

# 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-  
PATTA LAND**

**CLUSTER EXTENT = 13.85.7 ha** (3 Proposed + 1 Existing Quarries)

**THIRU.V. THULASIAMMAL ROUGH STONE AND GRAVEL QUARRY**

At

Palathurai Village, Madukkarai Taluk, Coimbatore District.

## NAME OF PROJECT PROPONENT

Sl. No.	Proponent Name	S.F.No & Extent
1	Tmt.V.Thulasiammal, W/o. Valaithottagounder, residing at No.2/170, Murugan Kovil Street, Palathurai, Madukkarai Taluk, Coimbatore District - 641 105	34/1,  <b>3.86.50 ha</b>

**Obtained ToR**

**Lr No.SEIAA-TN/F.No.9171/ToR-1392/2022 Dated: 21.03.2023 for P1**

### Environmental Consultant

**GEO EXPLORATION AND MINING SOLUTIONS**

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### Laboratory



**CHENNAI METTEX LAB PRIVATE LIMITED,**

(ISO/IEC 17025:2017)

**No.83, M.K.N. Road, Jothi Complex, Guindy, Chennai –**

**600 032 Tamilnadu, INDIA.**



**Baseline Monitoring Period: March 2023 to May 2023**

**SEP 2023**

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

<b>PROPOSED QUARRIES</b>					
<b>CODE</b>	<b>Name of the Owner</b>	<b>Village</b>	<b>S.F. Nos</b>	<b>Extent in Ha</b>	<b>Status</b>
<b>P1</b>	<b>Tmt.V.Thulasiammal</b>	Palathurai	34/1	3.86.5	LrNo.SEIAA-TN/F.No.9171/ToR-1392/2022 Dated: 21.03.2023
<b>P2</b>	Thiru.A.Senthilkumar	Palathurai	67 (P)	3.00.0	-
<b>P3</b>	Tmt.V.Thulasiammal	Palathurai	30/2B3 (P)	2.58.20	LrNo.SEIAA-TN/F.No.7998/SEAC/ToR-897/2020 Dated:16.03.2021
<b>TOTAL EXTENT</b>				<b>9.44.7</b>	
<b>Existing Quarry</b>					
<b>CODE</b>	<b>Name of the Owner</b>	<b>Village</b>	<b>S.F. Nos</b>	<b>Extent in Ha</b>	<b>Status</b>
E1	Thiru.G.Murali	Palathurai	30/1 (P), 30/2A (P)	4.41.0	08.11.2017 to 07.11.2022
<b>TOTAL EXTENT</b>				<b>4.41.0</b>	
<b>TOTAL CLUSTER EXTENT</b>				<b>13.85.7</b>	

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

## TERMS OF REFERENCE (ToR) COMPLIANCE

### P1 – Tmt.V.Thulasiammal

“LrNo.SEIAA-TN/F.No.9171/ToR-1392/2022 Dated: 21.03.2023”

SPECIFIC CONDITIONS		
1.	In the case of proposed lease in an existing (or old) quarry where the benches are not formed (or) partially formed as per the approved Mining Plan, the Project Proponent (PP) shall prepare and submit an "Action Plan for carrying out the realignment of the benches in the proposed quarry lease after it is approved by the concerned Asst. Director of Geology and Mining during the time of appraisal for obtaining the EC.	Noted and Agreed
2	PP shall produce EC compliance report from Competent Authority in the EIA Report for the mining activity already done in the same site.	Noted and Agreed
3	The PP shall include the letter received from DFO concerned stating the proximity details of Reserve Forests, Protected Areas, Sanctuaries, Tiger reserve etc., upto a radius of 25 km from the proposed site.	DFO Letter No Noc.No 4554/2022 dated 02.08.2022
4	Details of odai (water course), viz nature of odai, origin, category etc.,	Noted and Agreed
5	The Proponent shall submit a conceptual 'Slope Stability Plan' for the proposed quarry during the appraisal while obtaining the EC, as the depth of the working is extended beyond 30 m below ground level.	Noted and Agreed
6	The PP shall furnish the affidavit stating that the blasting operation in the proposed quarry is carried out by the statutory competent person as per the MMR 1961 such as blaster, mining mate, mine foreman, III Class mines manager appointed by the proponent.	Noted and agreed
7	The EIA Coordinates shall obtain and furnish the details of quarry /quarries operated by the PP in the past, either in the same location or else where in the state with video and Photographic evidences.	Noted and agreed
8	If the proponent has already carried out the mining activity in the proposed mining lease area after 15.01.2016, then the proponent shall furnish the following details from AD/DD, mines.	None
9	<p>What was the period of the operation and stoppage of the earlier mines with last work permit issued by the AD/DD mines?</p> <p>b) Quantity of minerals mined out.</p> <p>c) Highest production achieved in any one year</p> <p>d) Detail of approved depth of mining.</p> <p>e) Actual depth of the mining achieved earlier.</p> <p>f) Name of the person already mined in that leases area.</p> <p>g) If EC and CTO already obtained, the copy of the same shall be submitted.</p>	<p>With Existing Pit Dimension –</p> <p>1. 117m (L) x 54m (W) x 15m(D) bgl</p> <p>2. 95m (L) x 45m (W) x 1m(D) bgl</p> <p>47 m bgl (2 m Gravel + 45 m Rough Stone)</p>

	h) Whether the mining was carried out as per the approved mine plan (or EC if issued) with stipulated benches	
10	All corner coordinates of the mine lease area, superimposed on a High-Resolution Imagery/Topo sheet, topographic sheet, geomorphology, lithology and geology of the mining lease area should be provided. Such an Imagery of the proposed area should clearly show the land use and other ecological features of the study area (core and buffer zone)	Discussed under Chapter 2 & Chapter 3.
11	The PP shall carry out Drone video survey covering the cluster, Green belt, fencing etc.	Noted and agreed
12	The proponent shall furnish photographs of adequate fencing, green belt along the periphery including replantation of existing trees & safety distance between the adjacent quarries & water bodies nearby provided as per the approved mining plan.	Noted and agreed. Fencing will be carried out before execution of lease deed and greenbelt development will be carried out from the 1 <sup>st</sup> Year of Mining Plan Period and periodical compliance with photographs will be submitted to SEIAA every 6 months.
13	The Project Proponent shall provide the details of mineral reserves and mineable reserves, planned production capacity, proposed working methodology with justifications, the anticipated impacts of the mining operations on the surrounding environment and the remedial measures for the same.	Noted and agreed. Discussed under Chapter 2
14	The Project Proponent shall provide the Organization chart indicating the appointment of various statutory officials and other competent persons to be appointed as per the provisions of Mines Act 1952 and the MMR, 1961 for carrying out the quarrying operations scientifically and systematically in order to ensure safety and to protect the environment.	Noted and agreed. Detailed under Chapter 6.
15	contour map of the water table detailing the number of ground water The Project Proponent shall conduct the hydro-geological study considering the pumping & open wells, and surface water bodies such as rivers, tanks, canals, ponds etc. within 1 km (radius) along with the collected water level data for both monsoon and non-monsoon seasons from the PWD/TWAD so as to assess the impacts on the wells due to mining activity. Based on actual monitored data, it may clearly be shown whether working will intersect groundwater. Necessary data and documentation in this regard may be provided.	The hydro-geological study was conducted to evaluate the possible impact on the ground water table. No significant impacts are anticipated on the water bodies around the project area. Details are discussed under Chapter No. 3.
16	The proponent shall furnish the baseline data for the environmental and ecological parameters with regard to surface water/ground water quality, air quality, soil quality & flora/fauna including traffic/vehicular movement study.	Baseline data for the environmental and ecological parameters with regard to surface water/ground water quality, air quality, soil quality, & flora/fauna including traffic/vehicular movement study to assess the cumulative impact of the proposed project on the environment is prepared as a Draft EIA EMP and will be finalized after public consultation and will be submitted as Final EIA EMP Report.
17	The Proponent shall carry out the Cumulative impact study due to mining operations: carried out in the quarry specifically with reference to the specific environment in terms of air pollution, water pollution. & health impacts. Accordingly, the Environment Management plan should be prepared keeping the concerned quarry and the surrounding habitations in the mind.	The Cumulative impact study due to mining operations is explained in chapter - 7
18	Rain water harvesting management with recharging details along with water balance (both) monsoon & non-monsoon) be submitted.	The proposed project is Existing lease

19	Issues relating to Mine Safety, including slope geometry in case of Granite quarrying, blasting parameters etc. should be detailed. The proposed safeguard measures in each case should also be provided.	Its is a Rough Stone and Gravel Quarry
20	Land use of the study area delineating forest area, agricultural land, grazing land, wildlife sanctuary, national park, migratory routes of fauna, water bodies, human settlements and Cother ecological features should be indicated. Land use plan of the mine lease area should be prepared to encompass preoperational, operational and post operational phases and submitted. Impact, if any, of change of land use should be given.	It is a Patta Land
21	Details of the land for storage of Overburden/Waste Dumps (or) Rejects outside the mine lease, such as extent of land area, distance from mine lease, its land use. R&R issues, if any. should be provided.	It is Stored in Safety area 7.5m radius
22	Since non-saleable waste /OB/ intermediate waste etc. is huge in the granite quarry, the Proponent shall provide the details pertaining to management of the above material with year wise utilization and average moving inventory be submitted.	Its is a Rough Stone and Gravel Quarry, no waste will be generated
23	Proximity to Areas declared as 'Critically Polluted' (or) the Project areas which attracts the court restrictions for mining operations, should also be indicated and where so required. clearance certifications from the prescribed Authorities, such as the TNPCB (or) Dept of Geology and Mining should be secured and furnished to the effect that the proposed mining activities could be considered.	It is a Patta Land. Got Permission from AD Mines
24	Description of water conservation measures proposed to be adopted in the Project should be given. Details of rainwater harvesting proposed in the Project, if any, should be provided	Mine Closure in Chapter -2
25	Impact on local transport infrastructure due to the Project should be indicated.	Transportation details mentioned in Chapter -2
26	A tree survey study shall be carried out (nos., name of the species, age, diameter etc..) both within the mining lease applied area & 300m buffer zone and its management during mining activity.	Greenbelt details in Chapter-4. It is proposed to plant 330 trees along boundary and panchayat roads.
27	A detailed mine closure plan for the proposed project shall be included in EIA/EMP report which should be site-specific.	Mine Closure in Chapter -2
28	Public Hearing points raised and commitments of the Project Proponent on the same along with time bound Action Plan with budgetary provisions to implement the same should be provided and also incorporated in the final EIA/EMP Report of the Project and to be submitted to SEIAA/SEAC with regard to the Office Memorandum of MoEF& CC accordingly.	Noted and Agreed
29	The Public hearing advertisement shall be published in one major National daily and one most circulated vernacular daily.	Noted and Agreed
30	The PP shall produce/display the EIA report, Executive summary and other related information with respect to public hearing in Tamil Language also.	Noted and Agreed
31	As a part of the study of flora and fauna around the vicinity of the proposed site, the EIA coordinator shall strive to educate the local students on the importance of preserving local flora and fauna by involving them in the study, wherever possible.	Noted and Agreed

32	The recommendation for the issue of "Terms of Reference" is subjected to the outcome of the Hon'ble NCT, Principal Bench, New Delhi in O.A No. 186 of 2016 M.A.No.350/2016). and O.A. and O.A.No.580/2016 (M.A.No 1182/2016) and O.A.No.102 2017 and OA No.404/2016 (M.A.No. 758/2016, M.A.No 920/2016. MA.No.1122/2016, அனந்தகிரு SEIAA-TNM.A.No.12/2017 & M.A. No. 843/2017) and OA.No 405/2016 and O.A. No.520 of 2016 (M.A.No. 981/2016, MA No.982/2016 & M.A.No.384/2017)	Noted and Agreed
33	The purpose of Green belt around the project is to capture the fugitive emissions, carbon sequestration and to attenuate the noise generated, in addition to improving the aesthetics A wide range of indigenous plant species should be planted as given in the appendix-I in consultation with the DFO. State Agriculture University and local school/college authorities. The plant species with dense/moderate canopy of native origin should be chosen.Species of small/medium/tall trees alternating with shrubs should be planted in a mixed manner	Noted and Agreed
34	Taller/one year old Saplings raised in appropriate size of bags, preferably eco-friendly bags should be planted as per the advice of local forest authorities/botanist/Horticulturist with regard to site specific choices. The proponent shall earmark the greenbelt area with GPS coordinates all along the boundary of the project site with at least 3 meters wide and in between blocks in an organized manner	The proposed project is Existing lease. Around 330 trees are proposed to plant
35	A Disaster management Plan shall be prepared and included in the EIA/EMP Report.	Disaster management Plan details in Chapter-7
36	A Risk Assessment and management Plan shall be prepared and included in the ELA/EMP Report.	A Risk Assessment and management Plan Chapter- 7
37	Occupational Health impacts of the Project should be anticipated and the proposed preventive measures spelt out in detail. Details of pre-placement medical examination and periodical medical examination schedules should be incorporated in the EMP. The project specific occupational health mitigation measures with required facilities proposed in the mining area may be detailed.	Occupational Health impacts chapter- 10
38	Public health implications of the Project and related activities for the population in the impact zone should be systematically evaluated and the proposed remedial measures should be detailed along with budgetary allocations.	It is explained in Chapter -3
39	The Socio-economic studies should be carried out within a 5 km buffer zone from the mining activity. Measures of socio-economic significance and influence to the local community proposed to be provided by the Project Proponent should be indicated. As far as possible, quantitative dimensions may be given with time frames for implementation.	It is explained in Chapter -3
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 against the project
41	If any quarrying operations were carried out in the proposed quarrying site for which now the EC is sought, the Project Proponent shall furnish the detailed compliance to EC conditions given in the previous EC with the site photographs which shall duly be certified	Noted & agreed.

	by MoEF&CC. Regional Office, Chennai (or) the concerned DEE/TNPCB.	
42	Concealing any factual information or submission of false/fabricated data and failure to comply with any of the conditions mentioned above may result in withdrawal of this Terms of Conditions besides attracting penal provisions in the Environment (Protection) Act, 1986.	Noted & agreed.

#### ADDITIONAL CONDITIONS-Annexure-B

<b>Cluster Management committee</b>		
1.	Cluster Management Committee shall be framed which must include all the proponents in the cluster as members including the existing as well as proposed quarry.	Details in 7 salient features of quarry with existing quarry.
2	The members must coordinate among themselves for the effective implementation of EMP as committed including Green Belt Development, Water sprinkling, tree plantation, blasting etc..	Noted & agreed
3	The List of members of the committee formed shall be submitted to AD/Mines before the execution of mining lease and the same shall be updated every year to the AD/Mines.	Noted & agreed
4	Detailed operational Plan must be submitted which must include the blasting frequency with respect to the nearby quarry situated in the cluster, the usage of haul roads by the individual quarry in the form of route map and network.	Transport details in chapter-2
5	The committee shall deliberate on risk management plan pertaining to the cluster in a holistic manner especially during natural calamities like intense rain and the mitigation measures considering the inundation of the cluster and evacuation plan	Noted & agreed
6	The Cluster Management Committee shall form Environmental Policy to practice sustainable mining in a scientific and systematic manner in accordance with the law. The role played by the committee in implementing the environmental policy devised shall be given in detail.	Noted & agreed
7	The committee shall furnish action plan regarding the restoration strategy with respect to the individual quarry falling under the cluster in a holistic manner.	Noted & agreed
8	The committee shall furnish the Emergency Management plan within the cluster.	Details discussed in chapter 7.
9	The committee shall deliberate on the health of the workers/staff involved in the mining as well as the health of the public.	Details discussed in chapter 10.
10	The committee shall furnish an action plan to achieve sustainable development goals with reference to water, sanitation & safety.	Noted & agreed
11	The committee shall furnish the fire safety and evacuation plan in the case of fire accidents.	Detailed discussed in chapter 7.
<b>Impact study of mining</b>		
12	Detailed study shall be carried out in regard to impact of mining around the proposed mine lease area covering the entire mine lease period as per precise area communication order issued from reputed research institutions on the following a) Soil health & bio-diversity	Species Recommended for Plantation in chapter 3&10.

	<p>b) Climate change leading to Droughts, Floods etc.</p> <p>c) Pollution leading to release of Greenhouse gases (GHG), rise in Temperature' &amp; Livelihood of the local people.</p> <p>d) Possibilities of water contamination and impact on aquatic ecosystem health'</p> <p>e) Agriculture, Forestry &amp; Traditional practices.</p> <p>1) Hydrothermal/Geothermal effect due to destruction in the Environment'</p> <p>g) Bio-geochemical processes and its foot prints including environmental stress'</p> <p>h) Sediment geochemistry in the surface steams.</p>	
<b>Agriculture &amp; Agro-Biodiversity</b>		
13	Impact on surrounding agricultural fields around the proposed mining Area.	Detailed discussed in chapter 4.
14	Impact on soil flora & vegetation around the project site.	Detailed discussed in chapter 4.
15	Details of type of vegetations including no. of trees & shrubs within the proposed mining area and. If so, transplantation of such vegetations all along the boundary of the proposed mining area shall committed mentioned in EMP.	Details in Chapter 2,3 and 7
16	The Environmental Impact Assessment should study the biodiversity, the natural ecosystem, the soil micro flora. fauna and soil seed banks and suggest measures to maintain the natural Ecosystem.	Details in Chapter 3
17	Action should specifically suggest for sustainable management of the area and restoration of ecosystem for flow of goods and services.	Noted & agreed
18	The project proponent shall study and furnish the impact of project on plantations in adjoining patta lands. Horticulture, Agriculture and livestock.	The project area is bounded by Existing quarries on the East and west side. Proponent proposed to erect green mesh along with fencing on the South side besides, Budgetary allocation given in the Chapter No. 10.
<b>Forest</b>		
19	The project proponent shall detail study on impact of mining on Reserve forests free ranging wildlife.	Noted and agreed, there is no reserve forest and wildlife in the buffer zone.
20	The Environmental Impact Assessment should study impact on forest, vegetation, endemic, vulnerable and endangered indigenous flora and fauna.	Ecology and Biodiversity environment deals in Chapter-3
21	The Environmental Impact Assessment should study impact on standing trees and the existing trees should be numbered and action suggested for protection.	Ecology and Biodiversity environment deals in Chapter-3
22	The Environmental Impact Assessment should study impact on protected areas, Reserve Forests, National Parks, Corridors and Wildlife pathways, near project site.	Anticipated Environment Impact and Mitigation measures are detailed in Chapter No.4
<b>Water Environment</b>		
23	Hydro-geological study considering the contour map of the water table detailing the number of ground water pumping & open wells, and surface water bodies such as rivers, tanks, canals, ponds etc. within 1 km (radius) so as to assess the impacts on the nearby waterbodies due to mining activity. Based on actual monitored data, it may clearly be shown whether working will intersect groundwater. Necessary data and documentation in this regard	Hydro-geological study considering the contour map of the water table detailing Chapter-3



	may be provided, covering the entire mine lease period.	
24	Erosion Control measures.	Noted & agreed
25	Detailed study shall be carried out in regard to impact of mining around the proposed mine lease area on the nearby villages, water-bodies/ Rivers. & any ecological fragile areas.	Details in Chapter 2
26	The project proponent shall study impact on fish habitats and the food WEB/ food chain in the water body and Reservoir.	Details in Chapter 2 and 4 impact of bio diversity
27	The project proponent shall study and furnish the details on potential fragmentation impact on natural environment by the activities.	Noted & agreed
28	The project proponent shall study and furnish the impact on aquatic plants and animals in water bodies and possible scars on the landscape, damages to nearby caves, heritage site, and archaeological sites possible land form changes visual and aesthetic impacts.	Noted & agreed. Detailed under Chapter 3.
29	The Terms of Reference should specifically study impact on soil health, soil erosion, the soil, physical, chemical components and microbial components.	Details in Chapter 3 soil environment.
30	The Environmental Impact Assessment should study on wetlands, water bodies, rivers streams, lakes and farmer sites.	Nearest agriculture activity is coconut plantation located North side of the project area. Proponent erected fencing in the previous lease period. The same will be reconstructed around the quarry pits
<b>Energy</b>		
31	The measures taken to control Noise. Air, Water. Dust Control and steps adopted to efficiently utilise the Energy shall be furnished.	Details in Chapter 3 environmental monitoring details.
<b>Climate Change</b>		
32	The Environmental Impact Assessment shall study in detail the carbon emission and also suggest the measures to mitigate carbon emission including development of carbon sinks and temperature reduction including control of other emission and climate mitigation activities.	Details of carbon emission and mitigation activities are given in the Chapter No.4
33	The Environmental Impact Assessment should study impact on climate change, temperature rise, pollution and above soil & below soil carbon stock.	Details in Chapter-3 for meteorological and climate/weather data representation of graphs.
<b>Mine Closure Plan</b>		
34	Detailed Mine Closure Plan covering the entire mine lease period as per precise area communication order issued.	Details in Chapter 2 mine closure plan
<b>EMP</b>		
35	Detailed Environment Management Plan along with adaptation, mitigation & remedial strategies covering the entire mine lease period as per precise area communication order issued.	Detailed under Chapter 10
36	The Environmental Impact Assessment should hold detailed study on EMP with budget for green belt development and mine closure plan including disaster management plan.	Details in Green belt development in chapter 4
<b>Risk Assessment</b>		
37	To furnish risk assessment and management plan including anticipated vulnerabilities during operational and post operational phases of Mining.	Detailed under Chapter 7
<b>Disaster Management Plan</b>		
38	To furnish disaster management plan and disaster mitigation measures in regard to all aspects to	Details study 7.3 Disaster Management Plan in Chapter -7

	avoid/reduce vulnerability to hazards & to cope with disaster/untoward accidents in & around the proposed mine lease area due to the proposed method of mining activity & its related activities covering the entire mine lease period as per precise area communication order issued.	
<b>Others</b>		
39	The project proponent shall furnish VAO certificate with reference to 300m radius regard to approved habitations. schools. Archaeological sites. Structures. railway lines, roads. Water bodies such as streams, odai, vaari, canal, channel. river, lake pond, tank etc.	Noted & agreed. Detailed under Chapter 4
40	As per the MoEF& CC office memorandum tr.No.22-651201 7-1A.III dated: 30.09.2020 and 20.10.2020 the proponent shall address the concerns raised during the public consultation and all the activities proposed shall be part of the Environment Management Plan.	Noted and agreed
41	The project proponent shall study and furnish the possible pollution due to plastic and microplastic on the environment. The ecological risks and impacts of plastic & microplastics on aquatic environment and fresh water systems due to activities, contemplated during mining may be investigated and reported.	Details of carbon emission and mitigation activities are given in the Chapter No.4
<b>STANDARD TERMS OF REFERENCE</b>		
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.	<b>Not applicable.</b> This is not a violation category project. This proposal falls under B1 Category
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.	<b>Noted &amp; agreed.</b>
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 with adjacent quarries details is enclosed in Figure No1.1 Project area boundary coordinates superimposed on Toposheet – Figure No. 1.1A Toposheet of the project area covering 10km radius – Figure No. 1.2 Geology map of the project area covering 10km radius - Figure No. 2.11
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.	<b>Map showing –</b> Geology map of the project area covering 10km radius - Figure No. 2.11 Geomorphological features are incorporated in the Toposheet map covering 10km radius around the project area Figure No. 2.12
6	Details about the land proposed for mining activities should be given with information as to whether mining conforms to the land use policy of the State; land diversion for mining should have	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.

	approval from State land use board or the concerned authority.	
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 <sup>0</sup> 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.	<b>Noted &amp; agreed.</b> 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	<b>Not Applicable.</b> There is no waste anticipated during this quarry operation. The entire quarried rough stone will be transported to the needy customers. No Dumps is proposed outside the lease area.
12	A Certificate from the Competent Authority in the State Forest Department should be provided, confirming the involvement of forest land, if any, in the project area. In the event of any contrary claim by the Project Proponent regarding the status of forests, the site may be inspected by the State Forest Department along with the Regional Office of the Ministry to ascertain the status of forests, based on which, the Certificate in this regard as mentioned above be issued. In all such cases, it would be desirable for representative of the State Forest Department to assist the Expert Appraisal Committees.	<b>Not Applicable.</b> 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	<b>Not Applicable.</b>

	including deposition of net present value (NPV) and compensatory afforestation (CA) should be indicated. A copy of the forestry clearance should also be furnished.	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.	<b>Not Applicable.</b> The project doesn't attract Recognition of Forest Rights Act, 2006.
15	The vegetation in the RF / PF areas in the study area, with necessary details, should be given.	Bolampatti Block-1 Reserve Forest -2.74km.
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.	<b>Not Applicable.</b> 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	<b>Not Applicable.</b> 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.	<b>Not Applicable.</b> Project area / Study area is not declared in 'Critically Polluted' Area and does not come under 'Aravalli Range'.
20	Similarly, for coastal Projects, A CRZ map duly authenticated by one of the authorized agencies demarcating LTL, HTL, CRZ area, location of the mine lease w.r.t CRZ, coastal features such as mangroves, if any, should be furnished. (Note: The Mining Projects falling under CRZ would also need to obtain approval of the concerned Coastal Zone Management Authority).	<b>Not Applicable.</b> The project doesn't attract The C. R. Z. Notification, 2018.
21	R&R Plan/compensation details for the Project Affected People (PAP) should be furnished. While	<b>Not Applicable.</b>

	<p>preparing the R&amp;R Plan, the relevant State/National Rehabilitation &amp; 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&amp;R and socio-economic aspects should be discussed in the Report.</p>	<p>There are no approved habitations within a radius of 300 meters. Therefore, R&amp;R Plan / Compensation details for the Project Affected People (PAP) is not anticipated and Not Applicable for this project.</p>
22	<p>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 predominant 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.</p>	<p>Baseline Data were collected for Summer Season (March 2023-May 2023) as per CPCB Notification and MoEF &amp; CC Guidelines. Details in Chapter No. 3.</p>
23	<p>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.</p>	<p>Air Quality Modelling for prediction of incremental GLC's of pollutant was carried out using AERMOD Model. Details in Chapter No. 4,</p>
24	<p>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.</p>	<p>Total Water Requirement for this project is given in the chapter No 2, Table No 2.13.</p>
25	<p>Necessary clearance from the Competent Authority for drawl of requisite quantity of water for the Project should be provided.</p>	<p>Water for dust suppression, greenbelt development and domestic use will be obtained from accumulated rainwater/seepage water in mine pits. Drinking water will be sourced from the approved water vendors, No 2, Table No 2.13.</p>
26	<p>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.</p>	<p>The rain water collected in the pits after spell of rain will be used for greenbelt development and dust suppression.</p>
27	<p>Impact of the Project on the water quality, both surface and groundwater, should be assessed and</p>	<p>Impact Studies and Mitigation Measures of Water Quality discussed in Chapter No. 4.</p>

	necessary safeguard measures, if any required, should be provided.	
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.	The ground water table is at 70-65m below ground level. The ultimate depth of this projects is 47m from the general ground profile.  Maximum depth is proposed in this EIA project is 47m.
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.	Highest elevation of the project area is 294m AMSL  Ultimate depth of the mine is 47m AMSL  Water level in the area is 70m to 65m BGL
30	Information on site elevation, working depth, groundwater table etc. Should be provided both in AMSL and BGL. A schematic diagram may also be provided for the same.	Progressive greenbelt development plan has been prepared and discussed along with Recommended Species details are given in the Chapter 4, Table No.4.9
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.	Traffic density survey was carried out to analyse the impact of Transportation in the study area as per IRC guidelines 1961 and it is inferred that there is no much significant impact due to the proposed transportation from the project area. Details in Chapter 2.
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.	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. .
33	Details of the onsite shelter and facilities to be provided to the mine workers should be included in the EIA Report.	Discussed in 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.	Details in Chapter 10.
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	Details in Chapter 10.

	incorporated in the EMP. The project specific occupational health mitigation measures with required facilities proposed in the mining area may be detailed.	
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.	Details in Chapter 4,
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.	Environment Management Plan Chapter 10.
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.	The outcome of public hearing will be updated in the final EIA/AMP report
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.	No litigation is pending in any court against this project.
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.	The proposed capital cost for Environmental Monitoring Programme is Rs 3,80,000/- and the recurring cost is Rs 76,000/- per annum. Details in Chapter 6 .
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.	Details in Chapter 10.
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	<b>Besides the above, the below mentioned general points are also to be followed: -</b>	
A	Executive Summary of the EIA/EMP Report	Encloses as separate volume
B	All documents to be properly referenced with index and continuous page numbering.	All the documents are properly referenced with index and continuous page numbering.
C	Where data are presented in the Report especially in Tables, the period in which the data were collected and the sources should be indicated.	List of Tables and source of the data collected are given properly.
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 mining plan
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.	Instructions issued by MoEF & CC O.M. No. J-11013/41/2006-IA. II (I) Dated: 4th August, 2009 are followed.

	J-11013/41/2006-IA. II(I) Dated: 4th August, 2009, which are available on the website of this Ministry, should be 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 and Gravel are the major requirements for construction industry. This EIA report is prepared by considering Cumulative load of proposed & existing quarries of Palathurai Rough Stone and Gravel Cluster Quarries consisting of three Proposed and one Existing Quarry with total extent of Cluster of 13.85.7 Ha in Palathurai Village, Madukkarai Taluk, Coimbatore District and Tamil Nadu State, cluster area calculated as per MoEF & CC Notification S.O. 2269(E) Dated 1<sup>st</sup> July 2016.

This EIA Draft is prepared in compliance with ToR obtained vide:

Code	Proponent Name	Extent	ToR obtained
P1	Tmt.V.Thulasiammal,	3.86.50 ha	Lr No.SEIAA-TN/F.No.9171/ToR-1392/2022 Dated: 21.03.2023

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

### 1.1 PURPOSE OF THE REPORT

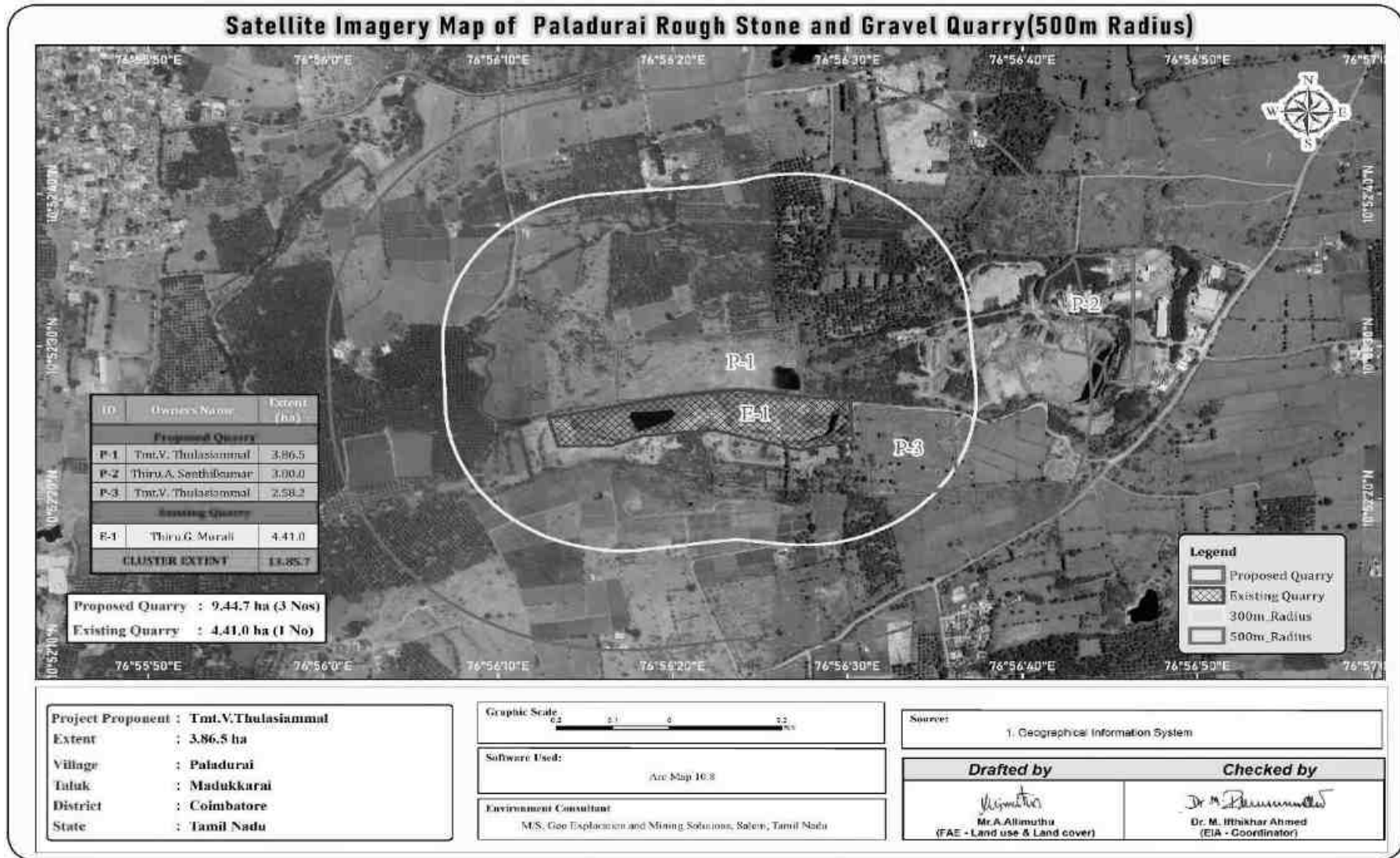
The Ministry of Environment and Forests, Govt. of India, through its EIA notification S.O. 1533(E) of 14<sup>th</sup> September 2006 and its subsequent amendments as per Gazette Notification S.O. 1889 of 20<sup>th</sup> April 2022, Mining Projects are classified under two categories i.e. A (> 250 Ha)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

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

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

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

**FIGURE 1.1 SATELLITE IMAGERY CLUSTER QUARRIES**



## 1.2 IDENTIFICATION OF PROJECT AND PROJECT PROPONENTS

### 1.2.1 Identification of Project

**TABLE 1.1: SALIENT FEATURES OF THE PROPOSED PROJECTS**

PROPOSAL – P1	
Name of the Project	Tmt.V.Thulasiammal Rough stone and Gravel quarry
S.F. No.	34/1
Extent	3.86.5 ha
Land Type	Patta Land
Village Taluk and District	Palathurai Village, Madukkarai Taluk, Coimbatore District.

Source: Approved Mining Plan of Respective Proposals

### 1.2.2 Identification of Project Proponent

**TABLE 1.2: DETAILS OF PROJECT PROPONENTS**

PROPOSAL – P1	
Name of the Project Proponent	Tmt.V.Thulasiammal Rough stone and Gravel quarry
Address	W/o. Valaithottagounder, residing at No.2/170, Murugan Kovil Street, Palathurai, Madukkarai Taluk, Coimbatore District – 641 105
Mobile	93631 22838
Status	Individual

Source: Approved Mining Plan of Respective Proposal

## 1.3 BRIEF DESCRIPTION OF THE PROJECT

### 1.3.1 Nature and Size of the Project

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

**TABLE 1.3: BRIEF DESCRIPTION OF THE PROJECT – P1**

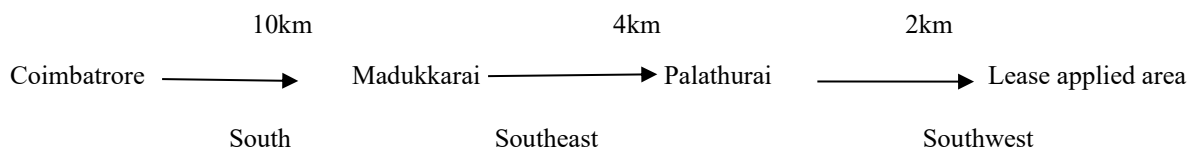
Name of the Project	Tmt.V.Thulasiammal Rough Stone & Gravel Quarry	
Land type	It is a Patta land (Barren land) which is not fit for vegetation/ Cultivation	
Land owner details	Registered in the name of the applicant (Tmt.V.Thulasiammal). Refer the Patta No.983.	
Previous lease details	1. The quarry lease was previously granted in the favour of Tvl. Century 21 Crushers, The lessee has obtained Environmental Clearance from the State Level Environment Impact Assessment Authority, Tamil Nadu vide letter No. SEIAA-TN/F.No.1720/EC/1(a)/2432/2015, Dated: 15.09.2015. 2. The applicant has applied a quarry lease on 22.10.2021, over an extent of 3.86.5 hectares of Patta land in S.F.No. 34/1 of Palathurai Village, Madukkarai Taluk, Coimbatore District for the period of five years.	
Toposheet No	58-B/13	
Latitude between	10°52'26.31"N to 10°52'31.53"N	
Longitude between	76°56'16.72"E to 76°56'27.48"E	
Highest Elevation	294m AMSL	
Mining Plan period	5 years	
Proposed Depth of Mining	47 m bgl (2 m Gravel + 45 m Rough Stone)	
Geological Resources	Rough Stone in m <sup>3</sup>	Gravel m <sup>3</sup>
	16,56,933	48,172
Mineable Reserves	Rough Stone in m <sup>3</sup>	Gravel m <sup>3</sup>
	6,27,086	35,234
Yearwise Production	Rough Stone in m <sup>3</sup>	Gravel m <sup>3</sup>
	93,316	35,234
Existing Pit Dimension	Pit-1 117m (L) x 54m (W) x 15m(D) bgl Pit-2 95m (L) x 45m (W) x 1m(D) bgl	
Ultimate Pit Dimension	302m (L) x 112m (W) x 47m(D) bgl	

Water Level in the surrounding areas	70 – 65 m bgl	
Method of Mining	Opencast Mechanized Mining Method involving small drilling and Controlled blasting using Slurry Explosives	
Topography	The lease applied area is exhibits plain terrain. The area has gentle sloping towards Southwestern side. The altitude of the area is 294 m (max) above mean sea level. The area is covered by 2 m thickness of Gravel Formation. Massive Charnockite is clearly inferred from the nearby existing quarrying pit.	
Machinery proposed	Jack Hammer	3 Nos
	Compressor	1 Nos
	Excavator with Bucket and Rock Breaker	1 No
	Tippers	2 Nos
Blasting Method	Controlled Blasting Method by shot hole drilling and small dia of 25mm slurry explosive are proposed to be used for shattering and heaving effect for removal and winning of Rough Stone. No deep hole drilling is proposed.	
Proposed Manpower Deployment	18 Nos	
Project Cost	Rs. 66,52,000/-	
EMP Cost	Rs. 3,80,000/-	
CER Cost	Rs. 5,00,000,-/	
Nearby Water Bodies	Odai	220m West
	Odai	570m SW
	Varattar Stream	960m SE
	Sengulam	8km North
	Walayar Lake	9km SW
	Kurichikulam	9.5km NE
Greenbelt Development Plan	As per Mining plan it is Proposed to plant 330 trees in the 7.5 m Safety Zone ,approach road and panchayat roads.	
Proposed Water Requirement	2.5 KLD	
Nearest Habitation	400m -West	

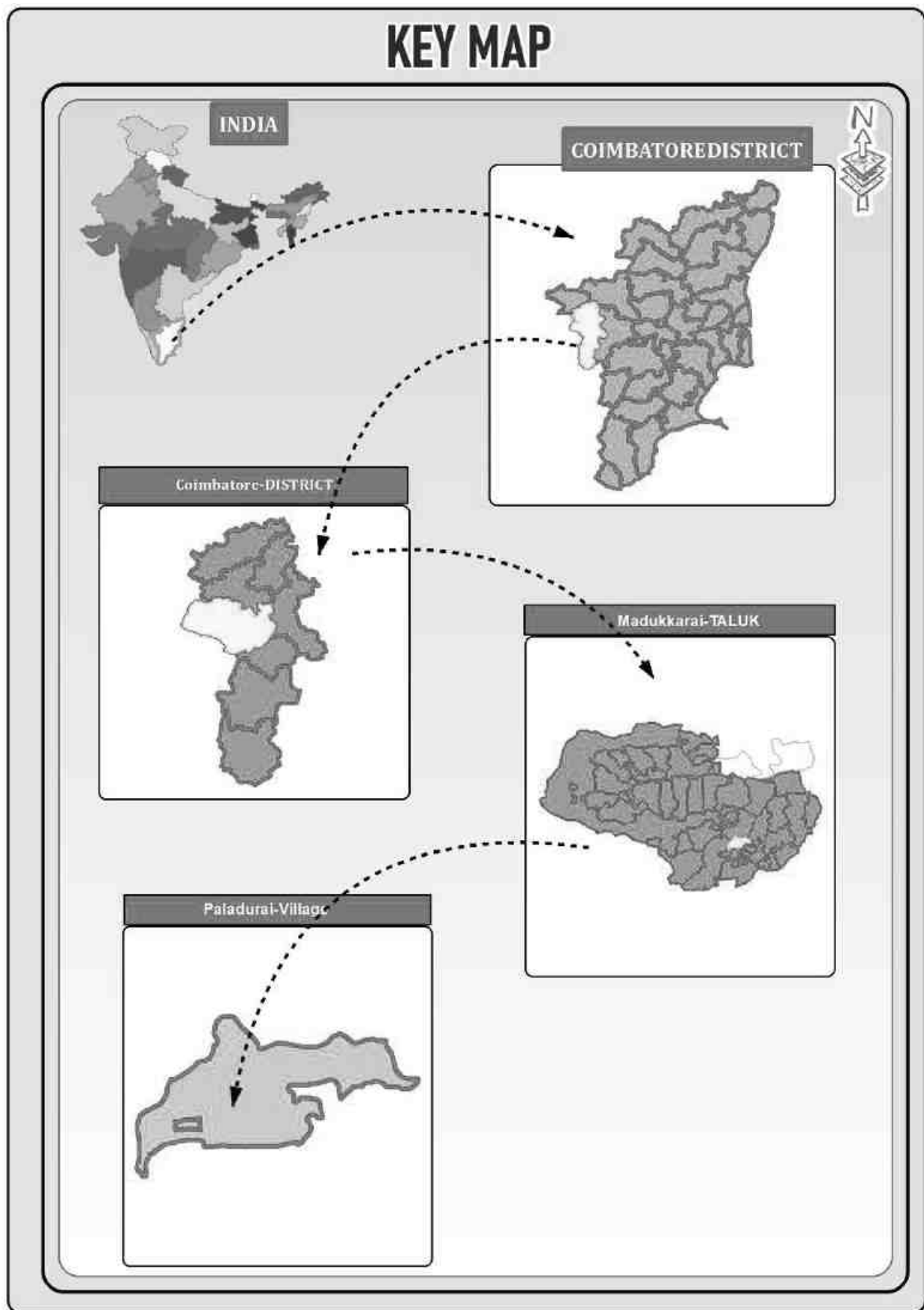
Source: Approved Mining Plan

### 1.3.2 Location of the Project

- All the proposed quarry projects fall in Palathurai Village, Madukkarai Taluk and Coimbatore District.
- The project Projects is located about 16.0 km Southwestern of Coimbatore, and 4.0km Southwest of Madukkarai and 2.0 km South west side of Palathurai Village.



