aquatic vegetation was also undertaken during the study period. The list of aquatic plants observed in the study area is given in Table 3.34.

TABLE 3.34: AQUATIC VEGETATION

S.No	Scientific name	Common Name	Vernacular Name (Tamil)	IUCN Red List of Threatened Species
1	*Aponogetonnatans*	Floating laceplant	Kottikizhnagu	NA
2	*Cyperus exaltatus*	Tall Flat Sedge	Koraikizhangu	LC
3	*Nymphaea nouchali*	Blue waterlily	Nellambal	LC
4	*Carex cruciata*	Cross Grass	Koraipullu	NA
5	*Chrysopogon aciculatus*	Golden false beardgrass	Kampuputpi	NA
6	*Cynodon dactylon*	Scutch grass	Arugampul	LC
7	*Nymphaea nauchali*	Blue lotus	Alli	LC
8	*Hydrilla verticillata*	Waterthymes	Amiranappaci	LC
9	*Nelumbo nucifera*	Sacred lotus	Chenthaamarai	LC
10	*Eichornia crassipe*	Water hyacinth	Agayatamarai	NA
11	*Marsilea quadrifolia*	Water clover	Aaraikeerai	LC

*LC- Least Concern, NA-Not yet assessed

3.7.7 FAUNA

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

3.7.8 FAUNA METHODOLOGY

The study of fauna takes substantial amount of time to understand the specific faunal characteristics of the area. The assessment of fauna has been done on the bases of primary data collected from the lease sites. The presence was also confirmed from the local inhabitants depending on the animal sightings and the frequency of their visits in the project area. In addition, officials, local peoples were another source of information for studying the fauna of the area. Field activities are physical/active search, covering rocks, burrows, hollow inspection and location of nesting sites and habitat assessment etc. Taxonomical identification was done by the field guide book and wildlife envis data base (wiienvis.nic.in/Database/Schedule Species Database) and Zoological Survey of India (ZSI). Detailed faunas are mentioned in the Table No. 3.35 and 3.36.

3.7.9 SURVEY AND MONITORING OF MAMMALS

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

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

Survey and Monitoring of Birds

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

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

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

Survey and Monitoring of reptiles

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

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

3.7.10 FAUNA IN CORE ZONE

A total of 20 varieties of species observed in the Core zone of Velampalayam Village, Rough stone and Gravel quarry (Table No.3.8) among them numbers of Insects 4 (20%), Reptiles 5 (25%), Mammals 3 (15%) and Avian 8 (40%). A total of 20 species belonging to 16 families have been recorded from the core mining lease area. None of these species are threatened or endemic in the study area and surroundings. There is no Schedule I species and six species are under schedule IV according to Indian wild life Act 1972. A total seven species of bird were sighted in the mining lease area.

Dominant species are mostly birds and insects and three amphibians were observed during the extensive field visit (Hoplobatrachus tigerinus), (Rana hexadactyla), (Bufo melonosticatus). There are no critically endangered, endangered, vulnerable and endemic species were observed. Details of fauna in core zone with the scientific name were mentioned in Table No. 3.35.

3.7.11 FAUNA IN BUFFER ZONE

Taxonomically a total of 52 species belonging to 34 families have been recorded from the buffer zone area. Based on habitat classification the majority of species were Birds 21 (40%), followed by Insects 13 (25%), Reptiles 11 (21%), Mammals 4 (8%) and amphibians 3 (6%). There are six Schedule II species and twenty-nine species are under schedule IV according to Indian wild life Act 1972. A total twenty-one species of bird were sighted in the study area. There are no critically endangered, endangered, vulnerable and endemic species were observed.

The result of core & Buffer zone of fauna studies shows that Nymphalidae and Scincidae, Agamidae are the main dominating species in the study area; it is mentioned in Table No.3.36. There is no schedule I Species in study area. A detail of fauna diversity of family's pattern is given in Fig No.3.24. There are no critically endangered, endangered, vulnerable and endemic species were observed. Details of faunal diversity in buffer zone are given in Table No.3.36.

TABLE 3.35: FAUNA IN CORE ZONE

SI.No	Common Name/English Name	Family Name	Scientific Name	Schedule list wildlife Protection act 1972	IUCN Red List data
Insects					
1	Striped tiger	Nymphalidae	*Danaus plexippus*	Schedule IV	LC
2	Common Tiger	Nymphalidae	*Danaus genutia*	NL	NL
3	Red-veined darter	Libellulidae	*Sympetrum fonscolombii*	NL	LC
4	Praying mantis	Mantidae	*mantis religiosa*	NL	NL
Reptiles					
5	Brahminy skink	Scincidae	*Eutropis carinata*	NL	LC
6	Common house gecko	Gekkonidae	*Hemidactylus frenatus*	NL	LC
7	Fan-Throated Lizard	Agamidae	*Sitanaponticeriana*	NL	LC
8	Common skink	Scincidae	*Mabuya carinatus*	NL	LC
9	Rat snake	Colubridae	*Ptyas mucosa*	Sch II (Part II)	LC
Mammals					
10	Indian Field Mouse	Muridae	*Mus booduga*	Schedule IV	NL
11	Asian Small Mongoose	Herpestidae	*Herpestes javanicus*	Schedule II	LC
12	Common rat	Muridae	*Rattus rattus*	Schedule IV	LC
Aves					
13	Two-tailed Sparrow	Dicruridae	*Dicrurus macrocercus*	Schedule IV	LC
14	Black drongo	Dicruridae	*Dicrurus macrocercus*	Schedule IV	LC
15	Koel	Cucalidae	*Eudynamys*	Schedule IV	LC
16	Common myna	Sturnidae	*Acridotheres tristis*	NL	LC
17	Asian green bee-eater	Meropidae	*Meropsorientalis*	NL	LC
18	Rose-ringed parkeet	Psittaculidae	*Psittacula krameri*	NL	LC
19	House crow	Corvidae	*Corvussplendens*	NL	LC
20	Indian pond heron	Ardeidae	*Ardeola grayii*	Schedule IV	LC

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

TABLE 3.36: FAUNA IN BUFFER ZONE

SI.No	Common Name/English Name	Family Name	Scientific Name	Schedule list wildlife Protection act 1972	IUCN Red List data
Insects					
1	Jewel beetle	Buprestidae	*Eurythyrea austriaca*	Schedule IV	NA
2	Common Indian crow	Nymphalidae	*Euploea core*	Schedule IV	LC
3	Blue tiger	Nymphalidae	*Tirumala limniace*	Schedule IV	LC
4	Striped tiger	Nymphalidae	*Danaus plexippus*	Schedule IV	LC
5	Grasshopper	Acrididae	*Hieroglyphus sp*	NL	LC
6	Lesser grass blue	Lycaenidae	*Zizina Otis indica*	Schedule IV	LC
7	Red-veined darter	Libellulidae	*Sympetrum fonscolombii*	NL	LC
8	Common Tiger	Nymphalidae	*Danaus genutia*	Schedule IV	LC
9	Dragonfly	Gomphidae	*Ceratogomphus pictus*	Schedule IV	LC
10	Tawny coster	Nymphalidae	*Danaus chrysippus*	Schedule IV	LC
11	Praying mantis	Mantidae	*mantis religiosa*	NL	NL
12	Indian honey bee	Apidae	*Apis cerana*	Schedule IV	LC
13	Milkweed butterfly	Nymphalidae	*Danainae*	NL	LC
Reptiles					
14	Garden lizard	Agamidae	*Calotes versicolor*	NL	LC
15	Fan-Throated Lizard	Agamidae	*Sitanaponticeriana*	NL	LC
16	Chameleon	Chamaeleonidae	*Chameleon zeylanicus*	Sch II (Part II)	LC
17	Indian wall lizard	Gekkonidae	*Hemidactylus flaviviridis*	Schedule IV	NL
18	Olive keelback water snake	Natricidae	*Atretium schistosum*	Sch II (Part II)	LC
19	Brahminy skink	Scincidae	*Eutropis carinata*	NL	LC
20	Rat snake	Colubridae	*Ptyas mucosa*	Sch II (Part II)	LC
21	Saw scaled viper	Elapidae	*Echis carinatus*	Sch II (Part II)	LC
22	Common house gecko	Gekkonidae	*Hemidactylus frenatus*	NL	LC
23	Whip Snake	Elapidae	*Dryphis nasutus*	Sch II (Part II)	LC
24	Common skink	Scincidae	*Mabuya carinatus*	NL	LC
Mammals					
25	Indian palm squirrel	Sciuridae	*Funambulus palmarum*	Schedule IV	LC
26	Brown rat	Muridae	*Rattus norwegicus*	Schedule IV	LC

27	Asian Small Mongoose	Herpestidae	*Herpestes javanicus*	Schedule (Part II)	LC
28	Indian Field Mouse	Muridae	*Mus booduga*	Schedule IV	LC
Aves					
29	Koel	Cucalidae	*Eudynamys*	Schedule IV	LC
30	Rose-ringed parkeet	Psittaculidae	*Psittacula krameri*	NL	LC
31	Shikra	Accipitridae	*Accipiter badius*	NL	LC
32	Blue Rock Pigeon	Columbidae	*Columba livia*	Schedule IV	LC
33	Eurasian coot	Rallidae	*Fulica atra*	Schedule IV	LC
34	Common Coot	Rallidae	*Fulica atra*	Schedule IV	LC
35	Asian green bee-eater	Meropidae	*Meropsorientalis*	NL	LC
36	Small blue Kingfisher	Alcedinidae	*Alcedo atthis*	Schedule IV	LC
37	House crow	Corvidae	*Corvussplendens*	NL	LC
38	White-breasted waterhen	Rallidae	*Amaurornis phoenicurus*	NL	LC
39	Common quail	Phasianidae	*Coturnix coturnix*	Schedule IV	LC
40	Small Sunbird	Nectariniidae	*Nectarinia asiatica*	Schedule IV	LC
41	Black drongo	Dicruridae	*Dicrurus macrocercus*	Schedule IV	LC
42	Two-tailed Sparrow	Dicruridae	*Dicrurus macrocercus*	Schedule IV	LC
43	Common myna	Sturnidae	*Acridotheres tristis*	NL	LC
44	Common Quail	Phasianidae	*Coturnix coturnix*	Schedule IV	LC
45	Grey Francolin	Phasianidae	*Francolinus pondicerianus*	Schedule IV	LC
46	Cattle egret	Ardeidae	*Bubulcus ibis*	NL	LC
47	Grey Heron	Ardeidae	*Ardea Cinerea*	Schedule IV	LC
48	Indian pond heron	Ardeidae	*Ardeola grayii*	Schedule IV	LC
49	Little Green Heron	Ardeidae	*Butorides Striatus*	NL	LC
Amphibians					
50	Indian Burrowing frog	Dicroglossidae	*Sphaerotheca breviceps*	Schedule IV	LC
51	Green Pond Frog	Ranidae	*Rana hexadactyla*	Schedule IV	LC
52	Tiger Frog	Chordata	*Hoplobatrachus tigerinus (Rana tigerina)*	Schedule IV	LC

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

FIGURE 3.27: FLORAL DIVERSITY IN CORE ZONE

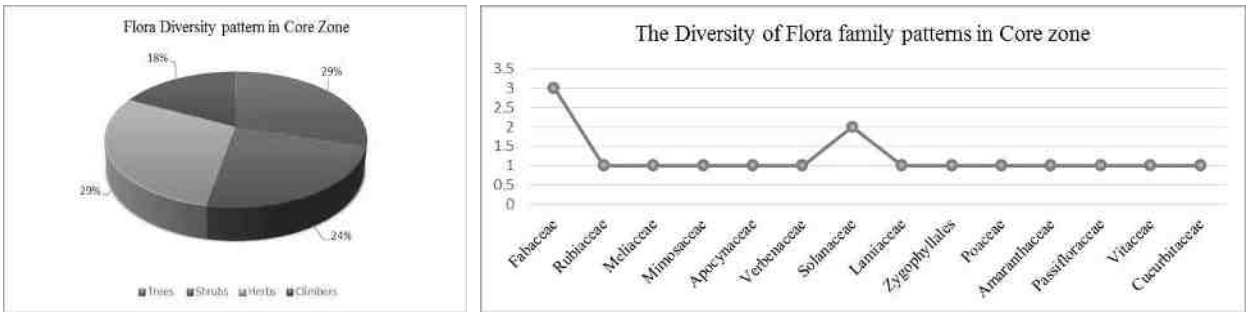


FIGURE 3.28: FLORAL DIVERSITY IN BUFFER ZONE

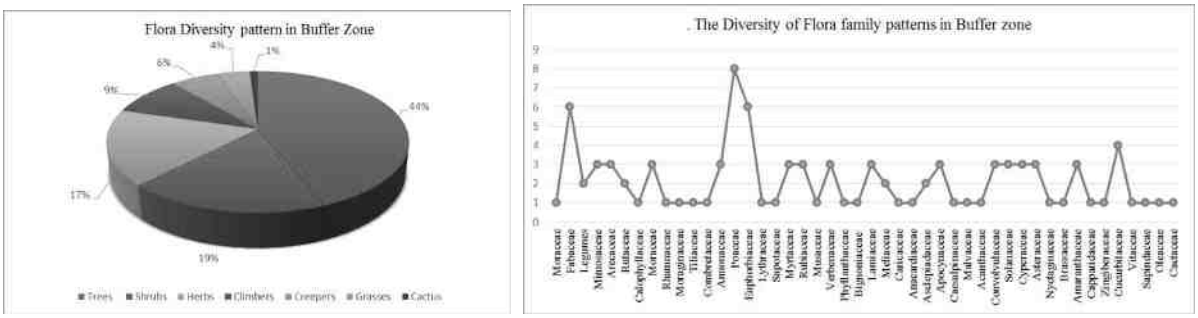


FIGURE 3.29: FAUNA DIVERSITY IN CORE ZONE

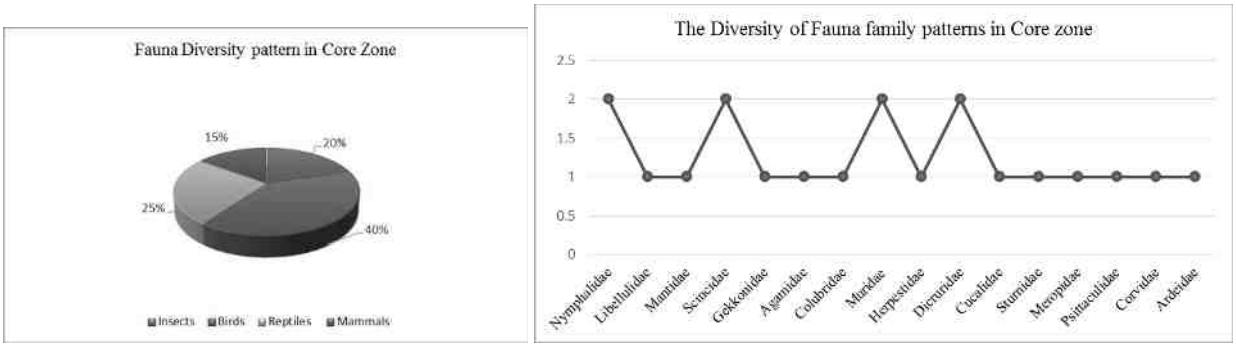
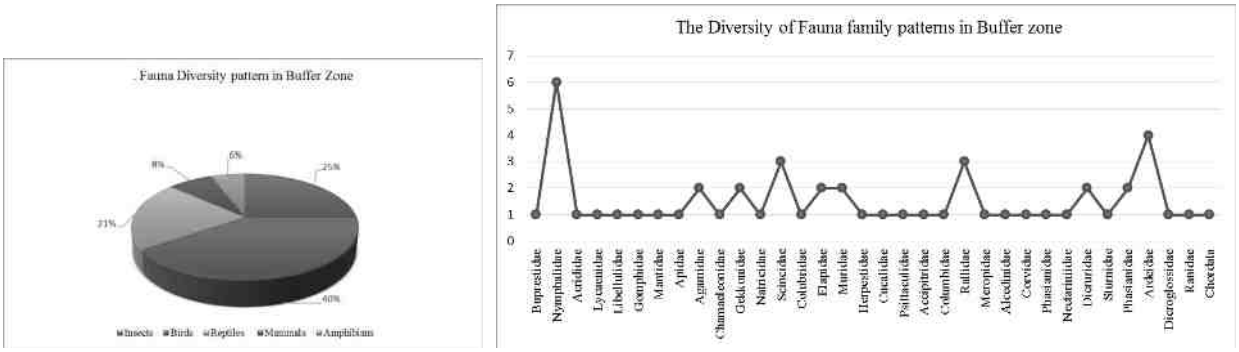


FIGURE 3.30: FAUNA DIVERSITY IN BUFFER ZONE



3.7.12 INTERPRETATION& CONCLUSION

There is no schedule I species of animals observed within study area as per Wildlife Protection Act 1972 as well as no species is in vulnerable, endangered or threatened category as per IUCN. There is no endangered red list species found in the study area. Hence this small operation over short period of time will not have any significant impact on the surrounding flora and fauna.