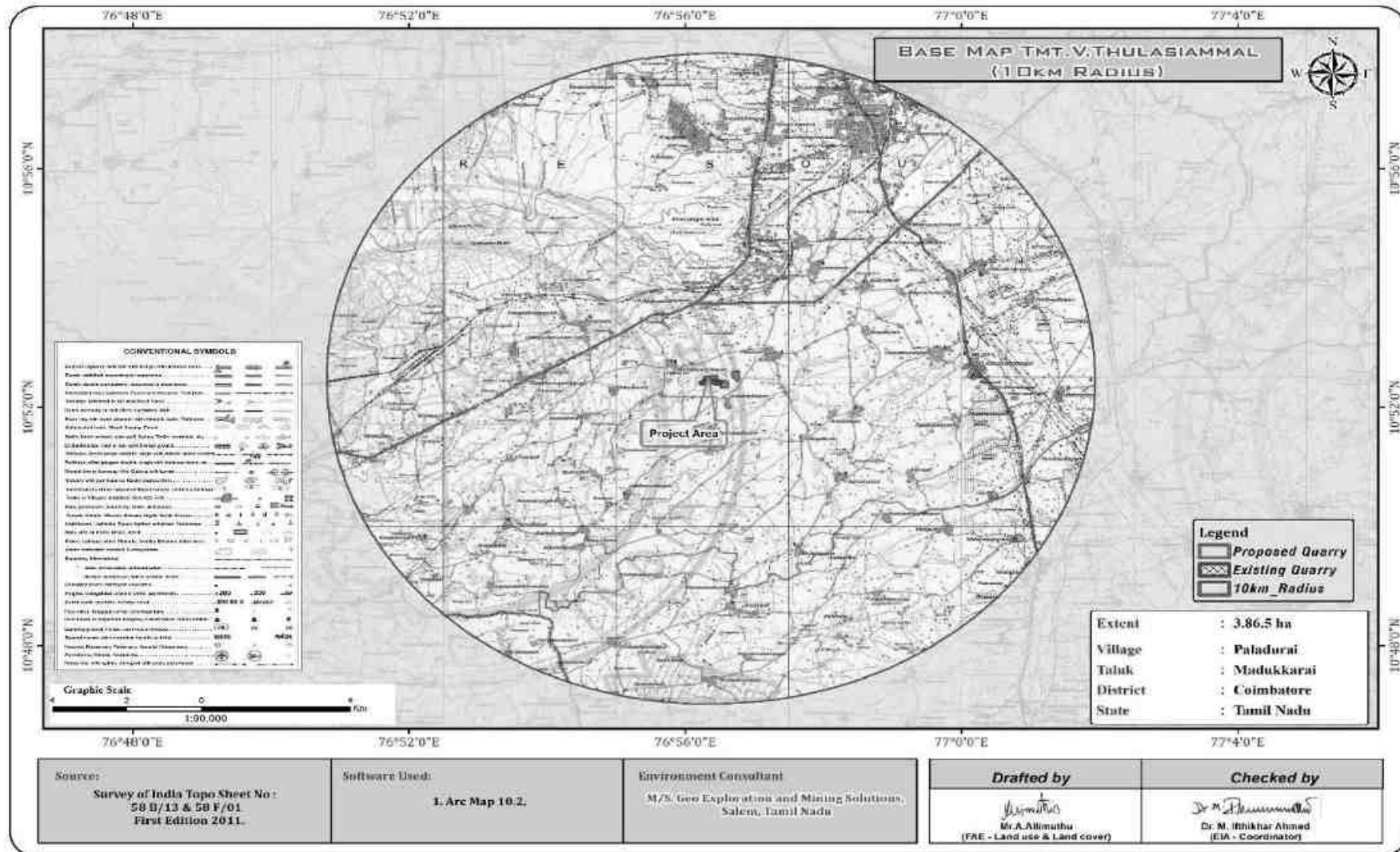
**FIGURE 1.2 KEY MAP SHOWING THE LOCATION OF THE CLUSTER SITE**



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

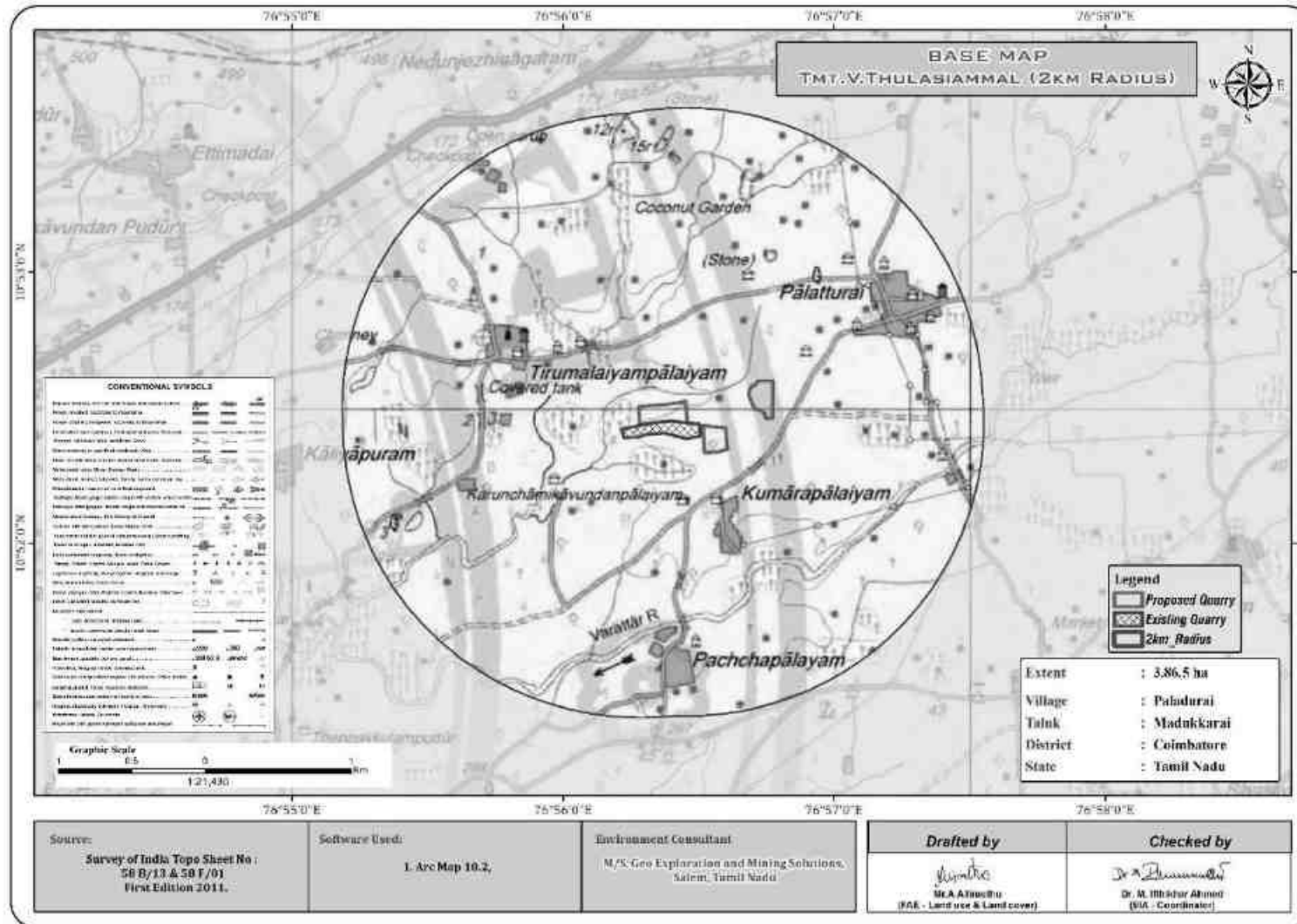


**FIGURE 1.3: TOPOSHEET MAP OF THE STUDY AREA 10 KM RADIUS**



Source: Survey of India Toposheet

FIGURE 1.4: TOPOSHEET MAP OF THE STUDY AREA 10 KM RADIUS



## 1.4 ENVIRONMENTAL CLEARANCE

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

- Screening,
- Scoping
- Public consultation &
- Appraisal

### SCREENING –

#### PROPOSAL – P1

- The proponent applied for Rough Stone and Gravel Quarry Lease Dated: 22.10.2021.
- Precise Area Communication Letter was issued by the District Collector, Coimbatore Rc.No. 4698/Mines/2021, Dated: 08.02.2022.
- The Mining Plan was prepared by Recognized Qualified Person and approved by Assistant Director, Geology and Mining, Coimbatore District, vide Rc.No.1226/Mines/2021, Dated: 02.03.2022.
- The proposed project falls under “B1” Category as per Order Dated: 04.09.2018 & 13.09.2018 passed by Hon'ble National Green tribunal, New Delhi in O.A. No. 173 of 2018 & O.A. No, 186 of 2016 and MoEF & CC Office Memorandum F. No. L-11011/175/2018-IA-II (M) Dated: 12.12.2018
- Proponent applied for ToR for Environmental Clearance vide online Proposal No.SIA/TN/MIN/74611/2022. dated: 02.04.2022.

### SCOPING:

#### PROPOSAL – P1

- The proposal was placed in 357<sup>th</sup> SEAC meeting held on 23.02.2023 and the committee recommended for issue of ToR.
- The proposal was considered in 603<sup>rd</sup> SEIAA meeting held on 20.03.2023 and 21.03.2023 and issued ToR vide LrNo.SEIAA-TN/F.No.9171/ToR-1392/2022 Dated: 21.03.2023

### PUBLIC CONSULTATION

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

### APPRAISAL –

- Appraisal is the detailed scrutiny by the State Expert Appraisal Committee (SEAC) of the application and other documents like the final EIA & EMP Report, outcome of the Public Consultations including Public Hearing Proceedings, submitted by the proponent to the regulatory authority concerned for grant of environmental clearance.
- The report has been prepared using the following references:
  - Guidance Manual of Environmental Impact Assessment for Mining of Minerals, Ministry of Environment and Forests, 2010
  - EIA Notification, 14<sup>th</sup> September, 2006
  - ToR LrNo.SEIAA-TN/F.No.9171/ToR-1392/2022 Dated: 21.03.2023– P1
  - Approved Mining Plan of Respective Proposed Projects.

## 1.5 TERMS OF REFERENCE (ToR)

Compliance to ToR issued vide –

- ToR LrNo.SEIAA-TN/F.No.9171/ToR-1392/2022 Dated: 21.03.2023 – P1 (Detailed in above)

## 1.6 POST ENVIRONMENT CLEARANCE MONITORING

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

## 1.7 GENERIC STRUCTURE OF EIA DOCUMENT

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

## 1.8 THE SCOPE OF THE STUDY

The main scope of the EIA study is to quantify the cumulative impact in the study area due to cluster quarries and formulate the effective mitigation measures for individual leases. A detailed account of the emission sources, emissions control equipment, background Air quality levels, Meteorological measurements, Dispersion model and all other aspects of pollution like effluent discharge, Dust generation etc., have been discussed in this report. The baseline monitoring study has been carried out during the summer season (March 2023 to May 2023) for various environmental components so as to assess the anticipated impacts of the cluster quarry projects on the environment and suggest suitable mitigation measures for likely adverse impacts due to the proposed project.

**TABLE 1.4: ENVIRONMENT ATTRIBUTES**

Sl.No.	Attributes	Parameters	Source and Frequency
1	Ambient Air Quality	PM <sub>10</sub> , PM <sub>2.5</sub> , SO <sub>2</sub> , NO <sub>2</sub>	Continuous 24-hourly samples twice a week for three months at 8 locations (1 Core & 7 Buffer)
2	Meteorology	Wind speed and direction, temperature, relative humidity and rainfall	Near project site continuous for three months with hourly recording and from secondary sources of IMD station
3	Water quality	Physical, Chemical and Bacteriological parameters	Grab samples were collected at 6 locations – 2 Surface water and 4 Ground water samples; once during study period.
4	Ecology	Existing terrestrial and aquatic flora and fauna within 10 km radius circle.	Limited primary survey and secondary data was collected from the Forest department.
5	Noise levels	Noise levels in dB(A)	8 locations – data monitored once for 24 hours during EIA study
6	Soil Characteristics	Physical and Chemical Parameters	Once at 6 locations during study period

7	Land use	Existing land use for different categories	Based on Survey of India topographical sheet and satellite imagery and primary survey.
8	Socio-Economic Aspects	Socio-economic and demographic characteristics, worker characteristics	Based on primary survey and secondary sources data like census of India 2011.
9	Hydrology	Drainage pattern of the area, nature of streams, aquifer characteristics, recharge and discharge areas	Based on data collected from secondary sources as well as hydro-geology study report prepared.
10	Risk assessment and Disaster Management Plan	Identify areas where disaster can occur by fires and explosions and release of toxic substances	Based on the findings of Risk analysis done for the risk associated with mining.

Source: Field Monitoring Data

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

- Application for Quarrying Lease as per Tamil Nadu Minor Mineral Concession Rules, 1959.
- Obtained Precise Area Communication Letter as per Tamil Nadu Minor Mineral Concession Rules, 1959 for Preparation of Mining Plan and obtaining Environmental Clearance.
- The Mining Plan has been approved under Rule 41 & 42 as amended of Tamil Nadu Minor Mineral Concession Rules, 1959.
- ToR LrNo.SEIAA-TN/F.No.9171/ToR-1392/2022 Dated: 21.03.2023– P1



**TABLE 2.2: BOUNDARY CO-ORDINATES OF PROPOSED PROJECT**

<b>PROJECT – P1</b>		
<b>Corner Nos.</b>	<b>Latitude</b>	<b>Longitude</b>
1	10°52'26.37"N	76°56'16.86"E
2	10°52'30.22"N	76°56'16.72"E
3	10°52'30.49"N	76°56'19.50"E
4	10°52'30.63"N	76°56'21.42"E
5	10°52'30.72"N	76°56'22.91"E
6	10°52'31.04"N	76°56'24.82"E
7	10°52'31.09"N	76°56'26.01"E
8	10°52'31.53"N	76°56'27.04"E
9	10°52'31.53"N	76°56'27.06"E
10	10°52'26.69"N	76°56'27.48"E
11	10°52'27.13"N	76°56'23.71"E
12	10°52'26.74"N	76°56'20.21"E
13	10°52'26.63"N	76°56'19.64"E
14	10°52'26.31"N	76°56'17.13"E
<b>Datum: UTM-WGS84, Zone 43 North</b>		

Source: Approved Mining Plan

**FIGURE 2.1: TOPOGRAPHICAL VIEW OF THE PROJECT SITE**



**FIGURE 2.2: FENCING VIEW OF THE PROJECT SITE**



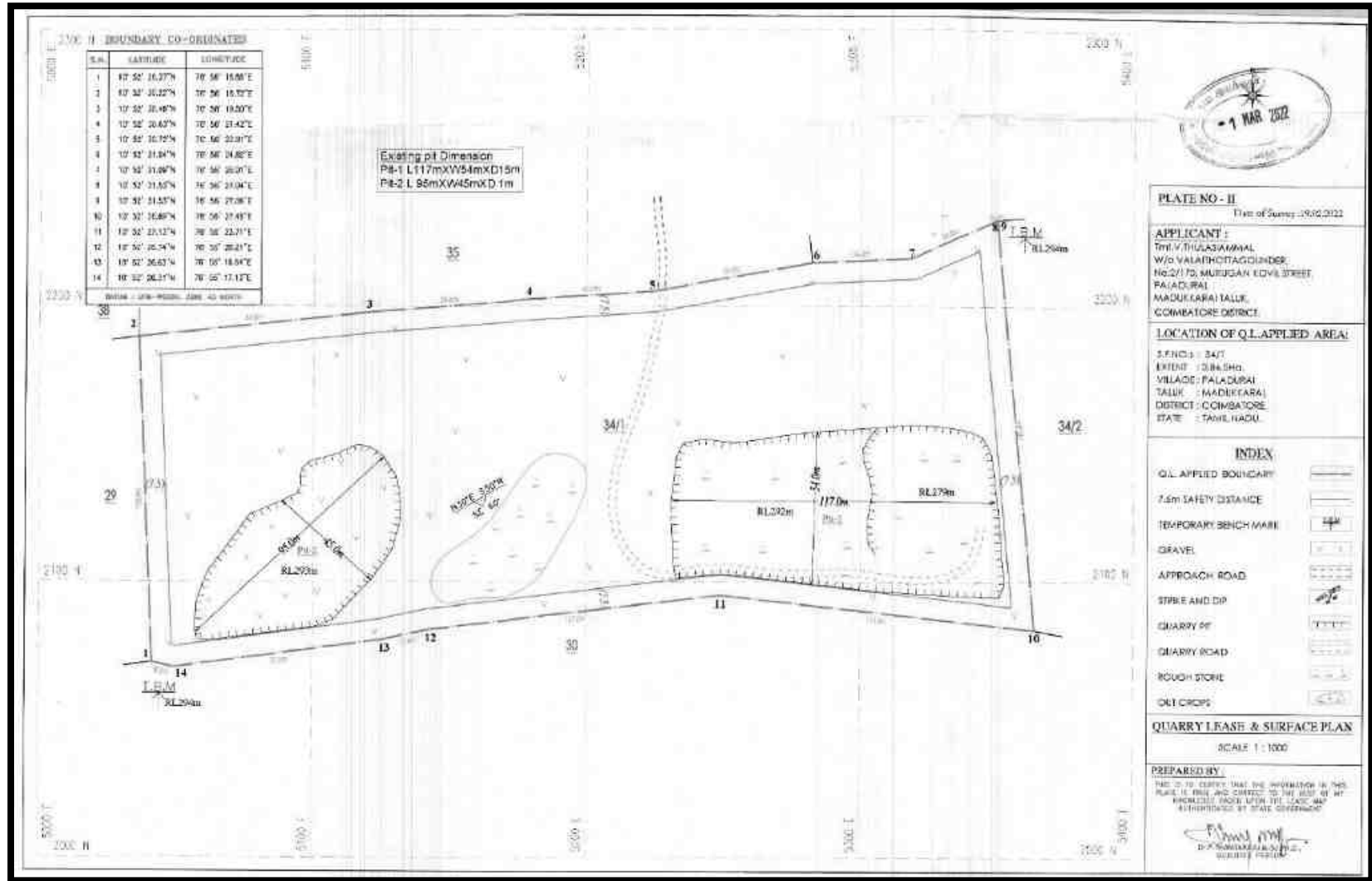
FIGURE 2.3: GOOGLE IMAGE OF THE PROJECT AREA – P1



Source: Google Earth Imagery

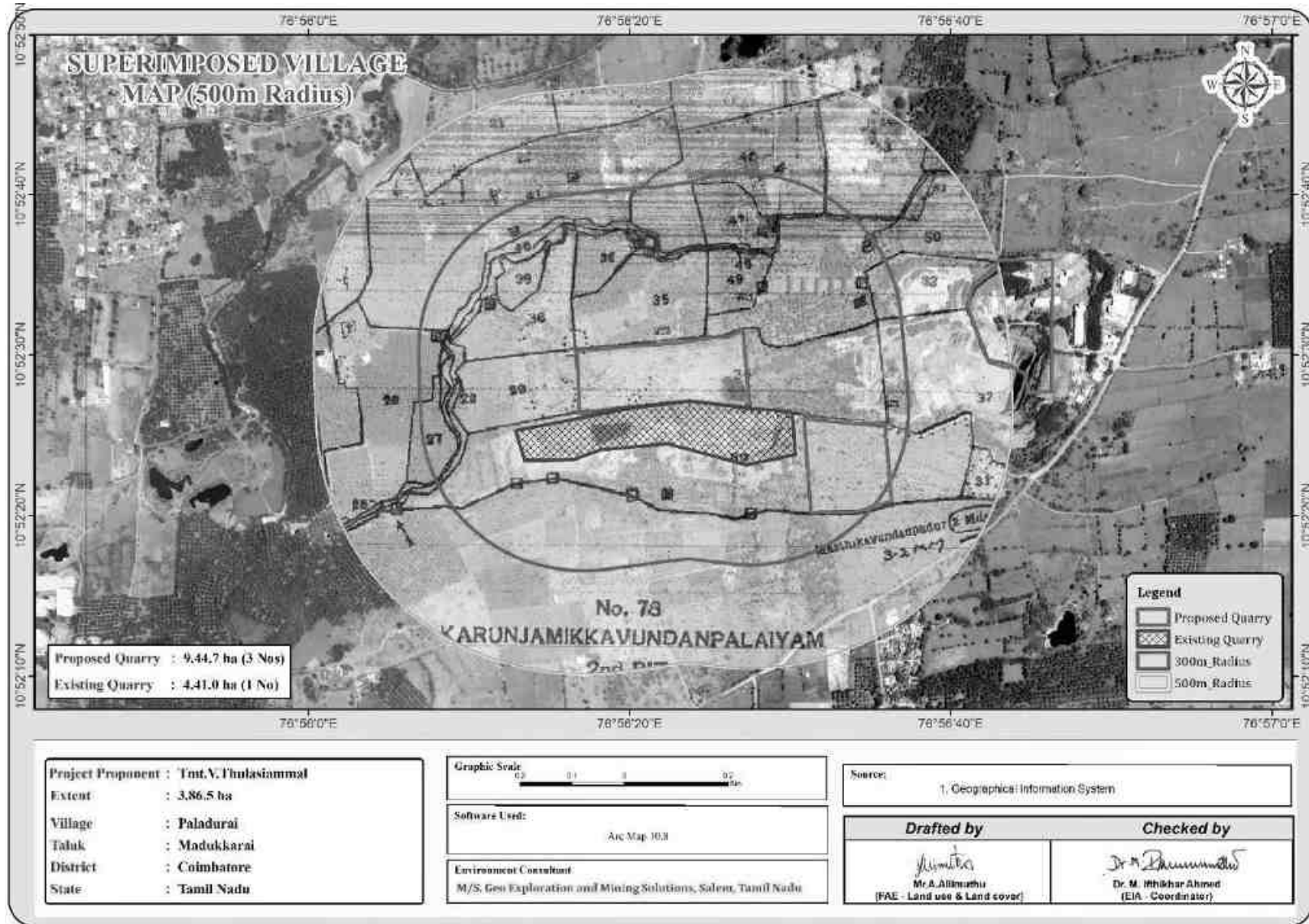


FIGURE 2.4: QUARRY LEASE PLAN / SURFACE PLAN – P1

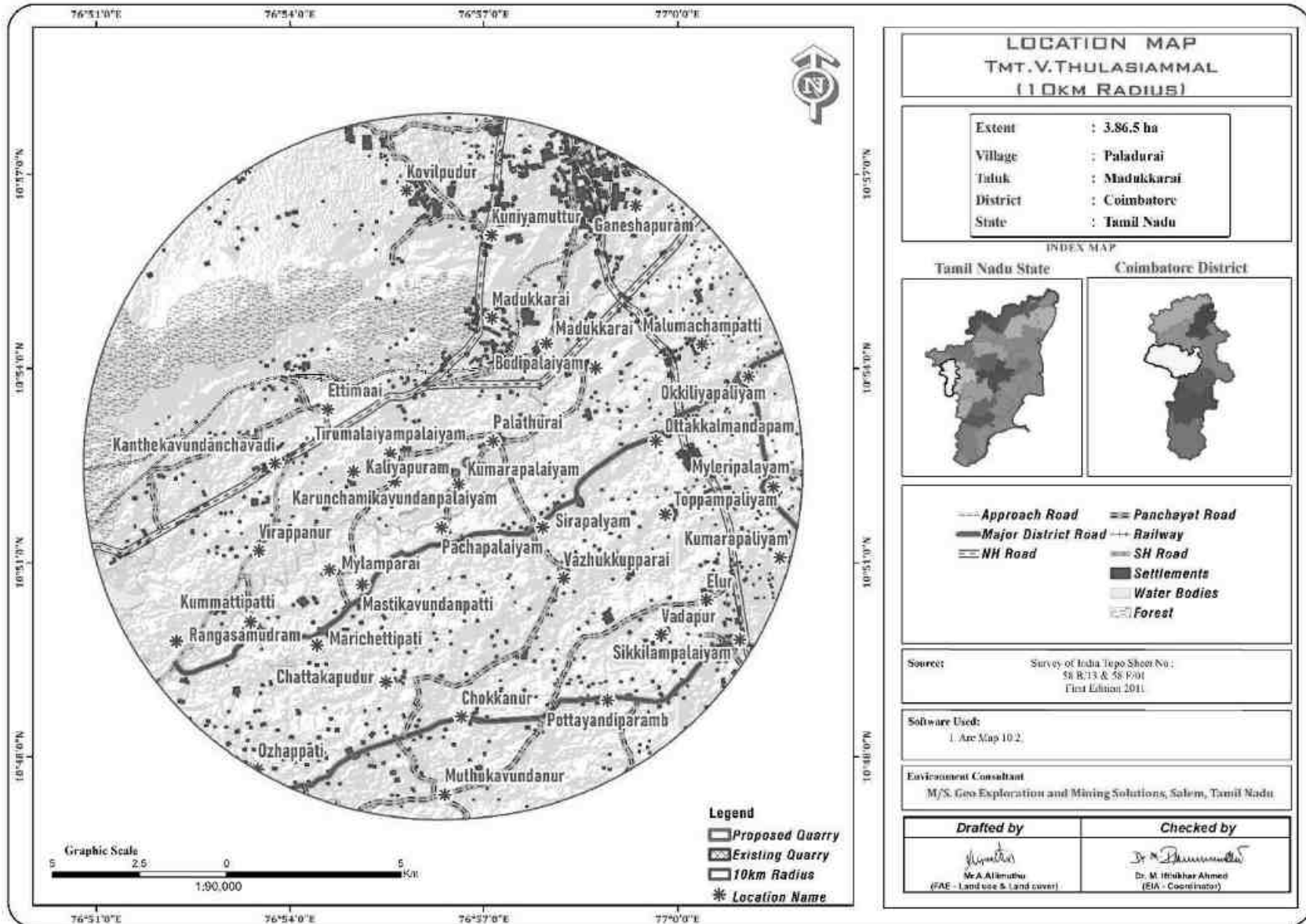


Source: Approved Mining Plan

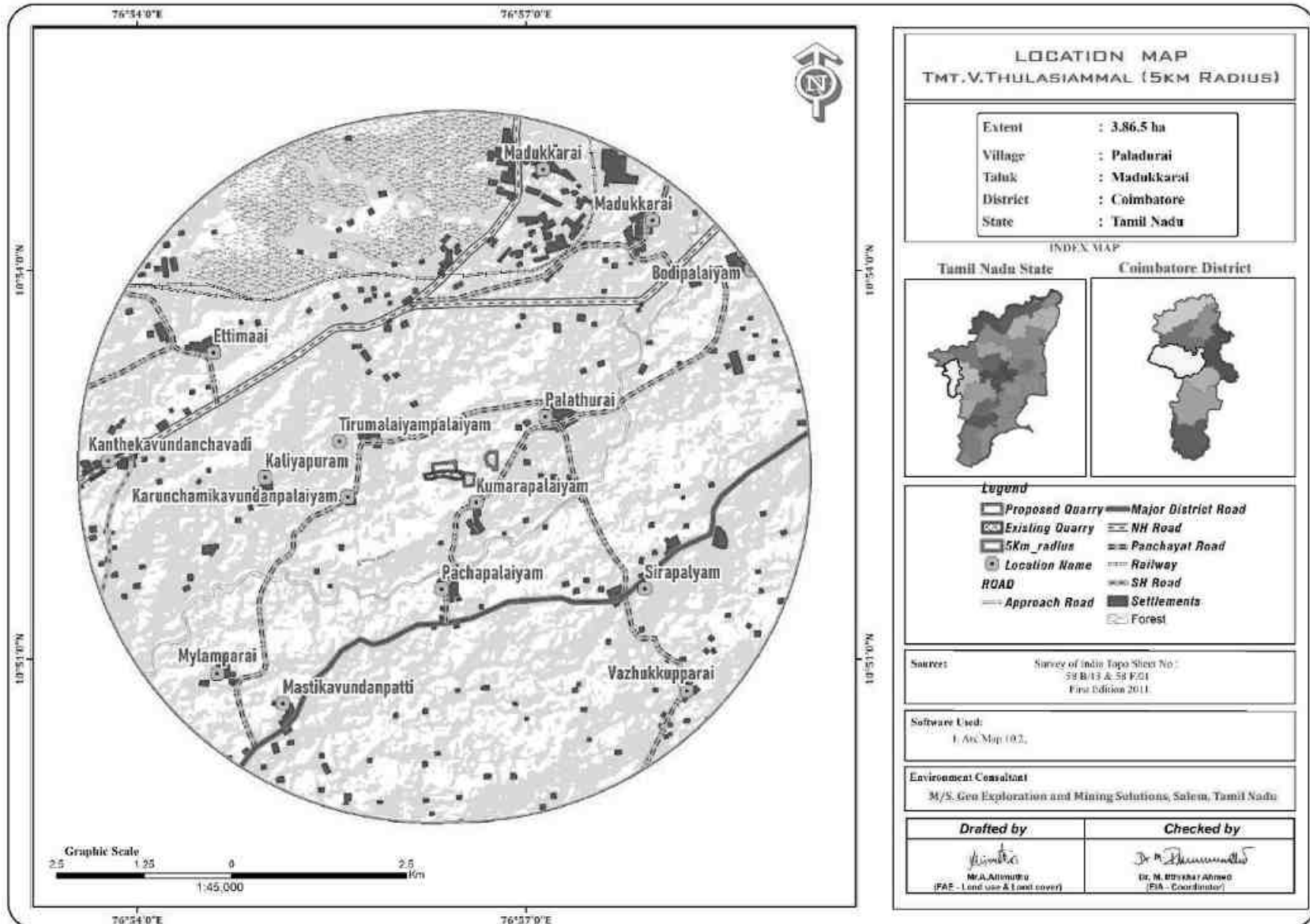
**FIGURE 2.5: VILLAGE MAP SUPERIMPOSED ON GOOGLE EARTH IMAGE**



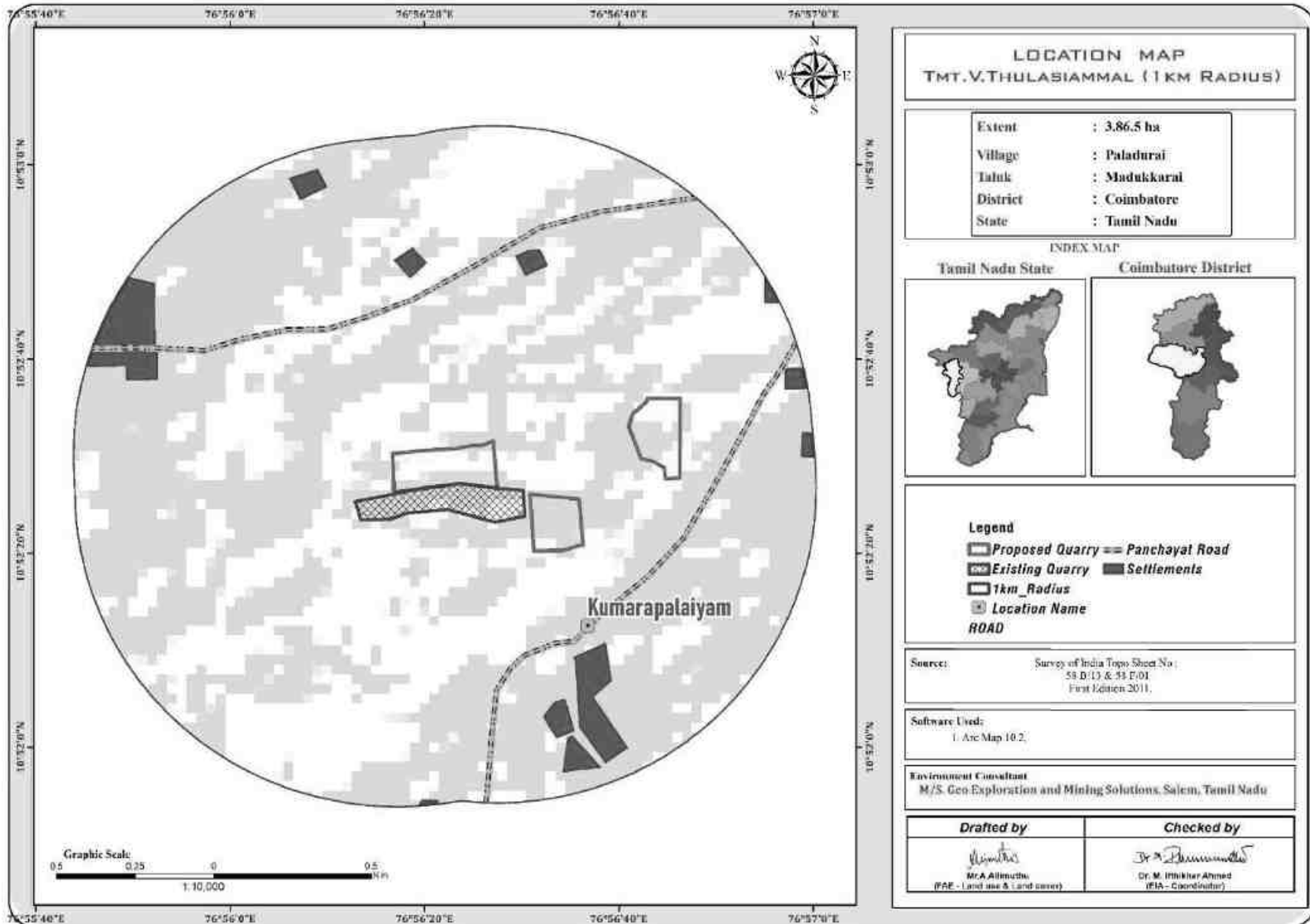
**FIGURE 2.6: IMAGE SHOWING SURFACE FEATURES AROUND 10 KM RADIUS**



**FIGURE 2.7: IMAGE SHOWING SURFACE FEATURES AROUND 5KM RADIUS**



**FIGURE 2.8: IMAGE SHOWING SURFACE FEATURES AROUND 1 KM RADIUS**



### 2.2.1 Project Area

- All the Proposed Projects are site specific.
- There is no beneficiation or processing proposed inside all the project area.
- There is no forest land involved in the proposed 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	0.98.7	3.20.1
Infrastructure	Nil	0.01.0
Roads	Nil	0.02.0
Green Belt	Nil	0.29.3
Unutilized Area	2.87.8	0.34.1
<b>Grand Total</b>	<b>3.86.5</b>	<b>3.86.5</b>

Source: Approved Mining Plans of respective Proposals

### 2.2.2 Size or Magnitude of Operation

**TABLE 2.4: OPERATIONAL DETAILS FOR PROPOSED PROJECTS**

PROJECT – P1		
PARTICULARS	DETAILS	
	Rough Stone (5Year Plan period)	Gravel in m <sup>3</sup>
Geological Resources	16,56,933	48,172
Mineable Reserves	6,27,086	35,234
Production for five-year plan period	93,316	35,234
Mining Plan Period / Lease Applied Period	5 Years	
Number of Working Days	300 Days	
Production per day	62	39
No of Lorry loads (6m <sup>3</sup> per load)	10	7
Total Depth of Mining	47 m bgl (2 m Gravel + 45 m Rough Stone)	

Source: Respective proposed quarries mining plan \* Gravel 3 years as per plan.

## 2.3 GEOLOGY

### 2.3.1 Regional Geology

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

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

**Stratigraphy of the area –**

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

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

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

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

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

(<https://www.tnmines.tn.gov.in/pdf/dsr/9.pdf>)

### 2.3.2 Local Geology: -

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

### 2.3.3 Hydrogeology

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

Quaternary - Laterites, Sands and Clays

Tertiary - Sandstone, Gravels and Clays

Cretaceous - Limestone, Calcareous Sandstone and Clay unconformity.

Archaean - Charnockites, Gneisses, Granites, Dolerites and Pegmatite

- The major part of the area is covered by metamorphic crystalline rocks of charnockite, granitic gneiss of Archaean age intruded by dolerite dykes and pegmatite veins. These rocks are highly metamorphosed and have been subjected to very severe folding, crushing and faulting.

- Ground Water occurs under the phreatic condition and wherever there are deep seated fractures, it occurs under semi-confined to confined conditions.
- Occurrence of Ground Water in hard rock depends upon the intensity and depth of weathering, fractures and fissures present in the rocks.
- Granites and gneisses yield moderately compared to the yield in Charnockites.
- Depth of well in hard rock generally ranges between 8 and 15m below ground level.
- Generally, yield in open wells ranges from 30 to 250m<sup>3</sup> /day and in bore well between 260 and 430m<sup>3</sup> /day. The weathered thickness varies from 2.5 m to 42m in general there are 3 to 5 fracture zones within 100 m and 1 to 4 fracture zones between 100 and 200 m.

The Cretaceous formation is represented by Arenaceous Lime stone, Calcareous sand - stone and marl.

The Tertiary formation is argillaceous comprising of Silty clay stones, argillaceous Lime stone.

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

#### **Aquifer Systems:**

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

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

#### **Alluvial Formations**

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

#### **Tertiary Cuddalore sandstone**

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

#### **Cretaceous Formations**

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

#### **Hard Rock Formations**

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

#### **Granitic Gneiss**

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



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### **Charnockite**

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

### **Aquifer Parameters**

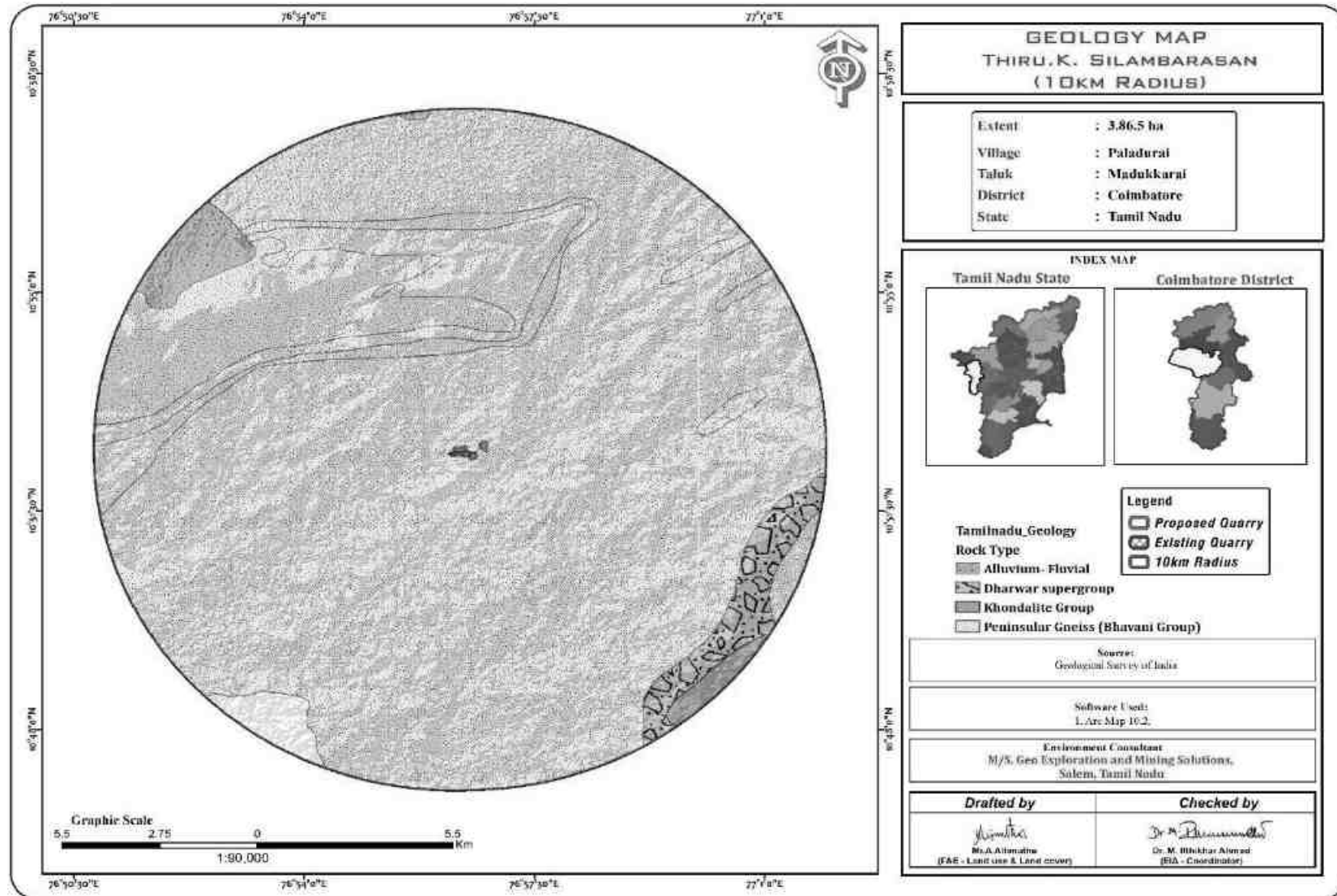
The thickness of aquifer in this district is highly erratic and varies between 15m to 40m below ground level. The intergranular Porosity is essentially dependent on the intensity and degree of weathering and fracture development in the bed rock. As discussed earlier deep weathering has developed in Gneissic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

**TABLE 2.5: RANGE OF AQUIFER PARAMETERS**

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

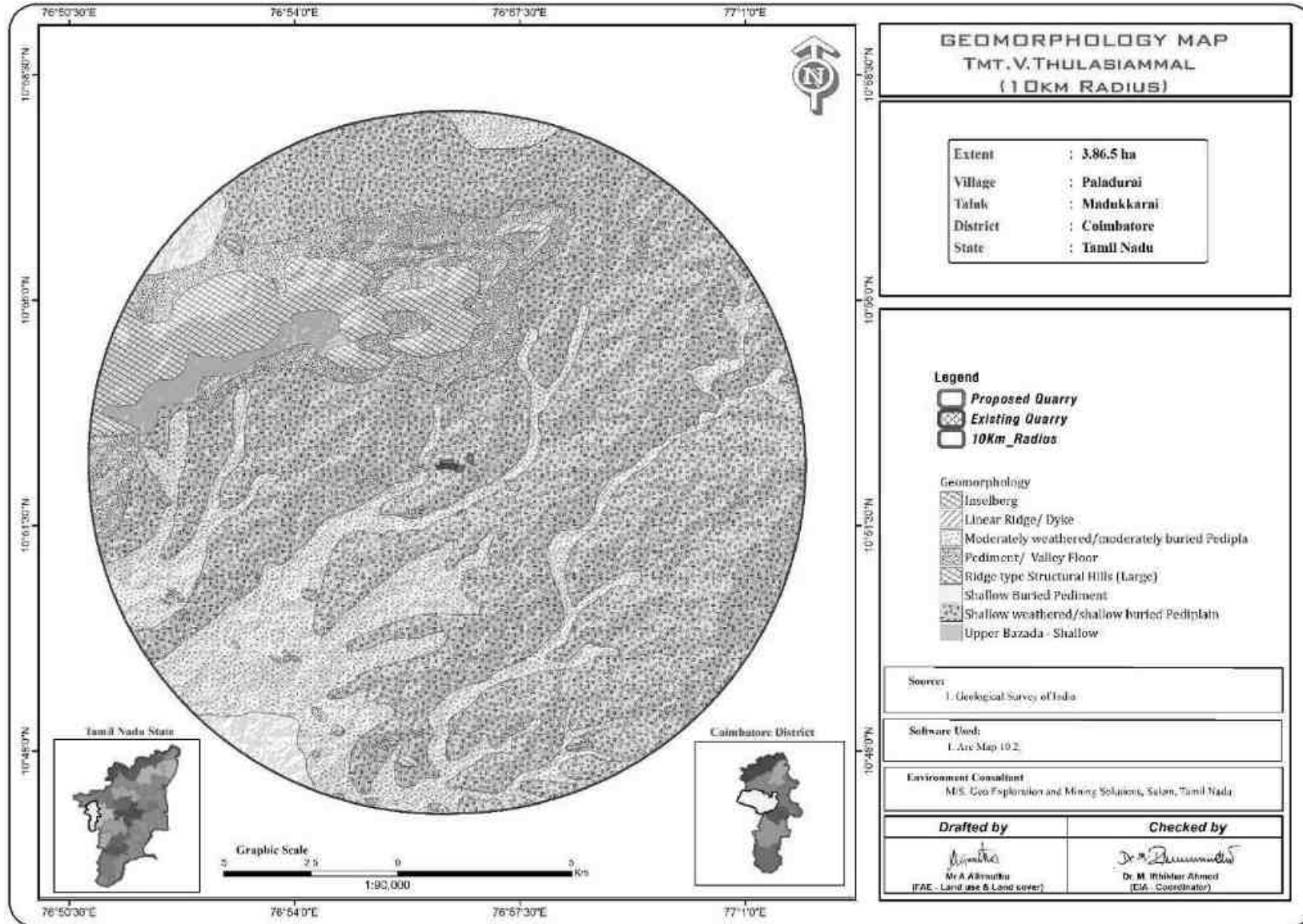
Source: <http://nwm.gov.in/sites/default/files/Notes%20on%20Coimbatore%20District.pdf> and <https://www.twadboard.tn.gov.in/content/coimbatore>

**FIGURE 2.9: REGIONAL GEOLOGY MAP**

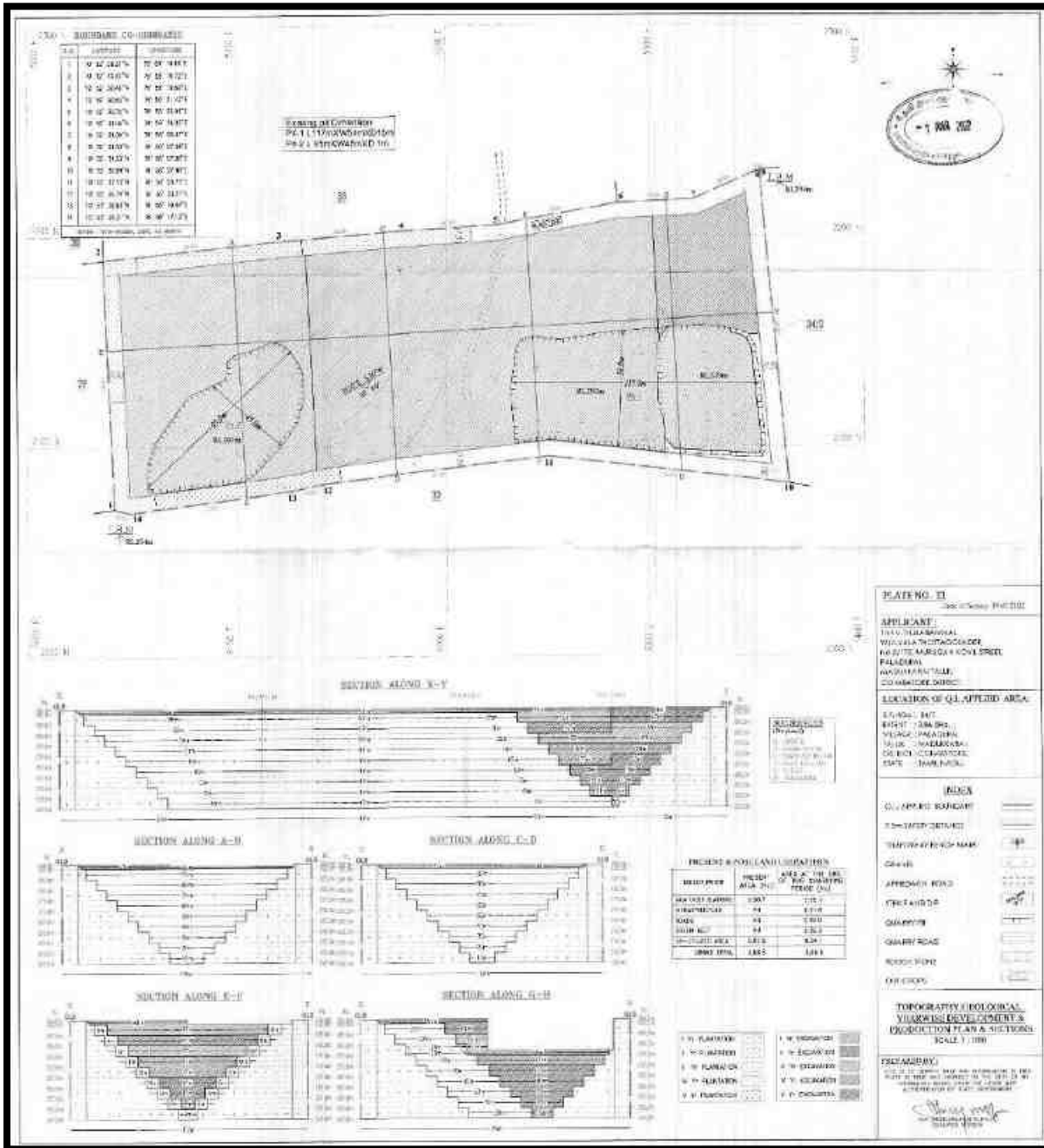


From the above map it is inferred that the cluster quarries fall in the hard rock terrain (Peninsular Gneiss)Source:

**FIGURE 2.10: GEOMORPHOLOGY MAP**



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



Source: Approved Mining Plan



## 2.4 RESOURCES AND RESERVES

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

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

**TABLE 2.6: AVAILABLE GEOLOGICAL RESOURCES OF PROPOSED PROJECT**

PROPOSAL – P1		
	Rough Stone	Gravel
Geological Resource in m <sup>3</sup>	16,56,933	48,172
Mineable Resource in m <sup>3</sup>	6,27,086	35,234
Year wise production for five year plan period	93,316	35,234

Source: Approved Mining Plan

**TABLE 2.7: YEAR-WISE PRODUCTION PLAN**

PROPOSAL – P1		
YEAR	ROUGH STONE (m <sup>3</sup> )	GRAVEL (m <sup>3</sup> )
I	20523	17778
II	17700	4784
III	18303	12672
IV	20215	-
V	16575	-
<b>TOTAL</b>	<b>93,316</b>	<b>35,234</b>

Source: Approved Mining Plan

### Disposal of Waste

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

### Conceptual Mining Plan/ Final Mine Closure Plan

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

**TABLE 2.8: ULTIMATE PIT DIMENSION**

PROPOSAL – P1			
Pit	Length (Max) (m)	Width (Max) (m)	Depth (Max)
I	302	112	47m bgl

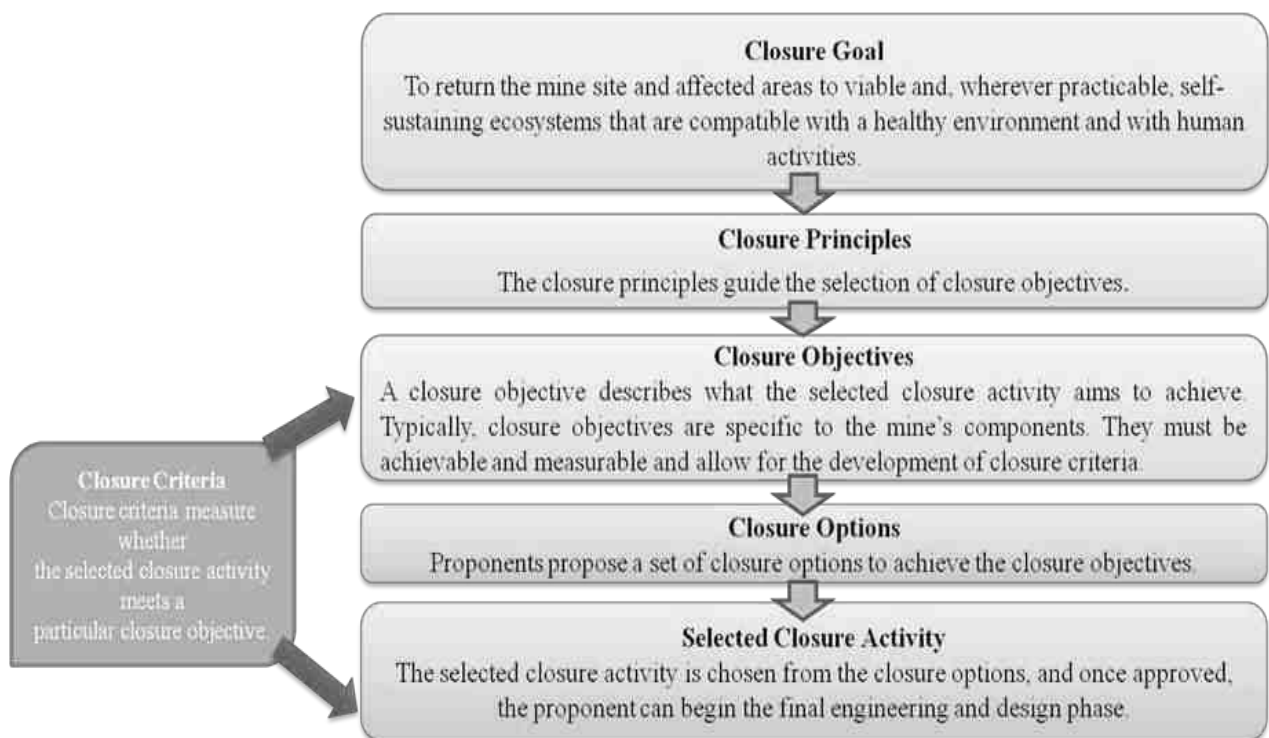
Source: Approved Mining Plan

- At the end of life of mine, the excavated mine pit / void will act as artificial reservoir for collecting rain water and helps to meet out the demand or crises during drought season.
- After mine closure the greenbelt developed along the safety barrier and top benches and temporary water reservoir will enhance the ecosystem
- Mine Closure is a process of returning a disturbed site to its natural state or which prepares it for other productive uses that prevents or minimizes any adverse effects on the environment or threats to human health and safety.

- The principal closure objectives are for rehabilitated mines to be physically safe to humans and animals, geo-technically stable, geo-chemically non-polluting/ non-contaminating, and capable of sustaining an agreed post-mining land use.

#### Closure Objectives –

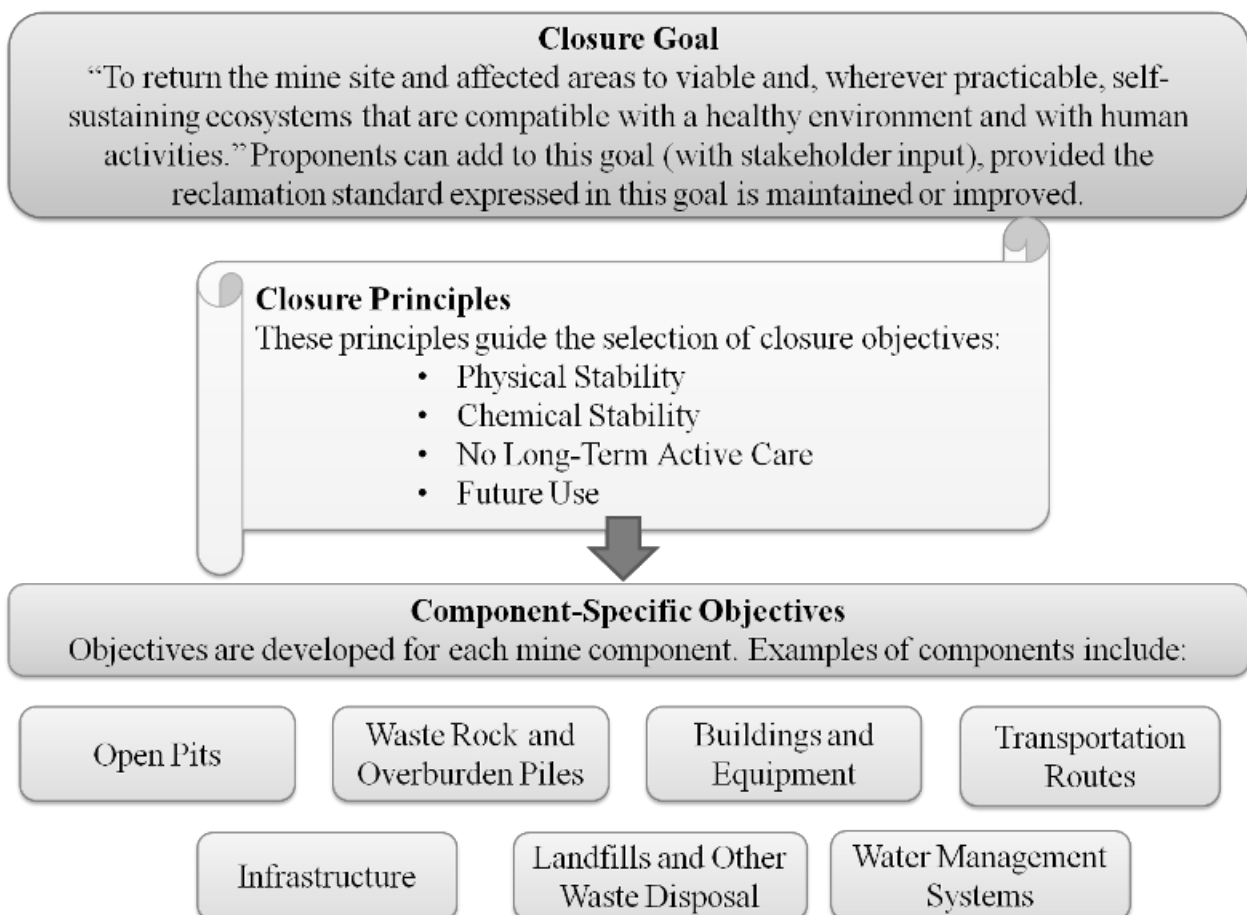
- Access to be limited, for the safety of humans and wildlife.
- The open pit mine workings and pit boundary are physically and geo-technically stable.
- Water quality in flooded pits is safe for humans, aquatic life, and wildlife.
- Discharge of contaminated drainage has been minimized and controlled.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



#### Closure Planning & Options Considerations in Mine Design –

- The closure of mine is well planned at the initial stage of planning & design consideration by the internal and external stake holders
- Construction of 2m height bund all along the mine pit boundary and ensure its stability all time & construction of garland drain along the natural slope to avoid sliding and collection of soil to the pit & surface runoff during rainfall
- After complete exploitation of mineral, the lowest bench foot wall side will be maintained as plain surface without any sump pits to avoid any accidents
- All the sharp edges will be dressed to smoother face before the closure of mine and ensure no loose debris on hanging wall side
- There is a canal on Western side of the cluster project area. The river canal will not be hindered by any of mine closure activities

- The project proponent as a part of social responsibilities assures to supply the stored mine pit water to the nearby villages after effective treatment process as per the standards of TNPCB & TWAD
- Native species will be planted in 3 row patterns on the boundary barriers and 1<sup>st</sup> 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	COST (Rs.)
		I	II	III	IV	V		
Plantation under safety zone	Nos.	66	66	66	66	66	@100 Rs Per sapling	33,000/-
	Cost	6600	6600	6600	6600	6600		20,000/-
Plantation in the quarried out top benches, approach road and panchayat road	Nos.	40	40	40	40	40		20,000/-
	Cost	4000	4000	4000	4000	4000		
Wire Fencing (In Mtrs) 900 Mtrs		2,70,000	-	-	-	-	@300 Rs Per Meter	2,70,000/-
Garland drain (In Mtrs) 860 Mtrs		2,58,000	-	-	-	-	@300 Rs Per Meter	2,58,000/-
<b>TOTAL</b>								<b>5,81,000/-</b>

Source: Proposed by FAE's and EC

## 2.5 METHOD OF MINING

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

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

### 2.5.1 Drilling & Blasting Parameters

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

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

#### Type of Explosives to be used –

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

### Storage of Explosives –

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

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

### 2.5.2 Extent of Mechanization

**TABLE 2.10 PROPOSED MACHINERY DEPLOYMENT**

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

Source: Approved Mining Plan

## 2.6 GENERAL FEATURES

### 2.6.1 Existing Infrastructures

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

### 2.6.2 Drainage Pattern

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

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

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

### 2.6.3 Traffic Density

The traffic survey conducted based on the transportation route of material, the Rough Stone is proposed to be transported mainly through Palathurai Panchayat Road that connects to Chettipalayam District Road on North west Side.

Traffic density measurements were performed at two locations

1. Palathurai Panchayat Road
2. Chettipalayam District Road

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

**TABLE.2.11: TRAFFIC SURVEY LOCATIONS**

Station Code	Road Name	Distance and Direction	Type of Road
TS1	Palathurai Panchayat Road	1.5 km-NE	Panchayat Road
TS2	Chettipalayam District Road	6.2 km-NW	District Road

Source: On-site monitoring by GEMS FAE & TM

**TABLE 2.12: EXISTING TRAFFIC VOLUME**

Station code	HMV		LMV		2/3 Wheelers		Total PCU
	No	PCU	No	PCU	No	PCU	
TS1	100	300	75	75	150	75	450
TS2	175	525	125	125	140	70	720

Source: On-site monitoring by GEMS FAE & TM

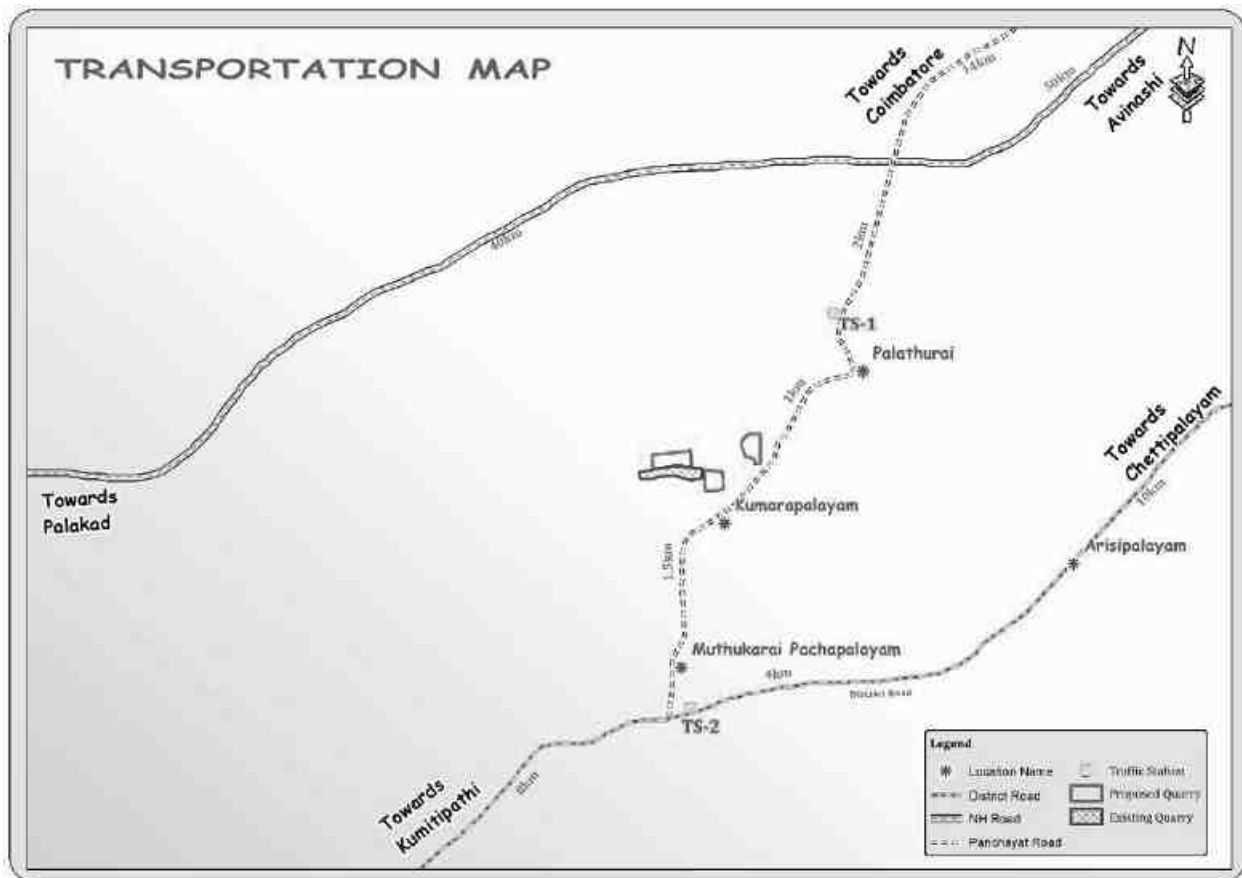
\* PCU conversion factor: HMV (Trucks and Bus) = 3, LMV (Car, Jeep and Auto) = 1 and 2/3 Wheelers = 0.5

**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
10/20 tonnes	17	51

Source: Data analysed from Approved Mining Plan

**FIGURE.2.13: MINERAL TRANSPORTATION ROUTE MAP**



**TABLE 2.14: SUMMARY OF TRAFFIC VOLUME**

Route	Existing Traffic volume in PCU	Incremental traffic due to the project	Total traffic volume	Hourly Capacity in PCU as per IRC – 1960 guidelines
Palathurai Panchayat Road	450	51	501	1500
Chettipalayam District Road	720	51	771	1200

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

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

#### 2.6.4 Mineral Beneficiation and Processing

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

### 2.7 PROJECT REQUIREMENT

#### 2.7.1 Water Source & Requirement

Detail of water requirements in KLD as given below:

**TABLE 2.15: WATER REQUIREMENT FOR THE PROJECT**

PROPOSAL – P1		
Purpose	Quantity	Source
Dust Suppression	1.5 KLD	Rainwater accumulated in Mine Pit/ Water Tanker
Green Belt development	0.7 KLD	Rainwater accumulated in Mine Pit/ Water Tanker
Sanitation & Drinking	0.3 KLD	Water Tankers
Total	<b>2.5 KLD</b>	

Source: Prefeasibility report

#### 2.7.2 Power and Other Infrastructure Requirement

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

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

#### 2.7.3 Fuel Requirement

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

#### 2.7.4 Project Cost

**TABLE 2.16: PROJECT COST OF PROPOSED PROJECTS**

PROPOSAL – P1	
Total Project Cost	Rs.66,52,000

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 mine's regulations, 1961 for all the proposed projects.

**TABLE 2.17: PROPOSED MANPOWER DEPLOYMENT**

<b>PROPOSAL – P1</b>	
Mines Manager/Mines Foreman	1
Mate/Blaster	1
Jack hammer operator	6
Excavator Operator	1
Tippers driver	2
Helper	3
Cleaner & Co-operator	3
Security	1
<b>Total</b>	<b>18</b>

Source: Approved Mining Plan of respective Project

## 2.9 PROJECT IMPLEMENTATION SCHEDULE

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

**TABLE 2.18: EXPECTED TIME SCHEDULE**

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

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

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### 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 March 2023 to May 2023 with CPCB guidelines. Environmental data has been collected with reference to cluster quarries by Chennai Mettix Lab Private Limited, – An accredited by ISO/IEC 17025:2017 (NABL) Laboratory for the below attributes –

- Land
- 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 summer season i.e., March 2023 to May 2023.

#### Study Methodology

- The project area was surveyed in detail with the help of Total Station and the boundary pillars were picked up with the help of GPS. The boundary coordinates were superimposed on the satellite imagery to understand the relief of the area, besides Land use pattern of the area was studied through the Bhuvan (ISRO)
  - Soil samples were collected and analysed for relevant physio-chemical characteristics, exchangeable Cations, nutrients & micro nutrients etc., in order to assess the impact due to mining activities and to recommend saplings for Greenbelt development.
  - Ground water samples were collected during the study period from the existing bore wells, while surface water was collected from ponds in the buffer zone. The samples were analysed for parameters necessary to determine water quality (based on IS: 10500:2012 criteria) and those which are relevant from the point of view of environmental impact of the proposed mines.
  - An onsite meteorological station was setup in cluster area, to collect data about wind speed, wind direction, temperature, relative humidity, rainfall and general weather conditions were recorded throughout the study period.
  - In order to assess the Ambient Air Quality (AAQ), samples of ambient air were collected by installation of Respiratory Dust Samplers (RDS) for Fugitive dust, PM<sub>10</sub> and SO<sub>2</sub>, NO<sub>x</sub> with gaseous attachments & Fine Dust Samplers (FDS) for PM<sub>2.5</sub> 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 (1 core & 5 buffer zone)	IS 2720 Agriculture Handbook - Indian Council of Agriculture Research, New Delhi
*Water Quality	Physical, Chemical and Bacteriological Parameters	Once during the study period	6 (2 surface water & 4 ground water)	IS 10500& CPCB Standards
Meteorology	Wind Speed Wind Direction Temperature Cloud cover Dry bulb temperature Rainfall	1 Hourly Continuous Mechanical/Auto matic Weather Station	1	Site specific primary data& Secondary Data from IMD Station
*Ambient Air Quality	PM10 PM2.5 SO2 NOX Fugitive Dust	24 hourly twice a week (December 2020 – February 2021)	8 (1 core & 7 buffer)	IS 5182 Part 1-23 National Ambient Air Quality Standards, CPCB
*Noise Levels	Ambient Noise	Hourly observation for 24 Hours per location	8 (1 core & 7 buffer zone)	IS 9989 As per CPCB Guidelines
Ecology	Existing Flora and Fauna	Through field visit during the study period	Study Area	Primary Survey by Quadrate & Transect Study Secondary Data – 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 Private Limited in association with GEMS

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

### 3.1 LAND ENVIRONMENT

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

#### 3.1.1 Land Use/ Land Cover

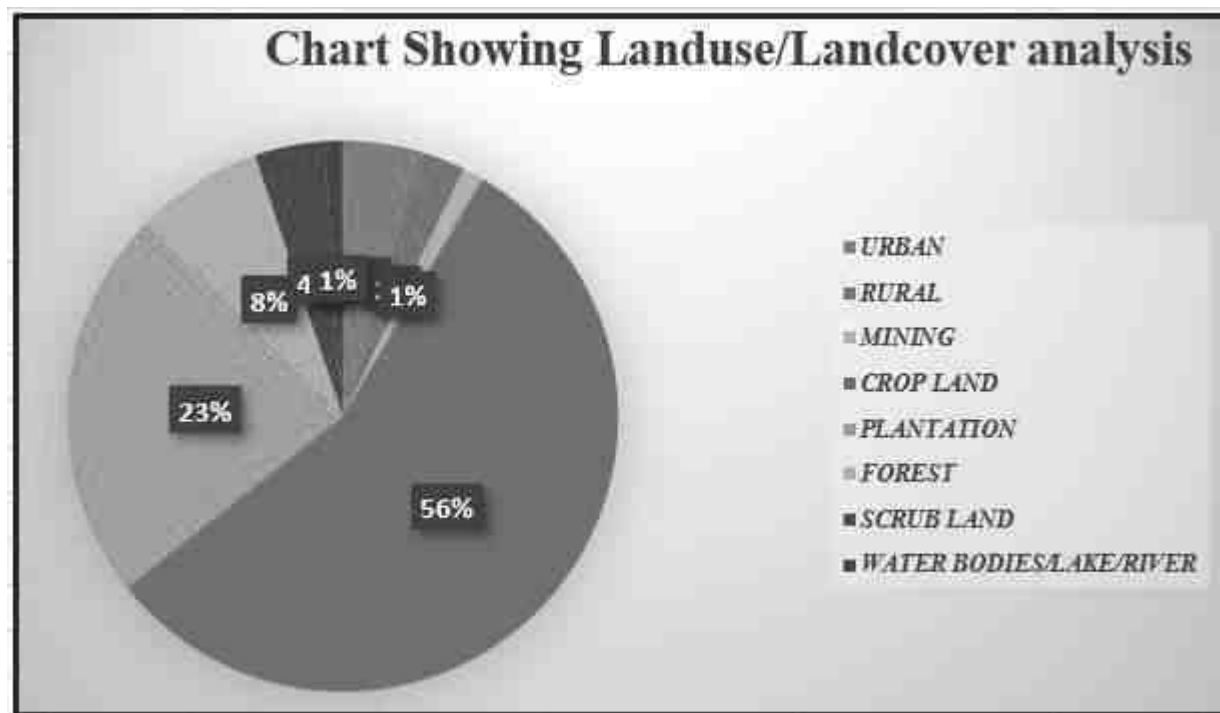
A visual interpretation technique has been adopted for land use classification based on the keys suggested in the chapter – V of the guidelines issued by NNRMS Bangalore & Level III classification with 1:50,000 scale for the preparation of land use mapping. Land use pattern of the area was studied through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

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

S.No	CLASSIFICATION	AREA_HA	AREA_%
<b>BUILTUP</b>			
1	URBAN	1525.23	4.71
2	RURAL	820.26	2.53
3	MINING	392.83	1.21
<b>AGRICULTURAL LAND</b>			
4	CROP LAND	18084.03	55.87
5	PLANTATION	7428.42	22.95
<b>FOREST</b>			
6	FOREST	2444.61	7.55
<b>BARREN/WASTE LANDS</b>			
7	SCRUB LAND	1324.41	4.09
<b>WETLANDS/ WATER BODIES</b>			
8	WATER BODIES/LAKE/RIVER	350.04	1.08
<b>TOTAL</b>		32369.83	100.00

Source: Survey of India Toposheet and Landsat Satellite Imagery

**FIGURE 3.1: PIE DIAGRAM OF LAND USE AND LAND IN STUDY AREA**



Source: Table 3.2

From the above table, pie diagram and land use map it is inferred that the majority of the land in the study area is Agriculture and fallow land (includes crop land) 55.87% , Plantation is (22.95%), followed by Built-up Lands - 7.24%, Scrub & Forest land – 11.64%, and Water bodies 1.08%.



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The total mining area within the study area is 392.83 ha i.e., 1.21%. The cluster area of 13.85.7 ha contributes about 0.035% of the total mining area within the study area. This small percentage of Mining Activities shall not have any significant impact on the environment.

### **3.1.2 Topography**

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

### **3.1.3 Drainage Pattern of the Area**

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

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

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

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

### **3.1.4 Seismic Sensitivity**

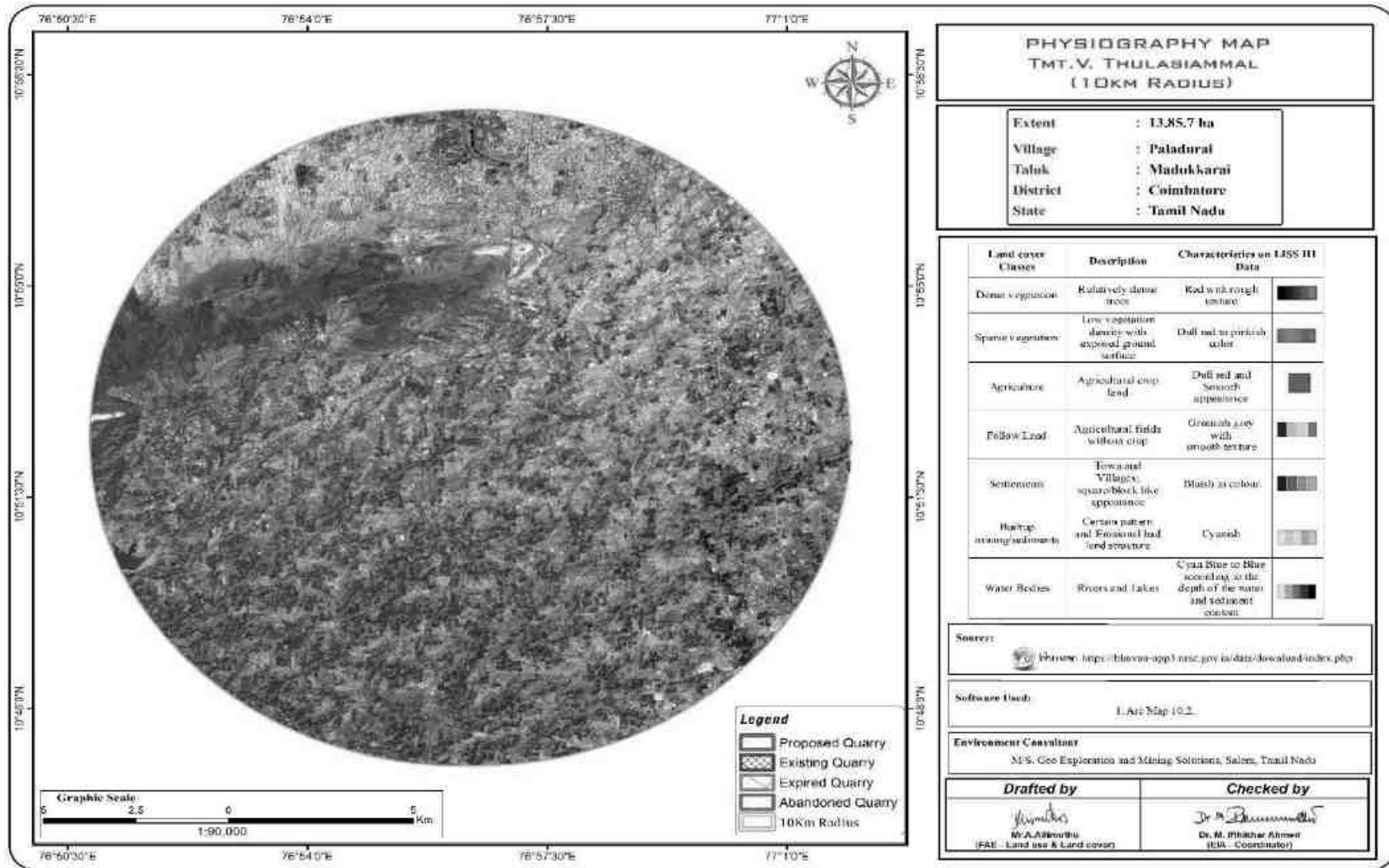
The proposed project site falls in the seismic Zone II, low damage risk zone as per BMTPC, Vulnerability Atlas of Seismic zone of India IS: 1893 – 2002. The project area falls in the hard rock terrain on the peninsular shield of south India which is highly stable.