3.8 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.

3.8.1 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.

3.8.2 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

3.8.3 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.

3.8.4 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.

3.8.5 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 Kuppam Village, Pugalur Taluk, Karur 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).

3.8.6 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 3.37: 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.

3.8.7 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, Karur, 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.

3.8.8 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.

3.8.9 POPULATION GROWTH RATE

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

TABLE 3.38: POPULATION GROWTH RATE

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

3.8.10 KARUR DISTRICT

Karur Taluk, which was once a part of Coimbatore district, was merged with Tiruchirappalli district during 1910. Karur District came into existence by the bifurcation of Trichy District. It is bounded on the North by Namakkal, South by Dindugal, East by Tiruchirappalli and West by Erode districts.

Karur District consists of two Revenue Divisions viz., Karur and Kulithalai, Seven Taluks viz., Karur, Aravakurichi, Manmangalam, Pugalur, Kulithalai, Krishnarayapuram and Kadavur.

Karur District is located in central Tamil Nadu and is 410 K.M. away from Chennai. The District has an area of 2904 Sq.Km. It is an inland district without any coast line. The District has Amaravathi River and Cauvery River and it has no well marked natural divisions. The District is rich in mineral deposits. Granite occurs at Thogamalai, K.Pitchampatty and various places in the district. Apart from the above major minerals the common use minor minerals viz Red Gravel, Brick Clay, filling earth and Kankar are also found in this District. Source: https://karur.nic.in/about-district/

3.8.11 STUDY AREA

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

3.8.12 DEMOGRAPHIC PATTERN OF 10KM STUDY AREA CHARACTERISTICS A COMPARATIVE ANALYSIS

TABLE 3.39 SHOWS THE SOCIO-ECONOMIC PROFILE OF THE STUDY AREA AS COMPARED TO DISTRICT, STATE AND NATIONAL LEVEL SOCIO-ECONOMIC PROFILE

Particular	India	Tamil Nadu	Karur District	Study Area (10km Radius)
Area (in sq. km.)	3,287,263	130058	2904	320
Population Density/ sq. Km.	368	554	367	157
No. of Households	249454252	13357027	287095	15124
Population	1210569573	72147030	1064493	50311
Male	623121843	36137975	528184	24855
Female	587447730	36009055	536309	25456
Scheduled Tribes	104281034	794697	575	26
Scheduled Castes	201378086	14438445	221385	10485
Literacy Rate	**72.99%**	**80%**	**75.60%**	**73.42%**
Sex Ratio (Females per 1000 Males)	**943**	**996**	**1015**	**1024**

Source: Census of India, 2011

Table no 3.39 show demographic pattern of India, Tamil Nadu, Karur District & Study area (10km Radius). In India had total area of 3.2 sqkm, State of Tamil Nadu area was 130058 sqkm, District of Karur area was 2904 sqkm and study area is about 320 sqkm. Population density is total population per sqkm. So, India population density was 368 sqkm, state of Tamil Nadu density was 554 sqkm, District

had density about 367 sqkm and study area density is about 157 sqkm. As per Census 2011, about 5.96percent of population in the state lives in areas. Karur had comparing state wise 2.14 percent of population lives in the district. In study area has 3.09 % around 10km radius. State, District and study area. In Tamil Nadu state SC categories people had about 20.02 %, district of Karur about 20.79 % it has increasing to Study area about 20.84% increasing in the total population Similarly ST population is about 1.10%, 1.26% and 0.05% of the total population in the study area. State level Literacy rate is 80%, district level is 76% but study area has almost decreased about 73.42%. There is literacy rate is study area decrease comparing district level decrease in the study area. Sex ratio female per thousand males about state level is 996, District level is 1015 and study area is 1024.

The study area has population density 157 persons per sq.km of total population about 50311 as per census 2011. There were about 49.40 percent male and 50.60 % female population. Study area has literate rate is about 73.42%. District had about 75.60% of literate rate as per census 2011.

3.8.13 POPULATION PROJECTION OF THE STUDY AREA

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

TABLE 3.40 TOTAL POPULATION OF STUDY AREA

Sl No.	Population in 2001	Population in 2011
1	42956	50311

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

TABLE 3.41 POPULATION PROJECTION OF STUDY AREA

S. No	Year	Projected Population (Approximately)
1.	2021	50311
2.	2031	57666
3.	2041	65021
4.	2051	72376

Source: Calculated by SPSS v29, 2022.

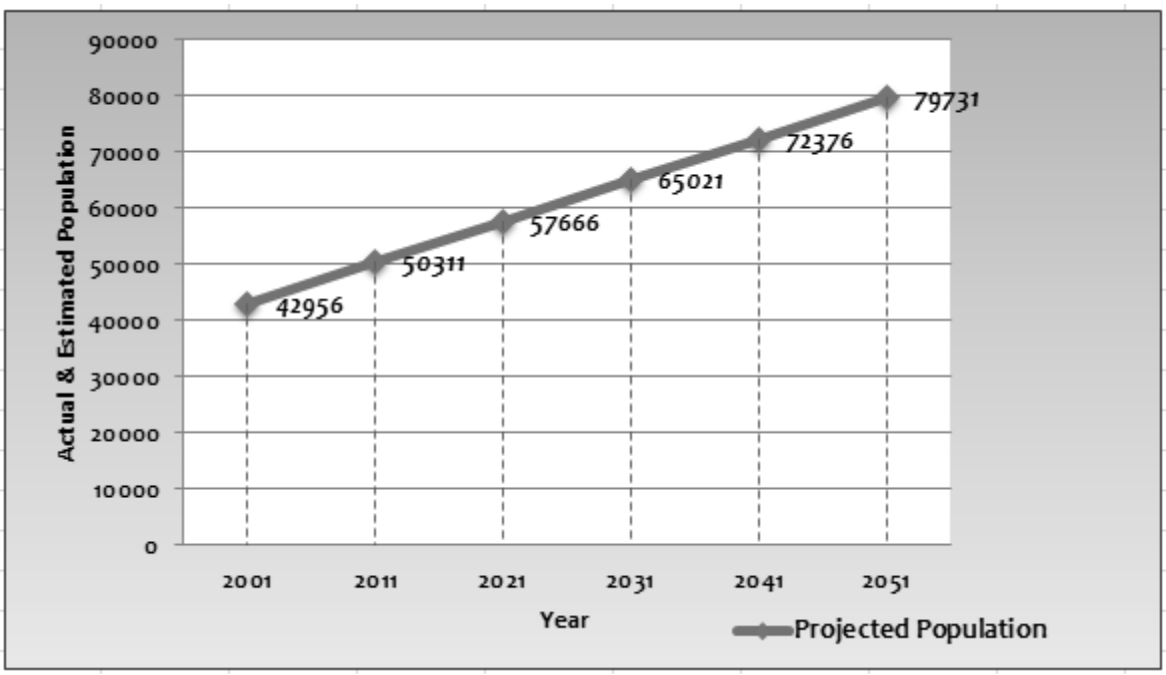


FIGURE.3.31: GRAPH SHOWING POPULATION PROJECTION

Following formula has been used for the projection of population.

$$Y=a+b_t$$

Where: Y= Dependent variable (Population)

a=Intercept

b=Slope

t=Interdependent variables (Time)

Above formula is applied to project population for the years (2021, 2031,2041,2051). Due to avoid the errors in manual calculation the statistical software SPSS (demo version 29) is used to calculate the intercept and the slope.

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

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

3.8.14 POPULATION GROWTH OF THE STUDY AREA

TABLE 3.42 POPULATION GROWTH RATE IN STUDY AREA

Year	Actual Population	Growth Rate %
2001	42956	-
2011	50311	11.71
2021	57666	11.46
2031	65021	11.28
2041	72376	11.13
2051	79731	11.02

Source: Compiled by Author-2022

Above table no 3.14.1 is showing the growth rate of population since 2001, as per census in 2001 the population of study area was 42956 and 2011 it was 50311 if the population growth rate is 11.71%, it will approximately 57666 in year 2021 and 79731 in the year of 2051. It has approximately population growth rate decline will be 11.02%.

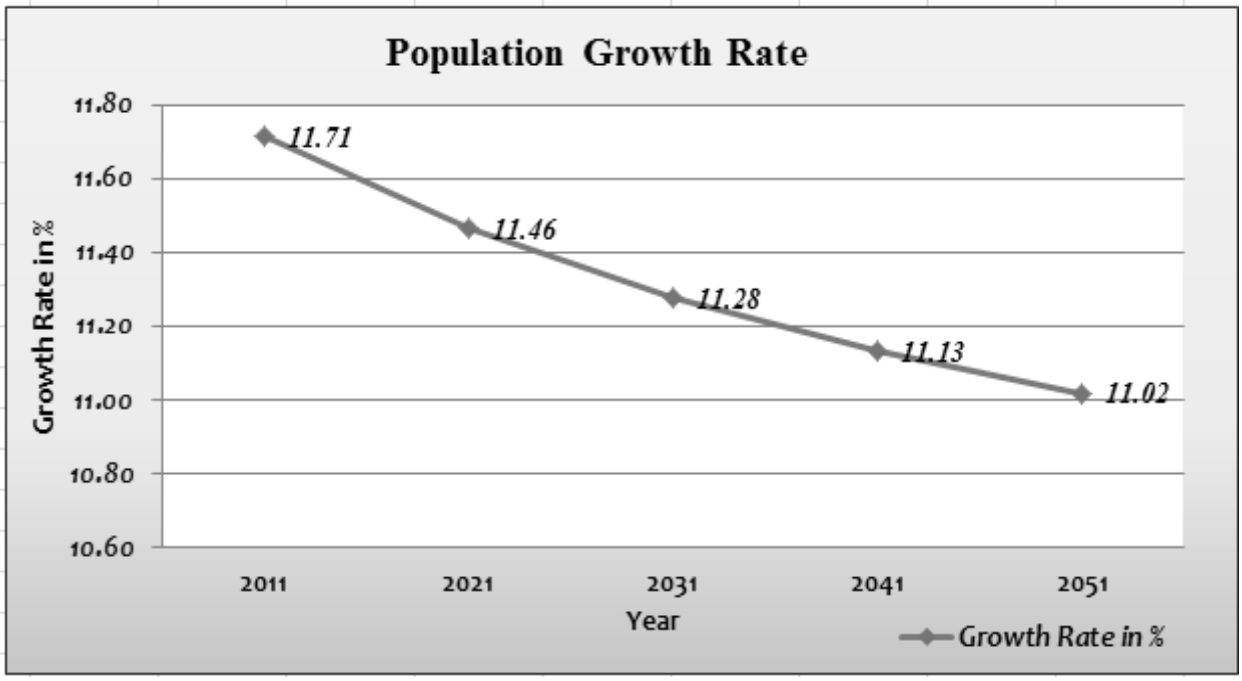


FIGURE. 3.32 GRAPH SHOWING POPULATION GROWTH RATE

Planning Analysis:

Calculating Growth Rates

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

Where:

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

PR=Percent Rate

$V_{Present}$ =Present or Future Value

V_{Past} = Past or Present Value

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

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

3.8.15 POPULATION DISTRIBUTION AND COMPOSITION OF STUDY AREA

The population as per 2011 Census records is 50311 (for 10 km radius buffer zone). Total no. of household is 1120, 10062 and 3942 respectively, in primary, secondary and tertiary zone. Sex ratio is 1064, 1014 and 1042 (females per 1000 males) observed in primary, secondary and tertiary zone respectively. SC population distribution is 600, 7776 and 2109 respectively in primary, secondary and tertiary zone. ST population distribution is 0,25 and 16 respectively in primary, secondary and tertiary. Average household size is 3. Zone wise Demographic profile of study area is given in the table 1.18.1 below:

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

TABLE 3.43 ZONE WISE DEMOGRAPHIC PROFILE OF STUDY AREA

Zone	No. of Villages	Total Household	Total Population	Male Population	%	Female Population	%
Primary Zone (0 - 3 Km)	1	1120	3503	1697	48.44	1806	51.56
Secondary Zone (3 - 7 Km)	9	10062	34221	16993	49.66	17228	50.34
Tertiary Zone (7 - 10 km)	4	3942	12587	6165	48.98	6422	51.02
Study Area (0-10 km)	**14**	**15124**	**50311**	**24855**	**49.40**	**25456**	**50.60**

Source: Census of India, 2011

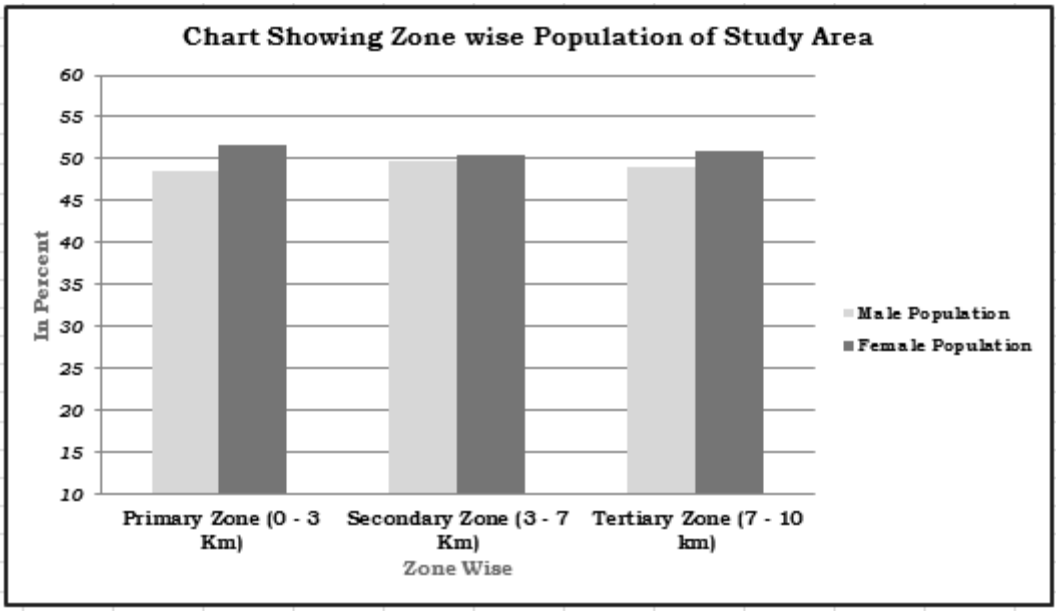


FIGURE 3.33 POPULATION OF STUDY AREA

TABLE 3.44 VILLAGE WISE DEMOGRAPHIC PROFILE OF THE STUDY AREA (CORE AND BUFFER ZONE)