(Source: [https://moes.gov.in/writereaddata/files/LS\\_EN\\_20032020\\_385.pdf](https://moes.gov.in/writereaddata/files/LS_EN_20032020_385.pdf))

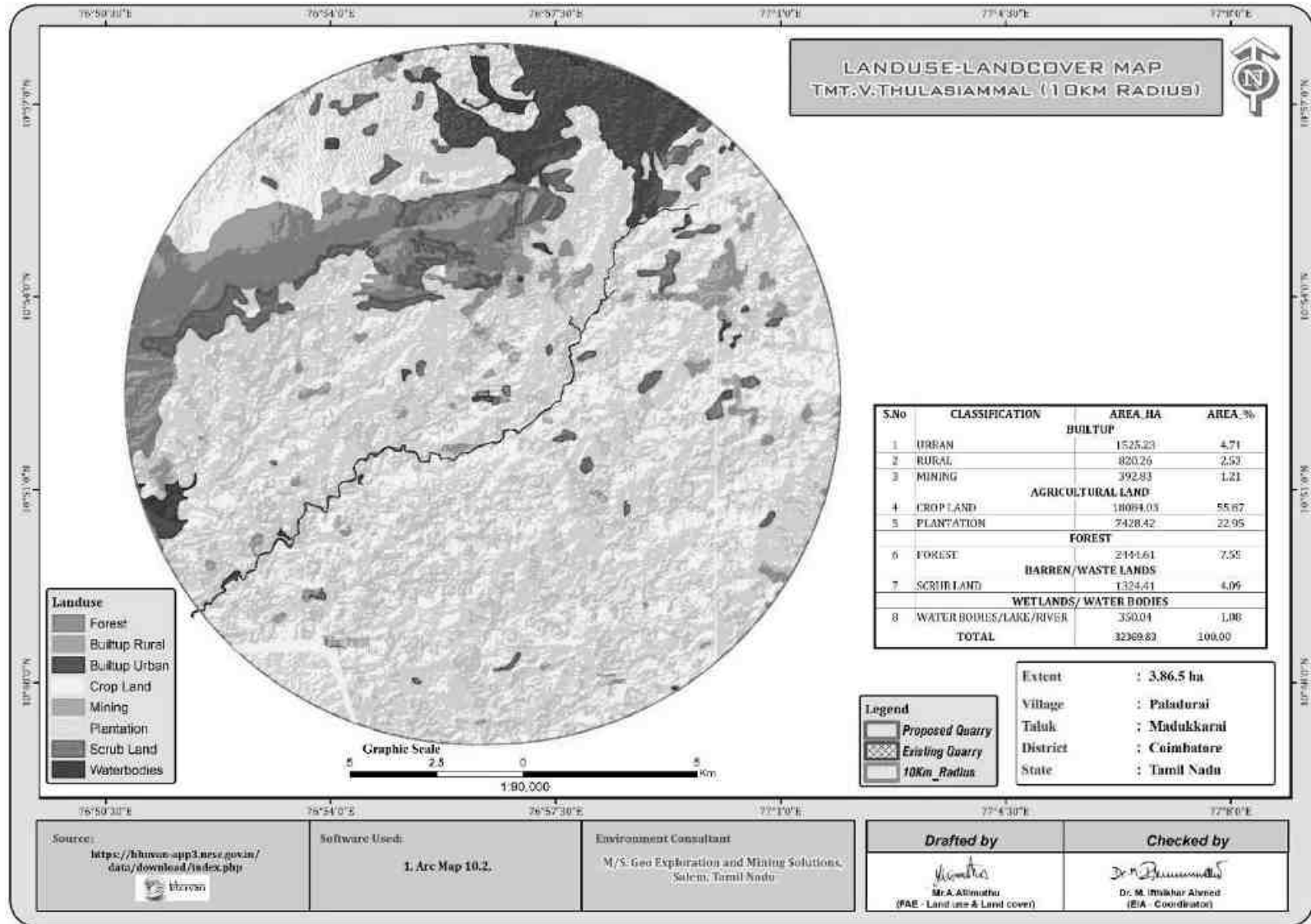
### **3.1.5 Environmental Features in the Study Area**

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

**FIGURE 3.2: PHYSIOGRAPHIC MAP 10KM RADIUS**



**FIGURE 3.3: LAND USE LAND COVER MAP 10KM RADIUS**



**TABLE 3.3: DETAILS OF ENVIRONMENT SENSITIVITY AROUND THE CLUSTER**

Sl.No	Sensitive Ecological Features	Name	Arial Distance in km from Cluster
1	National Park / Wild life Sanctuaries	Indiragandhi (Anamalai)	36km-S
2	Reserve Forest	Boluvampatti R.F	2.8 Km North
3	Tiger Reserve/ Elephant Reserve/ Biosphere Reserve	None	Nil within 10Km Radius
4	Critically Polluted Areas	None	Nil within 10km Radius
5	Mangroves	None	Nil within 10km Radius
6	Mountains/Hills	None	Nil within 10km Radius
7	Notified Archaeological Sites	None	Nil within 10km Radius
8	Industries/ Thermal Power Plants	None	Nil within 10km Radius
9	Defence Installation	None	Nil within 10km Radius

Source: Survey of India Toposheet

**TABLE 3.4: NEARBY WATER BODIES FROM THE PROPOSED PROJECT SITE**

PROPOSAL – P1		
Sl.No	NAME	DISTANCE & DIRECTION
1	Odai	220m West
2	Odai	570m SW
3	Varattar Stream	960m SE
4	Sengulam	8km North
5	Walayar Lake	9km SW
6	Kurichikulam	9.5km NE

Source: Village Cadastral Map and Field Survey

### 3.1.6 Soil Environment

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

**The objective of the soil sampling is -**

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

**TABLE 3.5: SOIL SAMPLING LOCATIONS**

S. No	Location Code	Monitoring Locations	Distance & Direction	Coordinates
1	S-1	Core Zone	Project Area	10°52'29.80"N 76°56'24.87"E
2	S-2	Palathurai	1.2km NE	10°52'49.25"N 76°57'3.64"E
3	S-3	Veerappanur	5.5km SW	10°51'6.82"N 76°53'33.49"E
4	S-4	Pachapalayam	1.4km South	10°51'41.52"N 76°56'26.64"E
5	S-5	Ettimadai	3.6km NW	10°53'20.50"N 76°54'33.05"E
6	S-6	Kuttikavundanpatti	5.3km SW	10°50'4.70"N 76°54'34.82"E

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

**Methodology –**

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

**TABLE 3.6: METHODOLOGY OF SAMPLING COLLECTION**

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

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

**Soil Testing Result –**

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

**FIGURE 3.4: SOIL SAMPLING LOCATIONS AROUND 10 KM RADIUS**

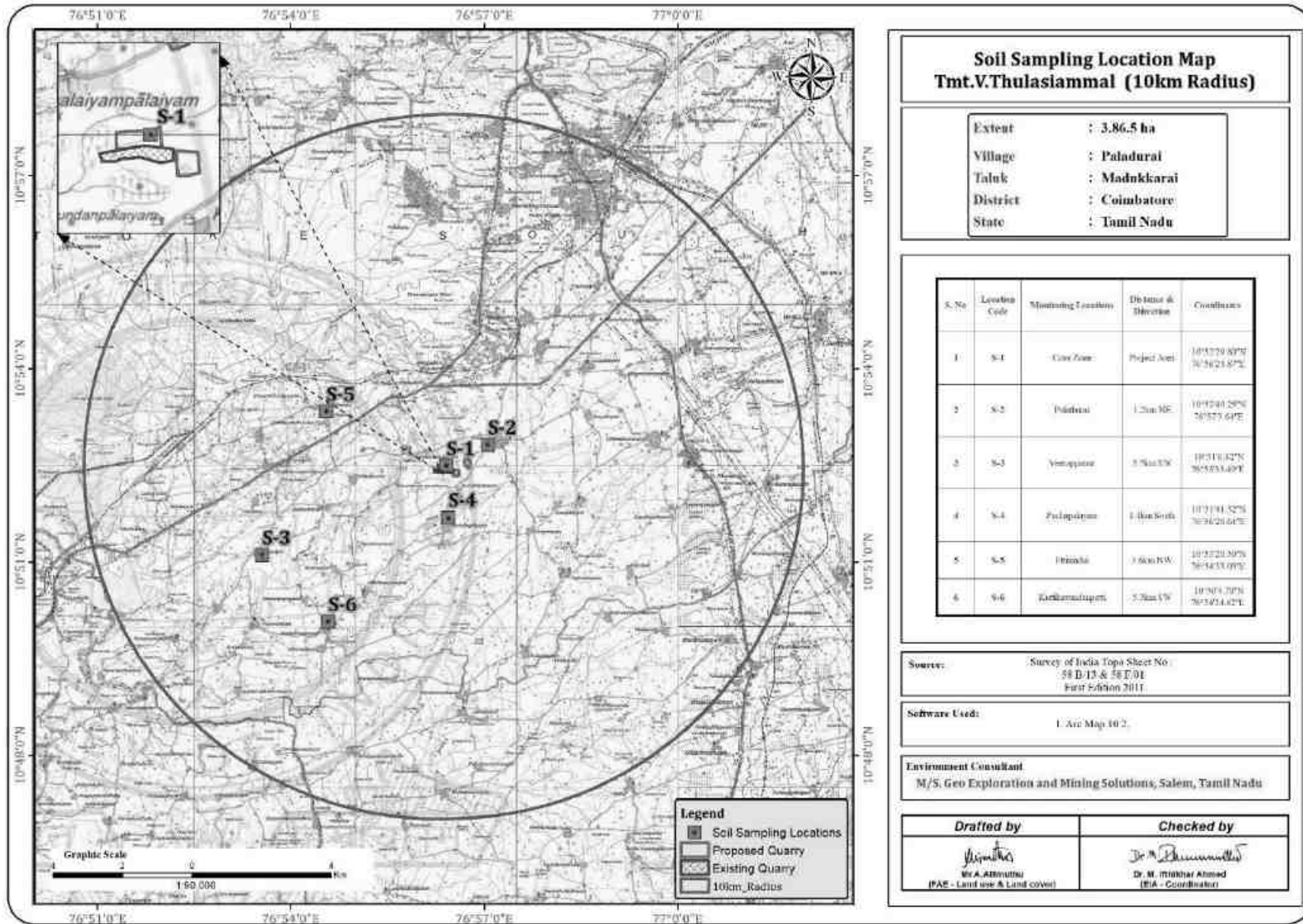
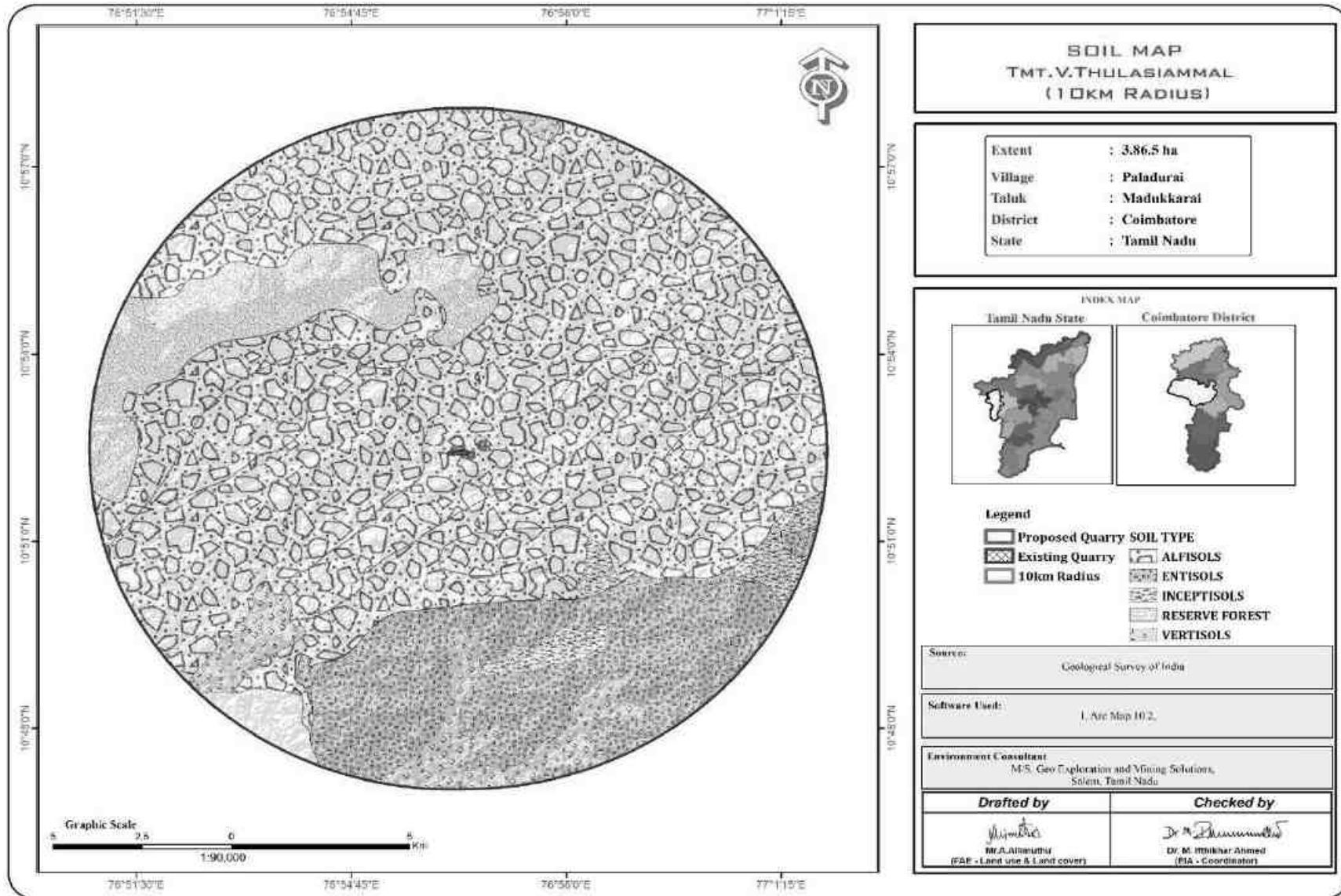


FIGURE 3.5: SOIL MAP



**TABLE 3.7: SOIL QUALITY OF THE STUDY AREA**

S. No	Test Parameters	Protocols	S-1 Near Project area	S-2 Palathurai	S-3 Veerappanur	S-4 Veerappanur	S-5 Ettimadai	S-6 Kuttikavunda npatti
01	pH @ 25°C	IS 2720 Part 26 - 1987 (Reaff:2016)	8.29	7.99	8.41	8.25	8.03	8.49
02	Conductivity @ 25°C	IS 14767 - 2000 (Reaff : 2016)	650 µmhos/cm	562 µmhos/cm	515 µmhos/cm	561 µmhos/cm	496 µmhos/cm	315 µmhos/cm
03	<b>Texture :</b>							
	Clay	34.6 %	31.5 %	27.3 %	34.2 %	28.2 %	27.5 %	33.5 %
	Sand	38.1%	34.7 %	34.6 %	30.5 %	30.9 %	35.6 %	34.0 %
	Silt	44.0 %	33.8 %	38.1%	35.3 %	40.9 %	36.9 %	32.5 %
04	Water Holding Capacity	1.10 g/cm <sup>3</sup>	45.6 %	44.0 %	42.5 %	42.0 %	43.8 %	46.2 %
05	Bulk Density	40.1 %	1.2 g/cm <sup>3</sup>	1.10 g/cm <sup>3</sup>	0.98 g/cm <sup>3</sup>	1.11 g/cm <sup>3</sup>	1.09 g/cm <sup>3</sup>	1.04 g/cm <sup>3</sup>
06	Porosity	135 mg/kg	39.8 %	40.1 %	45.2 %	41.6 %	42.6 %	44.8 %
07	Calcium as Ca	68.6 mg/kg	146 mg/kg	135 mg/kg	124 mg/kg	97.5 mg/kg	136 mg/kg	138.6 mg/kg
08	Magnesium as Mg	15 mg/kg	69.5 mg/kg	68.6 mg/kg	51 mg/kg	42.8 mg/kg	73.8 mg/kg	61.6 mg/kg
09	Manganese as Mn	0.8 mg/kg	15.3mg/kg	15 mg/kg	18.4 mg/kg	19.6 mg/kg	22.6 mg/kg	28.0mg/kg
10	Zinc as Zn	0.92 mg/kg	1.1mg/kg	0.8 mg/kg	5.8 mg/kg	1.76 mg/kg	4.5 mg/kg	1.1 mg/kg
11	Boron as B	146 mg/kg	0.98 mg/kg	0.92 mg/kg	0.9 mg/kg	1.04 mg/kg	1.9 mg/kg	0.79 mg/kg
12	Chloride as Cl	0.004 %	40.5 mg/kg	146 mg/kg	113.8 mg/kg	36.7 mg/kg	71.1 mg/kg	116 mg/kg
13	Total Soluble Sulphate as SO <sub>4</sub>	35.4 mg/kg	0.014 %	0.004 %	0.0019 %	0.058 %	0.007 %	0.009 %
14	Potassium as K	3.1 mg/kg	19.3 mg/kg	35.4 mg/kg	54 mg/kg	21.6 mg/kg	119 mg/kg	30.8 mg/kg
15	Total Phosphorus as P	502 mg/kg	2.2mg/kg	3.1 mg/kg	1.97 mg/kg	2.3 mg/kg	2.2 mg/kg	3.2 mg/kg
16	Total Nitrogen as N	BDL (DL : 1.0 mg/kg)	278 mg/kg	502 mg/kg	515 mg/kg	426 mg/kg	504 mg/kg	565.8 mg/kg
17	Cadmium as Cd	BDL (DL : 1.0 mg/kg) BDL (DL : 1.0 mg/kg) 0.25 mg/kg 1.16 mg/kg 2.94 %	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		BDL (DL : 1.0 mg/kg)	BDL (DL : 1.0 mg/kg)	BDL (DL : 1.0 mg/kg)	BDL (DL : 1.0 mg/kg)	BDL (DL : 1.0 mg/kg)	BDL (DL : 1.0 mg/kg)
19	Copper as Cu		BDL (DL : 1.0 mg/kg)	BDL (DL : 1.0 mg/kg)	BDL (DL : 1.0 mg/kg)	BDL (DL : 1.0 mg/kg)	BDL (DL : 1.0 mg/kg)	BDL (DL : 1.0 mg/kg)
20	Lead as Pb		0.46 mg/kg	0.25 mg/kg	0.59 mg/kg	0.20 mg/kg	0.35 mg/kg	0.86 mg/kg
21	Iron as Fe		1.18 mg/kg	1.16 mg/kg	1.87 mg/kg	1.46 mg/kg	1.17 mg/kg	1.20 mg/kg
22	Organic Matter	1.72 %	1.82 %	2.94 %	2.15 %	1.55 %	2.25 %	2.15 %
23	Organic Carbon	38.8 meq/100g of soil	1.05 %	1.72 %	1.25 %	0.90%	1.30 %	1.25 %
24	Cation Exchange Capacity	USEPA 9080 – 1986	36 meq/100g of soil	38.8 meq/100g of soil	39.8 meq/100g of soil	36.6 meq/100g of soil	43.0 meq/100g of soil	39.8 meq/100g of soil

Source: Sampling Results by Chennai Mettlex Lab Private Limited.



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## **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 (27.3 %-34.2 %) to Sandy Loam Soil and Bulk Density of Soils in the study area varied between 0.98 – 1.2 g/cc. The Water Holding Capacity and Porosity of the soil samples is found to be medium i.e., ranging from 42.0 – 46.2 % and 39.8-45.2 %.

### **Chemical Characteristics –**

- The nature of soil is slightly alkaline to strongly alkaline with pH range 7.99 to 8.49
- The available Nitrogen content range between 278 to 565.8 mg/kg
- The available Phosphorus content range between 1.97 to 3.2 mg/kg
- The available Potassium range between 30.8 mg/kg to 119 mg/kg

## **3.2 WATER ENVIRONMENT**

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

### **3.2.1 Surface Water Resources:**

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

### **3.2.2 Ground Water Resources:**

Groundwater occurs in all the crystalline formations of oldest Achaean and Recent Alluvium. The occurrence and behaviour of groundwater are controlled by rainfall, topography, geomorphology, geology, structures etc.

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

### **3.2.3 Methodology**

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

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

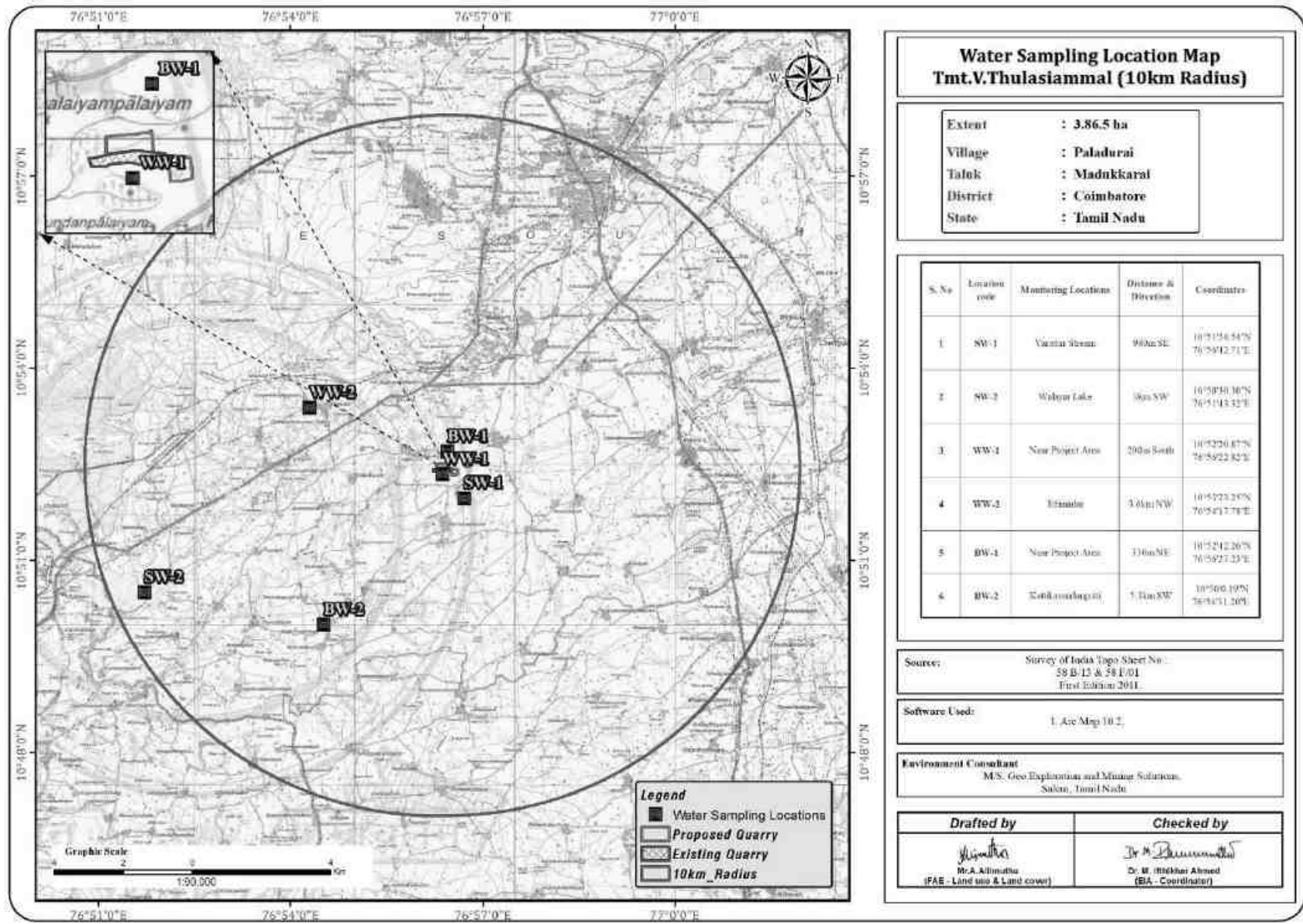
Two (2) surface water and Four (4) ground water samples were collected from the study area and were analysed for physio-chemical, heavy metals and bacteriological parameters in order to assess the effect of mining and other activities on surface and ground water. The samples were analysed as per the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

**TABLE 3.8: WATER SAMPLING LOCATIONS**

S.NO	CODE	LOCATIONS	DISTANCE & DIRECTION	COORDINATES
<b>SURFACE WATER</b>				
1	SW-1	Varattar Stream	980m SE	10°51'58.54"N 76°56'42.71"E
2	SW-2	Walayar Lake	9km SW	10°50'30.30"N 76°51'43.32"E
<b>GROUND WATER</b>				
3	WW-1	Near Project Area	200m South	10°52'20.87"N 76°56'22.82"E
4	WW-2	Ettimadai	3.6km NW	10°53'23.25"N 76°54'17.78"E
5	BW-1	Near Project Area	330m NE	10°52'42.26"N 76°56'27.23"E
6	BW-2	Kuttikavundanpatti	5.3km SW	10°50'0.19"N 76°54'31.20"E

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

**FIGURE 3.6: WATER SAMPLING LOCATIONS AROUND 10 KM RADIUS**



**TABLE 3.9: GROUND WATER SAMPLING RESULTS**

S.NO	Parameter	BW-1 Near Project Area	BW-2 Kuttikavundenpatti	WW-1 Near Project Area	WW-2 Ettimadai
1	Color	5 Hazen	5 Hazen	5	5 Hazen
2	Odour	Agreeable	Agreeable	Agreeable	Agreeable
3	pH@ 25°C	7.15	7.45	7.36	7.01
4	Electrical Conductivity @ 25°C	956 µmhos/cm	968 µmhos/cm	714 µmhos/cm	996 µmhos/cm
5	Turbidity	1.5 NTU	1 NTU	< 1 NTU	2.0 NTU
6	Total Dissolved Solids	611 mg/l	619 mg/l	429 mg/l	641 mg/l
7	Total Hardness as CaCO <sub>3</sub>	121mg/l	166 mg/l	108 mg/l	174 mg/l
8	Calcium as Ca	29.6 mg/l	29.4 mg/l	21.6 mg/l	30.2 mg/l
9	Magnesium as Mg	11.3 mg/l	22.6 mg/l	13.2 mg/l	24.0 mg/l
10	Total Alkalinity	135 mg/l	148 mg/l	137 mg/l	202 mg/l
11	Chloride as Cl <sup>-</sup>	114 mg/l	109 mg/l	99 mg/l	116 mg/l
12	Sulphate as SO <sub>4</sub> <sup>-</sup>	41.8 mg/l	32.5 mg/l	42.6 mg/l	32.6 mg/l
13	Iron as Fe	0.35 mg/l	0.15 mg/l	0.18 mg/l	0.15 mg/l
14	Free Residual Chlorine	BDL (DL:0.1 mg/l)	BDL (DL:0.1 mg/l)	BDL (DL:0.1 mg/l)	BDL (DL:0.1 mg/l)
15	Fluoride as F	0.25 mg/l	0.40 mg/l	0.20 mg/l	0.3 mg/l
16	Nitrates as NO <sub>3</sub>	8.6 mg/l	8.4 mg/l	6.6 mg/l	3.2 mg/l
17	Copper as Cu	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)
18	Manganese as Mn	BDL (DL:0.02 mg/l)	BDL (DL:0.02 mg/l)	BDL (DL:0.02 mg/l)	BDL (DL:0.02 mg/l)
19	Mercury as Hg	BDL (DL:0.0005 mg/l)	BDL (DL:0.0005 mg/l)	BDL (DL:0.0005 mg/l)	BDL (DL:0.0005 mg/l)
20	Cadmium as Cd	BDL (DL:0.001 mg/l)	BDL (DL:0.001 mg/l)	BDL (DL:0.001 mg/l)	BDL (DL:0.001 mg/l)
21	Selenium as Se	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)
22	Aluminium as Al	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)
23	Lead as Pb	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)
24	Zinc as Zn	BDL(DL : 0.05 mg/l)	BDL(DL : 0.05 mg/l)	BDL(DL : 0.05 mg/l)	BDL(DL : 0.05 mg/l)
25	Total Chromium	BDL(DL : 0.02 mg/l)	BDL(DL : 0.02 mg/l)	BDL(DL : 0.02 mg/l)	BDL(DL : 0.02 mg/l)
26	Boron as B	BDL(DL : 0.05 mg/l)	BDL(DL : 0.05 mg/l)	BDL(DL : 0.05 mg/l)	BDL(DL : 0.05 mg/l)
27	Mineral Oil	BDL(DL : 0.01 mg/l)	BDL(DL : 0.01 mg/l)	BDL(DL : 0.01 mg/l)	BDL(DL : 0.01 mg/l)
28	Phenolic Compounds as C <sub>6</sub> H <sub>5</sub> OH	BDL (DL:0.0005 mg/l)	BDL (DL:0.0005 mg/l)	BDL (DL:0.0005 mg/l)	BDL (DL:0.0005 mg/l)
29	Anionic Detergents as	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)
30	Cynaide as CN	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)
31	Total Coliform	110 MPN/100ml	120 MPN/100ml	56 MPN/100ml	68 MPN/100ml
32	E-Coli	< 1.8 MPN/100ml	< 1.8 MPN/100ml	< 1.8 MPN/100ml	< 1.8 MPN/100ml
33	Barium as Ba	BDL(DL:0.05 mg/l)	BDL(DL:0.05 mg/l)	BDL(DL:0.05 mg/l)	BDL(DL:0.05 mg/l)
34	Ammonia (as Total	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)
35	Sulphide as H <sub>2</sub> S	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)
36	Molybdenum as Mo	BDL (DL:0.02 mg/l)	BDL (DL:0.02 mg/l)	BDL (DL:0.02 mg/l)	BDL (DL:0.02 mg/l)
37	Total Arsenic as As	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)
38	Total Suspended Solids	BDL (DL:1.0 mg/l)	BDL (DL:1.0 mg/l)	BDL (DL:1.0 mg/l)	BDL (DL:1.0 mg/l)

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

**TABLE 3.10: SURFACE WATER SAMPLING RESULTS**

Sl. No.	Parameter	Unit	RESULT		CPCB Designated Best Use
			SW1- Varattur Stream	SW2- Walayar Lake	
1	Colour	Hazen	5 Hazen	10 Hazen	300
2	Odour	-	Agreeable	Agreeable	Not specified
3	pH@ 25°C	-	7.89	7.49	6.5 – 8.5
4	Electrical Conductivity @ 25°C	µs/cm	1093 µmhos/cm	1168 µmhos/cm	
5	Turbidity	NTU	4.0 NTU	6.5 NTU	Not specified
6	Total Dissolved Solids	mg/l	705 mg/l	749 mg/l	1500
7	Total Hardness as CaCO <sub>3</sub>	mg/l	153 mg/l	172mg/l	Not specified
8	Calcium as Ca	mg/l	28.4 mg/l	33.6 mg/l	Not specified
9	Magnesium as Mg	mg/l	19.8 mg/l	21.4 mg/l	Not specified
10	Total Alkalinity as CaCO <sub>3</sub>	mg/l	188 mg/l	165 mg/l	Not specified
11	Chloride as Cl <sup>-</sup>	mg/l	94.0 mg/l	114 mg/l	600
12	Sulphate as SO <sub>4</sub> <sup>-</sup>	mg/l	31.8 mg/l	46.8 mg/l	400
13	Iron as Fe	mg/l	0.24 mg/l	0.35 mg/l	50
14	Free Residual Chlorine	mg/l	BDL (DL:0.1 mg/l)	BDL (DL:0.1 mg/l)	400
15	Fluoride as F	mg/l	0.12 mg/l	0.25 mg/l	1.5
16	Nitrates as NO <sub>3</sub>	mg/l	7.8 mg/l	9.8 mg/l	50
17	Copper as Cu	mg/l	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)	1.5
18	Manganese as Mn	mg/l	BDL (DL:0.02 mg/l)	BDL (DL:0.02 mg/l)	Not specified
19	Mercury as Hg	mg/l	BDL (DL:0.0005 mg/l)	BDL (DL:0.0005 mg/l)	Not specified
20	Cadmium as Cd	mg/l	BDL (DL:0.001 mg/l)	BDL (DL:0.001 mg/l)	0.01
21	Selenium as Se	mg/l	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)	Not specified
22	Aluminium as Al	mg/l	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)	Not specified
23	Lead as Pb	mg/l	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)	0.1
24	Zinc as Zn	mg/l	BDL(DL : 0.05 mg/l)	BDL(DL : 0.05 mg/l)	15
25	Total Chromium	mg/l	BDL(DL : 0.02 mg/l)	BDL(DL : 0.02 mg/l)	0.05
26	Boron as B	mg/l	BDL(DL : 0.05 mg/l)	BDL(DL : 0.05 mg/l)	Not specified
27	Mineral Oil	mg/l	BDL(DL : 0.01 mg/l)	BDL(DL : 0.01 mg/l)	Not specified
28	Phenolic Compounds as C <sub>6</sub> H <sub>5</sub> OH	mg/l	BDL (DL:0.0005 mg/l)	BDL (DL:0.0005 mg/l)	0.005
29	Anionic Detergents as MBAS	mg/l	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)	Not specified
30	Cyanide as CN	mg/l	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)	0.05
31	Biological Oxygen Demand, 3 days @ 27°C		9.4 mg/l	7.1 mg/l	3
32	Chemical Oxygen Demand		32 mg/l	26 mg/l	Not specified
33	Dissolved Oxygen		5.6 mg/l	6.2 mg/l	4
34	Total Coliform		780 MPN/100ml	present	5000
35	E-Coli	MPN/ 100ml	90 MPN/100ml	present	Not specified
36	Barium as Ba	mg/l	BDL (DL:0.5)	BDL (DL:0.5)	300
37	Ammonia (as Total Ammonia-N)	mg/l	BDL (DL:0.01 mg/l)	2.8 mg/l	Not specified
38	Sulphide as H <sub>2</sub> S	mg/l	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)	Not specified
39	Molybdenum as Mo	mg/l	BDL (DL:0.02 mg/l)	BDL (DL:0.02 mg/l)	Not specified
40	Total Arsenic as As	mg/l	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)	0.2
41	Total Suspended Solids	mg/l	9.6 mg/l	8.6 mg/l	-

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

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### 3.2.4 Interpretation & Conclusion

#### Surface Water

##### Ph:

The pH varied from 7.49 to 7.89 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 705 to 749mg/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 94.0 – 114mg/l. Nitrates varied from 7.8 to 9.8 mg/l, while sulphates varied from 31.8 to 46.8 mg/l.

#### Ground Water

The pH of the water samples collected ranged from 7.01 to 7.45 and within the acceptable limit of 6.5 to 8.5. pH, Sulphates and Chlorides of water samples from all the sources are within the limits as per the Standard. On Turbidity, the water samples meet the requirement. Total Dissolved Solids were found in the range of 429– 641mg/l in all samples. Total hardness varied between 108– 174mg/l for all samples.

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

### 3.2.5 Hydrology and Hydrogeological studies

The district is underlain by hard rock formation fissured and fractured crystalline rocks constitute the important aquifer systems in the district. Geophysical prospecting was carried out in that area by SSRMP-80 Instrument by qualified Geo physicist with the help of IGIS software and it was inferred that the low resistance encountered at the depth between 70-65m. The maximum depth proposed out of proposed projects is 47 m bgl (2 m Gravel + 45 m Rough Stone). Hence there is no possibilities of water table intersection during the entire mine life period besides it is also inferred topographically that there are no major water bodies intersecting the project area. There is no necessity of stream, channel diversion due to these proposed projects.