0-3km																										
Sno	Name	No.of Households	Total population	Total Male	Total Female	Sex Ratio	Population below 6	Male below 6	Female below 6	Child Sex Ratio	SC population	SC Male	SC Female	ST population	ST Male	ST Female	Literate population	Male Literate	Female Literate	Total Lite.rate (%)	Male Lite rate (%)	Female Lite.rate (%)	Total workers	Total Workers Rate (%)	Main workers	MainWorkers Rate (%)	Marginal workers	Marginal Workers Rate (%)	Nonworkers	Non Workers Rate (%)
1	Kuppam	1120	3503	1697	1806	1064	264	127	137	1079	600	286	314	0	0	0	1947	1143	804	60.11	72.80	48.17	2246	64.12	1941	55.41	305	8.71	1257	35.88
Total		**1120**	**3503**	**1697**	**1806**	**1064**	**264**	**127**	**137**	**1079**	**600**	**286**	**314**	**0**	**0**	**0**	**1947**	**1143**	**804**	**60.11**	**72.80**	**48.17**	**2246**	64.12	**1941**	55.41	**305**	8.71	**1257**	35.88
3-7km																										
Sno	Name	No.of Households	Total population	Total Male	Total Female	Sex Ratio	Population below 6	Male below 6	Female below 6	Child Sex Ratio	SC population	SC Male	SC Female	ST population	ST Male	ST Female	Literate population	Male Literate	Female Literate	Total Lite.rate (%)	Male Lite rate (%)	Female Lite.rate (%)	Total workers	Total Workers Rate (%)	Main workers	MainWorkers Rate (%)	Marginal workers	Marginal Workers Rate (%)	Nonworkers	Non Workers Rate (%)
1	Punnam	1452	5446	2839	2607	918	427	237	190	802	906	468	438	0	0	0	3679	2208	1471	73.30	84.86	60.86	2718	49.91	1504	27.62	53	0.97	2728	50.09
2	K.Paramathi	1093	3488	1709	1779	1041	299	148	151	1020	1256	619	637	0	0	0	2554	1380	1174	80.09	88.40	72.11	1782	51.09	1108	31.77	59	1.69	1706	48.91
3	Nedungur	403	1190	586	604	1031	61	33	28	848	298	149	149	6	5	1	800	469	331	70.86	84.81	57.47	753	63.28	418	35.13	19	1.60	437	36.72
4	Karudayampalayam	577	2347	1211	1136	938	132	62	70	1129	438	219	219	0	0	0	1614	977	637	72.87	85.03	59.76	1176	50.11	501	21.35	329	14.02	1171	49.89
5	Viswanathapuri	350	1105	511	594	1162	104	48	56	1167	1005	466	539	1	1	0	759	416	343	75.82	89.85	63.75	726	65.70	353	31.95	2	0.18	379	34.30
6	Vettamangalam (west)	1827	5882	2887	2995	1037	420	213	207	972	816	398	418	7	4	3	3953	2225	1728	72.37	83.21	61.98	3541	60.20	1920	32.64	86	1.46	2341	39.80
7	Vettamangalam (East)	807	2657	1310	1347	1028	202	99	103	1040	714	346	368	5	2	3	1521	900	621	61.96	74.32	49.92	1609	60.56	886	33.35	16	0.60	1048	39.44
8	Andankoil(West)	1687	6038	2939	3099	1054	580	304	276	908	801	381	420	4	3	1	4404	2342	2062	80.69	88.88	73.04	3039	50.33	1817	30.09	151	2.50	2999	49.67
9	Manmangalam	1866	6068	3001	3067	1022	489	242	247	1021	1542	759	783	2	2	0	4068	2345	1723	72.92	84.99	61.10	3448	56.82	1901	31.33	129	2.13	2620	43.18
Total		**10062**	**34221**	**16993**	**17228**	**1014**	**2714**	**1386**	**1328**	958	**7776**	**3805**	**3971**	**25**	**17**	**8**	**23352**	**13262**	**10090**	**74.12**	**84.97**	**63.46**	**18792**	**54.91**	**10408**	**30.41**	**844**	**2.47**	**15429**	**45.09**
7-10km																										
Sno	Name	No.of Households	Total population	Total Male	Total Female	Sex Ratio	Population below 6	Male below 6	Female below 6	Child Sex Ratio	SC population	SC Male	SC Female	ST population	ST Male	ST Female	Literate population	Male Literate	Female Literate	Total Lite.rate (%)	Male Lite rate (%)	Female Lite.rate (%)	Total workers	Total Workers Rate (%)	Main workers	MainWorkers Rate (%)	Marginal workers	Marginal Workers Rate (%)	Nonworkers	Non Workers Rate (%)
1	Athur	1633	5186	2548	2638	1035	478	250	228	912	1245	614	631	1	1	0	3488	1977	1511	74.09	86.03	62.70	2874	55.42	1560	30.08	219	4.22	2312	44.58
2	Kombupalayam	614	1932	973	959	986	133	78	55	705	235	121	114	0	0	0	1371	766	605	76.21	85.59	66.92	945	48.91	566	29.30	43	2.23	987	51.09
3	Thirukkattuthurai	944	3011	1458	1553	1065	217	118	99	839	387	190	197	0	0	0	2091	1150	941	74.84	85.82	64.72	1694	56.26	954	31.68	12	0.40	1317	43.74
4	Nanjaipugalur	751	2458	1186	1272	1073	208	120	88	733	242	113	129	0	0	0	1741	922	819	77.38	86.49	69.17	1215	49.43	738	30.02	36	1.46	1243	50.57
Total		**3942**	**12587**	**6165**	**6422**	**1042**	**1036**	**566**	**470**	**830**	**2109**	**1038**	**1071**	**1**	**1**	**0**	**8691**	**4815**	**3876**	**75.24**	**86.00**	**65.12**	**6728**	**53.45**	**3818**	**30.33**	**310**	**2.46**	**5859**	**46.55**
Grand total		15124	50311	24855	25456	1024	4014	2079	1935	931	10485	5129	5356	26	18	8	33990	19220	14770	73.42	84.39	62.79	27766	55.19	16167	32.13	1459	2.90	22545	44.81

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

- ✓ Above table identifies the presence of villages and their subsequent population divided under three zones from plant boundary (i.e., Primary, secondary and tertiary zone
- ✓ Primary zone has 1 villages where as much as 1120 households with 3503 population are located. Mostly lying on Built-up land for their livelihood and substance.
- ✓ Secondary and tertiary zone both comprise of 9 and 4 villages having a total population of 34221 and 12587 respectively.

3.8.16 GENDER AND SEX RATIO

Sex ratio is used to describe the number of females per 1000 of males. Sex ratio is a valuable source for finding the population of women in India and what is the ratio of women to that of men in India. In the Population Census of 2011, it was revealed that the population ratio in India 2011 is 940 females per 1000 of males. The study area has 1024 females per 1000 males. Gender and sex ratio determine the Human Development Index (HDI) of an area thereby understanding the status of women in that region. Following table entails information about sex ratio of 14 villages lying in study area (buffer zone) as primary, secondary and tertiary zone.

TABLE 3.45 SEX RATIO OF THE STUDY AREA

S. No.	Buffer Zone	Sex Ratio of Study area Female/ 1000 Male
1	Primary Zone (0-3 km)	**1064**
2	Secondary zone (3-7 km)	**1014**
3	Tertiary Zone (7-10 km)	**1042**

Source: Census of India, 2011

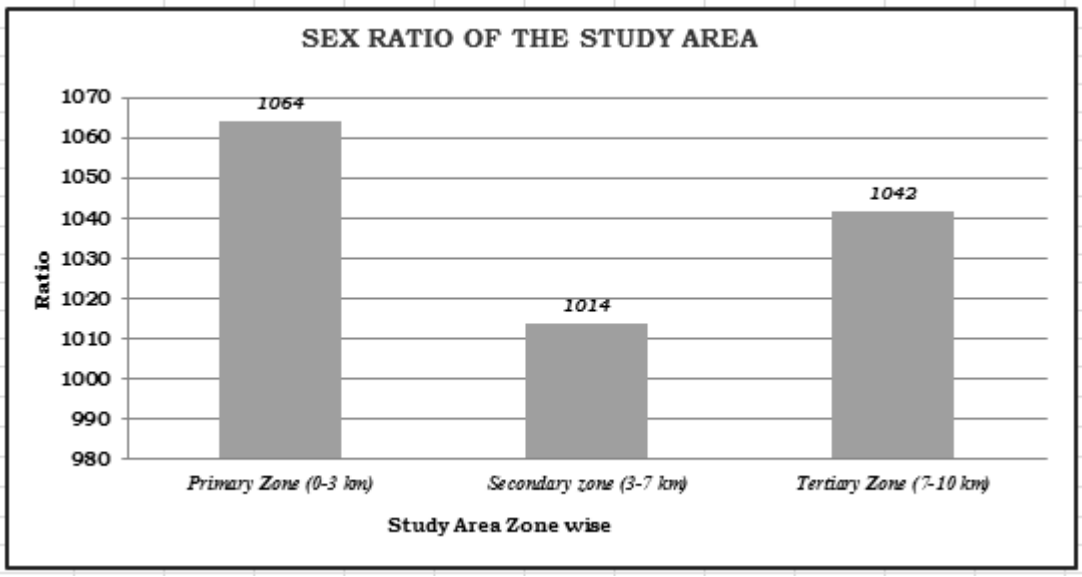


FIGURE 3.34 SEX RATIO WITHIN 10 KM STUDY AREA

3.8.17 LITERACY RATE IN STUDY AREA

Literacy Rate is the percentage of people in a country with the ability to read and write. The analysis of the literacy levels is done in the study area. The 10 km radius of study area demonstrates a literacy rate of 73.42% as per census data 2011. The male literacy rate in the study area indicates 84.39% whereas the female literacy rate, which is an important indicator for social change, is observed to be 62.79% as per the census data 2011. This needs to focus on the region and enhance further development focusing on education. (Table no 3.17.1).

TABLE 3.46 LITERACY RATE OF THE STUDY AREA

Zone	No. of Villages	Male Literacy Population	Male literacy Rate	Female Literacy Population	Female literacy Rate	Total Literacy	Total Literacy Rate
Primary Zone (0 - 3 Km)	1	**1143**	72.80	**804**	48.17	**1947**	60.11
Secondary Zone (3 - 7 Km)	9	**13262**	84.97	**10090**	63.46	**23352**	74.12
Tertiary Zone (7 - 10 Km)	4	**4815**	86.00	**3876**	65.12	**8691**	75.24
Study Area (0-10km)	**14**	**19220**	**84.39**	**14770**	**62.79**	**33990**	**73.42**

Source: Census of India, 2011

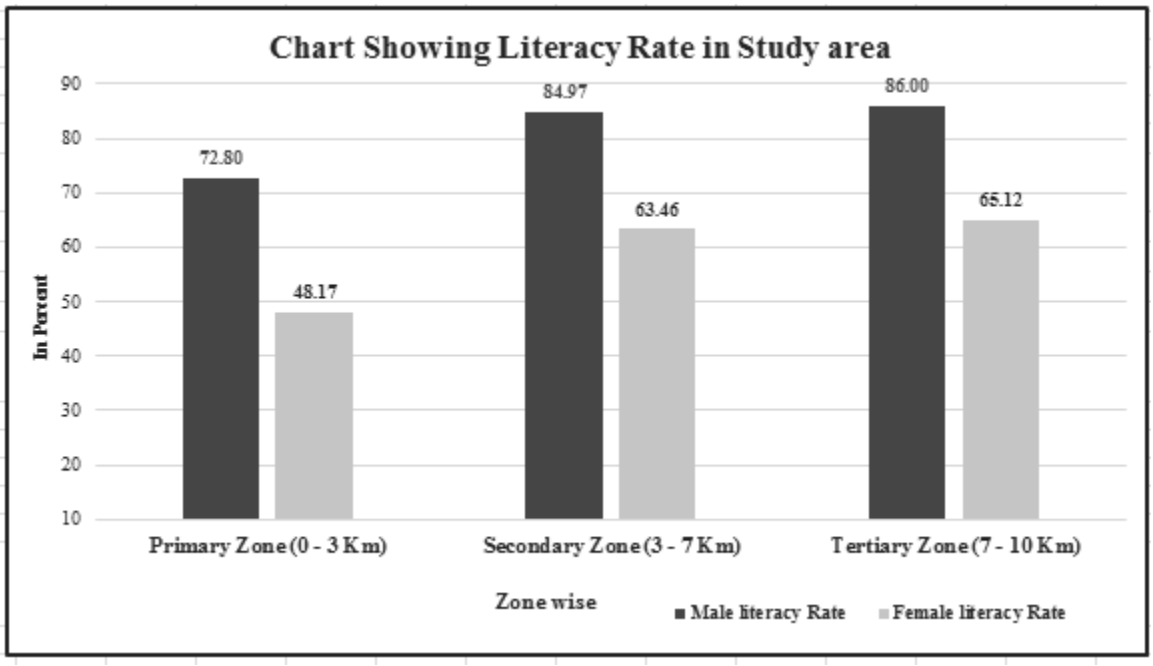


FIGURE 3.35 GENDER WISE LITERACY RATE IN THE STUDY AREA

3.8.18 FAMILY SIZE

Size of family also describes about family functioning, resource consumption, total income generated and their expenditure pattern. Census 2011 data suggests that most of these households have a family size of up to 3 members, knowing the size of family also give fair understanding of relating how much resource consumption is being incurred, and annual income being generated and spent.

3.8.19 VULNERABLE GROUP

While developing an action plan, it is very important to identify the population who fall under the marginalized and vulnerable groups and special attention has to be given towards these groups while making action plans. Special provisions should be made for them. In the observed villages schedule caste (SC) population is 26.86% and Schedule Tribe population 0.03%, Other Population is 73.11% in Total study area.

TABLE 3.47 VULNERABLE GROUPS OF THE STUDY AREA

Zone	No. of Villages	Vulnerable Groups					
		SC Population	%	ST Population	%	Other Population	%
Primary Zone (0 - 3 Km)	1	600	17.13	0	0.00	2903	82.87
Secondary Zone (3 - 7 Km)	9	7776	22.72	25	0.07	26420	77.20
Tertiary Zone (7 - 10 Km)	4	2109	16.76	1	0.01	10477	83.24
Total area (10km)	**14**	**10485**	**20.84**	**26**	**0.05**	**39800**	**79.11**

Source: Census of India, 2011

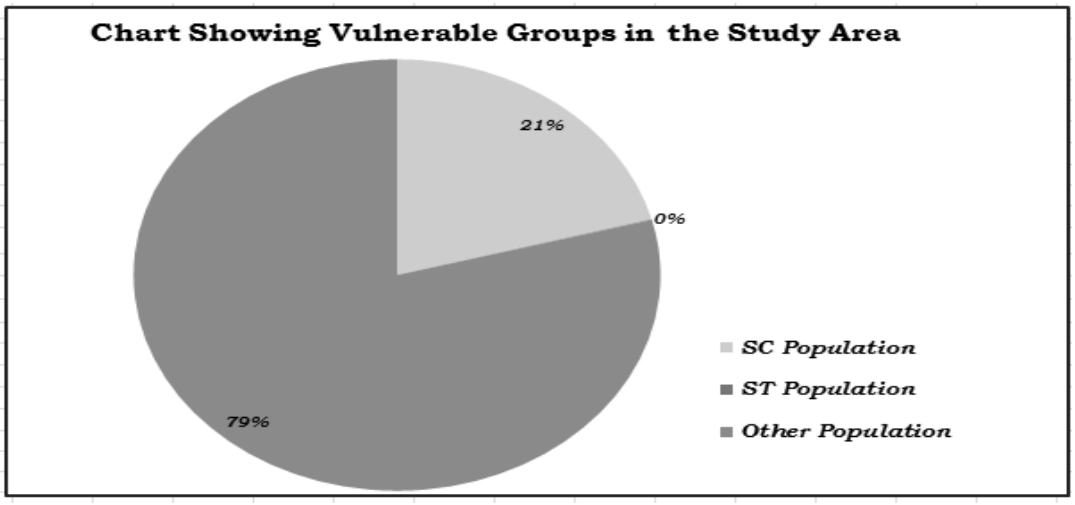


FIGURE 3.36 VULNERABLE GROUPS

3.8.20 ECONOMIC ACTIVITIES

The economy of an area is defined by the occupational pattern and income level of the people in the area. The occupational structure of residents in the study area is studied with reference to work category. The

population is divided occupation wise into three categories, viz., Total workers, Main workers and non-workers. The main workers include cultivators, agricultural laborers, those engaged in household industry and other services. The non-workers include those engaged in unpaid household duties like, students, retired persons, dependents, beggars, vagrants etc. besides Institutional intimates or all other non-workers who do not fall under the above categories.

TABLE 3.48 SHOWS THE WORK FORCE OF THE STUDY AREA

Zone	No. of Villages	Total Workers	%	Main Workers	%	Marginal Workers	%	Non-Workers	%
Primary Zone (0 - 3 Km)	1	2246	64.12	1049	29.95	305	8.71	1257	35.88
Secondary Zone (3 - 7 Km)	9	18792	54.91	10408	30.41	844	2.47	15429	45.09
Tertiary Zone (7 - 10 Km)	4	6728	53.45	3818	30.33	310	2.46	5859	46.55
Study Area (10 Km)	**14**	**27766**	**55.19**	**15275**	**30.36**	**1459**	**2.90**	**22545**	**44.81**

Source: Census of India, 2011

The above table shows that out of the total working population, the percentage of main workers is 30.36 % while 2.90% are marginal workers. Number of working populations is 55.19% and non-working population is 44.81% in the study area. As per the data obtained from the survey (as mentioned previously in occupational structure) most of these people are employed for major period of the year. Also, to mention the natural environment also restricts the people in finding stable business is performed for only certain months. Thus, proposed project will act as possible exposure for them to get enroll and earn sustain livelihood.

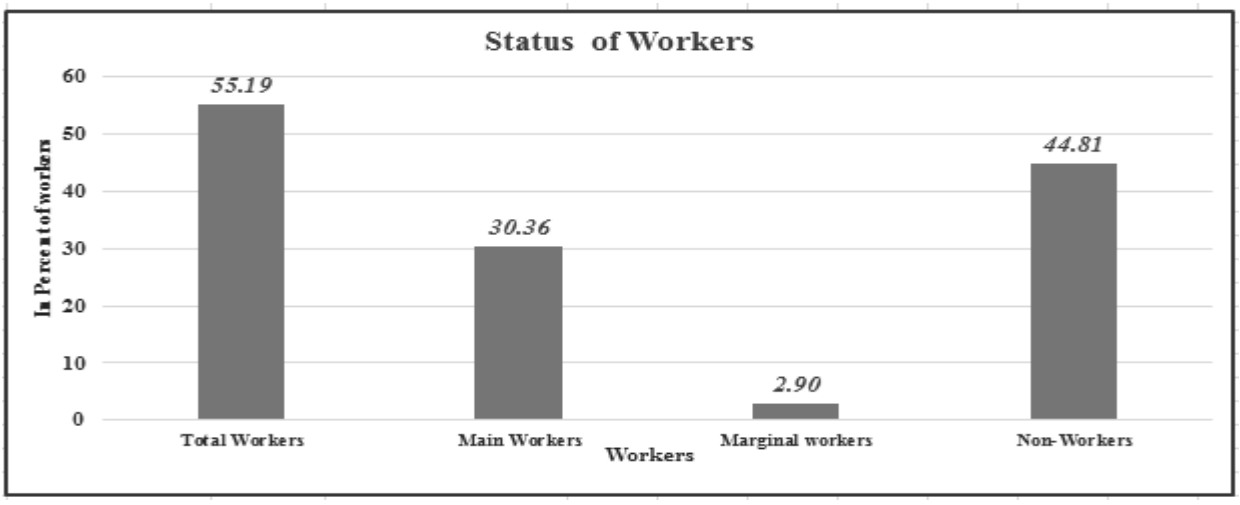


FIGURE: 3.37 WORKING POPULATION IN THE STUDY AREA

3.8.21 INFRASTRUCTURE BASE

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

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

- Administrative offices are located in Tamil Nadu, Karur district (15km-E) from site which by local transport.
- Amaravathi River Southern East side 10 km from mine lease boundary.
- Availability of Government high school Chathiram Village (NE-3.0km) ADW Government Higher Secondary school, Punnandupalayam Village (E-5.0km), Government school, Kurumpapatti (SE-4.0km), Government Elementary school, Orambuppalayam (6km-N), Cambridge college of Arts and Science, Maravapalayam Village and Karur Taluk many college and Training institute found in study area.
- Health facilities covered in the Buffer zone area like Punnam PHC, Mochakottam Palayam Village Government Hospital, Chinnasamuthram PHC, etc.

TABLE 3.49 EDUCATIONAL FACILITIES IN THE SURVEYED AREA

Sno	Village Name	Govt Primary School (Numbers)	Private Primary School (Numbers)	Govt Middle School (Numbers)	Private Middle School (Numbers)	Govt Secondary School (Numbers)	Private Secondary School (Numbers)	Govt Senior Secondary School (Numbers)	Govt Arts and Science Degree College (Numbers)
0-3km									
1	Kuppam	5	0	1	0	0	0	0	0
	Total	**5**	**0**	**1**	**0**	**0**	**0**	**0**	**0**
3-7km									
1	Punnam	7	1	2	2	1	1	1	0
2	Manmangalam	5	2	1	3	1	3	0	0
3	Andankoil(West)	5	0	1	0	0	0	0	0
4	K.Paramathi	3	0	1	0	1	0	1	0
5	Nedungur	3	0	0	0	0	0	0	0
6	Karudayampalayam	3	0	1	0	0	0	0	0
7	Viswanathapuri	1	0	1	0	0	0	0	0
8	Vettamangalam (west)	8	0	1	1	1	1	1	0
9	Vettamangalam (East)	4	0	0	0	0	0	0	0
	Total	**39**	**3**	**8**	**6**	**4**	**5**	**3**	**0**
7-10km									
1	Kombupalayam	2	1	1	1	1	1	1	0
2	Thirukkattuthurai	3	1	0	1	0	1	0	0
3	Nanjaipugalur	2	0	2	0	0	0	0	0
4	Athur	5	0	1	0	0	0	0	0
	Total	**12**	**2**	**4**	**2**	**1**	**2**	**1**	**0**
	G.Total	**56**	**5**	**13**	**8**	**5**	**7**	**4**	**0**

Source: ***DCHB Census 2011, Tamil Nadu.***

TABLE 3.50 HEALTH/ MEDICAL FACILITIES IN THE SURVEYED AREA

Sno	Village Name	Community Health Centre (Numbers)	Primary Health Centre (Numbers)	Primary Heallth Sub Centre (Numbers)	Maternity And Child Welfare Centre (Numbers)	Hospital Allopathic (Numbers)	Dispensary (Numbers)	Veterinary Hospital (Numbers)	Family Welfare Centre (Numbers)	Non Government Medical facilities Medicine Shop (Numbers)
0-3km										
1	Kuppam	0	0	1	0	0	0	1	0	0
	Total	**0**	**0**	**1**	**0**	**0**	**0**	**1**	**0**	0
3-7km										
1	Punnam	0	1	1	1	0	1	1	1	1
2	Manmangalam	1	1	1	1	0	1	1	1	0
3	Andankoil(West)	0	0	1	1	0	0	0	0	2
4	K.Paramathi	0	1	2	1	0	1	1	1	1
5	Nedungur	0	0	0	0	0	0	0	0	0

6	Karudayampalayam	0	0	1	0	0	0	0	0	0
7	Viswanathapuri	0	1	1	1	0	1	0	1	0
8	Vettamangalam (west)	0	0	2	1	0	0	1	0	1
9	Vettamangalam (East)	0	1	2	1	0	1	0	1	0
	Total	**1**	**5**	**11**	**7**	**0**	**5**	**4**	**5**	5
7-10km										
1	Kombupalayam	0	0	1	1	0	0	0	0	0
2	Thirukkattuthurai	0	0	1	1	0	0	0	0	0
3	Nanjaipugalur	0	0	1	1	0	0	0	0	0
4	Athur	0	0	2	1	0	0	1	0	0
	Total	**0**	**0**	**5**	**4**	**0**	**0**	**1**	**0**	0
	G.Total	**1**	**5**	**17**	**11**	**0**	**5**	**6**	**5**	5

Source: ***DCHB Census 2011, Tamil Nadu.***

TABLE 3.51 WATER & DRAINAGE FACILITIES IN THE SURVEYED AREA

Sno	Village Name	Tap Water-Treated (Status A(1)/NA(2))	Tap Water Untreated (Status A(1)/NA(2))	Covered Well (Status A(1)/NA(2))	Uncovered Well (Status A(1)/NA(2))	Hand Pump (Status A(1)/NA(2))	Tube Wells/Borehole (Status A(1)/NA(2))	Spring (Status A(1)/NA(2))	River/Canal (Status A(1)/NA(2))	Tank/Pond/Lake (Status A(1)/NA(2))	Closed Drainage (Status A(1)/NA(2))	Open Drainage (Status A(1)/NA(2))	No Drainage (Status A(1)/NA(2))
0-3km													
1	Kuppam	1	1	1	1	1	1	2	2	2	1	1	1
	Total	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**0**	0	1	1	1
3-7km													
1	Punnam	1	1	1	1	1	1	1	1	1	1	1	1
2	Manmangalam	1	1	1	1	1	1	2	1	2	1	1	1
3	Andankoil(West)	1	1	2	1	1	1	2	2	2	1	1	1
4	K.Paramathi	1	1	1	1	1	1	2	2	2	1	1	1
5	Nedungur	1	1	2	1	1	1	2	2	2	1	1	1
6	Karudayampalayam	1	1	2	1	2	1	2	2	2	1	1	1
7	Viswanathapuri	1	1	2	1	2	2	2	2	2	1	1	1
8	Vettamangalam (west)	1	1	1	1	1	1	2	1	2	1	1	1
9	Vettamangalam (East)	1	1	1	1	1	1	2	1	2	1	1	1
	Total	**9**	**9**	**5**	**9**	**7**	**8**	**1**	**4**	1	9	9	9
7-10km													
1	Kombupalayam	1	1	1	1	2	1	1	2	2	1	1	1
2	Thirukkattuthurai	1	1	1	1	1	1	2	2	2	1	1	1
3	Nanjaipugalur	1	1	1	1	1	1	2	2	2	1	1	1
4	Athur	1	1	2	1	1	1	1	2	2	1	1	1
	Total	**4**	**4**	**3**	**4**	**3**	**4**	**2**	**8**	8	4	4	4
	G.Total	**14**	**14**	**9**	**14**	**11**	**13**	**3**	**12**	5	14	14	14

Source: DCHB Census 2011, Tamil Nadu.

TABLE :3.52 TRANSPORT AND OTHER INFRASTRUCTURE FACILITIES IN THE SURVEYED AREA

Sno	Village Name	Post Office (Status A(1)/NA(2))	Sub Post Office (Status A(1)/NA(2))	Post And Telegraph Office (Status A(1)/NA(2))	Telephone (landlines) (Status A(1)/NA(2))	Mobile Phone Coverage (Status A(1)/NA(2))	Private Courier Facility (Status A(1)/NA(2))	Public Bus Service (Status A(1)/NA(2))	Private Bus Service (Status A(1)/NA(2))	Railway Station (Status A(1)/NA(2))	Auto/Modified Autos (Status A(1)/NA(2))	Taxi (Status A(1)/NA(2))	Vans (Status A(1)/NA(2))	Tractors (Status A(1)/NA(2))	Cycle-pulled Rickshaws (manual driven) (Status A(1)/NA(2))	Cycle-pulled Rickshaws (machine driven) (Status A(1)/NA(2))	Carts Drivens by Animals (Status A(1)/NA(2))	Sea/River/Ferry Service (Status A(1)/NA(2))	National Highway (Status A(1)/NA(2))	State Highway (Status A(1)/NA(2))	Major District Road (Status A(1)/NA(2))	Other District Road (Status A(1)/NA(2))
0-3km																						
1	Kuppam	2	1	2	1	1	2	1	1	2	1	2	2	2	2	2	2	2	2	1	1	1
	Total	**0**	**1**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**1**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
3-7km																						
1	Punnam	2	2	2	1	1	2	1	1	2	2	1	1	2	2	2	2	2	2	1	2	2
2	Manmangalam	2	1	2	1	1	2	1	1	2	2	2	2	2	2	2	2	2	1	1	1	2
3	Andankoil(West)	2	2	2	1	1	2	1	1	2	2	2	2	2	2	2	2	2	1	1	1	1
4	K.Paramathi	2	1	2	1	1	2	1	1	2	2	1	1	2	2	2	2	2	2	1	1	1
5	Nedungur	2	2	2	1	1	2	1	1	2	2	2	2	2	2	2	2	2	1	2	2	1
6	Karudayampalayam	2	1	2	1	1	2	1	1	2	2	2	2	2	2	2	2	2	1	2	2	1
7	Viswanathapuri	2	1	2	1	1	2	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2
8	Vettamangalam (west)	2	1	2	1	1	2	1	2	2	2	1	1	2	2	2	2	2	1	1	1	1
9	Vettamangalam (East)	2	2	2	1	1	2	1	1	2	2	2	2	2	2	2	2	2	2	2	1	1
	Total	**0**	**5**	**0**	**9**	**9**	**0**	**9**	**8**	**0**	**18**	**3**	**3**	**0**	**0**	**0**	**0**	**0**	**5**	**5**	**5**	**6**
7-10km																						
1	Kombupalayam	1	2	1	1	1	2	1	1	2	2	2	2	2	2	2	2	2	2	2	1	1
2	Thirukkattuthurai	2	1	2	2	1	2	1	1	2	2	2	2	2	2	2	2	2	2	2	1	1
3	Nanjaipugalur	2	1	2	1	1	2	1	1	2	2	2	2	2	2	2	2	2	1	2	2	2
4	Athur	2	1	2	2	1	2	1	1	2	2	2	2	2	2	2	2	2	1	1	2	2
	Total	**1**	**3**	**1**	**2**	**4**	**0**	**4**	**4**	**8**	**8**	**8**	**8**	**0**	**0**	**0**	**0**	**0**	**2**	**1**	**2**	**2**
	G.Total	**1**	**9**	**1**	**12**	**14**	**0**	**13**	**12**	**5**	**27**	**12**	**12**	**0**	**0**	**0**	**0**	**0**	**7**	**6**	**7**	**8**

Source: DCHB Census 2011, Tamil Nadu.