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

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

S.NO	LABEL	LONGITUDE	LATITUDE	Mar-23	Apr-23	May-23
1	OW-1	76° 56' 22.7640" E	10° 52' 20.8081" N	13.6	14.2	14.8
2	OW-2	76° 56' 15.8462" E	10° 52' 20.1684" N	13.5	14.1	14.7
3	OW-3	76° 55' 59.2787" E	10° 52' 18.9711" N	14	14.6	15.2
4	OW-4	76° 55' 41.6953" E	10° 52' 23.6374" N	14.1	14.7	15.3
5	OW-5	76° 55' 56.0461" E	10° 52' 28.2332" N	13.9	14.5	15.1
6	OW-6	76° 56' 09.4698" E	10° 53' 02.6099" N	14.3	14.9	15.5
7	OW-7	76° 56' 28.8877" E	10° 53' 26.9582" N	13.8	14.4	15
8	OW-8	76° 57' 04.4135" E	10° 52' 26.3692" N	14.2	14.8	15.4
9	OW-9	76° 56' 48.5440" E	10° 52' 05.9039" N	13.7	14.3	14.9
10	OW-10	76° 56' 35.6543" E	10° 51' 47.9577" N	14	14.6	15.2

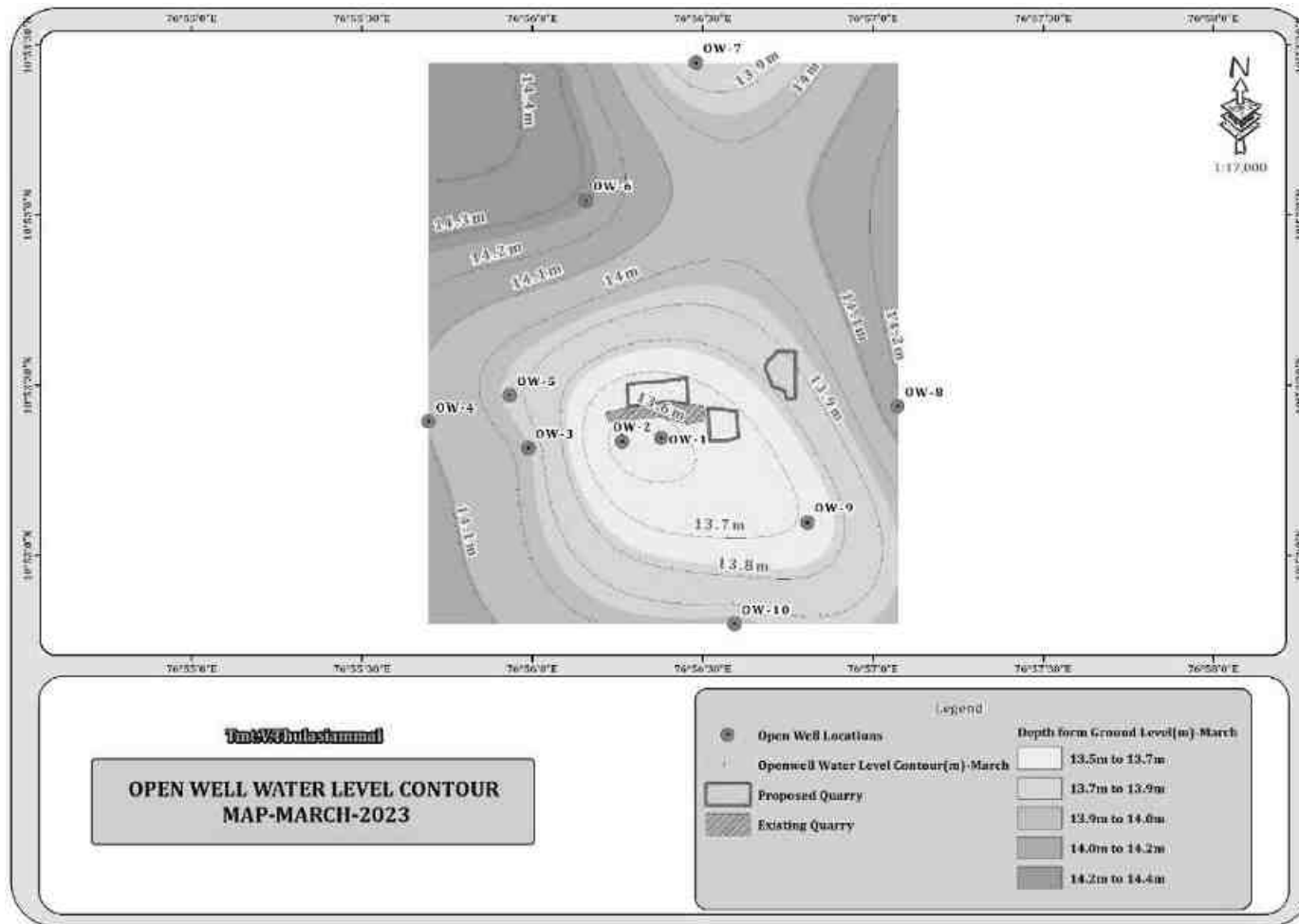
Source: Onsite monitoring data

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

S.NO	LABEL	LONGITUDE	LATITUDE	Mar-23	Apr-23	May-23
1	BW-1	76° 56' 27.2809" E	10° 52' 42.1917" N	66.5	67.1	67.7
2	BW-2	76° 56' 18.3757" E	10° 52' 41.9634" N	67	67.6	68.2
3	BW-3	76° 56' 08.2213" E	10° 53' 01.6984" N	66.8	67.4	68
4	BW-4	76° 56' 22.2242" E	10° 53' 15.2847" N	66.7	67.3	67.9
5	BW-5	76° 57' 08.6108" E	10° 52' 32.9721" N	67.3	67.9	68.5
6	BW-6	76° 56' 50.6837" E	10° 52' 01.4173" N	66.6	67.2	67.8
7	BW-7	76° 56' 33.7341" E	10° 52' 06.1884" N	67.2	67.8	68.4
8	BW-8	76° 56' 00.8666" E	10° 51' 54.8600" N	67.4	68	68.6
9	BW-9	76° 56' 22.1137" E	10° 51' 40.5598" N	66.9	67.5	68.1
10	BW-10	76° 56' 00.5229" E	10° 52' 29.4509" N	66.6	67.2	67.8
11	BW-11	76° 55' 37.6542" E	10° 52' 18.5318" N	67	67.6	68.2

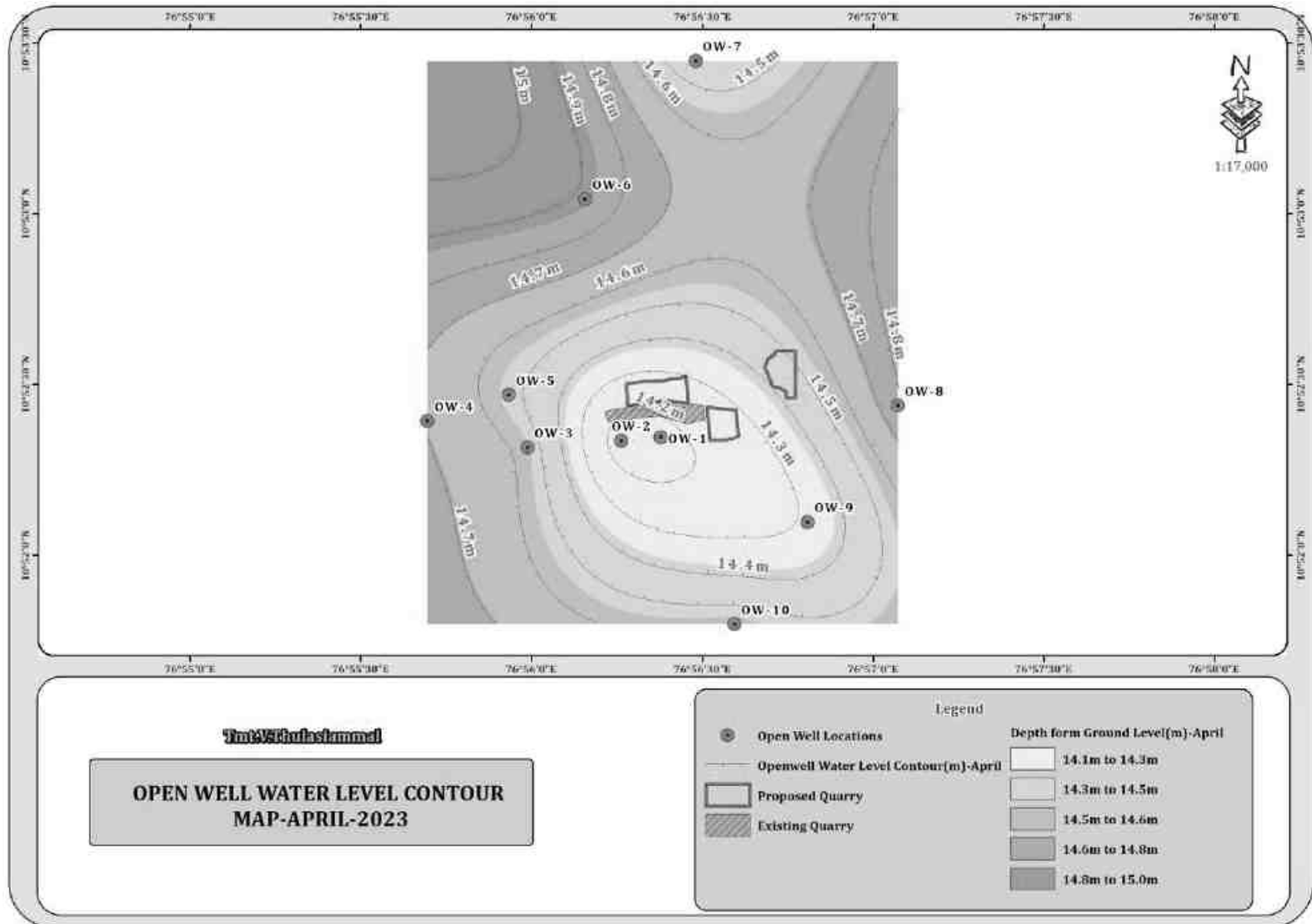
Source: Onsite monitoring data

**FIGURE 3.7: OPEN WELL CONTOUR MAP – MARCH 2023**

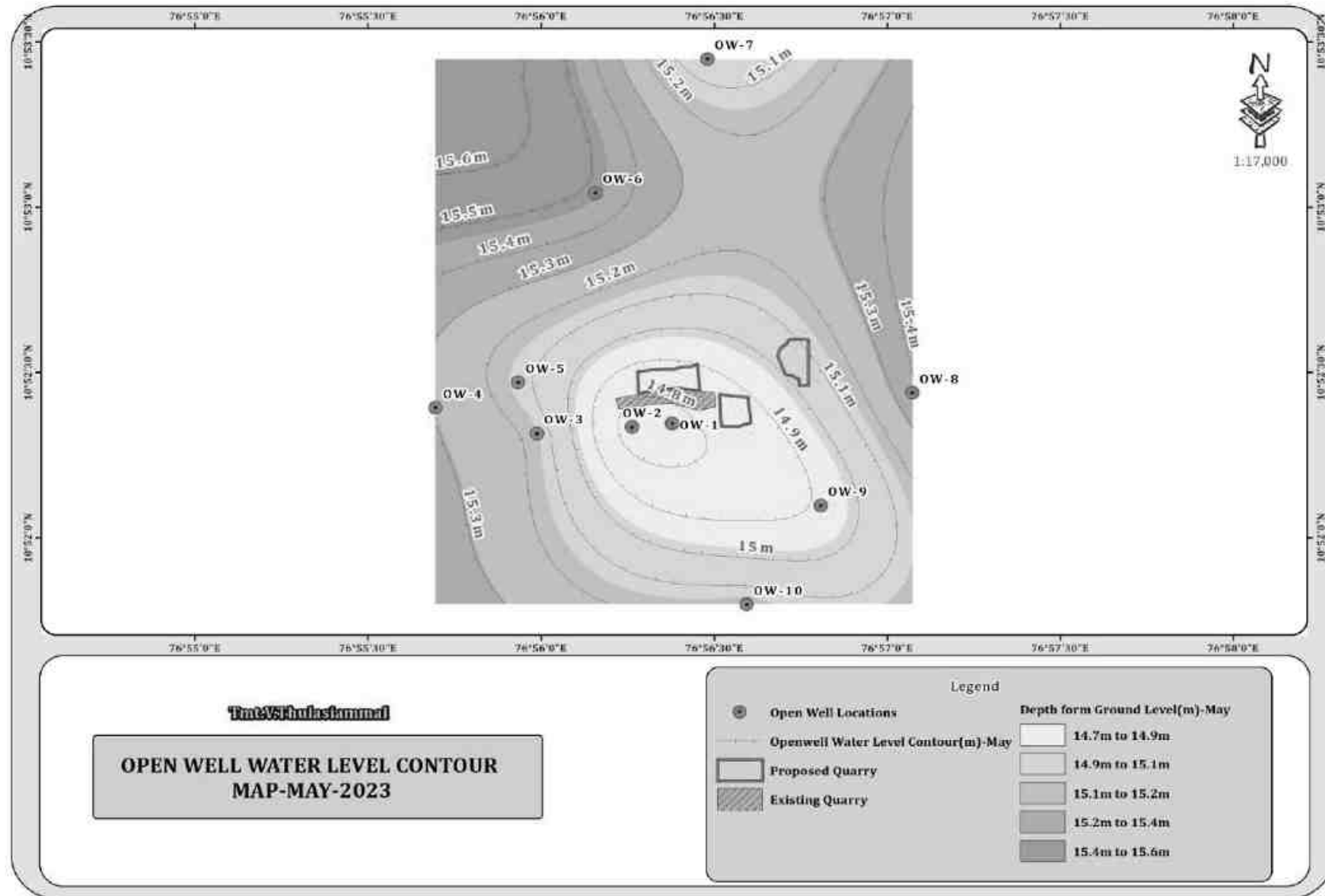




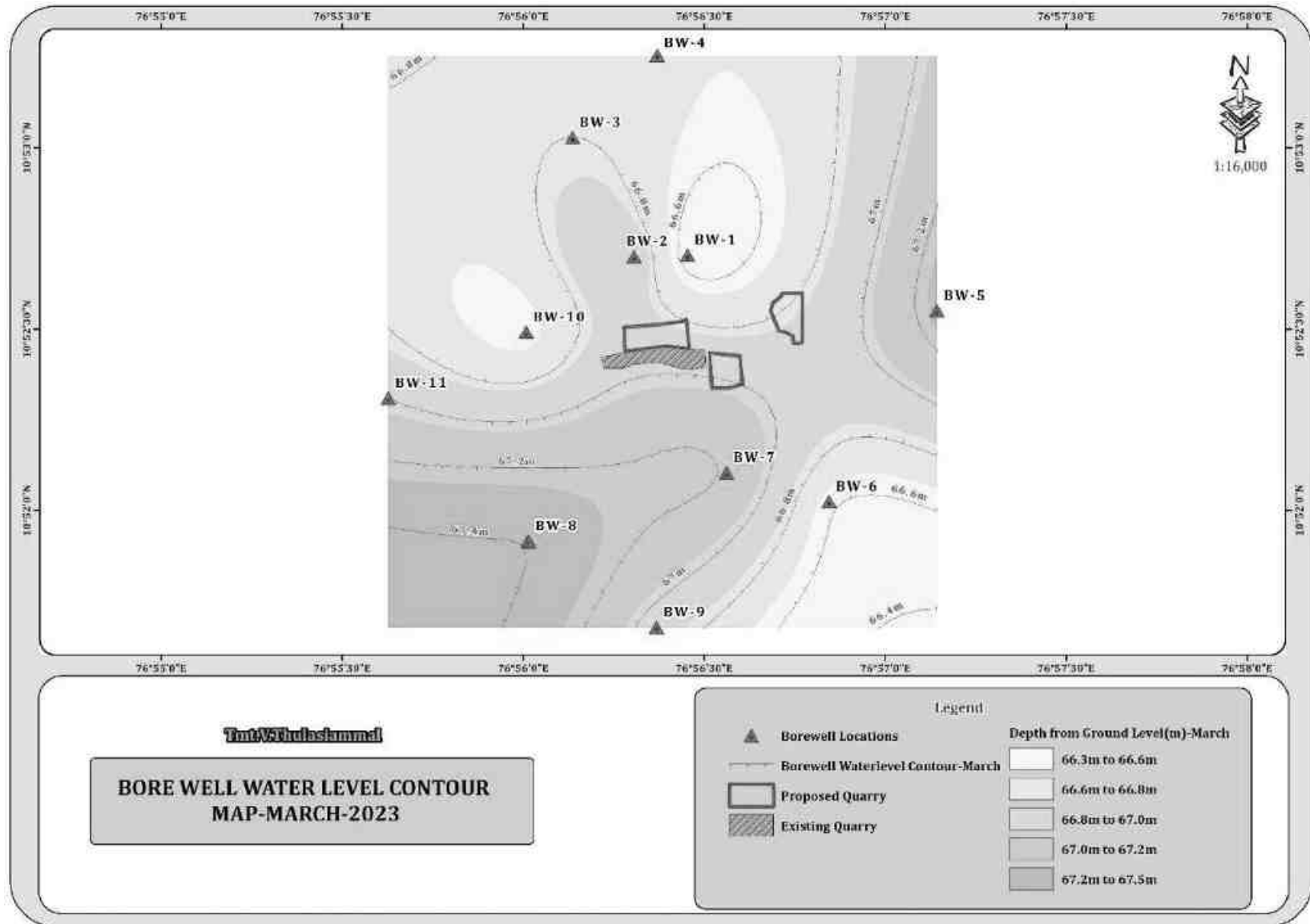
**FIGURE 3.8: OPEN WELL CONTOUR MAP – APRIL 2023**



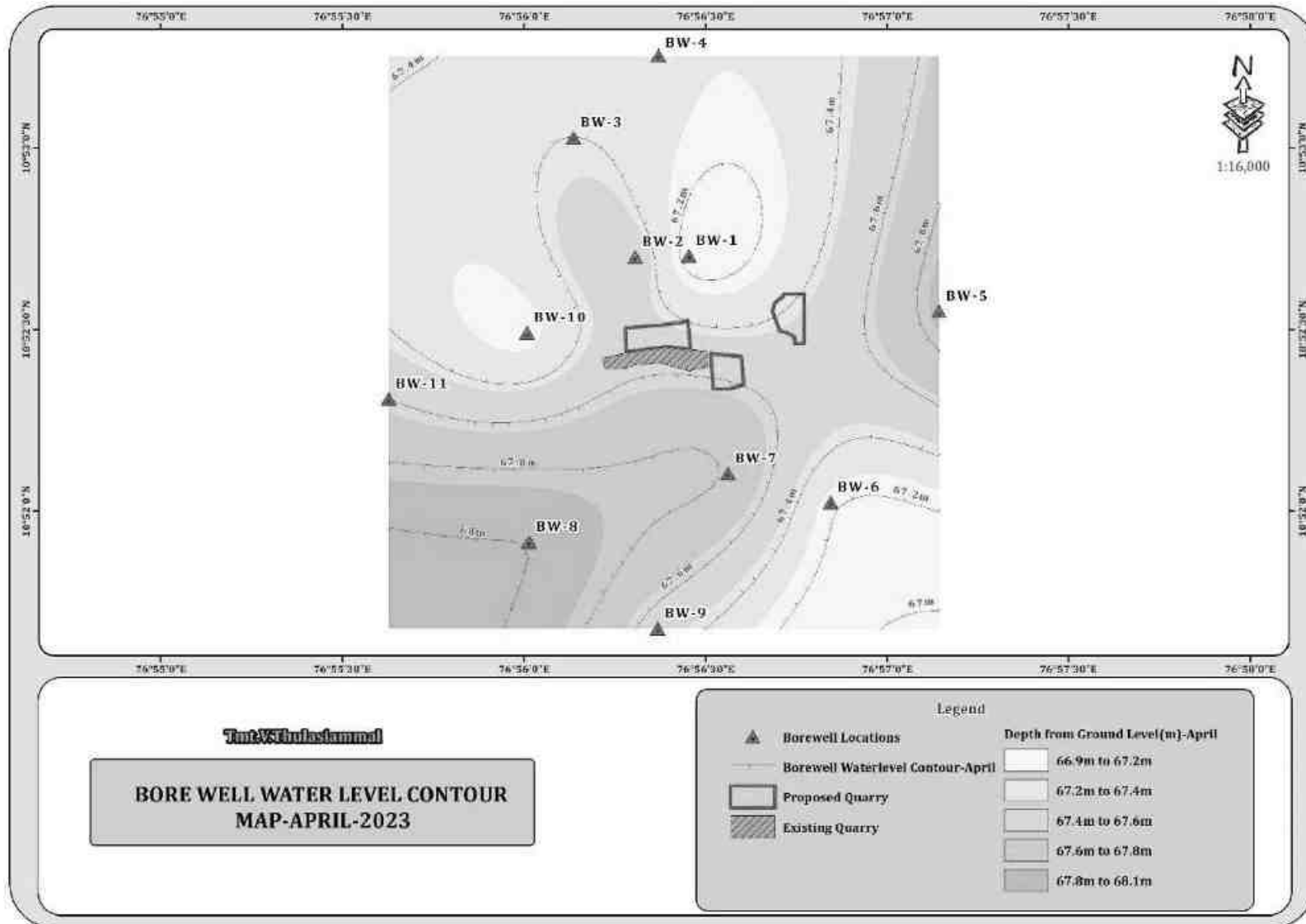
**FIGURE 3.9: OPEN WELL CONTOUR MAP – MAY 2023**



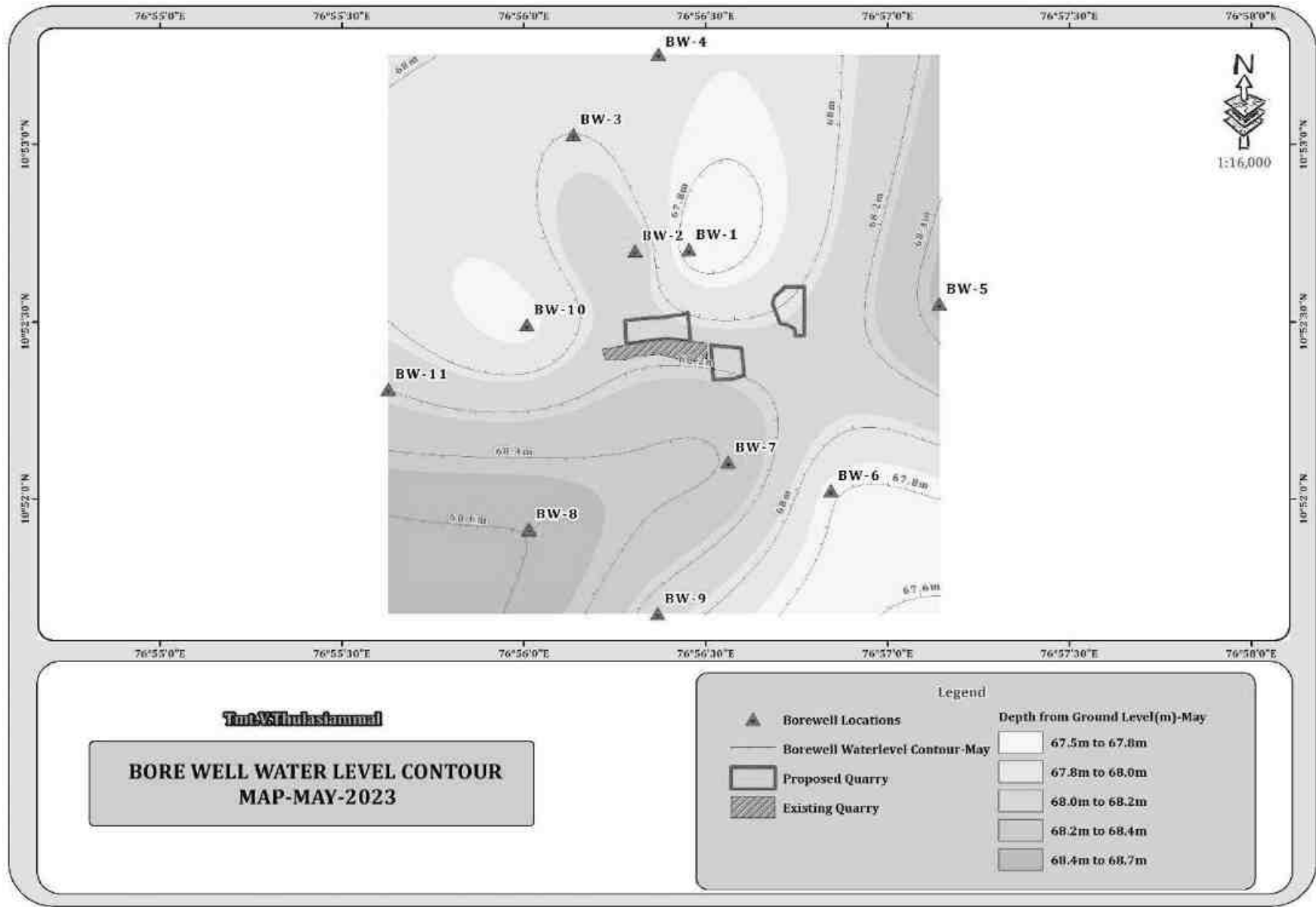
**FIGURE 3.10: BOREWELL CONTOUR MAP – MARCH 2023**



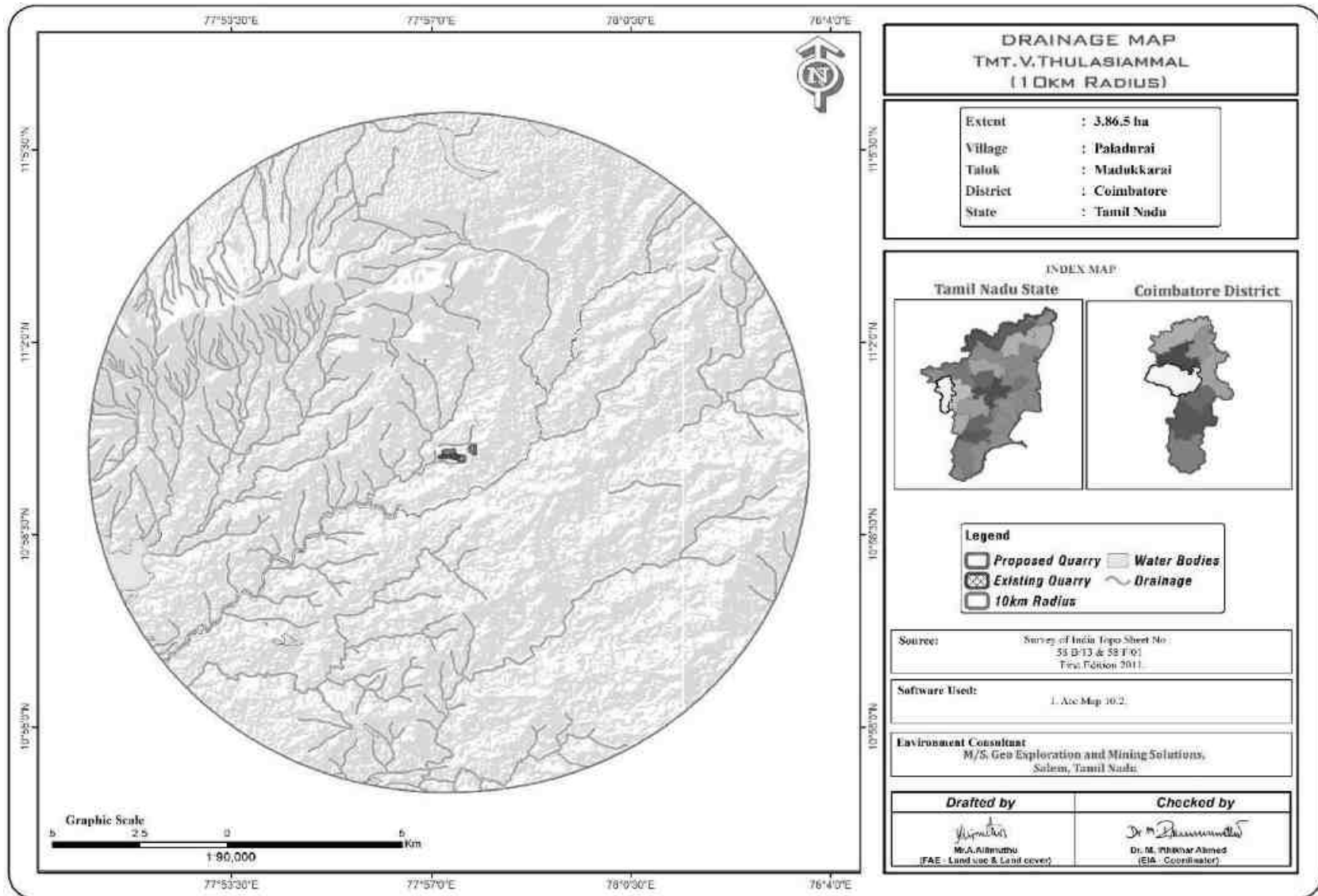
**FIGURE 3.11: BOREWELL CONTOUR MAP – APRIL 2023**



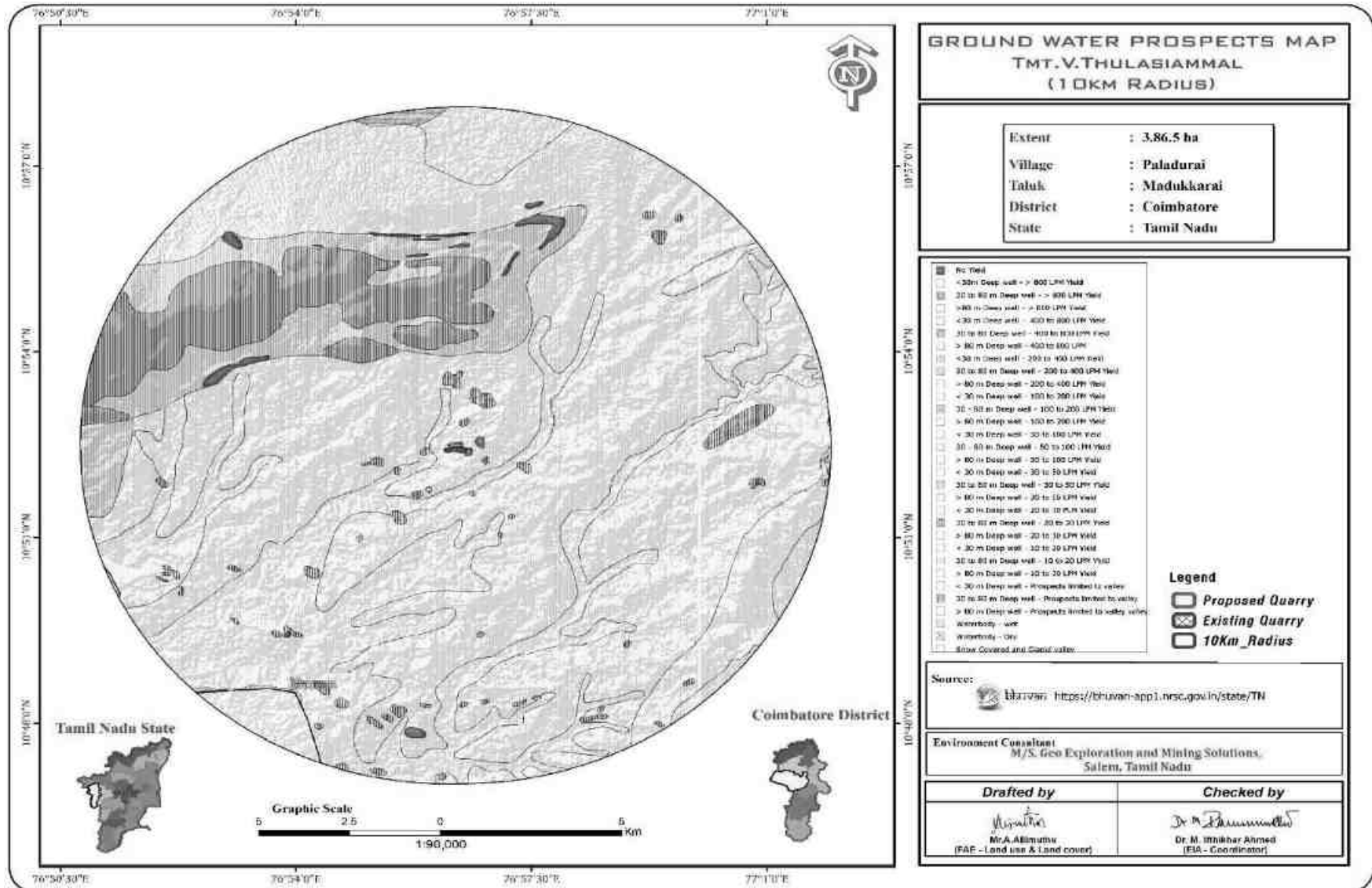
**FIGURE 3.12: BOREWELL CONTOUR MAP – MAY 2023**



**FIGURE 3.13: DRAINAGE MAP AROUND 10 KM RADIUS FROM PROJECT SITE**



**FIGURE 3.14: GROUND WATER PROSPECT MAP**



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### 3.2.5.1 Methodology and Data Acquisition

Electric Resistivity Method is well established for delineating lateral as well vertical discontinuities in the resistive structure of the Earth's subsurface. The present study makes use of vertical electric sounding (VES) to delineate the Vertical Resistivity structure at depth. Schlumberger electrode set up was employed for making sounding measurements. Since it is least influenced by lateral inhomogeneities 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 form 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 inhomogeneities that is consistent with the measured data.

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

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

$\Delta V$  = 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,

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

$\rho_r$  = Resistivity of Rocks

$\rho_w$  = Resistivity of water in pores of rock

$F$  = Formation Factor

$\emptyset$  = Fractional pore volume

$A$  = Constants with values ranging from 0.5 to 2.5

### 3.2.5.2 Survey Layout

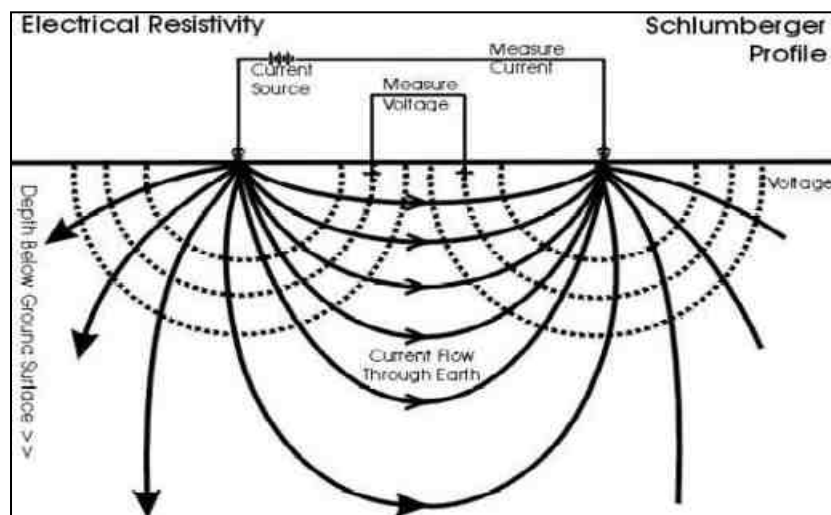
The layout for a resistivity survey depends on the choice of the current and potential electrode arrangement, which is called electrode array. Here the present study is considered with Schlumberger array. In which the distance may be used for current electrode separation while potential electrode separation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

The field equipment deployed for the study is in a deep resistivity meter with a model of SSR – MP – AT. This Signal stacking Resistivity meter is a high-quality data acquisition system incorporating several innovation features for Earth resistivity. In the presence of random earth Noises the signal to noise ratio can be enhanced by  $\sqrt{N}$  where  $N$  is the number of stacked readings. This SSR meter in which running averages of measurements  $[1, (1+2)/2, (1+2+3)/3 \dots (1+2+\dots+16/16)]$  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.

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## RESISTIVITY SURVEY PROFILE



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

### 3.2.5.3 Data Presentation

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

### 3.2.5.4 Geophysical Data Interpretation

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

## 3.3 AIR ENVIRONMENT

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

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

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

### 3.3.1 Meteorology & Climate

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

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

#### Climate –

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

- The climatic conditions in this region are characterized by a tropical climate. During the winter season, there is a significant decrease in precipitation levels within Coimbatore as compared to the summer months. Köppen and Geiger classify this climate as Aw. The average annual temperature in Coimbatore is 25.4 °C | 77.8 °F. Approximately 952 mm | 37.5 inch of rainfall occurs on a yearly basis.
- The region of Coimbatore is characterized by a temperate climate, and the summer season presents some challenges in terms of precise categorization. The most favored period for a visit is during the months of March, April, May.
- During January, the amount of precipitation is at its lowest, with only 13 mm | 0.5 inch recorded. The month of October experiences the highest amount of precipitation, with an average value of 181 mm | 7.1 inch.
- The month of maximum warmth in a year is April. The average temperature during this period reaches up to 28.9 °C | 84.1 °F, making it the hottest time of the year. The month of December is characterized by the lowest temperatures, which have an average reading of 23.2 °C | 73.7 °F.

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

#### Rainfall –

**TABLE 3.13: RAINFALL DATA**

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

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

**TABLE 3.14: METEOROLOGICAL DATA RECORDED AT SITE**

S.No	Parameters		March-2023	Apri-2023	May 2023
1	Temperature (°C)	Max	28.75	30.17	28.41
		Min	24.69	25.4	24.51
		Avg.	26.72	27.78	26.46
2	Relative Humidity (%)	Avg.	54.62	57.40	79.44
3	Wind Speed (m/s)	Max	4.63	3.62	4.09
		Min	1.13	1.27	1.5
		Avg.	2.88	2.44	2.79
4	Cloud Cover (OKTAS)		0-8	0-8	0-8
5	Wind direction		E,ENE	E,SSE	WSW,W

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

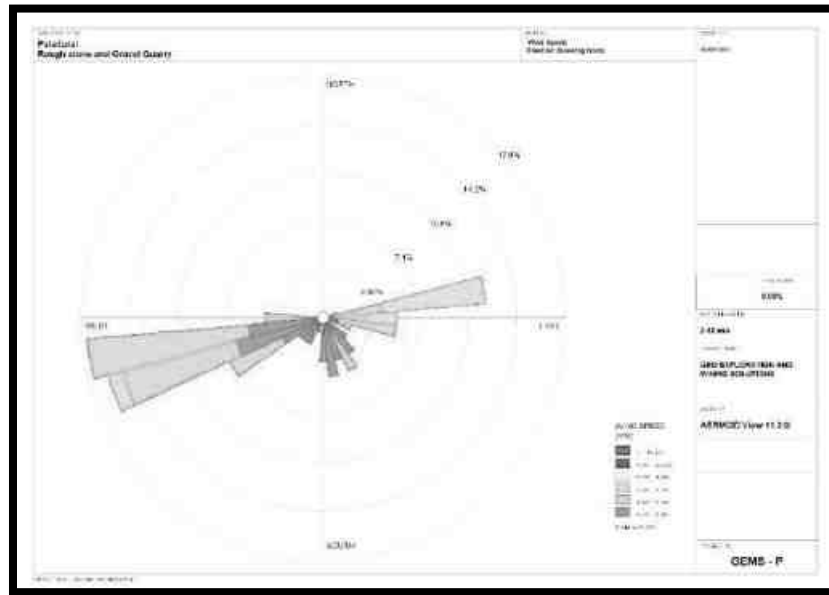
### Correlation between Secondary and Primary Data

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

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

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

**FIGURE 3.15: WINDROSE DIAGRAM**



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

1. Predominant winds were from ENE, E, SSE, WSW, W
2. Wind velocity readings were recorded between 0.50 to 5.70m/s
3. Calm conditions prevail of about 0 % of the monitoring period
4. Temperature readings ranging from 24.51 to 30.17 °C
5. Relative humidity ranging from 54.62 to 79.44 %
6. The monitoring was carried out continuously for three months.

### 3.3.2 Methodology and Objective

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

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

### 3.3.3 Sampling and Analytical Techniques

**TABLE 3.15: METHODOLOGY AND INSTRUMENT USED FOR AAQ ANALYSIS**

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

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

**TABLE 3.16: NATIONAL AMBIENT AIR QUALITY STANDARDS**

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

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

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

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

### 3.3.4 Frequency & Parameters for Sampling

Ambient air quality monitoring has been carried out with a frequency of two samples per week at eight (8) locations, adopting a continuous 24 hourly (3 shift of 8-hour) schedule for the period March2023-May2023. The baseline data of ambient air has been generated for PM<sub>10</sub>, PM<sub>2.5</sub>, Sulphur Dioxide (SO<sub>2</sub>) & Nitrogen Dioxide (NO<sub>2</sub>) Monitoring has been carried out as per the CPCB, MoEF guidelines and notifications.

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

### 3.3.5 Ambient Air Quality Monitoring Stations

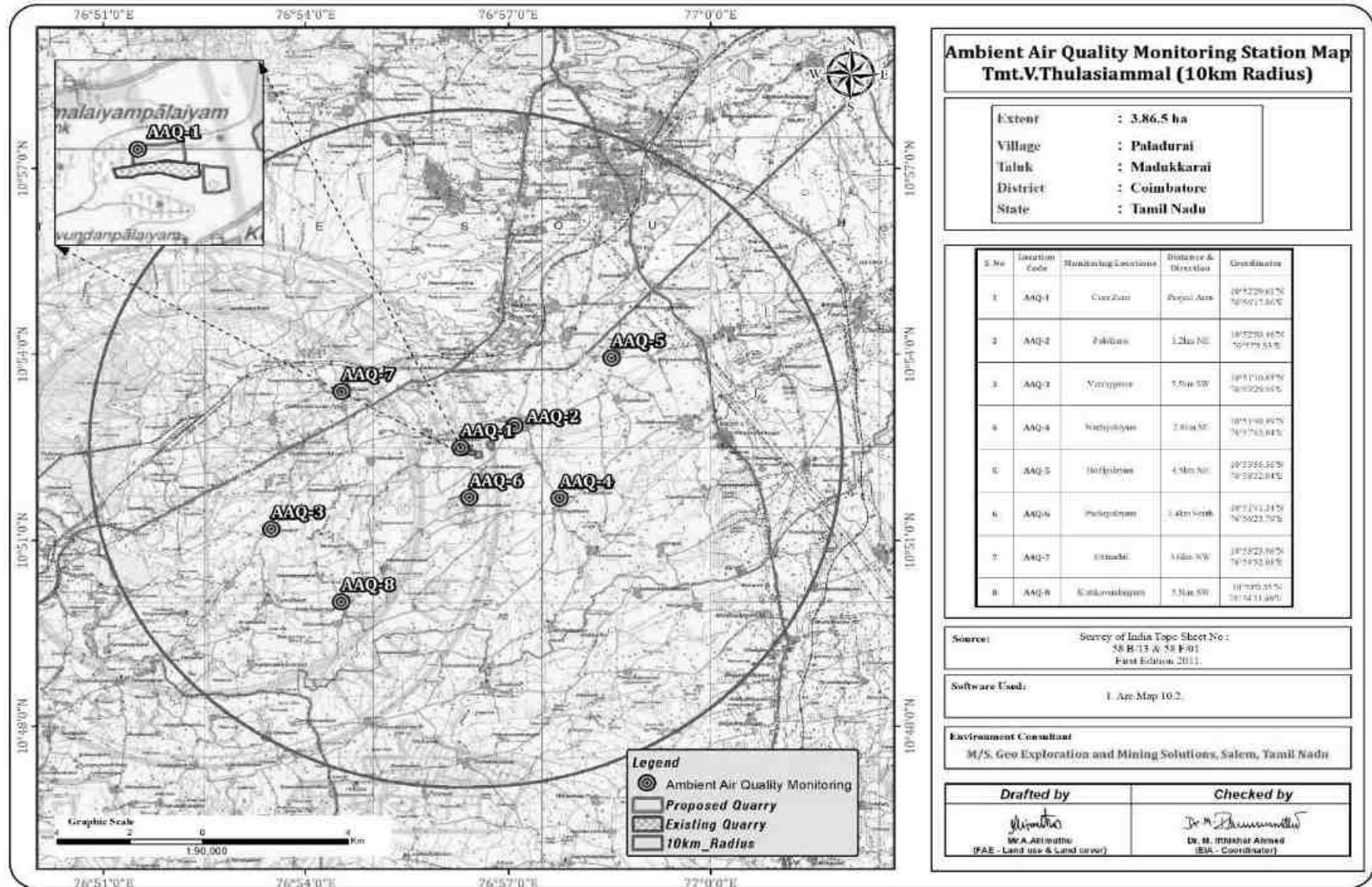
Eight (8) monitoring stations were set up in the study area as depicted in Figure 3.15 for assessment of the existing ambient air quality. Details of the sampling locations are as per given below.

**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	10°52'29.61"N 76°56'17.86"E
2	AAQ-2	Palathurai	1.2km NE	10°52'50.46"N 76°57'5.93"E
3	AAQ-3	Veerappanur	5.5km SW	10°51'10.65"N 76°53'29.55"E
4	AAQ-4	Nachipalayam	2.8km SE	10°51'40.49"N 76°57'45.94"E
5	AAQ-5	Bodipalayam	4.5km NE	10°53'56.36"N 76°58'32.04"E
6	AAQ-6	Pachapalayam	1.4km South	10°51'41.24"N 76°56'25.79"E
7	AAQ-7	Ettimadai	3.6km NW	10°53'23.96"N 76°54'32.08"E
8	AAQ-8	Kuttikavundanpatti	5.3km SW	10°50'0.35"N 76°54'31.46"E

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

FIGURE 3.16: AMBIENT AIR QUALITY LOCATIONS AROUND 10 KM RADIUS



**TABLE 3.18 AMBIENT AIR QUALITY DATA LOCATION AAQ1-:**

Period: Mar 2023 – May 2023

Location: AAQ1- Core Zone

Sampling Time: 24-hourly

Ambient Air Monitoring Details		Particulate Pollutant			Gaseous Pollutant					Metals Pollutant			Organic Pollutant	
Parameters		SPM	PM <sub>2.5</sub>	PM <sub>10</sub>	SO <sub>2</sub>	NO <sub>2</sub>	NH <sub>3</sub>	O <sub>3</sub>	CO	Pb	Ni	As	C <sub>6</sub> H <sub>6</sub>	BaP
NAAQ Norms		200	60	100	80	80	400	180	4	1	20	6	5	1
Unit		µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	mg/m <sup>3</sup>	µg/m <sup>3</sup>	ng/m <sup>3</sup>	ng/m <sup>3</sup>	µg/m <sup>3</sup>	ng/m <sup>3</sup>
Date	Period.hrs	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
02.03.2023	7:00-7:00	63.8	22.3	42.7	8.2	24.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
03.03.2023	7:15-7:15	61.5	22.7	41.9	8.4	25.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
06.03.2023	7:00-7:00	62.2	23.5	42.6	8.6	24.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07.03.2023	7:15-7:15	61.8	23.3	43.7	7.3	25.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13.03.2023	7:00-7:00	62.1	21.9	42.8	7.4	23.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.03.2023	7:15-7:15	62.4	22.6	43.6	6.2	24.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20.03.2023	7:00-7:00	62.4	20.7	41.5	6.4	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21.03.2023	7:15-7:15	61.7	22.2	42.7	6.5	25.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
27.03.2023	7:00-7:00	62.5	22.5	41.8	7.7	24.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28.03.2023	7:15-7:15	61.2	21.9	43.7	7.8	23.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
03.04.2023	7:00-7:00	62.4	20.5	42.9	5.6	22.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04.04.2023	7:15-7:15	63.9	21.8	40.4	6.4	23.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10.04.2023	7:00-7:00	62.2	21.7	41.6	8.4	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11.04.2023	7:15-7:15	62.4	21.5	42.7	8.3	23.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17.04.2023	7:00-7:00	63.6	22.7	43.9	8.2	23.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18.04.2023	7:15-7:15	61.3	21.6	41.6	6.3	24.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24.04.2023	7:00-7:00	62.8	24.7	42.4	6.7	26.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25.04.2023	7:15-7:15	63.7	20.9	40.5	6.2	22.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.04.2023	7:00-7:00	62.9	22.6	42.6	6.6	24.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01.05.2023	7:15-7:15	61.6	24.6	41.2	7.5	23.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.05.2023	7:00-7:00	63.5	21.8	43.5	7.4	24.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
09.05.2023	7:15-7:15	61.9	23.8	41.9	7.2	26.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.05.2023	7:00-7:00	62.6	21.9	42.3	6.7	23.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
16.05.2023	7:15-7:15	60.5	20.7	41.6	6.9	22.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.05.2023	7:00-7:00	62.6	22.1	42.8	6.0	24.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
30.05.2023	7:15-7:15	61.8	22.9	41.7	8.6	23.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

**Note:**BDL: Below Detection Limit ;DL: Detection Limit ; NH<sub>3</sub>: BDL (DL:20); O<sub>3</sub>: BDL (DL:20); CO: BDL (DL:1.0); Pb: BDL (DL:0.1); Ni: BDL (DL:1.0); As: BDL (DL:1.0); C<sub>6</sub>H<sub>6</sub>: 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 LOCATIO NAAQ2-:**

Period: Mar 2023 – May 2023

Location: AAQ2- Palathurai

Sampling Time: 24-hourly

Ambient Air Monitoring Details		Particulate Pollutant			Gaseous Pollutant					Metals Pollutant			Organic Pollutant	
Parameters		SPM	PM <sub>2.5</sub>	PM <sub>10</sub>	SO <sub>2</sub>	NO <sub>2</sub>	NH <sub>3</sub>	O <sub>3</sub>	CO	Pb	Ni	As	C <sub>6</sub> H <sub>6</sub>	BaP
NAAQ Norms		200	60	100	80	80	400	180	4	1	20	6	5	1
Unit		µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	mg/m <sup>3</sup>	µg/m <sup>3</sup>	ng/m <sup>3</sup>	ng/m <sup>3</sup>	µg/m <sup>3</sup>	ng/m <sup>3</sup>
Date	Period.hrs	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
02.03.2023	7:00-7:00	60.4	20.1	40.1	6.3	23.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
03.03.2023	7:15-7:15	60.1	21.9	42.1	6.9	24.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
06.03.2023	7:00-7:00	61.2	22.1	42.3	7.2	26.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07.03.2023	7:15-7:15	62.4	23.4	43.5	7.6	25.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13.03.2023	7:00-7:00	63.5	21.0	40.1	7.0	23.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.03.2023	7:15-7:15	62.7	22.4	42.5	6.8	24.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20.03.2023	7:00-7:00	63.8	23.4	43.5	5.6	25.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21.03.2023	7:15-7:15	62.4	21.5	44.5	5.4	23.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
27.03.2023	7:00-7:00	63.5	20.9	42.9	6.2	22.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28.03.2023	7:15-7:15	61.7	21.7	41.7	6.9	23.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
03.04.2023	7:00-7:00	60.2	23.4	40.6	7.3	24.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04.04.2023	7:15-7:15	62.6	24.8	42.5	8.2	26.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10.04.2023	7:00-7:00	63.8	23.6	40.8	8.1	24.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11.04.2023	7:15-7:15	62.1	24.1	42.1	8.9	26.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17.04.2023	7:00-7:00	63.4	22.5	43.5	7.2	24.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18.04.2023	7:15-7:15	60.9	23.4	42.6	6.8	24.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24.04.2023	7:00-7:00	61.8	21.6	41.8	8.2	22.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25.04.2023	7:15-7:15	62.7	22.7	42.9	8.6	22.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.04.2023	7:00-7:00	63.4	20.1	40.7	7.9	25.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01.05.2023	7:15-7:15	60.2	23.6	41.5	7.1	26.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.05.2023	7:00-7:00	61.4	24.7	42.6	6.5	25.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
09.05.2023	7:15-7:15	62.6	21.8	43.8	6.9	23.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.05.2023	7:00-7:00	62.4	21.5	44.5	7.0	22.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
16.05.2023	7:15-7:15	61.8	22.5	43.6	6.6	24.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.05.2023	7:00-7:00	63.7	24.6	42.0	5.9	26.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
30.05.2023	7:15-7:15	60.8	25.6	41.8	6.3	26.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

**Note:** BDL: Below Detection Limit ;DL: Detection Limit ; NH<sub>3</sub>: BDL (DL:20); O<sub>3</sub>: BDL (DL:20); CO: BDL (DL:1.0); Pb: BDL (DL:0.1); Ni: BDL (DL:1.0); As: BDL (DL:1.0); C<sub>6</sub>H<sub>6</sub>: 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-:**

Period: Mar 2023 – May 2023

Location : AAQ3- Veerappanur

Sampling Time: 24-hourly

Ambient Air Monitoring Details		Particulate Pollutant			Gaseous Pollutant					Metals Pollutant			Organic Pollutant	
Parameters		SPM	PM <sub>2.5</sub>	PM <sub>10</sub>	SO <sub>2</sub>	NO <sub>2</sub>	NH <sub>3</sub>	O <sub>3</sub>	CO	Pb	Ni	As	C <sub>6</sub> H <sub>6</sub>	BaP
NAAQ Norms		200	60	100	80	80	400	180	4	1	20	6	5	1
Unit		µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	mg/m <sup>3</sup>	µg/m <sup>3</sup>	ng/m <sup>3</sup>	ng/m <sup>3</sup>	µg/m <sup>3</sup>	ng/m <sup>3</sup>
Date	Period.hrs	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
02.03.2023	7:00-7:00	64.2	21.7	43.2	5.6	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
03.03.2023	7:15-7:15	63.3	23.4	41.9	5.8	20.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
06.03.2023	7:00-7:00	63.9	21.5	42.8	8.3	21.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07.03.2023	7:15-7:15	62.8	20.9	40.6	7.6	21.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13.03.2023	7:00-7:00	61.4	22.5	43.7	8.3	22.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.03.2023	7:15-7:15	63.8	22.9	41.2	7.6	22.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20.03.2023	7:00-7:00	62.5	23.7	43.6	6.6	24.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21.03.2023	7:15-7:15	64.2	21.4	42.4	6.8	23.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
27.03.2023	7:00-7:00	63.3	23.6	40.5	6.9	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28.03.2023	7:15-7:15	64.4	22.5	42.4	6.1	21.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
03.04.2023	7:00-7:00	62.3	21.7	41.9	7.3	23.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04.04.2023	7:15-7:15	65.5	21.4	43.4	7.5	20.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10.04.2023	7:00-7:00	61.1	23.6	41.7	7.2	21.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11.04.2023	7:15-7:15	62.3	22.5	41.2	5.6	21.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17.04.2023	7:00-7:00	64.3	21.7	42.6	5.8	22.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18.04.2023	7:15-7:15	64.7	23.9	43.8	6.6	22.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24.04.2023	7:00-7:00	62.4	22.5	42.5	6.4	21.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25.04.2023	7:15-7:15	59.3	23.6	40.7	5.7	20.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.04.2023	7:00-7:00	65.7	22.5	41.5	5.9	22.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01.05.2023	7:15-7:15	64.4	24.4	43.8	6.6	21.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.05.2023	7:00-7:00	62.3	23.7	41.2	6.8	22.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
09.05.2023	7:15-7:15	63.8	23.5	43.9	6.1	23.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.05.2023	7:00-7:00	62.4	24.3	40.4	6.5	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
16.05.2023	7:15-7:15	67.3	23.6	41.6	6.2	21.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.05.2023	7:00-7:00	60.2	24.5	39.9	6.7	23.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
30.05.2023	7:15-7:15	65.3	23.1	40.5	6.5	22.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

**Note:** BDL: Below Detection Limit ;DL: Detection Limit ; NH<sub>3</sub>: BDL (DL:20); O<sub>3</sub>: BDL (DL:20); CO: BDL (DL:1.0); Pb: BDL (DL:0.1); Ni: BDL (DL:1.0); As: BDL (DL:1.0); C<sub>6</sub>H<sub>6</sub>: 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 LOCATIO NAAQ4-**

Period: Mar 2023 – May 2023

Location: AAQ4 – Nachipalayam

Sampling Time: 24-hourly

Ambient Air Monitoring Details		Particulate Pollutant			Gaseous Pollutant					Metals Pollutant			Organic Pollutant	
Parameters		SPM	PM <sub>2.5</sub>	PM <sub>10</sub>	SO <sub>2</sub>	NO <sub>2</sub>	NH <sub>3</sub>	O <sub>3</sub>	CO	Pb	Ni	As	C <sub>6</sub> H <sub>6</sub>	BaP
NAAQ Norms		200	60	100	80	80	400	180	4	1	20	6	5	1
Unit		µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	mg/m <sup>3</sup>	µg/m <sup>3</sup>	ng/m <sup>3</sup>	ng/m <sup>3</sup>	µg/m <sup>3</sup>	ng/m <sup>3</sup>
Date	Period.hrs	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
02.03.2023	7:00-7:00	64.3	21.7	40.2	4.9	22.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
03.03.2023	7:15-7:15	62.4	22.3	41.4	5.2	23.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
06.03.2023	7:00-7:00	61.8	19.9	42.3	4.7	20.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07.03.2023	7:15-7:15	63.8	20.3	43.2	5.6	22.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13.03.2023	7:00-7:00	62.9	21.9	41.9	5.6	23.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.03.2023	7:15-7:15	63.6	20.3	42.5	6.2	22.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20.03.2023	7:00-7:00	61.4	22.7	44.5	6.9	23.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21.03.2023	7:15-7:15	62.5	23.5	42.3	7.2	24.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
27.03.2023	7:00-7:00	62.2	22.6	40.1	7.8	25.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28.03.2023	7:15-7:15	62.6	23.4	41.9	6.4	24.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
03.04.2023	7:00-7:00	63.7	21.3	43.2	6.8	22.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04.04.2023	7:15-7:15	65.8	23.9	41.4	7.3	24.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10.04.2023	7:00-7:00	64.2	22.4	42.6	7.4	23.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11.04.2023	7:15-7:15	63.7	23.3	42.8	8.0	24.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17.04.2023	7:00-7:00	62.4	21.8	45.6	7.7	24.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18.04.2023	7:15-7:15	62.8	19.3	43.3	8.2	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24.04.2023	7:00-7:00	62.9	20.4	43.5	7.9	22.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25.04.2023	7:15-7:15	62.6	21.5	41.8	6.5	23.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.04.2023	7:00-7:00	64.6	18.6	42.7	6.8	20.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01.05.2023	7:15-7:15	63.7	20.5	43.4	7.6	22.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.05.2023	7:00-7:00	62.9	21.4	42.9	7.9	23.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
09.05.2023	7:15-7:15	63.7	21.6	42.6	6.4	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.05.2023	7:00-7:00	64.3	22.4	42.7	6.1	24.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
16.05.2023	7:15-7:15	62.4	20.9	43.8	7.2	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.05.2023	7:00-7:00	61.5	19.2	41.4	7.5	20.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
30.05.2023	7:15-7:15	60.6	21.4	41.6	8.2	23.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

**Note:** BDL: Below Detection Limit ;DL: Detection Limit ; NH<sub>3</sub>: BDL (DL:20); O<sub>3</sub>: BDL (DL:20); CO: BDL (DL:1.0); Pb: BDL (DL:0.1); Ni: BDL (DL:1.0); As: BDL (DL:1.0); C<sub>6</sub>H<sub>6</sub>: 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 LOCATIO NAAQ5-:**

Period: Mar 2023 – May 2023

Location: AAQ5- Bodipalayam

Sampling Time: 24-hourly

Ambient Air Monitoring Details		Particulate Pollutant			Gaseous Pollutant					Metals Pollutant			Organic Pollutant	
Parameters		SPM	PM <sub>2.5</sub>	PM <sub>10</sub>	SO <sub>2</sub>	NO <sub>2</sub>	NH <sub>3</sub>	O <sub>3</sub>	CO	Pb	Ni	As	C <sub>6</sub> H <sub>6</sub>	BaP
NAAQ Norms		200	60	100	80	80	400	180	4	1	20	6	5	1
Unit		µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	mg/m <sup>3</sup>	µg/m <sup>3</sup>	ng/m <sup>3</sup>	ng/m <sup>3</sup>	µg/m <sup>3</sup>	ng/m <sup>3</sup>
Date	Period.hrs	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
02.03.2023	7:00-7:00	62.1	21.2	40.2	6.5	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
03.03.2023	7:15-7:15	62.8	21.9	40.9	5.	22.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
06.03.2023	7:00-7:00	63.4	22.3	41.2	7.5	23.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07.03.2023	7:15-7:15	63.6	22.7	40.9	6.3	23.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13.03.2023	7:00-7:00	61.0	23.4	42.1	7.1	24.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.03.2023	7:15-7:15	61.5	23.6	42.4	5.5	24.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20.03.2023	7:00-7:00	62.4	21.0	42.1	6.3	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21.03.2023	7:15-7:15	62.9	21.3	42.3	6.8	22.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
27.03.2023	7:00-7:00	63.8	22.4	40.5	5.3	23.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28.03.2023	7:15-7:15	63.2	22.6	40.7	5.7	23.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
03.04.2023	7:00-7:00	62.3	23.7	41.5	7.2	24.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04.04.2023	7:15-7:15	62.6	23.2	41.9	7.5	24.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10.04.2023	7:00-7:00	63.7	22.6	42.1	5.6	23.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11.04.2023	7:15-7:15	63.0	22.4	42.5	6.4	23.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17.04.2023	7:00-7:00	63.9	23.9	43.7	5.8	25.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18.04.2023	7:15-7:15	63.2	23.4	43.3	6.7	24.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24.04.2023	7:00-7:00	62.5	22.1	40.5	5.6	23.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25.04.2023	7:15-7:15	62.3	22.6	40.9	6.4	23.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.04.2023	7:00-7:00	61.8	20.1	41.5	6.7	22.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01.05.2023	7:15-7:15	61.4	20.9	41.8	7.8	21.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.05.2023	7:00-7:00	62.5	21.3	42.6	5.4	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
09.05.2023	7:15-7:15	62.8	21.4	42.4	6.5	22.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.05.2023	7:00-7:00	63.7	22.3	41.0	6.7	23.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
16.05.2023	7:15-7:15	63.4	22.6	41.3	5.8	24.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.05.2023	7:00-7:00	62.9	23.1	40.5	6.6	25.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
30.05.2023	7:15-7:15	63.8	22.4	40.3	6.3	24.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

**Note:** BDL: Below Detection Limit ;DL: Detection Limit ; NH<sub>3</sub>: BDL (DL:20); O<sub>3</sub>: BDL (DL:20); CO: BDL (DL:1.0); Pb: BDL (DL:0.1); Ni: BDL (DL:1.0); As: BDL (DL:1.0); C<sub>6</sub>H<sub>6</sub>: 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 LOCATIO NAAQ6-:**

Period: Mar 2023 – May 2023

Location: AAQ6 – Pachapalayam

Sampling Time: 24-hourly

Ambient Air Monitoring Details		Particulate Pollutant			Gaseous Pollutant					Metals Pollutant			Organic Pollutant	
Parameters		SPM	PM <sub>2.5</sub>	PM <sub>10</sub>	SO <sub>2</sub>	NO <sub>2</sub>	NH <sub>3</sub>	O <sub>3</sub>	CO	Pb	Ni	As	C <sub>6</sub> H <sub>6</sub>	BaP
NAAQ Norms		200	60	100	80	80	400	180	4	1	20	6	5	1
Unit		µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	mg/m <sup>3</sup>	µg/m <sup>3</sup>	ng/m <sup>3</sup>	ng/m <sup>3</sup>	µg/m <sup>3</sup>	ng/m <sup>3</sup>
Date	Period.hrs	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
02.03.2023	7:00-7:00	66.3	22.8	41.4	7.2	23.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
03.03.2023	7:15-7:15	65.1	21.9	43.2	6.4	24.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
06.03.2023	7:00-7:00	64.4	20.5	41.9	6.6	23.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07.03.2023	7:15-7:15	63.7	23.1	43.5	7.5	21.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13.03.2023	7:00-7:00	65.8	22.9	41.7	6.8	22.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.03.2023	7:15-7:15	64.9	22.4	42.4	8.9	24.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20.03.2023	7:00-7:00	63.7	20.6	43.6	7.5	22.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21.03.2023	7:15-7:15	64.7	21.9	41.7	6.9	23.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
27.03.2023	7:00-7:00	63.8	23.5	42.3	6.4	22.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28.03.2023	7:15-7:15	62.5	21.9	44.4	5.2	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
03.04.2023	7:00-7:00	64.8	21.4	45.5	7.3	23.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04.04.2023	7:15-7:15	65.1	22.5	42.5	7.4	21.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10.04.2023	7:00-7:00	65.9	23.8	43.8	7.2	23.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11.04.2023	7:15-7:15	66.2	21.1	44.2	5.9	23.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17.04.2023	7:00-7:00	65.2	22.4	41.9	6.3	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18.04.2023	7:15-7:15	63.8	22.5	44.3	8.9	22.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24.04.2023	7:00-7:00	62.7	22.4	45.8	7.4	23.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25.04.2023	7:15-7:15	63.4	23.5	44.2	6.2	24.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.04.2023	7:00-7:00	64.8	20.3	43.2	7.1	25.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01.05.2023	7:15-7:15	65.3	21.5	44.3	6.3	24.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.05.2023	7:00-7:00	64.8	23.5	44.0	7.3	23.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
09.05.2023	7:15-7:15	63.5	22.1	45.2	6.8	25.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.05.2023	7:00-7:00	62.6	23.1	45.5	7.0	24.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
16.05.2023	7:15-7:15	61.7	20.1	45.3	6.2	23.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.05.2023	7:00-7:00	63.8	22.3	44.2	7.3	25.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
30.05.2023	7:15-7:15	62.5	22.4	44.8	6.4	24.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

**Note:** BDL: Below Detection Limit ;DL: Detection Limit ; NH<sub>3</sub>: BDL (DL:20); O<sub>3</sub>: BDL (DL:20); CO: BDL (DL:1.0); Pb: BDL (DL:0.1); Ni: BDL (DL:1.0); As: BDL (DL:1.0); C<sub>6</sub>H<sub>6</sub>: 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 LOCATIO NAAQ7-:**

Period: Mar 2023 – May 2023

Location: AAQ7 – Ettimadai

Sampling Time: 24-hourly

Ambient Air Monitoring Details		Particulate Pollutant			Gaseous Pollutant					Metals Pollutant			Organic Pollutant	
Parameters		SPM	PM <sub>2.5</sub>	PM <sub>10</sub>	SO <sub>2</sub>	NO <sub>2</sub>	NH <sub>3</sub>	O <sub>3</sub>	CO	Pb	Ni	As	C <sub>6</sub> H <sub>6</sub>	BaP
NAAQ Norms		200	60	100	80	80	400	180	4	1	20	6	5	1
Unit		µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	mg/m <sup>3</sup>	µg/m <sup>3</sup>	ng/m <sup>3</sup>	ng/m <sup>3</sup>	µg/m <sup>3</sup>	ng/m <sup>3</sup>
Date	Period.hrs	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
02.03.2023	7:00-7:00	64.2	22.5	44.5	6.2	19.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
03.03.2023	7:15-7:15	63.2	21.2	45.3	7.2	20.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
06.03.2023	7:00-7:00	65.3	23.5	46.1	6.3	22.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07.03.2023	7:15-7:15	66.1	21.4	45.0	7.4	20.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13.03.2023	7:00-7:00	62.1	22.0	44.2	8.0	21.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.03.2023	7:15-7:15	63.2	21.3	46.3	6.0	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20.03.2023	7:00-7:00	64.5	22.4	46.0	7.2	18.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21.03.2023	7:15-7:15	65.2	21.0	44.2	8.3	20.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
27.03.2023	7:00-7:00	66.0	22.4	45.3	6.2	19.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28.03.2023	7:15-7:15	64.3	20.3	46.1	8.3	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
03.04.2023	7:00-7:00	66.2	22.1	44.8	7.1	21.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04.04.2023	7:15-7:15	63.4	21.0	45.2	8.2	23.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10.04.2023	7:00-7:00	64.5	22.4	46.3	6.5	22.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11.04.2023	7:15-7:15	65.2	20.3	44.1	8.3	18.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17.04.2023	7:00-7:00	65.1	22.6	46.0	7.0	19.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18.04.2023	7:15-7:15	65.7	21.3	44.0	7.3	22.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24.04.2023	7:00-7:00	64.2	20.5	45.2	6.4	23.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25.04.2023	7:15-7:15	63.3	21.6	46.8	6.8	20.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.04.2023	7:00-7:00	65.5	22.3	45.2	6.1	21.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01.05.2023	7:15-7:15	65.7	23.5	44.2	5.8	23.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.05.2023	7:00-7:00	64.6	22.0	46.3	5.3	24.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
09.05.2023	7:15-7:15	65.7	23.5	44.0	5.7	21.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.05.2023	7:00-7:00	64.9	23.8	46.2	5.6	20.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
16.05.2023	7:15-7:15	64.2	21.2	45.5	6.8	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.05.2023	7:00-7:00	65.8	23.0	46.3	6.1	22.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
30.05.2023	7:15-7:15	64.1	23.4	45.2	6.7	21.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

**Note:** BDL: Below Detection Limit ;DL: Detection Limit ; NH<sub>3</sub>: BDL (DL:20); O<sub>3</sub>: BDL (DL:20); CO: BDL (DL:1.0); Pb: BDL (DL:0.1); Ni: BDL (DL:1.0); As: BDL (DL:1.0); C<sub>6</sub>H<sub>6</sub>: 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 LOCATIO NAAQ8**

Period: Mar 2023 – May 2023

Location: AAQ8 – Kuttikavundanpatti

Sampling Time: 24-hourly

Ambient Air Monitoring Details		Particulate Pollutant			Gaseous Pollutant					Metals Pollutant			Organic Pollutant	
Parameters		SPM	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>2</sub>	NO <sub>2</sub>	NH <sub>3</sub>	O <sub>3</sub>	CO	Pb	Ni	As	C <sub>6</sub> H <sub>6</sub>	BaP
NAAQ Norms		200	100	60	80	80	400	180	4	1	20	6	5	1
Unit		µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	mg/m <sup>3</sup>	µg/m <sup>3</sup>	ng/m <sup>3</sup>	ng/m <sup>3</sup>	µg/m <sup>3</sup>	ng/m <sup>3</sup>
Date	Period.hrs	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
02.03.2023	7:00-7:00	63.2	42.3	20.3	5.5	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
03.03.2023	7:15-7:15	62.1	43.2	19.1	6.3	21.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
06.03.2023	7:00-7:00	64.3	44.1	20.0	7.2	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07.03.2023	7:15-7:15	62.3	44.3	20.5	8.0	23.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13.03.2023	7:00-7:00	60.1	45.2	22.5	6.2	24.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.03.2023	7:15-7:15	63.5	43.5	22.6	7.4	23.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20.03.2023	7:00-7:00	65.5	41.2	19.8	6.0	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21.03.2023	7:15-7:15	63.2	43.0	20.2	8.2	21.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
27.03.2023	7:00-7:00	62.0	44.7	21.3	6.6	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28.03.2023	7:15-7:15	61.3	41.4	22.0	7.2	23.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
03.04.2023	7:00-7:00	63.4	48.1	21.7	8.2	22.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04.04.2023	7:15-7:15	64.0	49.3	22.1	7.6	23.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10.04.2023	7:00-7:00	65.0	46.0	20.5	5.3	21.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11.04.2023	7:15-7:15	64.2	47.2	21.3	8.5	23.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17.04.2023	7:00-7:00	65.3	48.3	20.1	7.1	22.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18.04.2023	7:15-7:15	62.1	46.0	21.3	8.6	23.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24.04.2023	7:00-7:00	63.0	47.3	20.2	7.3	22.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25.04.2023	7:15-7:15	64.5	48.2	22.2	6.5	24.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.04.2023	7:00-7:00	65.2	49.3	22.7	8.3	24.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01.05.2023	7:15-7:15	64.3	46.2	23.1	7.2	25.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.05.2023	7:00-7:00	61.2	47.2	24.3	6.3	26.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
09.05.2023	7:15-7:15	62.0	48.0	25.2	7.4	26.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.05.2023	7:00-7:00	63.1	49.3	24.5	6.8	25.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
16.05.2023	7:15-7:15	64.5	47.2	25.3	7.2	26.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.05.2023	7:00-7:00	63.4	48.3	24.1	8.3	25.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
30.05.2023	7:15-7:15	61.2	49.1	25.5	6.4	26.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

**Note:** BDL: Below Detection Limit ;DL: Detection Limit ; NH<sub>3</sub>: BDL (DL:20); O<sub>3</sub>: BDL (DL:20); CO: BDL (DL:1.0); Pb: BDL (DL:0.1); Ni: BDL (DL:1.0); As: BDL (DL:1.0); C<sub>6</sub>H<sub>6</sub>: 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 1 to AAQ – 8**

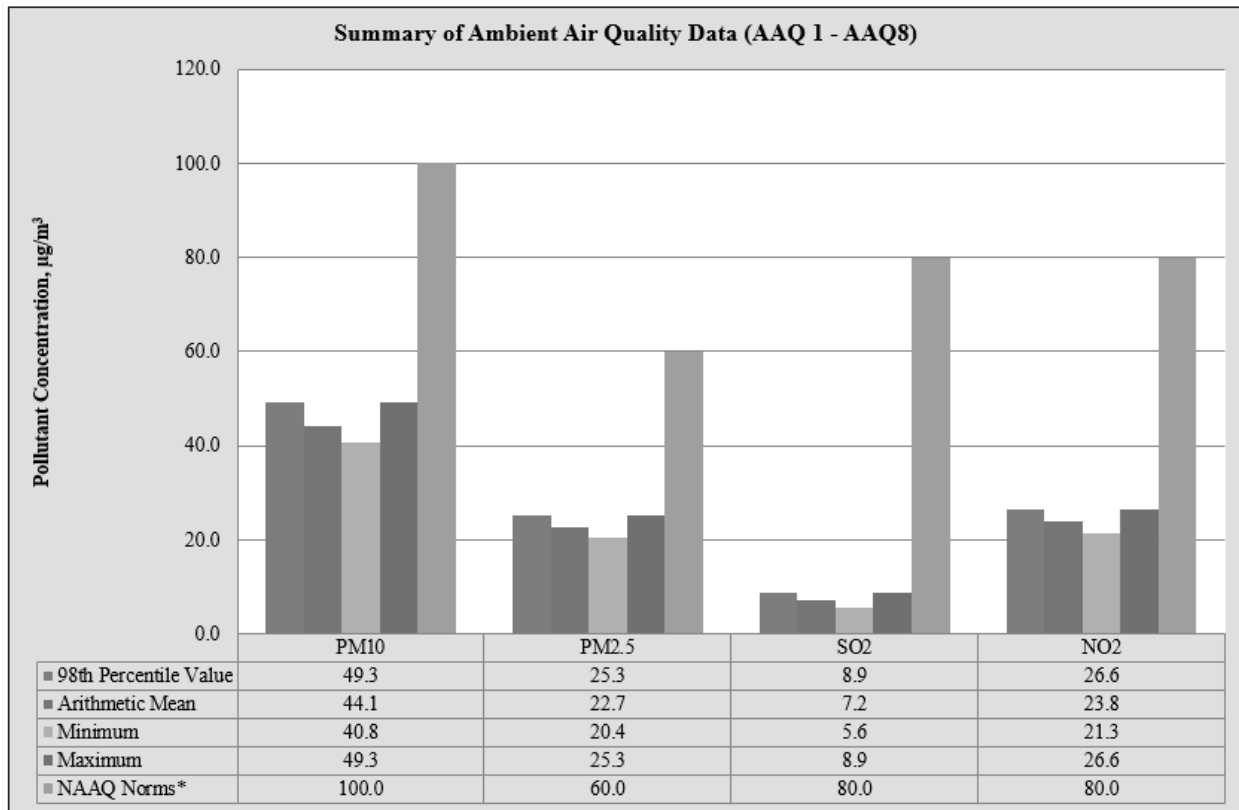
<b>PM10</b>	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8
Arithmetic Mean	42.3	42.3	42.0	42.5	41.6	41.6	45.3	46.1
Minimum	40.4	40.1	39.9	40.1	40.2	41.4	44.0	41.2
Maximum	43.9	44.5	43.9	45.6	43.7	45.8	46.8	49.3
<b>NAAQ Norms</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
<b>PM2.5</b>	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8
Arithmetic Mean	22.3	22.7	22.9	21.5	41.6	43.6	22.0	22.0
Minimum	20.5	20.1	20.9	18.6	20.1	20.1	20.3	19.1
Maximum	24.7	25.6	24.5	23.9	23.9	23.8	23.8	25.5
<b>NAAQ Norms</b>	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0
<b>SO<sub>2</sub></b>	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8
Arithmetic Mean	7.2	7.1	6.7	6.8	6.3	6.9	6.8	7.1
Minimum	5.6	5.4	5.6	4.7	5.0	5.2	5.3	5.3
Maximum	8.6	8.9	8.3	8.2	7.8	8.9	8.3	8.6
<b>NAAQ Norms</b>	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0
<b>NO<sub>2</sub></b>	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8
Arithmetic Mean	24.0	24.6	22.0	23.0	23.6	23.5	21.4	23.7
Minimum	22.3	22.1	20.2	20.3	21.4	21.4	18.2	21.0
Maximum	26.3	26.8	24.9	25.3	25.6	25.3	24.4	26.6
<b>NAAQ Norms</b>	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	<b>Parameter</b>	<b>PM10</b>	<b>PM2.5</b>	<b>SO<sub>2</sub></b>	<b>NO<sub>2</sub></b>
2	No. of Observations	260	260	260	260
3	10 <sup>th</sup> Percentile Value	40.8	20.4	5.6	21.3
4	20 <sup>th</sup> Percentile Value	41.5	21.2	6.2	22.1
5	30 <sup>th</sup> Percentile Value	41.9	21.5	6.4	22.4
6	40 <sup>th</sup> Percentile Value	42.4	21.9	6.6	22.7
7	50 <sup>th</sup> Percentile Value	42.8	22.3	6.8	23.2
8	60 <sup>th</sup> Percentile Value	43.5	22.5	7.1	23.6
9	70 <sup>th</sup> Percentile Value	44.0	22.8	7.3	24.1
10	80 <sup>th</sup> Percentile Value	45.2	23.5	7.6	24.5
11	90 <sup>th</sup> Percentile Value	46.2	23.9	8.2	25.3

12	95 <sup>th</sup> Percentile Value	47.9	24.6	8.3	26.2
13	98 <sup>th</sup> Percentile Value	49.3	25.3	8.9	26.6
14	Arithmetic Mean	44.1	22.7	7.2	23.8
15	Geometric Mean	44.1	22.7	7.1	23.8
16	Standard Deviation	2.7	1.5	1.0	1.7
17	Minimum	40.8	20.4	5.6	21.3
18	Maximum	49.3	25.3	8.9	26.6
19	<b>NAAQ Norms*</b>	<b>100.0</b>	<b>60.0</b>	<b>80.0</b>	<b>80.0</b>
	% Values exceeding Norms*	0.0	0.0	0.0	0.0

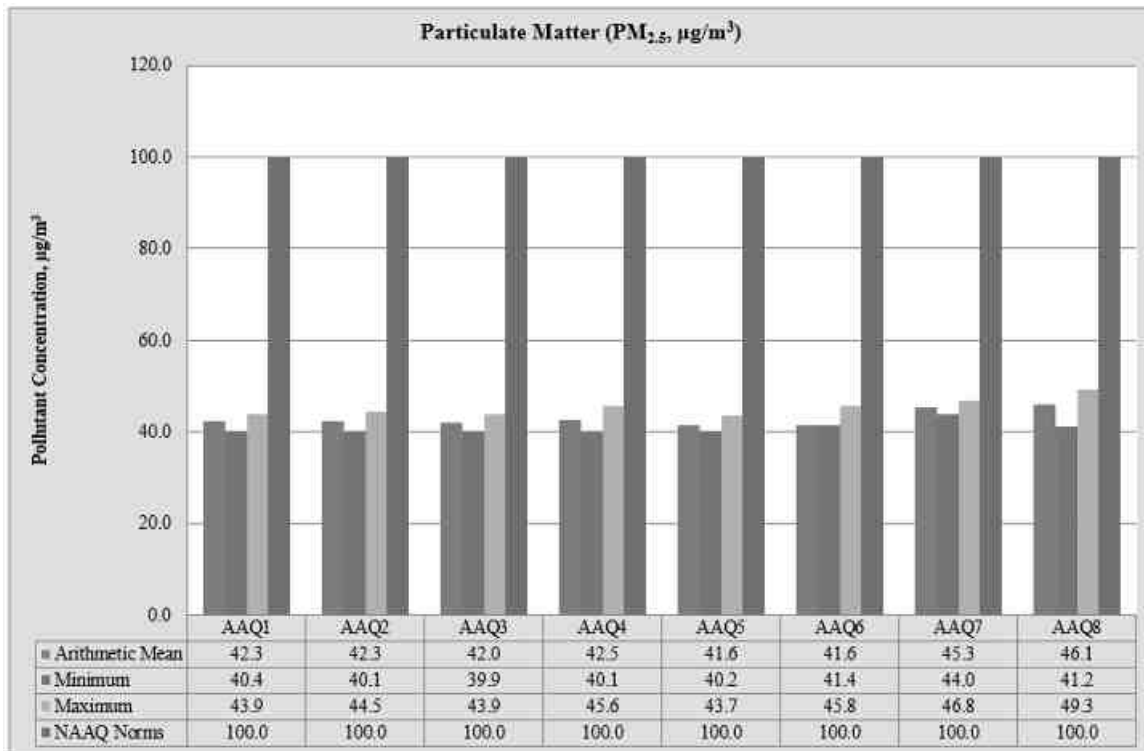
**FIGURE 3.17: BAR DIAGRAM OF SUMMARY OF AAQ 1 – AAQ8**