3.8.22 OTHER ISSUES IN THE STUDY AREA

1. Deforestation of Land (Cutting Trees or Plant etc.)
2. Agriculture Land decreases
3. Lack of awareness among vulnerable groups for their welfare
4. Medical/Clinic facilities and PHC need for the Core area
5. Environmental clean with solid wastage pin each village.
6. Functioning of Hospital facilities with Sub Health care centers.
7. Need proper drainage system with public toilet men and women separately.

3.8.23 INTERPRETATION

Based on the data, following inferences could be drawn:

- Total literacy rate in the study area is 73.42%.
- The study area had average educational facilities. The overall status depicts that the education is limited to primary and middle level.
- The schedule tribe community forms 0.05% and Scheduled Caste forms 20.84% of the total population of study area.
- The Other Population forms 79.11% of the total population of study area.
- The study area is well connected by District/Village Road.
- The study area not well health facilities of primary level.
- Considering the above facts, the proposed project will boost the socio-economic development activities in the area and hence will leave positive impact.
- The study area has mobile connectivity.

3.8.24 RECOMMENDATION AND SUGGESTIONS

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

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

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

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

3.8.25 CONCLUSION

To evaluate the impacts of proposed quarry project on the surrounding area, it is vital to assess the baseline status of the environmental quality in the locality of the site. Hence it can be concluded that the present environment status of the study area will not be affected by the project as Thiru.S. Sadhasivam 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.

4. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

4.0 GENERAL

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

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

To identify and validate a model for a particular situation, predictions have been arrived at based on logical reasoning / consultation / extrapolation.

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

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

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

4.1 LAND ENVIRONMENT

4.1.2 Anticipated Impact from 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 causes the siltation of water course

4.1.3 Common Mitigation Measures for Respective Individual 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

4.1.4 Soil Environment

All the proposed project area is covered by thin layer of gravel formation and the average thickness is about 2 m – 3 m, the excavated gravel will be dumped sold to needy customers in open market.

4.1.5 Impact on Soil Environment from all Proposed Projects

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

4.1.6 Common Mitigation Measures for Respective Individual Proposed Projects

- Run-off diversion – Garland drains will be constructed all around the project boundary to prevent surface flows from entering the quarry works areas. And will be discharged into vegetated natural drainage lines, or as distributed flow across an area stabilised against erosion.
- Sedimentation ponds - Run-off from working areas will be routed towards sedimentation ponds. These trap sediment and reduce suspended sediment loads before runoff is discharged from the quarry site. Sedimentation ponds should be designed based on runoff, retention times, and soil characteristics. There may be a need to provide a series of sedimentation ponds to achieve the desired outcome.

- Retain vegetation – Retain existing or re-plant the vegetation at the site wherever possible.
- Monitoring and maintenance – Weekly monitoring and daily maintenance of erosion control systems so that they perform as specified specially during rainy season

4.1.7 Waste Dump Management

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

4.2 WATER ENVIRONMENT

4.2.1 Anticipated Impact from Proposed Projects

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

Detail of water requirements in KLD as given below:

TABLE 4.1: WATER REQUIREMENTS

PROPOSAL		
***Purpose**	**Quantity**	**Source**
Dust Suppression	1.0 KLD	From Existing bore wells from nearby area
Green Belt development	0.5 KLD	From Existing bore wells from nearby area
Domestic purpose	0.5 KLD	From existing, bore wells and drinking water will be sourced from Approved water vendors.
Total	**2.0 KLD**	

* Water for drinking purpose will be brought from approved water vendors

Source: Approved Mining Plan Pre-Feasibility Report

4.2.2 Common Mitigation Measures for Respective Individual Proposed Projects

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

4.3 AIR ENVIRONMENT

4.3.1. Anticipated Impact from Proposed Projects

- During mining, at various stages activities like transportation of materials, particular matter (PM), gases such as Sulphur dioxide, oxides of Nitrogen from vehicular exhaust are the main air pollutants.
- Emissions of noxious gases due to incomplete detonation of explosive may sometimes pollute the air.

- The fugitive dust released from the mining operations may cause effect on the mine workers who are directly exposed to the fugitive dust.
- Simultaneously, the air-borne dust may travel to longer distances and settle in the villages located near the mine lease area.

4.3.2 Modelling of Incremental Concentration from Proposed Project

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

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

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

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

4.3.3 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:

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

Where:

E = emissions;

A = activity rate;

EF = emission factor, and

ER =overall emission reduction efficiency, %

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

TABLE 4.2: ESTIMATED EMISSION RATE FOR PM_{10}

Activity	Source type	Value	Unit
		P1	
Drilling	Point Source	0.075559310	g/s
Blasting	Point Source	0.000595737	g/s
Mineral Loading	Point Source	0.041535277	g/s
Haul Road	Line Source	0.002490152	g/s/m
Overall Mine	Area Source	0.046571645	g/s

TABLE 4.3: ESTIMATED EMISSION RATE FOR SO_2

Activity	Source type	Value	Unit
		P1	
Overall Mine	Area Source	0.0000511226	g/s

TABLE 4.4: ESTIMATED EMISSION RATE FOR NO_X

Activity	Source type	Value	Unit
		P1	
Overall Mine	Area Source	0.000018289	g/s

4.3.4 Frame work of Computation & Model details

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

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

FIGURE 4.1: AERMOD TERRAIN MAP

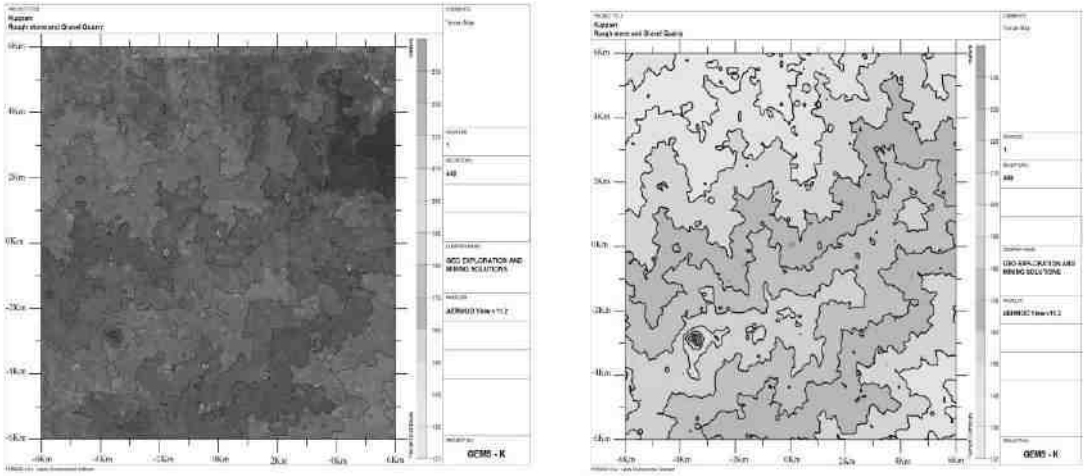


FIGURE 4.2: PREDICTED INCREMENTAL CONCENTRATION OF PM_{10}

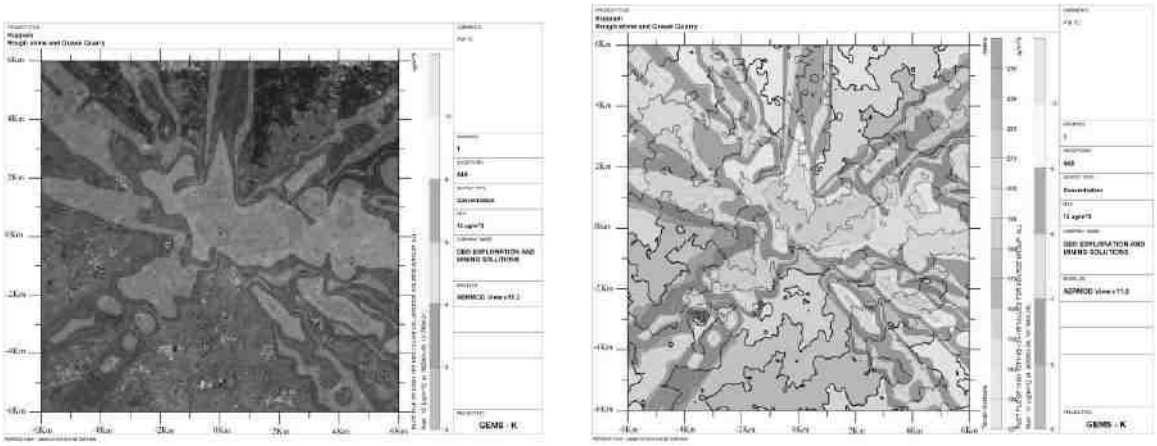


FIGURE 4.3: PREDICTED INCREMENTAL CONCENTRATION OF SO_2

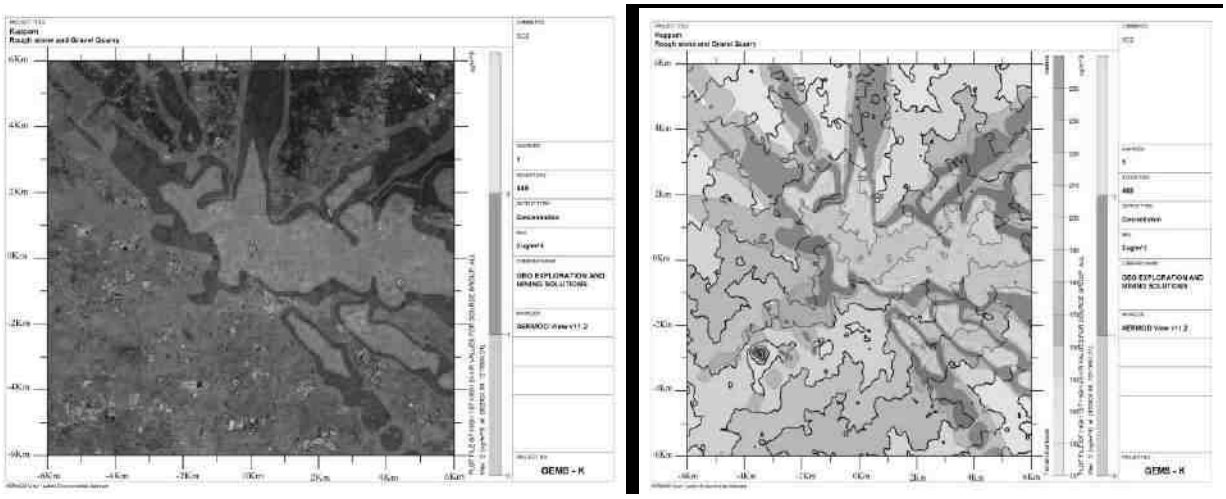


FIGURE 4.4: PREDICTED INCREMENTAL CONCENTRATION OF NOX

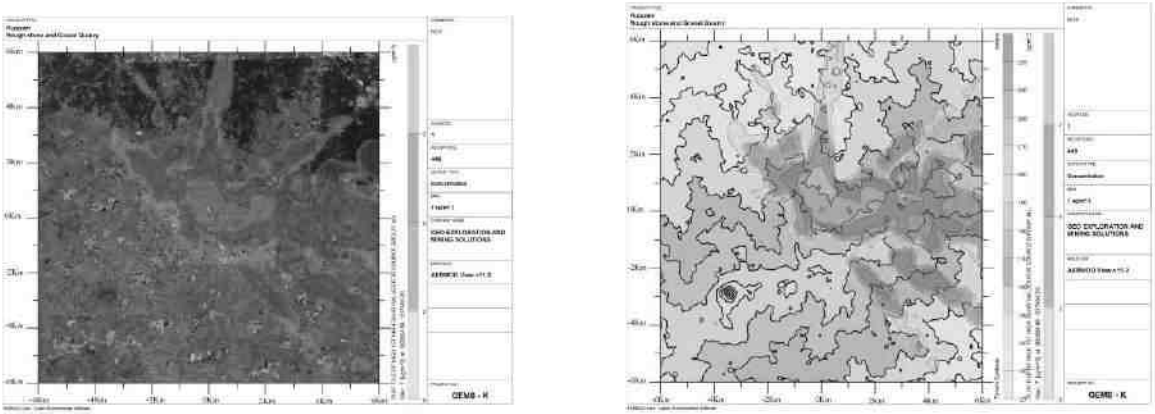
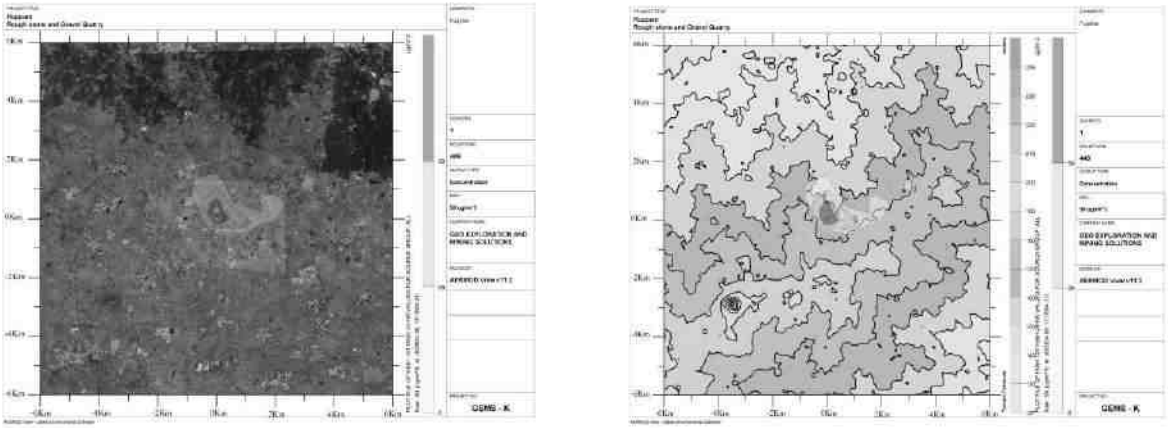