Source: Table 3.17 to 3.27

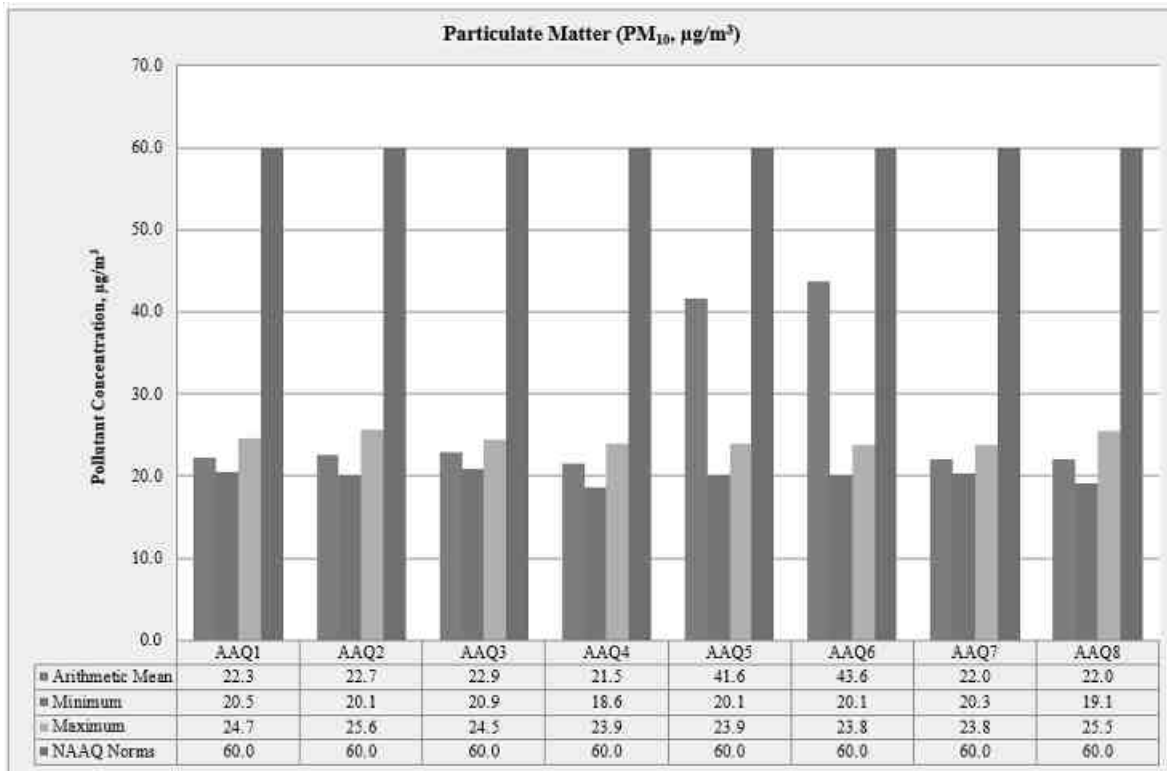


**FIGURE 3.18: BAR DIAGRAM OF PARTICULATE MATTER PM<sub>2.5</sub>**



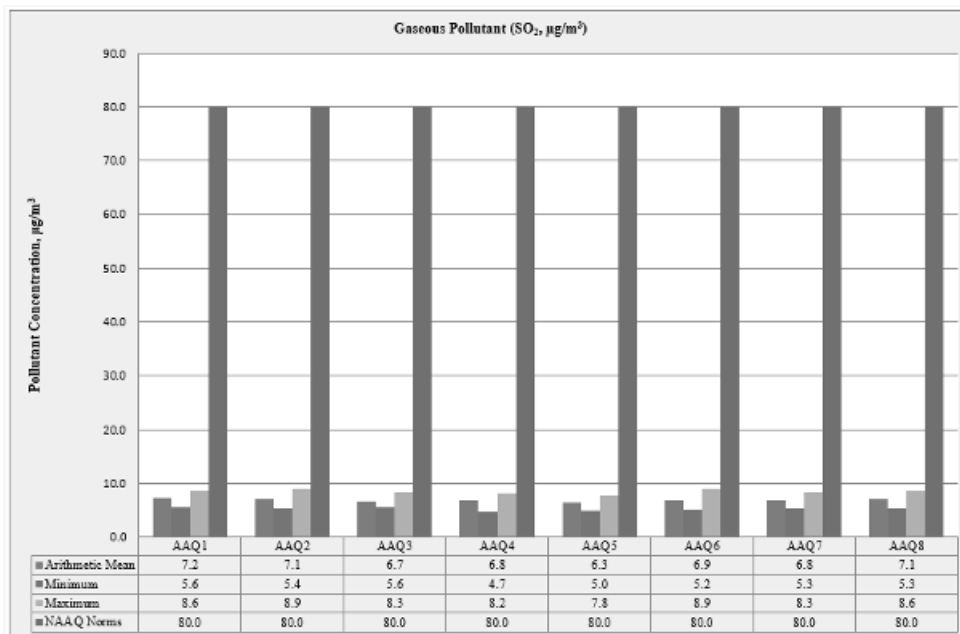
Source: Table 3.17 to 3.27

**FIGURE 3.19: BAR DIAGRAM OF PARTICULATE MATTER PM<sub>10</sub>**



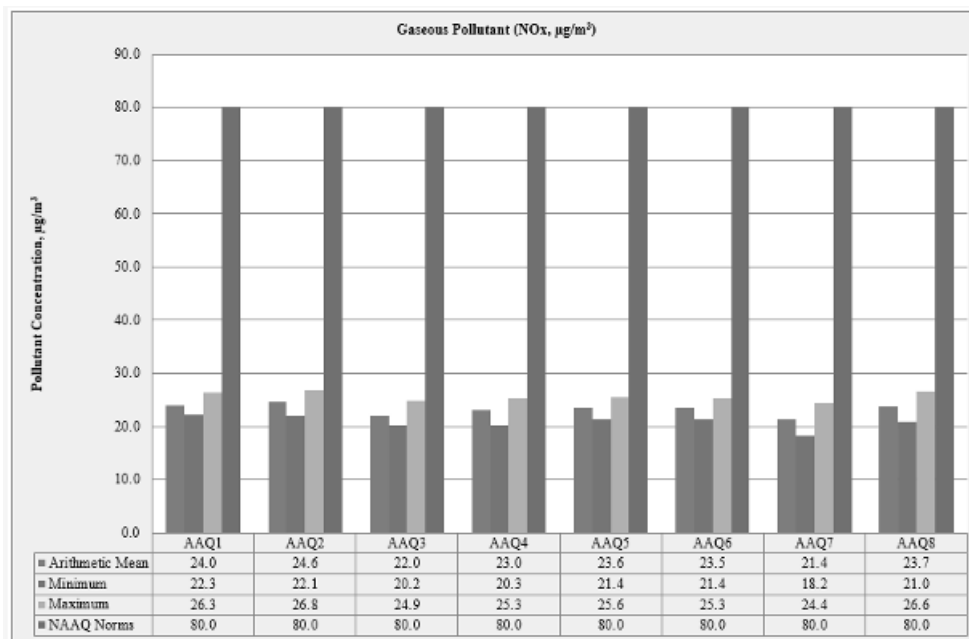
Source: Table 3.17 to 3.27

**FIGURE 3.20: BAR DIAGRAM OF GASEOUS POLLUTANT SO<sub>2</sub>**



Source: Table 3.17 to 3.27

**FIGURE 3.21: BAR DIAGRAM OF GASEOUS POLLUTANT NO<sub>x</sub>**



Source: Table 3.17 to 3.27

### 3.3.6 Interpretations & Conclusion

As per monitoring data, PM<sub>10</sub> ranges from 39.9 µg/m<sup>3</sup> to 49.3 µg/m<sup>3</sup>, PM<sub>2.5</sub> data ranges from 18.6 µg/m<sup>3</sup> to 25.6 µg/m<sup>3</sup>, SO<sub>2</sub> ranges from 4.7µg/m<sup>3</sup> to 8.9 µg/m<sup>3</sup> and NO<sub>2</sub> data ranges from 18.2 µg/m<sup>3</sup> to 26.8 µg/m<sup>3</sup>. The concentration levels of the above criteria pollutants were observed to be well within the limits of NAAQS prescribed by CPCB.

### 3.3.7 FUGITIVE DUST EMISSION –

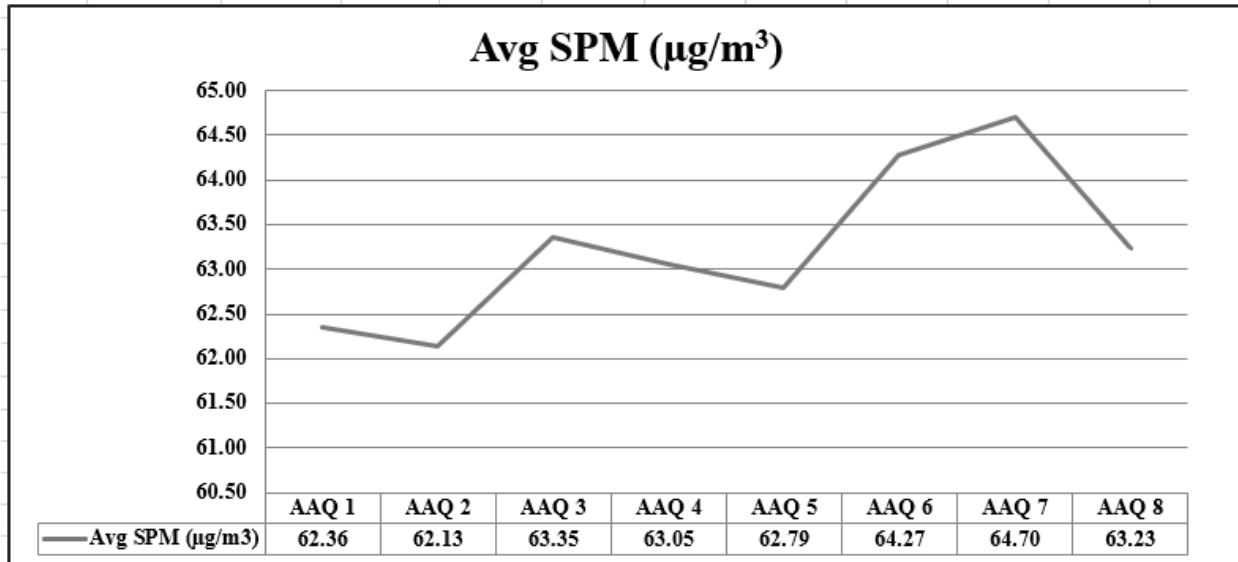
Fugitive dust was recorded at 8AAQ monitoring stations for 30 days average during the study period.

**TABLE 3.28: AVERAGE FUGITIVE DUST SAMPLE VALUES**

AAQ Locations	Avg SPM ( $\mu\text{g}/\text{m}^3$ )
AAQ 1	62.36
AAQ 2	62.13
AAQ 3	63.35
AAQ 4	63.05
AAQ 5	62.79
AAQ 6	64.27
AAQ7	64.70
AAQ 8	63.23

Source: Onsite monitoring/ sampling by Chennai Mettlex Lab Private Limited

**FIGURE 3.22: LINE DIAGRAM OF AVERAGE SPM VALUES**

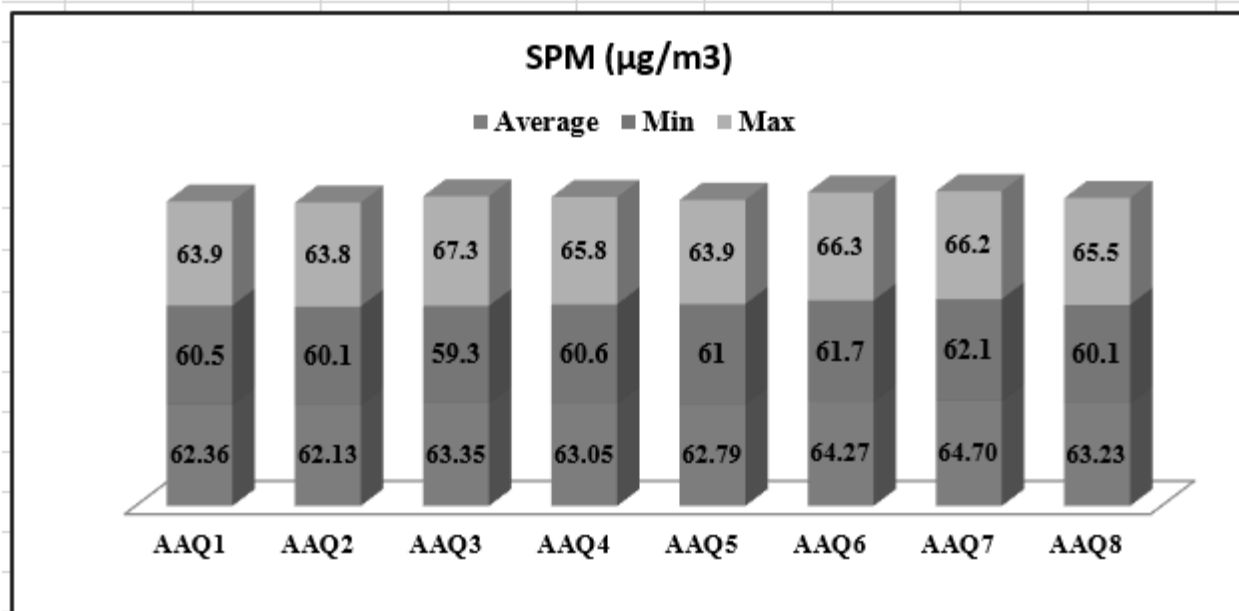


Source: Table 3.28

**TABLE 3.29: FUGITIVE DUST SAMPLE VALUES IN  $\mu\text{g}/\text{m}^3$**

SPM ( $\mu\text{g}/\text{m}^3$ )	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8
<b>Average</b>	62.36	62.13	63.35	63.05	62.79	64.27	64.70	63.23
<b>Min</b>	60.5	60.1	59.3	60.6	61	61.7	62.1	60.1
<b>Max</b>	63.9	63.8	67.3	65.8	63.9	66.3	66.2	65.5

Source: Calculations from Lab Analysis Reports

**FIGURE 3.23: BAR DIAGRAM OF SPM VALUES**

Source: Table 3.29

### 3.4 NOISE ENVIRONMENT

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

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

#### 3.4.1 Identification of Sampling Locations

In order to assess the ambient noise levels within the study area, noise monitoring was carried out at 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	N1	Core Zone	Project Area	10°52'29.68"N 76°56'20.92"E
2	N2	Palathurai	1.2km NE	10°52'50.08"N 76°57'5.74"E
3	N3	Veerappanur	5.5km SW	10°51'10.15"N 76°53'30.04"E
4	N4	Nachipalayam	2.8km SE	10°51'41.57"N 76°57'45.84"E
5	N5	Bodipalayam	4.5km NE	10°53'56.05"N 76°58'32.18"E
6	N6	Pachapalayam	1.4km South	10°51'41.47"N 76°56'25.47"E
7	N7	Ettimadai	3.6km NW	10°53'24.04"N 76°54'32.35"E
8	N8	Kuttikavundanpatti	5.3km SW	10°50'2.09"N 76°54'31.01"E

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

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### 3.4.2 Method of Monitoring

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

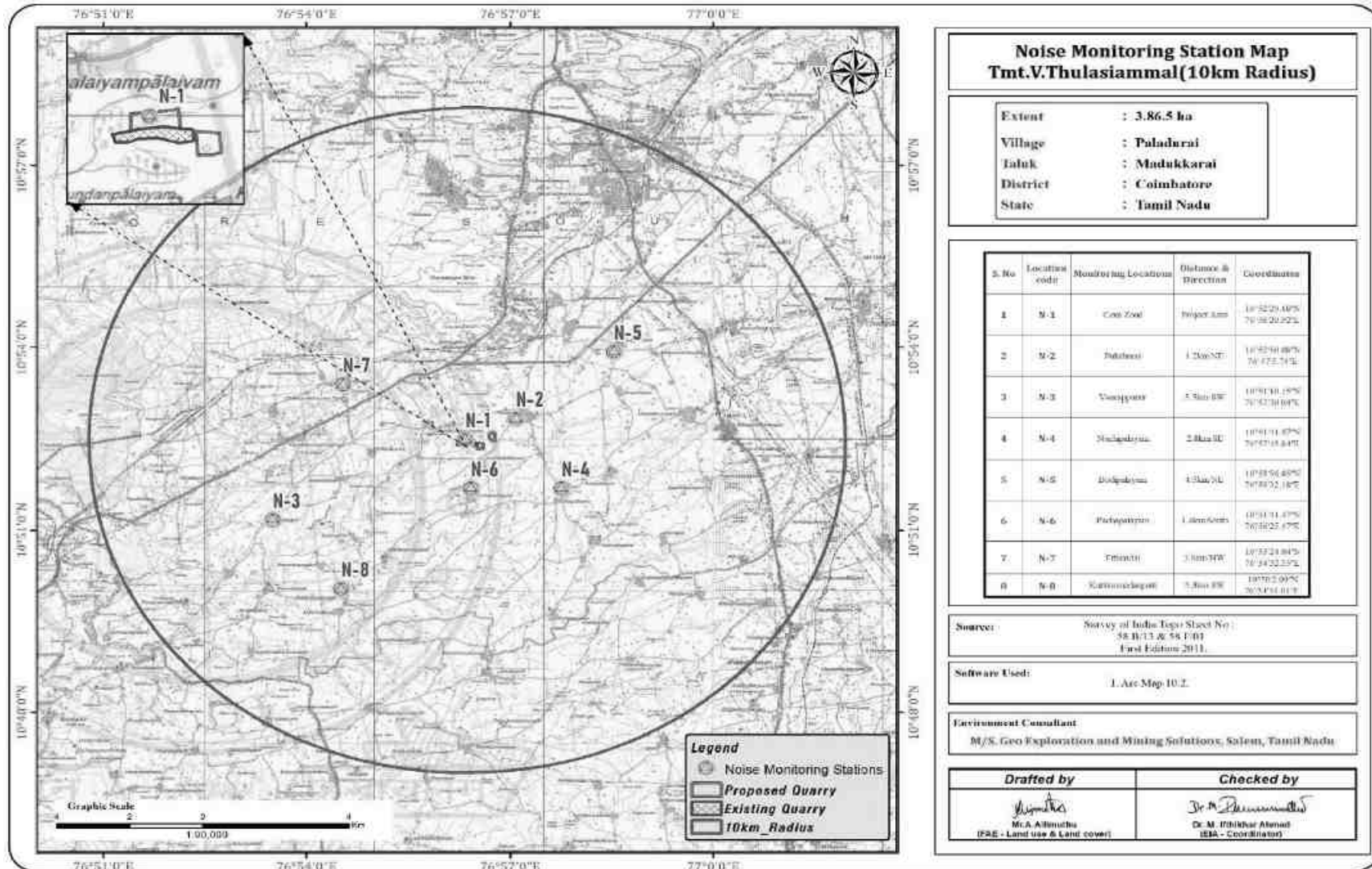
$$L_{eq} = 10 \text{ Log } L / T \sum (10L_n/10)$$

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

T = Time interval of observation

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

**FIGURE 3.24: NOISE MONITORING STATIONS AROUND 10 KM RADIUS**



### 3.4.3 Analysis of Ambient Noise Level in the Study Area

The Digital Sound pressure level has been measured by a sound level meter (Model: HTC SL-1352)

An analysis of the different Leq data obtained during the study period has been made. Variation was noted during the day-time as well as night-time. The results are presented in below Table 3.31.

Day time: 6:00 hours to 22.00 hours.

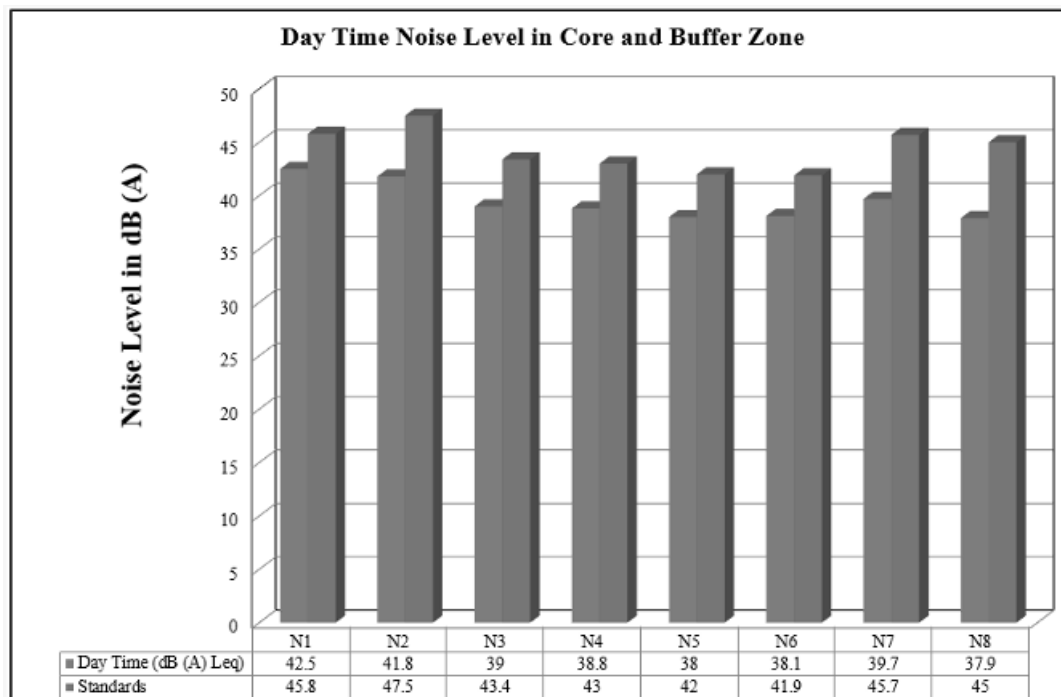
Night time: 22:00 hours to 6.00 hours.

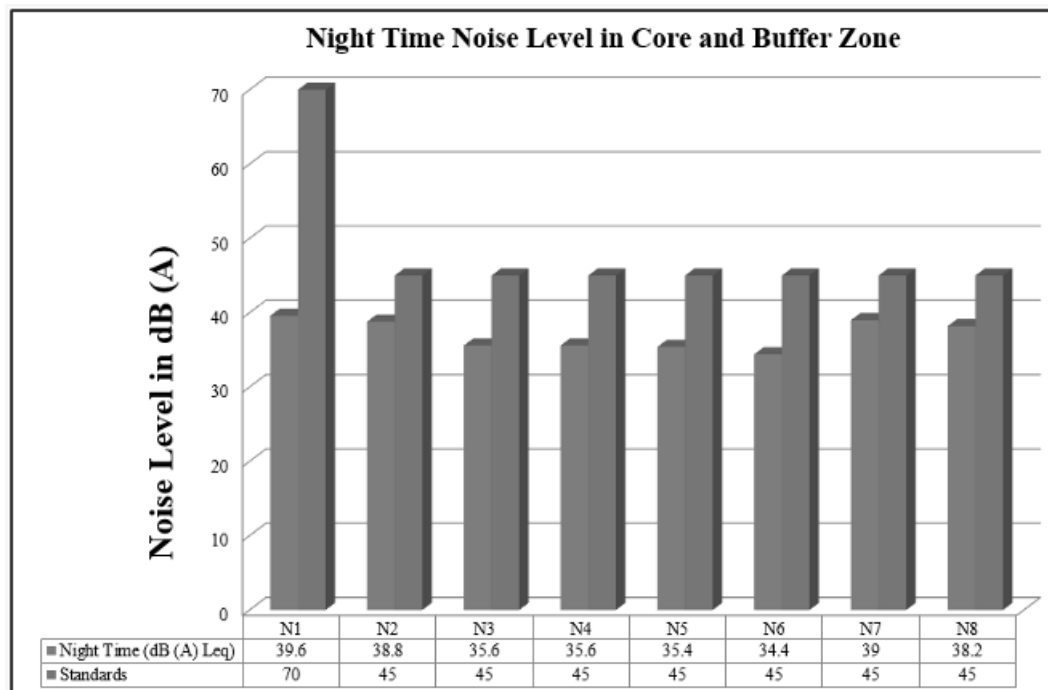
**TABLE 3.31: AMBIENT NOISE QUALITY RESULT**

S. No	Locations	Noise level (dB (A) Leq)		Ambient Noise Standards
		Day Time	Night Time	
1	Core Zone	45.8	39.6	<b>Industrial</b> Day Time- 75 dB (A) Night Time- 70 dB (A)
2	Palathurai	47.5	38.8	
3	Veerappanur	43.4	35.6	
4	Nachipalayam	43.0	35.6	
5	Bodipalayam	42.0	35.4	<b>Residential</b> Day Time- 55 dB (A) Night Time- 45 dB (A)
6	Pachapalayam	41.9	34.4	
7	Ettimadai	45.7	39.0	
8	Kuttikavundanpatti	45.0	38.2	

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

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



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

#### 3.4.4 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 41.8 to 42.5 dB (A) Leq and during night time were from 38.8 to 39.6 dB (A) Leq. Noise levels recorded in buffer zone during day time were from 37.9 to 39.7 dB (A) Leq and during night time were from 34.4 to 39.0 dB (A) Leq.

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

### 3.5 ECOLOGICAL ENVIRONMENT

#### 3.5.1. Study area Ecology

The core area extent of **3.86.5 Ha** of Rough stone and gravel quarry has an impact on diversity of flora and fauna of the surrounding area. But present work was carried out on detailed study of the impacts of Rough stone and gravel quarry on the ecology and biodiversity of the core lease area with the proper mitigation and sustainable management plan. The proposed mine lease area is flat terrain. The following methods were applied during the baseline study of flora, fauna, and diversity assessment.

#### 3.5.2. Objectives of Biological Studies

- To study the likely impact of the proposed mining project on the local biodiversity and to suggest mitigation measures, if required, for vulnerable biota.
- Undertake intensive field survey to assess the status of floral & faunal component in different habitats in the core and buffer areas of the project site.
- Identification and listing of flora and fauna which are important as per the Wildlife (Protection) Act 1972.
- Suggest Wildlife conservation (species specific/habitat specific) and management plan for the threatened (critically endangered & endangered species - schedule I) faunal species if any reported within the study area.
- To identify the impacts of mining on agricultural lands and how it affects.
- Proper collection of information about wildlife Sanctuaries/ national parks/ biosphere reserves of the project area.
- Devise management & conservation measures for biodiversity.



### 3.5.3. Methodology of Sampling

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

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

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

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

#### 3.5.3.1. Sampling

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

#### 3.5.3.2. Sampling Size

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

#### 3.5.3.3. Timing of Study

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

#### 3.5.3.4. Observations from Sampling

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

#### 3.5.3.5. Equipment/ References

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

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

### 3.5.4. Part I Field Sampling Techniques

#### 3.5.4.1. Transect walk – Birds

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

#### 3.5.4.2. Modified Pollard Walk – for Butterflies

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

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

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

#### 3.5.4.4. Observational methods- Mammals

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

#### 3.5.4.5. Multiple Stage Quadrat – Vegetation

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

### 3.5.5 Flora

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

### 3.5.6. Flora Composition in the Core Zone

Taxonomically a total of 27 species belonging to 22 families have been recorded from the core zone mining lease area. The lease applied area is flat terrain. The area has gently sloping South-western side. Based on the habitat classification of the enumerated plants the majority of species were Herbs 8, followed by Shrubs 7, Trees 7, Grass 2, Creeper 2, and Cactus 1. Details of flora with the scientific names were mentioned in Table No. 3.1. The result of the core zone of flora studies shows that Fabaceae and Poaceae, Euphorbiaceae are the main dominating species in the study area mentioned in Table No.3.32. No species were found as threatened category.

**Table No: 3.32 Flora in the Core zone of Tmt.V.Thulasiammal, Rough stone and gravel quarry**

Sl.No	English Name	Vernacular Name	Scientific Name	Family Name
<b>Trees</b>				
1.	Neem or Indian lilac	Vembu maram	Azadirachta indica	Meliaceae
2.	Indian mulberry	Nuna maram	Morinda tinctoria	Rubiaceae
3.	Khejri Tree	Parambai maram	Prosopis cineraria	Fabaceae
4.	White Bark Acacia	Vela maram	Vachellia leucophloea	Fabaceae

5.	Asian Palmyra palm	Panai maram	Borassus flabellifer	Arecaceae
6.	Indian Jujube	Ilanthai	Ziziphus jujuba	Rhamnaceae
7.	Velvet mesquite	Mullu maram	Prosopis juliflora	Fabaceae
<b>Shrubs</b>				
1.	West Indian Lantana	Unni chedi	Lantana camara	Verbenaceae
2.	Avaram	Avarai	Senna auriculata	Fabaceae
3.	Triangular spruge	Chaturakalli	Euphorbia antiquorum	Euphorbiaceae
4.	Carray Cheddle	Kaarai	Canthiumparviflorum	Rubiaceae
5.	Milk Weed	Erukku	Calotropis gigantea	Apocynaceae
6.	Carray Cheddle	Kaarai	Canthiumparviflorum	Rubiaceae
7.	Night shade plan	Sundaika	Solanum torvum	Solanaceae
<b>Herbs</b>				
1.	Common leucas	Thumbai	Leucas aspera	Lamiaceae
2.	Coat buttons	Thatha poo	Tridax procumbens	Asteraceae
3.	Asthma-plant	Amman pacharisi	Euphorbia hirta	Euphorbiaceae
4.	Holy basil	Thulasi	Ocimum tenuiflorum	Lamiaceae
5.	Bindii	Nerunji mullu	Tribulus terrestris	Zygophyllaceae
6.	Indian doab	Arugampul	Cynodon dactylon	Poaceae
7.	Indian nettle	Nayuruvi	Achyranthes aspera	Amaranthaceae
8.	Touch-me-not	Thottalchinungi	Mimosa pudica	Mimosaceae
<b>Climber</b>				
1.	Stemmed vine	Perandai	Cissus quadrangularis	Vitaceae
2.	Stinking passionflower	Poonai puduku chedi	Passiflora foetida	Passifloraceae
<b>Grasses</b>				
1.	Narrowleaf cattail	Sambu	Typha angustifolia	Typhaceae
2.	Eragrostis	Pullu	Eragrostis ferruginea	Poaceae
<b>Cactus</b>				
1.	Indian fig opuntia	Sapathikalli	Opuntia ficus-indica	Cactaceae

Sources: Species observation in the field study



a. Leucas aspera



b. Euphorbia hirta



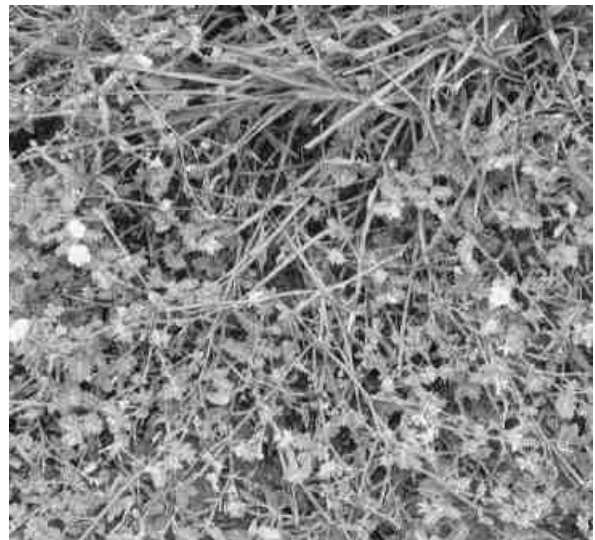
c. *Calotropis gigantea*



d. *Ocimum tenuiflorum*



e. *Lantana camara*



f. *Tribulus terrestris*



g. *Tridax procumbens*



h. *Senna auriculata*



i. *Borassus flabellifer*



j. *Prosopis cineraria*



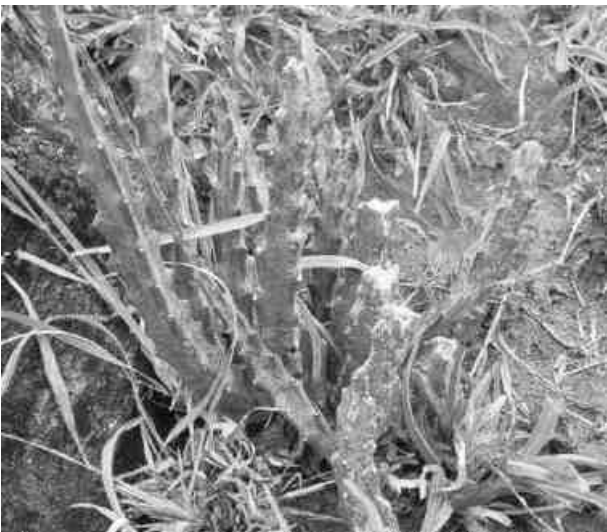
k. *Prosopis juliflora*



l. *Morinda tinctoria*



m. *Opuntia ficus-indica*



n. *Euphorbia antiquorum*

**Fig No: 3.27 Flora species observation in the Core zone area**

**Table No: 3.33 Flora in Buffer Zone of Tmt.V.Thulasiammal, Rough stone and gravel quarry**

Sl.No	English Name	Vernacular Name	Scientific Name	Family Name
<b>Trees</b>				
1.	Asian Palmyra palm	Panai maram	Borassus flabellifer	Arecaceae
2.	Kapok tree	Ilavam Panju	Ceiba pentandra	Malvaceae
3.	Velvet mesquite	Mullu maram	Prosopis juliflora	Fabaceae
4.	Neem or Indian lilac	Vembu	Azadirachta indica	Meliaceae
5.	Mango	Manga	Mangifera indica	Anacardiaceae
6.	Burflower-tree	Kadamba	Neolamarckiacadamba	Rubiaceae
7.	Wild Date Palm	Icham	Phoenix sylvestris	Arecaceae
8.	Khejri Tree	Parambai maram	Prosopis cineraria	Fabaceae
9.	Coconut	Thennai maram	Cocos nucifera	Arecaceae
10.	Madras thorn	Kudukapuli	Pithecellobium dulce	Fabaceae
11.	Portia tree	Poovarasan	Thespesia Populnea	Malvaceae
12.	Jack fruit	Bala maram	Artocarpusintegrifolia	Moraceae
13.	Lemon	Ezhumuchaipalam	Citrus lemon	Rutaceae
14.	Jamun Fruit Plant	Naval maram	Syzygium cumini	Myrtaceae
15.	Gum arabic tree	Karuvelam	Vachellia nilotica	Fabaceae
16.	Gulmohar	Neruppu Kondrai	Royal poinciana	Fabaceae
17.	Chinese chaste tree	Nochi	Vitex negundo	Verbenaceae
18.	Curry tree Plant	Karuveppilai	Murraya koenigii	Rutaceae
19.	Bamboo	Moongil	Bambusoideae	Poaceae
20.	Teak	Thekku	Tectona grandis	Verbenaceae
21.	Indian mulberry	Nuna maram	Morinda tinctoria	Rubiaceae
22.	Pongamia pinnata	Pongam	Millettia pinnata	Fabaceae
23.	Horsetail She-oak	Savukku maram	Casuarina equisetifolia	Casuarinaceae
24.	Indian-almond	Inguti	Terminalia catappa	Combretaceae
25.	Eucalyptus	Thailam maram	Eucalyptus tereticornis	Myrtaceae
26.	Yellow flame tree	Perunkondrai	Peltophorum pterocarpum	Fabaceae
27.	Monkey pod tree	Thungumoonchi	Samanea saman	Fabaceae
28.	Malayan Cherry	Ten Pazham	Muntingia calabura	Muntingiaceae
29.	Banyan tree	Alamaram	Ficus benghalensis	Moraceae
30.	Indian gooseberry	Nelli	Phyllanthus emblica	Phyllanthaceae

31.	Guava	Koyya	Psidium guajava	Myrtaceae
32.	Tamarind	Puliyamaram	Tamarindus indica	Legumes
33.	Agati	Agathi keerai	Sesbania grandiflora	Fabaceae
34.	Drumstick tree	Murunga maram	Moringa oleifera	Moringaceae
35.	Henna	Marudaani	Lawsonia inermis	Lythraceae
36.	Papaya	Pappali maram	Carica papaya L	Caricaceae
37.	Peepal	Asoka maram	Ficus religiosa	legume
38.	Banana tree	Vazhaimaram	Musa acuminata	Musaceae
39.	Jack fruit	Palamaram	Artocarpus heterophyllus	Moraceae
40.	Custard apple	Seethapazham	Annona reticulata	Annonaceae
41.	Manilkara zapota	Sapota	Manilkara zapota	Sapotaceae
42.	java olive tree	Kutiraippitukku	Sterculia foetida	Malvaceae
<b>Shrubs</b>				
1.	Devil's trumpet	Umathai	Datura metel	Solanaceae
2.	Avaram	Avarai	Senna auriculata	Fabaceae
3.	Castor bean	Amanakku	Ricinus communis	Euphorbiaceae
4.	Jungle geranium	Idly Poo	Ixora coccinea	Rubiaceae
5.	Shoe flower	Chemparuthi	Hibiscu rosa-sinensis	Malvaceae
6.	Milk Weed	Erukku	Calotropis gigantea	Apocynaceae
7.	Puriging nut	Kattamanakku	Jatropha curcas	Euphorbiaceae
8.	Malabar catmint	Pei veratti	Anisomeles malabarica	Lamiaceae
9.	Touch-me-not	Thottalchinungi	Mimosa pudica	Mimosaceae
10.	Indian mallow	Thuthi	Abutilon indicum	Meliaceae
11.	Night shade plan	Sundaika	Solanum torvum	Solanaceae
12.	Rosary pea	Kundumani	Abrus precatorius	Fabaceae
13.	Indian Oleander	Arali	Nerium indicum	Apocynaceae
14.	West Indian Lantana	Unni chedi	Lantana camara	Verbenaceae
<b>Herbs</b>				
1.	Carrot grass	Partiniyam	Parthenium hysterophorus	Asteraceae
2.	Billygoat weed	Pumpillu	Ageratum conyzoides	Asteraceae
3.	Aloe barbadensis	Katrazhai	Aloe vera	Asphodelaceae
4.	Madagascar Periwinkle	Nithyakalyani	Catharanthus roseus	Apocynaceae
5.	Indian Mercury	Kuppamani	Acalypha indica	Euphorbiaceae
6.	Indian nettle	Nayuruvi	Achyranthes aspera	Amaranthaceae

7.	Bui	Ciru-pulai	Aervalanata	Amaranthaceae
8.	Indian doab	Arugampul	Cynodon dactylon	Poaceae
9.	Cleome viscosa	Nai kadugu	Celome viscosa	Capparidaceae
10.	Common leucas	Thumbai	Leucas aspera	Lamiaceae
11.	Asthma-plant	Amman pacharisi	Euphorbia hirta	Euphorbiaceae
12.	Poor land flatsedg	Kunnakora	Cyperus compressus	Cyperaceae
13.	Holy basil	Thulasi	Ocimum tenuiflorum	Lamiaceae
14.	Peanut	Kadalai	Arachis hypogaea	Fabaceae
15.	Red Hogweed	Mukurattai	Boerhavia diffusa	Nyctaginaceae
16.	Tridax daisy	Thatha poo	Tridax procumbens	Asteraceae
17.	Gale of the wind	Keelaneeli	Phyllanthus niruri	Phyllanthaceae
18.	Eggplant	kathirikai	Solanum melongena	Solanaceae
19.	European black nightshade	Manathakkali	Solanumnigrum	Solanaceae
<b>Climber</b>				
1.	Ivy gourd	Kovai	Coccinia grandis	Cucurbitaceae
2.	Butterfly pea	Sangu poo	Clitoria ternatea	Fabaceae
3.	Wild water lemon	Poonai puduku chedi	Passiflora foetida	Passifloraceae
4.	Stemmed vine	Perandai	Cissus quadrangularis	Vitaceae
5.	Bottle Guard	Sorakkai	Lagenaria siceraria	Cucurbitaceae
<b>Creeper</b>				
1.	Nut grass	Korai	Cyperus rotandus	Poaceae
2.	Grona triflora	Siru puladi	Desmodium triflorum	Fabaceae
<b>Grass</b>				
1.	Eragrostis	Pullu	Eragrostis ferruginea	Poaceae
2.	Windmill grass	Chevvarakupul	Chloris barbata	Amaranthaceae
<b>Cactus</b>				
1.	Indian fig opuntia	Sapathikalli	Opuntia ficus-indica	Cactaceae

Sources: Species observation in the field study and secondary data



### 3.5.7 Abundance and Density

Both this term refers to the number of species in a community. Abundance of any individual species is expressed as a percentage of the total number of species present in community and therefore it is a relative measure. In sampling the abundance of species, the individual of species is counted instead of just noting their presence or absence was done while studying the frequency of a species.