FIGURE 4.5: PREDICTED INCREMENTAL CONCENTRATION OF FUGITIVE DUST



4.3.5 Model Results

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

TABLE 4.5: INCREMENTAL & RESULTANT GLC OF PM_{10}

Station Code	Location	X Coordinate (m)	Y Coordinate (m)	Average Baseline PM_{10} ($\mu g/m^3$)	Incremental value of PM_{10} due to mining ($\mu g/m^3$)	Total PM_{10} ($\mu g/m^3$)
AAQ1	11° 0'2.32"N 77°57'14.98"E	42	41	61.63	12.98	74.61
AAQ2	11° 0'38.05"N 77°58'30.54"E	2360	1149	61.25	7.50	68.75
AAQ3	10°59'28.95"N 77°59'38.24"E	4432	-994	61.33	11.08	72.41
AAQ4	10°59'43.49"N 77°56'16.55"E	-1750	-546	60.48	3.15	63.63
AAQ5	11° 1'48.37"N 77°56'42.74"E	-971	3331	60.39	0.89	61.28
AAQ6	10°57'51.03"N 77°56'59.49"E	-435	-4039	62.30	0	62.3
AAQ7	11° 0'48.64"N 77°55'31.64"E	-3132	1480	60.51	5.29	65.8
AAQ8	10°58'0.69"N 77°59'7.76"E	3499	-3734	61.95	2.42	64.37

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

Station Code	Location	X Coordinate (m)	Y Coordinate (m)	Average Baseline $PM_{2.5}$ ($\mu g/m^3$)	Incremental value of $PM_{2.5}$ due to mining ($\mu g/m^3$)	Total $PM_{2.5}$ ($\mu g/m^3$)
AAQ1	11° 0'2.32"N 77°57'14.98"E	42	41	32.67	5.78	38.45
AAQ2	11° 0'38.05"N 77°58'30.54"E	2360	1149	29.77	3.64	33.41
AAQ3	10°59'28.95"N 77°59'38.24"E	4432	-994	30.83	4.49	35.32
AAQ4	10°59'43.49"N 77°56'16.55"E	-1750	-546	30.60	1.61	32.21
AAQ5	11° 1'48.37"N 77°56'42.74"E	-971	3331	30.62	0.77	31.39
AAQ6	10°57'51.03"N 77°56'59.49"E	-435	-4039	29.29	0	29.29
AAQ7	11° 0'48.64"N 77°55'31.64"E	-3132	1480	29.22	2.73	31.95
AAQ8	10°58'0.69"N 77°59'7.76"E	3499	-3734	29.85	1	30.85

TABLE 4.7: INCREMENTAL & RESULTANT GLC OF SO_2

Station Code	Location	X Coordinate (m)	Y Coordinate (m)	Average Baseline SO_2 ($\mu g/m^3$)	Incremental value due to mining ($\mu g/m^3$)	Total SO_2($\mu g/m^3$)
AAQ1	11° 0'2.32"N 77°57'14.98"E	42	41	9.17	2.44	11.61
AAQ2	11° 0'38.05"N 77°58'30.54"E	2360	1149	8.58	1.85	10.43
AAQ3	10°59'28.95"N 77°59'38.24"E	4432	-994	8.64	2.01	10.65
AAQ4	10°59'43.49"N 77°56'16.55"E	-1750	-546	8.68	0	8.68
AAQ5	11° 1'48.37"N 77°56'42.74"E	-971	3331	8.74	0	8.74
AAQ6	10°57'51.03"N 77°56'59.49"E	-435	-4039	8.41	0	8.41
AAQ7	11° 0'48.64"N 77°55'31.64"E	-3132	1480	8.58	0.69	9.27
AAQ8	10°58'0.69"N 77°59'7.76"E	3499	-3734	8.68	0	8.68

TABLE 4.8: INCREMENTAL & RESULTANT GLC OF NO_X

Station Code	Location	X Coordinate (m)	Y Coordinate (m)	Average Baseline NOx ($\mu g/m^3$)	Incremental value due to mining ($\mu g/m^3$)	Total NOx ($\mu g/m^3$)
AAQ1	11° 0'2.32"N 77°57'14.98"E	42	41	22.10	7.44	29.54
AAQ2	11° 0'38.05"N 77°58'30.54"E	2360	1149	21.89	1.89	23.78
AAQ3	10°59'28.95"N 77°59'38.24"E	4432	-994	20.10	4.79	24.89
AAQ4	10°59'43.49"N 77°56'16.55"E	-1750	-546	17.80	0	17.8
AAQ5	11° 1'48.37"N 77°56'42.74"E	-971	3331	21.73	0	21.73
AAQ6	10°57'51.03"N 77°56'59.49"E	-435	-4039	23.20	0	23.2

AAQ7	11° 0'48.64"N 77°55'31.64"E	-3132	1480	23.99	0	23.99
AAQ8	10°58'0.69"N 77°59'7.76"E	3499	-3734	25.47	0	25.47

TABLE 4.9: INCREMENTAL & RESULTANT GLC OF FUGITIVE DUST

Station Code	Location	X Coordinate (m)	Y Coordinate (m)	Average Baseline Fugitive ($\mu g/m^3$)	Incremental value due to mining ($\mu g/m^3$)	Total Fugitive Dust ($\mu g/m^3$)
AAQ1	11° 0'2.32"N 77°57'14.98"E	42	41	121.6	59	180.63
AAQ2	11° 0'38.05"N 77°58'30.54"E	2360	1149	120.9	0	120.85
AAQ3	10°59'28.95"N 77°59'38.24"E	4432	-994	122.7	0	122.67
AAQ4	10°59'43.49"N 77°56'16.55"E	-1750	-546	119.8	0	119.81
AAQ5	11° 1'48.37"N 77°56'42.74"E	-971	3331	122.0	0	122.00
AAQ6	10°57'51.03"N 77°56'59.49"E	-435	-4039	122.1	0	122.15
AAQ7	11° 0'48.64"N 77°55'31.64"E	-3132	1480	121.2	0	121.22
AAQ8	10°58'0.69"N 77°59'7.76"E	3499	-3734	122.9	0	122.93

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/m^3 for PM_{10}, SO_2 & NO_X respectively. By adopting suitable mitigation measures, the pollutant levels in the atmosphere can be further being controlled.

4.3.6 Mitigation Measures for the Proposed Project

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

4.4 NOISE ENVIRONMENT

Noise pollution is mainly due to operation like drilling & blasting and plying of trucks & HEMM. There is no drilling and blasting is proposed in this project.

4.4.1 Anticipated Impact from Proposed Projects

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

- Source data
- Receptor data
- Attenuation factor

Source data has been computed taking into account of all the machinery and activities used in the mining process. Same has been listed in Table 4.10

TABLE 4.10: ACTIVITY AND NOISE LEVEL PRODUCED BY MACHINERY

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

*50 feet from source = 15.24 meters

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

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

TABLE 4.11: PREDICTED NOISE INCREMENTAL VALUES

Location ID	N1	N2	N3	N4	N5	N6	N7	N8
Maximum Monitored Value (Day) dB(A)	47.8	46.8	47.3	48.1	47.6	45.3	40.9	42.3
Incremental Value dB(A)	63.4	32.1	27.0	35.5	29.2	28.1	29.7	26.1
Total Predicted Noise level dB(A)	63.6	46.9	47.3	48.3	47.7	45.4	41.2	42.4

The incremental noise level is found within the range of 63.4 dB (A) in Core Zone and 47.8 dB (A) in Buffer zone. The noise level at different receptors in buffer zone is lower due to the distance involved and other topographical features adding to the noise attenuation. The resultant Noise level due to monitored values and calculated values at the receptors are based on the mathematical formula considering attenuation due to Green Belt as 4.9 dB (A) the barrier effect. From the above table, it can be seen that the ambient noise levels at all the locations are within permissible limits of Industrial area (core zone) & Residential area (buffer zone) as per THE NOISE POLLUTION (REGULATION AND CONTROL) RULES, 2000 (The Principal Rules were published in the Gazette of India, vide S.O. 123(E), dated 14.2.2000 and subsequently amended vide S.O. 1046(E), dated 22.11.2000, S.O. 1088(E), dated 11.10.2002, S.O. 1569 (E), dated 19.09.2006 and S.O. 50 (E) dated 11.01.2010 under the Environment (Protection) Act, 1986.).

4.4.2 Mitigation Measures Proposed Project

The following noise mitigation measures are proposed for control of Noise

- Proper maintenance, oiling and greasing of machines will be done every week to reduce generation of noise;

- Provision of sound insulated chambers for the workers working on machines (HEMM) producing higher levels of noise;
- Silencers / mufflers will be installed in all machineries;
- Green Belt/Plantation will be developed around the project area and along the haul roads. The plantation minimizes propagation of noise;
- Personal Protective Equipment (PPE) like ear muffs/ear plugs will be provided to the operators of HEMM and persons working near HEMM and their use will be ensured though training and awareness.
- Regular medical check–up and proper training to personnel to create awareness about adverse noise level effects

4.4.3 Ground Vibrations

Ground vibrations due to the proposed mining activities are anticipated due to operation of Mining Machines like Excavators, 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. Ther will be no major ground vibration is anticipated in this project

4.4.3.1 Mitigation Measures for Respective Proposed Projects

- 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;
- The charge per delay will be minimized and preferably more number of delays will be used per blasts;
- Drilling parameters like depth, diameter and spacing will be properly designed to give proper blast;
- 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

4.5 ECOLOGY AND BIODIVERSITY

4.5.1 Impact on Ecology and Biodiversity

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

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

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

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

4.5.2 Common Mitigation Measures for Respective Individual Proposed Projects

Keeping all this in mind the mitigations have been suggested under environmental management plan. With the understanding of the role of plant species as bio-filter to control air pollution, appropriate plant species (mainly tree species) have been suggested conceding the area/site requirements and needed

performance of specific species. The details of year wise proposed plantation program are given in Table 4.13.

The main objective of the green belt is to provide a barrier between the source of pollution and the surrounding areas.

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

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

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

4.5.2.1. Species Recommendation for Plantation granted in the district

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

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

TABLE 4.13: RECOMMENDED SPECIES FOR GREENBELT DEVELOPMENT PLAN

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

The 7.5m Safety distance along the boundary has been identified to be utilized for subsequent Afforestation. However, the afforestation should always be carried out in a systematic and scientific manner. Regional trees like Neem, Pongamia, Pinnata, and Casuarina will be planted along the Lease boundary and avenue plantation will be carried out in respective proposed projects. The rate of survival expected to be 80% in this area. Afforestation Plan is given in Table No.4.13 and budget of green belt development plan are given in Table No.4.14.

TABLE 4.14: GREENBELT DEVELOPMENT PLAN

Year	No. of tress proposed to be planted	Survival %	Area to be planted	Name of the species
I	920	85%	Safety barrier, Un utilized area's and nearby village roads	Neem, Pongamia Pinnata, Casuarina, etc.,

TABLE 4.15: BUDGET FOR GREENBELT DEVELOPMENT PLAN

Activity	Year & No of Trees	Cost	Total Cost
Greenbelt development within the project area and nearby village roads	1st year 920 Nos of trees	Site clearance, preparation of land, digging of pits / trenches, soil amendments, transplantation of saplings @ 200 per plant and maintenance	Rs 1,84,000

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

4.5.3. Anticipated Impact on Fauna

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

4.5.3.1. Measures for protection and conservation of wildlife species

- Undertaking mitigative measures for conducive environment to the flora and fauna in consultation with Forest Department.

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

4.5.3.2. Mitigation Measures

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

4.5.4. Impact on Aquatic Biodiversity

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

4.5.5. Impact Assessment on Biological Environment

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

TABLE 4.16: ECOLOGICAL IMPACT ASSESSMENTS

SI.No	Attributes	Assessment
1	Proximity to national park/wildlife sanctuary/reserve forest /mangroves/ coastline/estuary/sea	There is no 500m Radius from lease boundary.
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.

4.6 SOCIO ECONOMIC

4.6.1 Anticipated Impact from Proposed Projects

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

4.6.2 Common Mitigation Measures for 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.

4.7 OCCUPATIONAL HEALTH AND SAFETY

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

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

4.7.1 Respiratory Hazards

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

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

4.7.2 Noise

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

- No employee will be exposed to a noise level greater than 85 dB(A) for a duration of more than 8 hours per day without hearing protection

- The use of hearing protection will be enforced actively when the equivalent sound level over 8 hours reaches 85 dB(A), the peak sound levels reach 140 dB(C), or the average maximum sound level reaches 110 dB(A)
- Ear muffs provided will be capable of reducing sound levels at the ear to at least 85 dB(A)
- Periodic medical hearing checks will be performed on workers exposed to high noise levels

4.7.3 Physical Hazards

The following measures are proposed for control of physical hazards

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

4.7.4 Occupational Health Survey

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

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

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

4.8 MINE WASTE MANAGEMENT

No waste is anticipated from any of the proposed quarries.

4.9 MINE CLOSURE

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

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

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

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

4.9.1 Mine Closure Criteria

The criteria involved in mine closure are discussed below:

4.9.1.1 Physical Stability

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

4.9.1.2 Chemical Stability

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

4.9.1.3 Biological Stability

The stability of the surrounding environment is primarily dependent upon the physical and chemical characteristics of the site, whereas the biological stability of the mine site itself is closely related to

rehabilitation and final land use. Nevertheless, biological stability can significantly influence physical or chemical stability by stabilizing soil cover, prevention of erosion/wash off, leaching, etc.,

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

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

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

5. ANALYSIS OF ALTERNATIVES (TECHNOLOGY AND SITE)

5.1 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.

5.2 FACTORS BEHIND THE SELECTION OF PROJECT SITE

Kuppam Village, Pugalur Taluk, Karur District, Rough Stone & Gravel Quarry Projects at Kuppam Village is a mining project for excavation of Rough Stone and gravel, which is site specific. All the proposed mining lease areas have following advantages: -

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

5.3 ANALYSIS OF ALTERNATIVE SITE

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

5.4 FACTORS BEHIND SELECTION OF PROPOSED TECHNOLOGY

Mechanized open cast mining operation with handy hammer . chisel and mild explosive. 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

5.5 ANALYSIS OF ALTERNATIVE TECHNOLOGY

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

6. ENVIRONMENTAL MONITORING PROGRAMME

6.0 GENERAL

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

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

6.1 METHODOLOGY OF MONITORING MECHANISM

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

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

- ♣ The responsibilities of this cell will be:
- ♣ Implementation of pollution control measures
- ♣ Monitoring programme implementation
- ♣ Post-plantation care
- ♣ To check the efficiency of pollution control measures taken
- ♣ Any other activity as may be related to environment
- ♣ Seeking expert’s advice when needed.

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

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

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

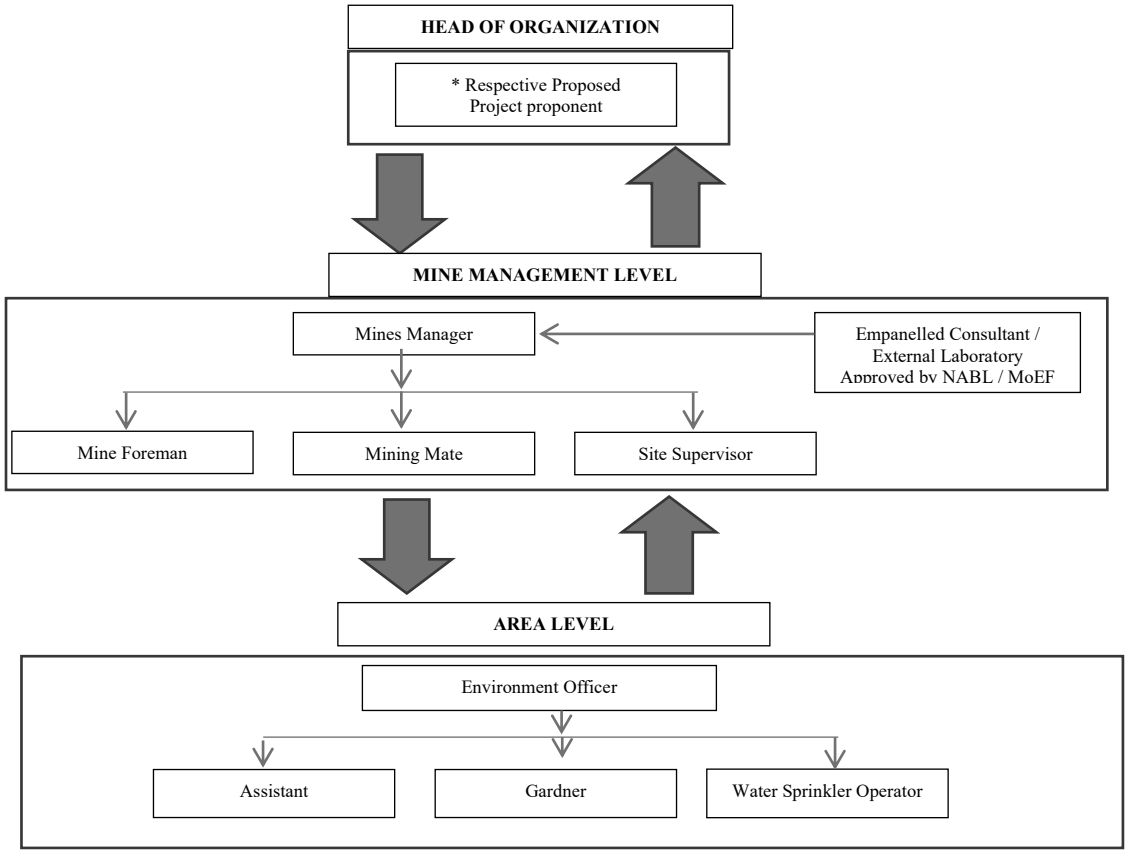


FIGURE 6.1: PROPOSED ENVIRONMENTAL MONITORING CELL PROPOSAL

* The Environmental Monitoring Cell will be formed in all the proposed projects

6.2 IMPLEMENTATION SCHEDULE OF MITIGATION MEASURES

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

TABLE 6.1 IMPLEMENTATION SCHEDULE FOR PROPOSED PROJECTS

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

6.3 MONITORING SCHEDULE AND FREQUENCY

Monitoring shall confirm that commitments are being met. This may take the form of direct measurement and recording of quantitative information, such as amounts and concentrations of discharges, emissions and wastes, for measurement against statutory standards. Monitoring may include socio-economic interaction, through local liaison activities or even assessment of complaints.

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

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

The details of monitoring are detailed in Table 6.2

TABLE 6.2: PROPOSED MONITORING SCHEDULE POST EC FOR MINES

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

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

6.4 BUDGETARY PROVISION FOR EMP

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

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

TABLE 6.3 ENVIRONMENT MONITORING BUDGET

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

Source: Approved Mining Plan

6.5 REPORTING SCHEDULES OF MONITORED DATA

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

Periodical reports to be submitted to: -

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

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

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

7. ADDITIONAL STUDIES

7.0 GENERAL

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

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

7.1. PUBLIC CONSULTATION

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	▪ 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

		Vibration due to movement of vehicles	during initial stage of operation ▪ Shots are fired during daytime only. ▪ All holes charged on any one day shall be fired on the same day. ▪ The danger zone will be distinctly demarcated (by means of red flags)
5	Transportation	Potential hazards and unsafe workings contributing to accident and injuries Overloading of material While reversal & overtaking of vehicle Operator of truck leaving his cabin when it is loaded.	▪ Before commencing work, drivers personally check the dumper/truck/tipper for oil(s), fuel and water levels, tyre inflation, general cleanliness and inspect the brakes, steering system, warning devices including automatically operated audio-visual reversing alarm, rear view mirrors, side indicator lights etc., are in good condition. ▪ Not allow any unauthorized person to ride on the vehicle nor allow any unauthorized person to operate the vehicle. ▪ Concave mirrors should be kept at all corners ▪ All vehicles should be fitted with reverse horn with one spotter at every tipping point ▪ Loading according to the vehicle capacity ▪ Periodical maintenance of vehicles as per operator manual
6	Natural calamities	Unexpected happenings	▪ Escape Routes will be provided to prevent inundation of storm water ▪ Fire Extinguishers & Sand Buckets
7	Failure of Mine Benches and Pit Slope	Slope geometry, Geological structure	▪ Ultimate or over all pit slope shall be below 60° and each bench height shall be 5m height.

Source: Analysed and Proposed by FAE & EC

7.3 DISASTER MANAGEMENT PLAN

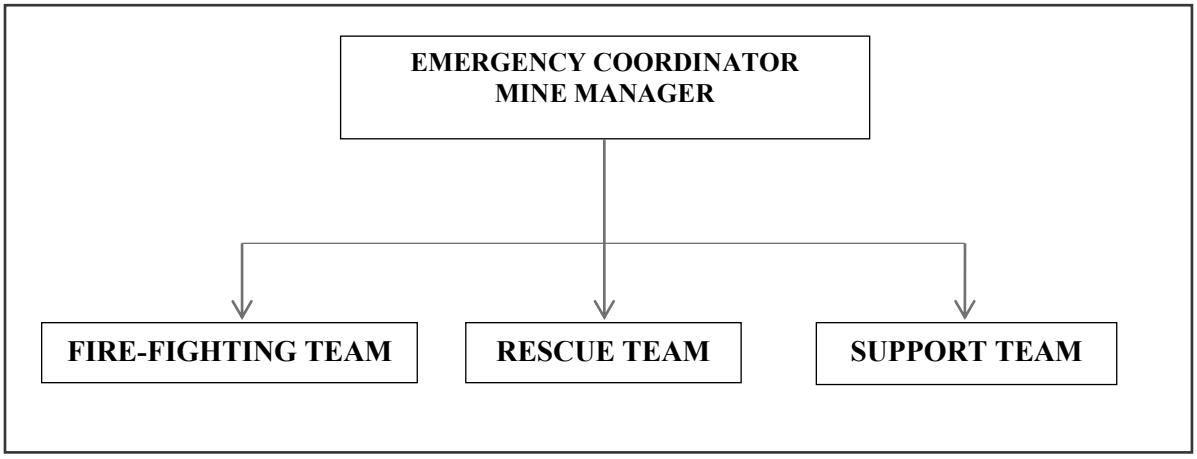
Natural disasters like Earthquake, Landslides have not been recorded in the past history as the terrain is categorized under seismic zone III. The area is far away from the sea hence the disaster due to heavy floods and tsunamis are not anticipated.

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 for respective proposed quarries. A mobile communication network and wireless shall connect Mine Emergency Control Room (MECR) to control various departments of the mine, fire station and neighbouring industrial units/mines.

Roles and responsibilities of emergency team –

(a) Emergency coordinator (EC)

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

(b) Incident controller (IC)

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

(c) Communication and advisory team

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

(d) Roll call coordinator

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

(e) Search and rescue team

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

(f) Emergency security controller

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

Emergency control procedure –

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

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

- He will receive information continuously from incident controller and give decisions and directions to:
  - Incident controller
  - Mine control rooms
  - Emergency security controller

Proposed fire extinguishers at different locations –

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

TABLE 7.3: PROPOSED FIRE EXTINGUISHERS AT DIFFERENT LOCATIONS

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

Alarm system to be followed during disaster –

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

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

- All safety precautions and provisions of Metalliferous Mines Regulations (MMR), 1961 is strictly followed during all mining operations.
- Observance of all safety precautions for blasting and storage of explosives as per MMR 1961.
- Entry of unauthorized persons into mine & allied areas is completely prohibited.
- Fire-fighting and first-aid provisions in the mines office complex and mining area are provided.
- Provisions of all the safety appliances such as safety boot, helmets, goggles, dust masks, ear plugs and ear muffs etc. are made available to the employees and the use of same is strictly adhered to through regular monitoring.
- Training and refresher courses for all the employees working in hazardous premises.
- Working of mine, as per approved plans and regularly updating the mine plans.
- Cleaning of mine faces is regularly done.
- Handling of explosives, charging and blasting are carried out only by qualified persons following SOP.
- Checking and regular maintenance of garland drains and earthen bunds to avoid any inflow of surface water in the mine pit.

- Provision of high-capacity standby pumps with generator sets with enough quantity of diesel for emergency pumping especially during monsoon.
- A blasting SIREN is used at the time of blasting for audio signal.
- Before blasting and after blasting, red and green flags are displayed as visual signals.
- Warning notice boards indicating the time of blasting and NOT TO TRESPASS are displayed at prominent places.
- Regular maintenance and testing of all mining equipment were carried out as per manufacturer's guidelines.

7.4 CUMULATIVE IMPACT STUDY

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

TABLE 7.4: LIST OF QUARRIES IN CLUSTER

PROPOSED QUARRIES				
CODE	**Name of the Owner**	**S.F. Nos**	**Extent**	**Status**
P1	**Thiru.S. Sadhasivam,** S/o.K.Subramaniyam, Door No.4/188, Velliampalayam, Punna chatram Post, Pugalur Taluk, Karur District - 639136	211/1, 211/2	1.54.0 ha	TOR Obtained: Lr. No. SEIAA-TN/F.No.8566/ToR-1280/2022 Dated:08.10.2022
P2	**Thiru.G. Prabhakar,** S/o.Govindasamy, 5/187, Samynathapuram, Kattumunnur Post, K.Paramathi Taluk, Karur District	361/2 (P)	1.21.5 ha	
P3	**Thiru.K. Nallasamy** S/o.Krishnan Punnamchatram Post, Aravakurichi Taluk, Karur District.	226/1(P)	2.89.0 ha	
P4	**Tvl.NTC Blue Metals LLP,** Prop.of. Mr.S.Muthusamy, Rasampalayam Keelasathambur Village, Namakkal -637 207	362/2(P)	2.19.0	
TOTAL			**7.83.5 ha**	
EXPIRED QUARRIES				
CODE	**Name of the Owner**	**S.F. No**	**Extent**	**Status**
E1	**Tvl.Venkatachalapathi** Blue Metals. S.F.No.233/1, Puthurpatti, Kuppam Post, Aravakurichi Taluk, Karur District.	213/1, 214/2A,214/2B, 214/2C,220/3P,221/P	4.05.0 ha	23.6.2017 To 22.6.2022 Last permit obtained on 24.05.2022
	TOTAL		**4.05.0 ha**	
	ABANDONES QUARRIES			
CODE	**Name of the Owner**	**S.F. No**	**Extent**	**Status**
A1	**N.Saraswathi** W/o.Nachimuthu Thalaiyeethupatti	**362/1**	**1.51.5 ha**	5.5.2006 to 4.5.2011

	Kuppam Aravakurichi			
	TOTAL		**1.51.5 Ha**	
TOTAL CLUSTER EXTENT			**7.83.5 ha**	

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

TABLE 7.5: SALIENT FEATURES OF PROPOSAL

Name of the Quarry	**Thiru.S.Sadhasivam,** Rough Stone & Gravel Quarry Project	
Toposheet No	58 - E/16	
Latitude between	10°59'58.89" N to 11°00'04.13" N	
Longitude between	77°57'11.01" E to 77°57'15.51" E	
Highest Elevation	172m AMSL	
Proposed Depth of Mining	The Ultimate depth of Mining up to a depth of **7m (2m Gravel + 5m Rough Stone)** below ground level.	
Geological Resources	Rough Stone in m^3	Gravel m^3
	77,000	30,800
Mineable Reserves	Rough Stone in m^3	Gravel m^3
	35,230	16,270
Yearwise Production	Rough Stone in m^3	Gravel m^3
	28,430	16,270
Ultimate Pit Dimension	121m (L) * 76m (W) * 7m Bgl (D)	
Water Level in the surrounds area	The Water Table in the area is 60m in summer season and 55m in Rainy season	
Method of Mining	Opencast Mechanized Mining Method involving by Handy hammer, chisel and mild explosive like expanding chemical.	
Topography	The lease applied area is exhibits plain topography. The area has gentle sloping towards Southeastern side and altitude of the area is 172m above from Mean Sea level. The area is covered by 2m thickness of Gravel and followed by Massive Charnockite which is clearly inferred from the nearby existing quarry pits.	
Machinery proposed	Splitting of rock mass of considerable volume from the parent rock mass by hand hammer, chisel and mild explosives	
	Tippers	1Nos
Blasting Method	Mild explosives like expanding chemical to loosen the Rough Stone, No deep hole drilling and blasting	
Proposed Manpower Deployment	23 Nos	
Project Cost	Rs.25,78,000/-	
CER Cost of Project Cost	Rs.5,00,000	
Nearby Water Bodies	Kaveri River -7.0km-N	
Greenbelt Development Plan	Proposed to plant 920 trees in Approach Road and nearby periphery of the village Road after consulting the local Panchayat authority and Agriculture Experts area 7.5 m Safety Zone	
Proposed Water Requirement	2.0 KLD	
Nearest Habitation	230m-North	

Source: Approved Mining Plan

Air Environment –

Calculating the Cumulative Load of Mining within the cluster is as shown in table 7.17& 7.18.

TABLE 7.6: PRODUCTION LOAD OF ROUGH STONE

	PROPOSED PRODUCTION DETAILS			
Quarry	**5 Years in m^3**	**Per Year in m^3**	**Per Day in m^3**	**Number of Lorry Load Per Day**
P1	28430	5686	19	3
Total	**28430**	**5686**	**19**	**3**
Grant Total	**28430**	**5686**	**19**	**3**

TABLE 7.7: PRODUCTION LOAD OF GRAVEL

	PROPOSED PRODUCTION DETAILS			
Quarry	**1 - 3 Years in m^3**	**Per Year in m^3**	**Per Day in m^3**	**Number of Lorry Load Per Day**
P1	16270	5423	18	3
Total	**16270**	**5423**	**18**	**3**
Grand Total	**16270**	**5423**	**18**	**3**

On a proposed 1 quarry it can be seen that the overall production of Rough Stone is 5686m^3 per year and overall production of Gravel is 5423 m^3 per year with a capacity of 3 trips of Rough Stone per day and 3 Trips per day of Gravel.

Note: Per day production of Rough Stone is calculated for 5 Years Lease Period and for Gravel production with 1, 2 or 3 or 5 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 4 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 7.19.

TABLE 7.8: 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	0.075559310	g/s
	Blasting	Point Source	0.000595737	g/s
	Mineral Loading	Point Source	0.041535277	g/s
	Haul Road	Line Source	0.002490152	g/s/m
	Overall Mine	Area Source	0.046571645	g/s
Estimated Emission Rate for SO_2	Overall Mine	Area Source	0.000511226	g/s
Estimated Emission Rate for NOx	Overall Mine	Area Source	0.000018289	g/s

Source: Emission Calculations

TABLE 7.9: INCREMENTAL & RESULTANT GLC WITHIN CLUSTER

PM_{10} in µg/m³								
Location	**AAQ1**	**AAQ2**	**AAQ3**	**AAQ4**	**AAQ5**	**AAQ6**	**AAQ7**	**AAQ8**
Background	39.81	41.35	39.92	39.76	41.45	43.25	42.42	42.65
Incremental	12.98	7.5	11.08	3.15	0.89	0	5.29	2.42
Resultant	52.79	48.85	51.00	42.91	42.34	43.25	47.71	45.07
NAAQ Norms	**100 µg/m³**							
SO_2 in µg/m³								
Location	**AAQ1**	**AAQ2**	**AAQ3**	**AAQ4**	**AAQ5**	**AAQ6**	**AAQ7**	**AAQ8**
Background	6.56	6.10	6.80	5.39	6.97	7.89	6.42	6.19
Incremental	2.44	1.85	2.01	0	0	0	0.69	0
Resultant	9.00	7.95	8.81	5.39	6.97	7.89	7.11	6.19
NAAQ Norms	**80 µg/m³**							
NO_x in µg/m³								
Location	**AAQ1**	**AAQ2**	**AAQ3**	**AAQ4**	**AAQ5**	**AAQ6**	**AAQ7**	**AAQ8**
Background	22.10	21.89	20.10	17.80	21.73	23.20	23.99	25.47
Incremental	7.44	1.89	4.79	0	0	0	0	0
Resultant	29.54	23.78	24.89	17.80	21.73	23.20	23.99	25.47
NAAQ Norms	**80 µg/m³**							

Noise Environment

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

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

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

Where:

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

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

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

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

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

TABLE 7.10: 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	45.9	50.0	51.4	55

Source: Lab Monitoring Data

The incremental noise level is found within the range of 50.0 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), dated19.09.2006 and S.O. 50 (E) dated 11.01.2010 under the Environment(Protection) Act, 1986).

Ground Vibrations

There will be no major ground vibration is anticipated in the quarry.

TABLE 7.11: NEAREST HABITATION FROM MINE

Location ID	Distance in Meters
Habitation Near P1	320

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)

Socio Economic Environment –

Mines shall contribute towards CER and the community shall develop.

TABLE 7.13: SOCIO ECONOMIC BENEFITS FROM MINES

Code	Project Cost	CER
Proposal Quarry	Rs.25,78,000/-	Rs.5,00,000/-
Total	**Rs.25,78,000/-**	**Rs.5,00,000/-**
Grand Total	**Rs.25,78,000/-**	**Rs.5,00,000/-**

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.

- 1Proposed projects shall fund towards CER –**Rs.5,00,000/-/-**

TABLE 7.14: EMPLOYMENT BENEFITS FROM 12 MINES

Quarry	**Employment**
P1	23
Total	**23**
Grand Total	**23**

A total of 134 people will get employment due to 8 proposed mines in cluster and 45 people are already employed at existing mines.

TABLE 7.15: GREENBELT DEVELOPMENT BENEFITS FROM MINES

Year	No. of tress proposed to be planted	Survival %	Area to be planted	Name of the species
I	920	85%	Safety barrier, Un utilized area's and nearby village roads	Neem, Pongamia Pinnata, Casuarina, etc.,

Based on the Proposed Mining Plans it's anticipated that there shall growth of native species of Neem, Casuarina, etc in the rate of 920 Trees Planted over a period of 1st Years with Survival Rate of 85% and expected growth is around 782 Trees in the Approach road and around the boundaries of the proposed mine.

7.5 PLASTIC WASTE MANAGEMENT PLAN FOR PROPOAL

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

Objective –

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

TABLE 7.16: 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

Proposed Project for Quarrying Rough Stone and Gravel at Kuppam Village aims to produce 28,430 m^3 Rough Stone a period of 5 years & 16,270 m^3 of Gravel over a 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 23 persons for carrying out mining operations and give preference to the local people in providing employment in this 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 Nadanthai (North) Village, Tiruthani Taluk and Karur 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.,

8.6 CORPORATE SOCIAL RESPONSIBILITY

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

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

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

8.7 CSR Cost Estimation

CSR activities will be taken up in the Kuppam 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.

8.8 CORPORATE ENVIRONMENT RESPONSIBILITY

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

As per para 6 (II) of the office memorandum, being a green field project & Capital Investment is ≤ 100 crores, All the proposed projects shall contribute Capital Investment towards CER as per directions of EAC/SEAC. Cumulative Capital cost is Rs. 25,78,000

TABLE 8.1: CER – ACTION PLAN

Activity	Beneficiaries	Total
Installation of Solar lamps at Kuppam Village village roads	Kuppam Village	Rs 5,00,000/-
Providing funds for improving Sanitation facilities at Kuppam Village Government School		
Providing funds for smart class facilities at Kuppam Village Government School		
TOTAL		**Rs 5,00,000/-**

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

9. ENVIRONMENTAL COST BENEFIT ANALYSIS

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

10. ENVIRONMENTAL MANAGEMENT PLAN

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 S.Sadhasivam

Meet the requirements of all laws, acts, regulations, and standards relevant to its operations and activities

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

Description of the Administration and Technical Setup –

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

The said team will be responsible for:

- Monitoring of the water/ waste water quality, air quality and solid waste generated
- Analysis of the water and air samples collected through external laboratory

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

10.2 LAND ENVIRONMENT MANAGEMENT

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

TABLE 10.1: PROPOSED CONTROLS FOR LAND ENVIRONMENT

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

Source: Proposed by FAE's & EIA Coordinator

10.3 SOIL MANAGEMENT

There is no overburden or waste anticipated from proposed project.

TABLE 10.2: PROPOSED CONTROLS FOR SOIL MANAGEMENT

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

Source: Proposed by FAE's & EIA Coordinator

10.4 WATER MANAGEMENT

In the proposed quarrying project, no process is involved for the effluent generation, only oil & grease from the machinery wash is anticipated and domestic sewage from mine office.

The quarrying operation is proposed upto a depth of 7 m BGL, the water table in the area is 55m – 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

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
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, and cutting activities. No mining activities are planned during night time.

TABLE 10.5: PROPOSED CONTROLS FOR NOISE ENVIRONMENT

CONTROL	RESPONSIBILITY
Development of thick greenbelt all along the Buffer Zone (7.5 Meters) of the project area to attenuate the noise and the same will be maintained	Mines Manager
Preventive maintenance of mining machinery and replacement of worn-out accessories to control noise generation	Mines Foreman
Deployment of mining equipment with an inbuilt mechanism to reduce noise	Mines Manager
Provision of earmuff / ear plugs to workers working in noise prone zones in the mines	Mining Mate
Provision of effective silencers for mining machinery and transport vehicles	Mines Manager
Provision of sound proof AC operator cabins to HEMM	Mines Manager
Controlled blasting technologies are adopted by using delay detonators to minimize noise from blasting	Mines Manager
Annual ambient noise level monitoring shall be 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
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 and Gravel quarry operation creates vibration due to the blasting and movement of Heavy Earth moving machineries, fly rocks due to the blasting.

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 100 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 FOR 5 YEAR PLAN PERIOD

Year	No. of tress proposed to be planted	Survival %	Area to be planted	Name of the species
I	900	85%	Safety barrier, Un utilized area's and nearby village roads	Neem, Pongamia Pinnata, Casuarina, etc.,

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

The objectives of the greenbelt development plan are –

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

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

10.8.2 Species Recommended for Plantation

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

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

TABLE 10.8: RECOMMENDED SPECIES TO PLANT IN THE GREENBELT

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

Source: Proposed by FAE's & EIA Coordinator

10.9 OCCUPATIONAL SAFETY & HEALTH MANAGEMENT

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

10.9.1 Medical Surveillance and Examinations –

- Identifying workers with conditions that may be aggravated by exposure to dust & noise and establishing baseline measures for determining changes in health.
- Evaluating the effect of noise on workers
- Enabling corrective actions to be taken when necessary
- Providing health education

The health status of workers in the mine shall be regularly monitored under an occupational surveillance program. Under this program, all the employees are subjected to a detail 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)					

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

10.9.2 Proposed Occupational Health and Safety Measures –

- The mine site will have adequate drinking water supply so that workers do not get dehydrated.
- Lightweight and loose-fitting clothes having light colours will be preferred to wear.
- Noise exposure measurements will be taken to determine the need for noise control strategies.
- The personal protective equipment will be provided for mine workers.
- Supervisor will be instructed for reporting any problems with hearing protectors or noise control equipment.
- At noisy working activity, exposure time will be minimized.
- Dust generating sources will be identified and proper control measure will be adopted.
- Periodic medical examinations will be provided for all workers.
- Strict observance of the provisions of DGMS Acts, Rules and Regulations in respect of safety both by management and the workers.
- The width of road will be maintained more than thrice the width of the vehicle. A code of traffic rules will be implemented.

- In respect of contract work, safety code for contractors and workers will be implemented. They will be allowed to work under strict supervision of statutory person/officials only after they will impart training at vocational training centres. All personal protective equipment's will be provided to them.
- A safety committee meeting every month will be organized to discuss the safety of the mines and the persons employed.
- Celebration of annual mines safety week and environmental week in order to develop safety awareness and harmony amongst employees and co quarry owners.

FIGURE 10.1: PERSONAL PROTECTIVE EQUIPMENT TO THE MINE WORKERS

10.9.3 Health and Safety Training Programme

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

TABLE 10.10: LIST OF PERIODICAL TRAININGS PROPOSED FOR EMPLOYEES

Course	Personnel	Frequency	Duration	Instruction

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

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

10.9.4 Budgetary Provision for Environmental Management

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

TABLE 10.11: EMP BUDGET FOR PROPOSED PROJECT

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	15400	15400
	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
	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 - 1 Units	5000	250
	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	30800
	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
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	15400	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	308000	10000
	3. Progressive Closure Activity Green belt development - 500 trees per one hectare - Proposal for 920 Tress (350 Tress inside the lease area and 570 Trees outside the 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)	70000	10500

		Avenue Plantation @ 300 per plant (capital) for plantation outside the lease area and @ 30 per plant maintenance (recurring)	171000	17100
	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	49050	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	167737	0
Implementation of EC, Mining Plan & DGMS Condition- Public hearing commitment	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) - 23 Employees	92000	23000
	Health check up for workers will be provisioned	IME & PME Health check up @ Rs. 1000/- per employee	0	23000
	First aid facility will be provided	Provision of 2 Kits per Hectare @ Rs. 2000/-	0	3080

	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	77000	10000
	Installation of CCTV cameras in the mines and mine entrance	Camera 4 Nos, DVR, Monitor with internet facility	30000	5000
	Implementation as per Mining Plan and ensure safe quarry working	Mines Manager (1st Class / 2nd Class / Mine Foreman) under regulation 34 / 34 (6) of MMR, 1961 and Mining Mate under regulation 116 of MMR,1961 @ 40,000/- for Manager & @ 25,000/- for Foreman / Mate	0	780000
	Construction of Greenmesh along with wire fencing around the lease area	Per Hectare greenmesh cost @ Rs. 50,000/- with Maintenance of Rs 20,000/- per annum	1,50,000	20,000
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			**2481537**	**1118130**

Year wise Break Up Cost

Year	Total Cost	Year	Total Cost
1st	₹ 35,99,667/-	6th	₹ 26,67,817/-
2nd	₹ 11,74,037/-	7th	₹ 15,60,440/-
3rd	₹ 12,32,738-	8t	₹ 16,38,462/-
4th	₹ 12,94,375/-	9th	₹ 17,20,385/-
5th	₹ 13,59,094/-	10t	₹ 18,55,454/-

Cost inflation 5% per annum

In order to implement the environmental protection measures, an amount of Rs.24.81 lakhs as capital cost and recurring cost as Rs.11.18 lakhs as recurring cost is proposed considering present market price considering present market scenario for the proposed project.

10.10 CONCLUSION

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

11. SUMMARY AND CONCLUSION

Thiru.S.Sadhasivam, Rough Stone & Gravel Cluster (Extent: 7.83.5) 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.

A detailed Draft EIA EMP Report is prepared for public and other stakeholders' suggestions and a final EIA/EMP Report will be prepared based on the outcome of Public Consultation.

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

The main scope of the EIA study is to quantify the cumulative impact in the study area due to cluster quarries and formulate the effective mitigation measures for each individual leases. A detailed account of the emission sources, emissions control equipment, background Air quality levels, Meteorological measurements, Dispersion model and all other aspects of pollution like effluent discharge, Dust generation etc., have been discussed in this report. The baseline monitoring study has been carried out during the months Oct to Dec 2022 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 & Gravel as per market demand.

Sustainable and modern mining leads us to see positive impact of mining operation and providing consistent employment for nearly 100 people directly in the cluster and indirectly around 200 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 Kuppam Village Rough Stone & Gravel Cluster (Extent: 7.83.5 ha)

12. DISCLOSURE OF CONSULTANT

The Project Proponent's –

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

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** **38**	**A** **B**	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	Mrs. Jisha parameswaran	In-house	-	**-**	SW	B
5	Mr. Govindasamy	In-house	-	**-**	WP	B
6	Mrs. K. Anitha	In-house	-	**-**	SE	A
7	Mrs. Amirtham	In-house	-	**-**	EB	B
8	Mr. A. Allimuthu	In-house	-	**-**	LU	B
9	Mr. N. Senthilkumar	Empanelled	**38** **28**	**B** **B**	AQ WP RH	B B A
10	Mr. Alagappa Moses	Empanelled	-	**-**	EB	A
11	Mr. S. Pavel	Empanelled	-	**-**	RH	B
12	Mr. J. R. Vikram Krishna	Empanelled	**1** **38**	**A** **B**	SHW RH	A A

Abbreviations

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

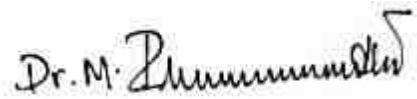
DECLARATION BY EXPERTS CONTRIBUTING TO THE EIA/EMP

Declaration by experts contributing to the Cluster EIA/EMP for Thiru.S.Sadhasivam Rough Stone & Gravel Quarry Project over a Cluster Extent of 7.83.5 ha in Kuppam Village of Pugalur Taluk, Karur District of Tamil Nadu. It is also certified that information furnished in the above EIA study are true and correct to the best of our knowledge.

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

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

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

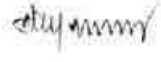
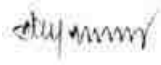
Date & Signature: 

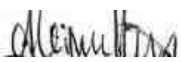
Period of Involvement: **January 2022 to till date**

Associated Team Member with EIA Coordinator:

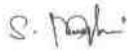
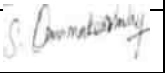
1. **Mr. S. Nagamani**
2. **Mr. Viswathanan**
3. **Mr. Santhoshkumar**
4. **Mr. S. Ilavarasan**

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	
3	HG	▪ Interpretation of ground water table and predict impact and propose mitigation measures. ▪ Analysis and description of aquifer Characteristics	Dr. P. Thangaraju	
4	GEO	▪ Field Survey for assessing the regional and local geology of the area. ▪ Preparation of mineral and geological maps. ▪ Geology and Geo morphological analysis/description and Stratigraphy/Lithology.	Dr. P. Thangaraju	
5	SE	▪ Revision in secondary data as per Census of India, 2011. ▪ Impact Assessment & Preventive Management Plan ▪ Corporate Environment Responsibility.	Mrs. 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.	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. 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. 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	E. Vadivel
8	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	

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.S.Sadhasivam Rough Stone & Gravel Quarry Project over a Cluster Extent of 7.83.5 ha in Kuppam Village, Pugalur Taluk, Karur District, Tamil Nadu State. It is also certified that information furnished in the EIA study are true and correct to the best of our knowledge.

Signature& Date:

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

Designation: **Managing Partner**

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

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