Taken together abundance and frequency are of great importance in determining the community structure.

$$\text{Abundance} = \frac{\text{Total no.of individual of the species}}{\text{No of quadrate per units in which they occur}} \times 100$$

$$\text{Density} = \frac{\text{Total no.of individual of the species}}{\text{No.of quadrat per units studied}} \times 100$$

$$\text{Relative abundance} = \frac{\text{Total no.of species}}{\text{Total no.of individual of all species recorded}} \times 100$$

$$\text{Relative Density} = \frac{\text{Density of a given species}}{\text{Total densities of all the species}} \times 100$$

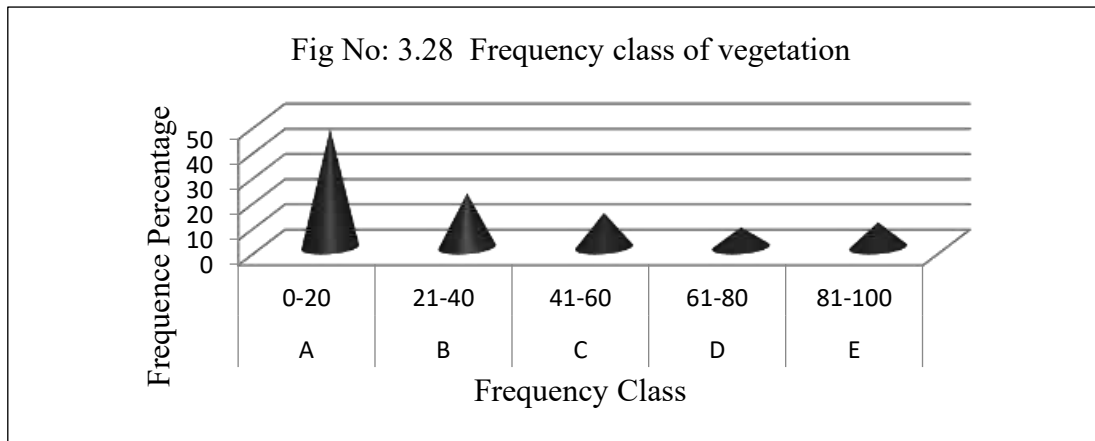
$$\% \text{ Frequency} = \frac{\text{Density of a given species}}{\text{Total densities of all the species}} \times 100$$

**Raunkiaer (1934)** made an elaborative study on the frequency of species and based on his data, he divided species into 5 Classes viz, A, B, C, D, E. Compare the observed frequency with the Raunkiaer's Law of frequency and depict it in form of histogram (Fig No: 3.30).

On the basis of per cent values various species distribute into five frequency class

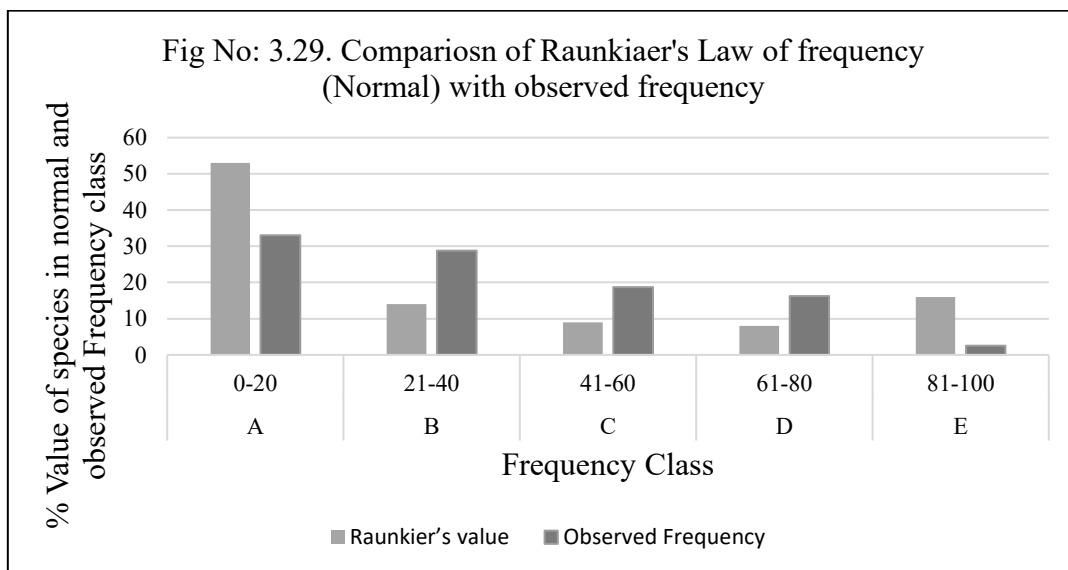
Frequency percentage	Class
0-20	A
21-40	B
41-60	C
61-80	D
81-100	E

A graph is plotted (Histogram) with frequency class on X-axis and frequency percentage on Y-axis and compared with Raunkier's value.



**Fig No: 3.28 Frequency class of vegetation**

Frequency class	Class value	Raunkier's value	Frequency class of vegetation
A	0-20	53	33%
B	21-40	14	28.75%
C	41-60	9	18.75%
D	61-80	8	16.25%
E	81-100	16	2.5%



**Fig No: 3.29. Comparison of Raunkiaer's Law of frequency (Normal) with observed frequency**

Histogram representing comparison of Raunkier's law of frequency (normal) with observed frequency (from table above.).

**3.5.8. Interpretation of result:**

Frequency data obtained indicates whether the distribution of the species is homogenous i.e., uniform throughout the buffer zone or heterogeneous. Heterogeneous distribution refers to the uneven distribution of various species within a specific area.

Higher the value of Class A&B, the more homogenous and undisturbed the vegetation.

Even observed % frequency classes (A\_B\_C\_D) Differ from the normal Frequency Law of Raunkiaer's as expected since the area under the study is highly disturbed due to various biotic factors.i.e. (A>B>C>=<D<E). In the present study class, D&E is less species.

### **3.5.9 The vegetation in the RF / PF areas, ecologically sensitive areas**

There are neither reserved (RF) nor protected (PF) forests either in the mine lease area or in the buffer zone. Boluvampatti R.F has located about 2.8km on the North side. Thus, no forest land is involved in any manner. Hence, no certificate from the Forest department is required. There are no impacts due to this mining activity.

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

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

### **3.5.10 Fauna**

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

### **3.5.11 Fauna Composition in the Core Zone**

A total of 20 varieties of species were observed in the Core zone of Paladura Village, Rough stone and gravel quarry (Table No.3.34) among them numbers of Insects 7, Reptiles 3, Mammals 2, and Avian 8. A total of 20 species belonging to 19 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 nine species are under Schedule IV according to the Indian Wildlife Act 1972. A total of 8 species of bird were sighted in the mining lease area. There are no critically endangered, endangered, vulnerable, and endemic species were observed.

**Table No: 3.34 Fauna in the Core zone of Tmt.V. Thulasiammal, Rough stone and gravel quarry**

SI. No	Common Name/English Name	Family Name	Scientific Name	Schedule list wildlife Protection act 1972	IUCN Red List data
<b>Insects</b>					
1.	Striped tiger	Nymphalidae	Danaus plexippus	Schedule IV	LC
2.	Dragonfly	Anisoptera	Agriansp	-	-
3.	House fly	Muscidae	Musca domestica	-	-
4.	Grasshopper	Acrididae	Hieroglyphus sp	NL	LC
5.	Colotis danae	Pieridae	Colotis danae	NL	LC
6.	Honey Bee	Apidae	Apisindica	-	-
7.	Termite	Blattodea	Hamitermes silvestri	NE	LC
<b>Reptiles</b>					
1.	Garden lizard	Agamidae	Calotes versicolor	NL	LC
2.	Green vine snake	Colubridae	Ahaetulla nasuta	Schedule IV	NL
3.	Common skink	Scincidae	Mabuya carinatus	NL	LC
<b>Mammals</b>					
1.	Indian Field Mouse	Muridae	Mus booduga	Schedule IV	NL
2.	Asian Small Mongoose	Herpestidae	Herpestes javanicus	Schedule (Part II)	LC
<b>Aves</b>					
1.	Common myna	Sturnidae	Acridotheres tristis	NL	LC
2.	Black drongo	Dicruridae	Dicrurus macrocercus	Schedule IV	LC
3.	Shikra	Laniidae	Laniusexcubitor	Schedule IV	LC
4.	House crow	Corvidae	Corvussplendens	NL	LC
5.	Koel	Cucalidae	Eudynamys	Schedule IV	LC
6.	Rose-ringed parkeet	Psittaculidae	Psittacula krameri	NL	LC
7.	Common quail	Phasianidae	Coturnix coturnix	Schedule IV	LC
8.	Sunbird	Nectariniidae	Cinnyrisasiaticus	Schedule IV	LC

\*NL- Not listed, LC- Least Concern

(Sources: Species observation in the field study)

### 3.5.12. Fauna Composition in the Buffer Zone

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

Boluvampatti R.F is located about 2.8km on the North side. There are no Sanctuaries, National Parks, Tiger Reserve or Biosphere Reserve or Elephant Corridor or other protected areas within 10 km radius of core area. It is evident from the available records, reports, and circumstantial evidence that the entire study area including the core and buffer areas was free from any endangered animals. There were no resident birds other than common bird species such as green bee-eaters, Rose-ringed parakeet, Common Mynas, Black dragons, Crows, Grey Francolin etc.

The list of bird species recorded during the field survey and literature from the study area are given in Table 3.5. The list of reptilian species recorded during the field survey and literature from the study area is given in Table 3.6. The list of insect species recorded during the field survey and literature from the study area are given in Table 3.7. The list of Amphibian species recorded during the field survey and literature from the study area are given in Table 3.9. It is apparent from the list that none of the species either spotted or reported is included in Schedule I of the Wildlife Protection Act. Similarly, none of them comes under the REET category.

Taxonomically a total of 59 species belonging to 37 families have been recorded from the buffer zone area. Based on habitat classification the majority of species were birds 24, followed by Butterflies 13, Reptiles 8, Mammals 5, Insect 5, and amphibians 4. There are six Schedule II species, and twenty-six species are under Schedule IV according to the Indian Wildlife Act 1972. A total of 24 species of bird were sighted in the study area. There are no critically endangered, endangered, vulnerable, and endemic species were observed. There are no impacts on nearby fauna species.

Dominant species are mostly birds and insects, and four amphibian was observed during the extensive field visit *Sphaerotheca breviceps*, *Euphlyctis hexadactylus*, *Bufo melanostictus*, *Euphlyctis cynophlyctis*. The result of the Buffer zone of fauna studies shows that Nymphalidae, Colubridae, and Scincidae are the main dominating species in the study area. There is no Schedule I Species in the study area. There are no critically endangered, endangered, vulnerable, and endemic species were observed.

**Table 3.35 List of Fauna & Their Conservation Status,  
Mammals: (\*directly sighted animals & Secondary data)**

SI. No	Common Name/English Name	Family Name	Scientific Name	Schedule list wildlife Protection act 1972	IUCN Red List data
1.	Indian palm squirrel	Sciuridae	Funambulus palmarum	Schedule IV	LC
2.	Indian Field Mouse	Muridae	Mus booduga	Schedule IV	LC
3.	Asian Small Mongoose	Herpestidae	Herpestes javanicus	Schedule (Part II)	LC
4.	Indian hare	Leporidae	Lepus nigricollis	Schedule (Part II)	LC
5.	Brown rat	Muridae	Rattus norvegicus	Schedule IV	LC

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

**Table 3.36 Listed birds**

SI. No	Common Name/English Name	Family Name	Scientific Name	Schedule list wildlife Protection act 1972	IUCN Red List data
1.	Asian Koel	Cuculidae	Eudynamys	Schedule IV	LC
2.	Cattle egret	Ardeidae	Bubulcus ibis	NL	LC
3.	Rock pigeon	Columba livi	Columbidae	Schedule IV	LC
4.	Common myna	Sturnidae	Acridotheres tristis	NL	LC
5.	House crow	Corvidae	Corvus splendens	NL	LC
6.	Sunbird	Nectariniidae	Nectariniidae	NL	LC
7.	Red Vented Bulbul	Pycnonotidae	Pycnonotus cafer	Schedule IV	LC
8.	Small Bee Eater	Meropidae	Merops orientalis	NL	LC
9.	Small blue Kingfisher	Alcedinidae	Alcedo atthis	Schedule IV	LC
10.	Rose-ringed parakeet	Psittaculidae	Psittacula krameri	NL	LC
11.	Asian Palm Swift	Apodidae	Cypsiurus balasiensis	Schedule IV	LC
12.	Common quail	Phasianidae	Coturnix coturnix	Schedule IV	LC
13.	Black drongo	Dicruridae	Dicrurus macrocercus	Schedule IV	LC
14.	Woodpecker bird	Picidae	Picidae	Schedule IV	LC
15.	Two-tailed Sparrow	Dicruridae	Dicrurus macrocercus	Schedule IV	LC
16.	Grey Francolin	Phasianidae	Francolinus pondicerianus	Schedule IV	LC
17.	Wood Sandpiper	Scolopacidae	Tringa glareola	Schedule IV	LC
18.	Blue-Tailed Bee Eater	Meropidae	Merops philippinus	Schedule IV	LC
19.	Indian Roller	Coraciidae	Coracias benghalensis	Schedule IV	LC
20.	Common Swallow	Hirundinidae	Hirundo rustica	Schedule IV	LC
21.	Purple Rumped Sunbird	Nectariniidae	Leptocoma zeylonica	Schedule IV	LC
22.	Common Tailor Bird	Cisticolidae	Orthotomus sutorius	NL	LC
23.	Purple Sunbird	Chordata	Cinnyris asiaticus	NL	LC
24.	Lesser Golden Backed Woodpecker	Picidae	Dinopium benghalense	Schedule IV	LC

**Reference:** Birds of Coimbatore Wetlands, By Dr. P.Pramod

Ali, S. (2002). The Book of Indian Birds (13th revised edition). Oxford University Press, New Delhi. 326pp.

**Table 3.37. List of Reptiles either spotted or reported from the study area. (\*indicates direct observations & Secondary data)**

SI. No	Common Name/English Name	Family Name	Scientific Name	Schedule list wildlife Protection act 1972	IUCN Red List data
1.	Oriental garden lizard	Agamidae	Calotes versicolor	NL	LC
2.	House lizards	Gekkonidae	Hemidactylus flaviviridis	Schedule IV	NL
3.	Indian cobra	Elapid snakes	Naja naja	Sch II (Part II)	LC
4.	Green vine snake	Colubridae	Ahaetulla nasuta	Schedule IV	NL
5.	Rat snake	Colubridae	Ptyas mucosa	Sch IV (Part II)	LC
6.	Common krait	Elapid snakes	Bungarus caeruleus	Schedule IV	NL
7.	Common skink	Scincidae	Mabuya carinatus	NL	LC
8.	Russell's viper	Viperidae	Vipera russeli	Sch II (Part II)	LC

**Table 3.38. List of insects either spotted or reported from the study area**

SI. No	Common Name/English Name	Family Name	Scientific Name	Schedule list wildlife Protection act 1972	IUCN Red List data
1.	Indian honey bee	Apidae	Apis cerana	-	-
2.	Termite	Blattodea	Hamitermes silvestri	NE	LC
3.	Grasshopper	Acrididae	Hieroglyphus sp	NL	LC
4.	Ant	Formicidae	Camponotus Vicinus	NL	NL
5.	Dragonfly	Gomphidae	Ceratogomphus pictus	-	-

**Table.3.39. List of Butterflies reported from the study area**

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

Reference: Butterflies of Coimbatore- <https://www.researchgate.net/publication/301730778>

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

Sl. No	Common Name/English Name	Family Name	Scientific Name	Schedule list wildlife Protection act 1972	IUCN Red List data
1.	Indian Burrowing frog	Dicroglossidae	Sphaerotheca breviceps	Schedule IV	LC
2.	Green pond frog	Dicroglossidae	Euphlyctis hexadactylus	Schedule IV	LC
3.	Indian Toad	Bufo	Bufo melanostictus	Schedule IV	LC
4.	Skipper	Dicroglossidae	Euphlyctiscynophlyctis	Schedule IV	LC

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

### 3.5.13 Findings/Results

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

#### Records of threatened species in the area

No threatened species were observed

#### Endangered Species as per Wildlife (Protection) Act

No Endangered fauna was recorded in the project area.

#### Endemic Species of the Project areas

No endemic species were observed in the project area.

#### Migratory species of the Project areas

No migratory fauna observed in project area.

#### Migratory corridors and Flight paths

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

#### Breeding and spawning grounds

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

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

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

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



### 3.5.14 Conclusion

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

## 3.6 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.

### 3.6.1 Objectives of the Study

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

- a) To study the socio-economic status of the people living in the study area of the project.
- b) To identify the basic needs of the nearby villages within the study area.
- c) To assess the impact on socio-economic environment due to the project.
- d) To provide the employment and improved living standards.
- 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.

### 3.6.2 Scope of Work

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

### 3.6.3 Methodology

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

- a) The details of the activities and population structure have been obtained from Census 2001 and 2011 and analyzed.
- b) Based on the above data, impacts due to plant operation on the community have been assessed and recommendations for further improvement have been made.

### 3.6.4 Sources of Information and Data Base

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

### 3.6.5 Primary Survey

The primary data collection includes the collection of data through a structured interview schedule by direct observation method. The questionnaire survey includes both open and closed methods. The sample size is limited respondents, who were selected on the basis of simple random sampling from Palathurai and Madukkarai Village, Madukkarai Taluk, Coimbatore 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).

### 3.6.6 Collection of Data from Secondary Sources

Data from secondary sources were collected on following aspects:

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

**Table 3.41 Type of Information and Sources**

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

### b) Data Presentation and Analysis

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

### 3.7 Background Information of the Area

**Tamil Nadu** is the 11th largest states in India in terms of area. The state is the seventh most populous state in the country and its main language Tamil has origins that date back to 500 BC. Chennai is the capital of Tamil Nadu and lies on the eastern coast line of India. Tamil Nadu is famous for its wonderful temples and monuments that have been built 1000s of years ago and has places that have been marked as heritage sites by the United Nations. In a 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, Coimbatore, 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 Geography of the Area

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

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

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

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

### 3.9 Population Growth Rate

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

Year	Tamil Nadu	India
1941	11.91	14.22
1951	14.66	13.31
1961	11.85	21.51
1971	22.30	24.80
1981	17.50	24.66
1991	15.39	23.86
2001	11.19	21.34
2011	15.61	5.96
2021	5.96	1.0

### 3.10 Coimbatore District

Coimbatore is the third largest city of the state, one of the most industrialized cities in Tamil Nadu, known as the textile capital of South India or the Manchester of the South India, the city is situated on the banks of the river Noyyal, Coimbatore existed even prior to the 2nd or 3rd century AD by Karikalan, the first of the early Cholas. Among its other great rulers were Rashtrakutas, Chalukyas, Pandyas, Hoysalas and the Vijayanagara kings. When Kongunadu fell to the British along with the rest of the state, its name was changed to Coimbatore and it is by this name that it is known today, in local Tamil language it is also called as Kovai.

Coimbatore serves as an entry and exit point to neighboring Kerala State and the very popular hill station of Udhamandalam (Ooty) is 70 kms from Coimbatore. It is the disembarking point for those who want to take the

Mountain train that runs from Mettupalayam just 35 kms away from Coimbatore, regular bus services also available daily from Coimbatore to Ooty and other districts, towns and major cities.

Coimbatore lies at 11°1'6"N 76°58'21"E in south India at 427 metres above sea level on the banks of the Noyyal River, in northwestern Tamil Nadu.

### 3.11 Study Area

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

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

**Table 3.42 Shows the socio-economic profile of the study area as compared to district, state and national level socio-economic profile**

Particular	India	Tamil Nadu	Coimbatore District	Study Area (10km Radius)
Area (in sq. km.)	3,287,263	130058	7649	319
Population Density/ sq. Km.	368	554	452	427
No. of Households	249454252	13357027	958035	37798
Population	1210569573	72147030	3458045	136299
Male	623121843	36137975	1729297	68359
Female	587447730	36009055	1728748	67940
Scheduled Tribes	104281034	794697	28342	2820
Scheduled Castes	201378086	14438445	535911	2926
Literacy Rate	<b>72.99%</b>	<b>80%</b>	<b>76.22%</b>	<b>77.37%</b>
Sex Ratio (Females per 1000 Males)	<b>943</b>	<b>996</b>	<b>1000</b>	<b>994</b>

**Source:** Census of India, 2011

Table no 3.12.1 show demographic pattern of India, Tamil Nadu, Coimbatore District & Study area (10km Radius). In India had total area of 3.2 sqkm, State of Tamil Nadu area was 130058 sqkm, District of Coimbatore area was 642 sqkm and study area is about 319 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 452 sqkm and study area density is about 427 sqkm. As per Census 2011, about 5.96percent of population in the state lives in areas. Coimbatore had comparing state wise 4.79 percent of population lives in the district. In study area has 3.94 % around 10km radius. State, District and study area. In Tamil Nadu state SC categories people had about 19 %, district of Coimbatore about

15.49 % it has increasing to Study area about 21.46% increasing in the total population Similarly ST population is about 1.10%, 0.82% and 2.07% of the total population in the study area. State level Literacy rate is 80%, district level is 76% but study area has an increased about 77.37%. There is literacy rate is study area increase comparing district level decrease in the study area. Sex ratio female per thousand males about state level is 996, District level is 1000 and study area is 994.

The study area has population density 427 persons per sq.km of total population about 136299 as per census 2011. There were about 50.15 percent male and 49.85% female population. Study area has literate rate is about 77%. District had about 76% of literate rate as per census 2011.

### 3.13 Population Projection of the Study Area

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

**Table 3.43 Total Population of Study Area**

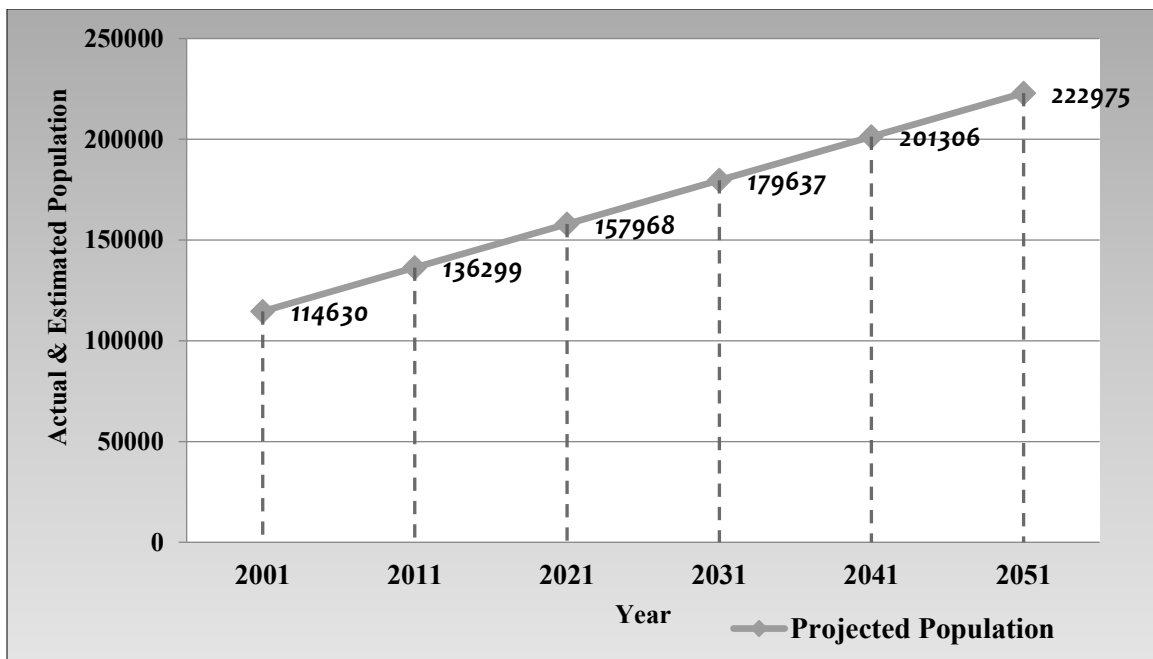
SI No.	Population in 2001	Population in 2011
1	114630	136299

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

**Table 3.13.2 Population Projection of Study Area**

S. No	Year	Projected Population (Approximately)
1.	2021	157968
2.	2031	179637
3.	2041	201306
4.	2051	222975

Source: Calculated by SPSS v29, 2022.



**Fig 3.30 Graph Showing Population Projection**

Following formula has been used for the projection of population.

$$Y=a+bt$$

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>

### 3.14 Population Growth of the Study Area

**Table 3.44 Population Growth rate in Study area**

Year	Actual Population	Growth Rate %
2001	114630	
2011	136299	11.89
2021	157968	11.59

2031	179637	11.37
2041	201306	11.21
2051	222975	11.08

Source: Compiled by Author-2022

Above table no 3.44 is showing the growth rate of population since 2001, as per census in 2001 the population of study area was 114630 and 2011 it was 136299 if the population growth rate is 11.89%, it will approximately 157968 in year 2021 and 222975 in the year of 2051. It has approximately population growth rate decline will be 11.08%.

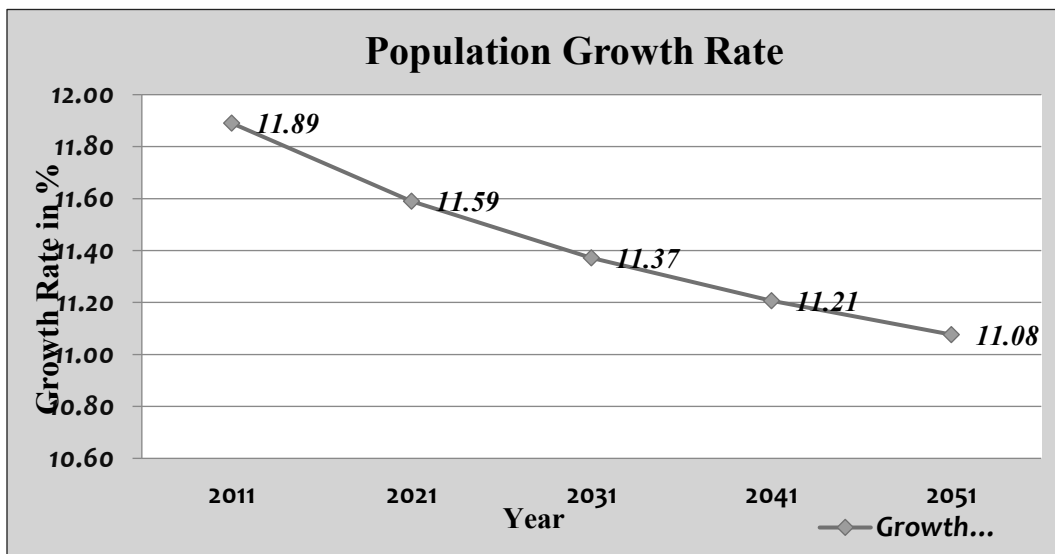


Fig.3.31 Graph Showing Population Growth Rate

**Planning Analysis:**

Calculating Growth Rates

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

Where:

$$PR = \frac{(V_{Present} - V_{Past})}{V_{Past}} \times 100$$

PR=Percent Rate

V<sub>Present</sub> =Present or Future Value

V<sub>Past</sub> = Past or Present Value

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

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

**3.15 Population Distribution and Composition of Study Area**

The population as per 2011 Census records is 92015 (for 10 km radius buffer zone). Total no. of household is 3060, 8153 and 15553 respectively, in primary, secondary and tertiary zone. Sex ratio is 1032, 976 and 1009 (females per 1000 males) observed in primary, secondary and tertiary zone respectively. SC population distribution is 2051, 5681 and 10306 respectively in primary, secondary and tertiary zone. ST population distribution is 10, 13 and 714

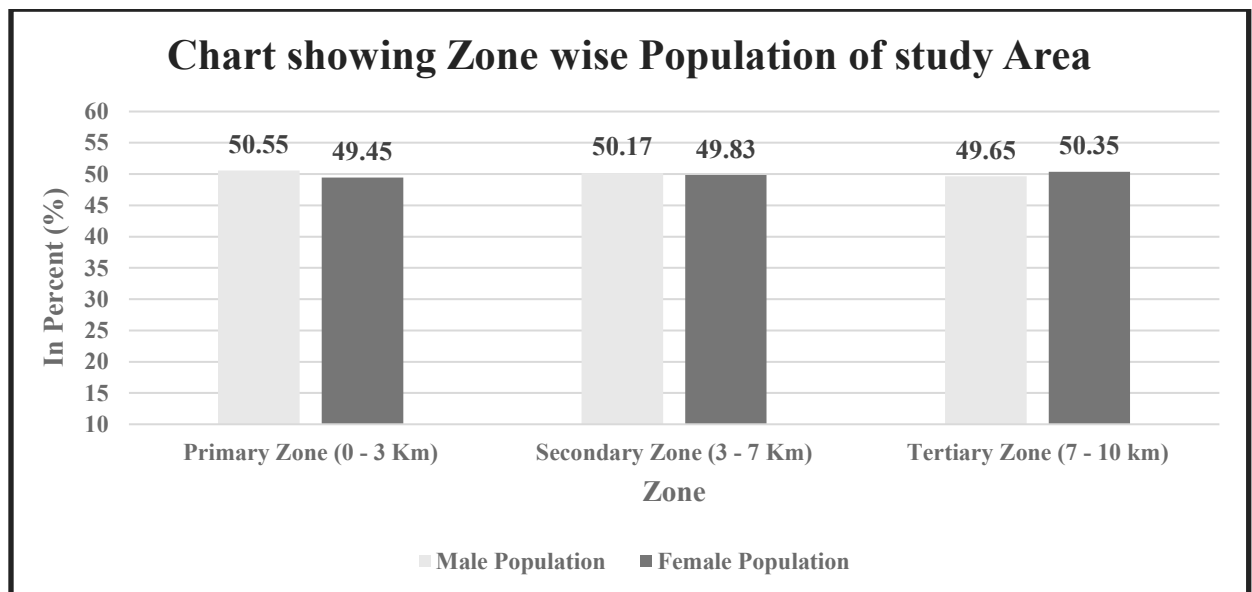
respectively in primary, secondary and tertiary. Average household size is 3. Zone wise Demographic profile of study area is given in the table 3.45 below:

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

**Table 3.45 Zone wise Demographic Profile of Study Area**

Zone	No. of Villages	Total Household	Total Population	Male Population	%	Female Population	%
Primary Zone (0 - 3 Km)	5	9676	34849	17615	50.55	17234	49.45
Secondary Zone (3 - 7 Km)	8	19807	71891	36067	50.17	35824	49.83
Tertiary Zone (7 - 10 km)	6	8315	29559	14677	49.65	14882	50.35
<b>Study Area (0-10 km)</b>	<b>19</b>	<b>37798</b>	<b>136299</b>	<b>68359</b>	<b>50.15</b>	<b>67940</b>	<b>49.85</b>

*Source: Census of India, 2011*



**Figure 3.32 Population of study area**

- ✓ Above table identifies the presence of villages and their subsequent population divided under three zones from plant boundary (i.e., Primary, secondary and tertiary zone)
- ✓ Primary zone has 5 villages where as much as 9676 households with 34849 population are located. Mostly lying on Built-up land for their livelihood and substance.
- ✓ Secondary and tertiary zone both comprise of 8 and 6 villages having a total population of 71891 and 29559 respectively.



Table 3.46 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	Kumarapalayam	1328	4612	2290	2322	1014	345	183	162	885	906	468	438	0	0	0	3122	1712	1410	73.17	81.25	65.28	2706	58.67	2655	57.57	51	1.11	1906	41.33
2	Palathurai	767	2727	1346	1381	1026	213	103	110	1068	1214	602	612	0	0	0	1906	1033	873	75.82	83.11	68.69	1403	51.45	768	28.16	635	23.29	1324	48.55
3	Chettipalayam (TP)	2841	10366	5268	5098	968	880	480	400	833	2920	1460	1460	0	0	0	7304	3991	3313	77.00	83.35	70.52	4450	42.93	4078	39.34	372	3.59	5916	57.07
4	Thirumalayampalayam (TP)	3375	12164	6034	6130	1016	1024	523	501	958	2904	1426	1478	164	83	81	8124	4418	3706	72.93	80.17	65.84	6164	50.67	5882	48.36	282	2.32	6000	49.33
5	Kaliyapuram	1365	4980	2677	2303	860	399	190	209	1100	814	388	426	1373	696	677	2897	1796	1101	63.24	72.22	52.58	2619	52.59	2498	50.16	121	2.43	2361	47.41
<b>Total</b>		<b>9676</b>	<b>34849</b>	<b>17615</b>	<b>17234</b>	<b>978</b>	<b>2861</b>	<b>1479</b>	<b>1382</b>	<b>934</b>	<b>8758</b>	<b>4344</b>	<b>4414</b>	<b>1537</b>	<b>779</b>	<b>758</b>	<b>23353</b>	<b>12950</b>	<b>10403</b>	<b>73.01</b>	<b>80.26</b>	<b>65.63</b>	<b>17342</b>	<b>49.76</b>	<b>15881</b>	<b>45.57</b>	<b>1461</b>	<b>4.19</b>	<b>17507</b>	<b>50.24</b>
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	Kallapalayam	860	3066	1581	1485	939	253	130	123	946	686	346	340	4	3	1	2350	1293	1057	83.54	89.11	77.61	1547	50.46	1522	49.64	25	0.82	1519	49.54
2	Seerappalayam	1646	5881	3053	2828	926	505	282	223	791	1041	513	528	0	0	0	4457	2470	1987	82.91	89.14	76.28	2623	44.60	2451	41.68	172	2.92	3258	55.40
3	Nachippalayam	878	3008	1517	1491	983	228	120	108	900	1033	509	524	0	0	0	2019	1105	914	72.63	79.10	66.09	1803	59.94	1598	53.13	205	6.82	1205	40.06
4	Arisippalayam	700	2400	1212	1188	980	225	127	98	772	823	414	409	0	0	0	1670	883	787	76.78	81.38	72.20	1126	46.92	974	40.58	152	6.33	1274	53.08
5	Valukkupparai	1412	4891	2376	2515	1059	383	182	201	1104	1368	667	701	55	33	22	3043	1670	1373	67.50	76.12	59.33	3055	62.46	2640	53.98	415	8.48	1836	37.54
6	Madukkarai (TP)	8153	30357	15084	15273	1013	3049	1544	1505	975	4640	2325	2315	29	12	17	23046	12155	10891	84.39	89.77	79.10	12474	41.09	11399	37.55	1075	3.54	17883	58.91
7	Ettimadai (TP)	2564	9352	4676	4676	1000	826	417	409	981	2694	1318	1376	79	38	41	6125	3341	2784	71.84	78.45	65.24	4490	48.01	3589	38.38	901	9.63	4862	51.99
8	Malumichampatti (CT)	3594	12936	6568	6368	970	1294	687	607	884	2561	1294	1267	4	2	2	10023	5315	4708	86.09	90.38	81.72	5517	42.65	5222	40.37	295	2.28	7419	57.35
<b>Total</b>		<b>19807</b>	<b>71891</b>	<b>36067</b>	<b>35824</b>	<b>993</b>	<b>6763</b>	<b>3489</b>	<b>3274</b>	<b>938</b>	<b>14846</b>	<b>7386</b>	<b>7460</b>	<b>171</b>	<b>88</b>	<b>83</b>	<b>52733</b>	<b>28232</b>	<b>24501</b>	<b>80.97</b>	<b>86.66</b>	<b>75.27</b>	<b>32635</b>	<b>45.40</b>	<b>29395</b>	<b>40.89</b>	<b>3240</b>	<b>4.51</b>	<b>39256</b>	<b>54.60</b>
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	Theethipalayam	2386	8629	4296	4333	1009	847	425	422	993	1395	686	709	25	16	9	6329	3424	2905	81.33	88.45	74.28	3901	45.21	3284	38.06	617	7.15	4728	54.79
2	Mavuthampathi	818	2843	1442	1401	972	251	127	124	976	40	15	25	624	320	304	1870	1057	813	72.15	80.38	63.66	1603	56.38	1289	45.34	314	11.04	1240	43.62
3	Pichanur	1687	6261	3094	3167	1024	526	259	267	1031	1523	765	758	69	36	33	4312	2333	1979	75.19	82.29	68.24	3214	51.33	3094	49.42	120	1.92	3047	48.67
4	Myleripalayam	1393	4990	2451	2539	1036	447	227	220	969	1381	679	702	0	0	0	3169	1746	1423	69.76	78.51	61.36	2912	58.36	2581	51.72	331	6.63	2078	41.64
5	Sokkanur	1776	6020	2978	3042	1021	464	218	246	1128	1166	584	582	339	165	174	3627	2066	1561	65.28	74.86	55.83	3810	63.29	3654	60.70	156	2.59	2210	36.71
6	Sangarayapuram	255	816	416	400	962	58	27	31	1148	147	67	80	55	27	28	604	338	266	79.68	86.89	72.09	518	63.48	446	54.66	72	8.82	298	36.52
<b>Total</b>		<b>8315</b>	<b>29559</b>	<b>14677</b>	<b>14882</b>	<b>1014</b>	<b>2593</b>	<b>1283</b>	<b>1310</b>	<b>1021</b>	<b>5652</b>	<b>2796</b>	<b>2856</b>	<b>1112</b>	<b>564</b>	<b>548</b>	<b>19911</b>	<b>10964</b>	<b>8947</b>	<b>73.84</b>	<b>81.86</b>	<b>65.92</b>	<b>15958</b>	<b>53.99</b>	<b>14348</b>	<b>48.54</b>	<b>1610</b>	<b>5.45</b>	<b>13601</b>	<b>46.01</b>
<b>Grand total</b>		<b>37798</b>	<b>136299</b>	<b>68359</b>	<b>67940</b>	<b>994</b>	<b>12217</b>	<b>6251</b>	<b>5966</b>	<b>954</b>	<b>29256</b>	<b>14526</b>	<b>14730</b>	<b>2820</b>	<b>1431</b>	<b>1389</b>	<b>95997</b>	<b>52146</b>	<b>43851</b>	<b>77.37</b>	<b>83.96</b>	<b>70.76</b>	<b>65935</b>	<b>48.38</b>	<b>59624</b>	<b>43.75</b>	<b>6311</b>	<b>4.63</b>	<b>70364</b>	<b>51.62</b>

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

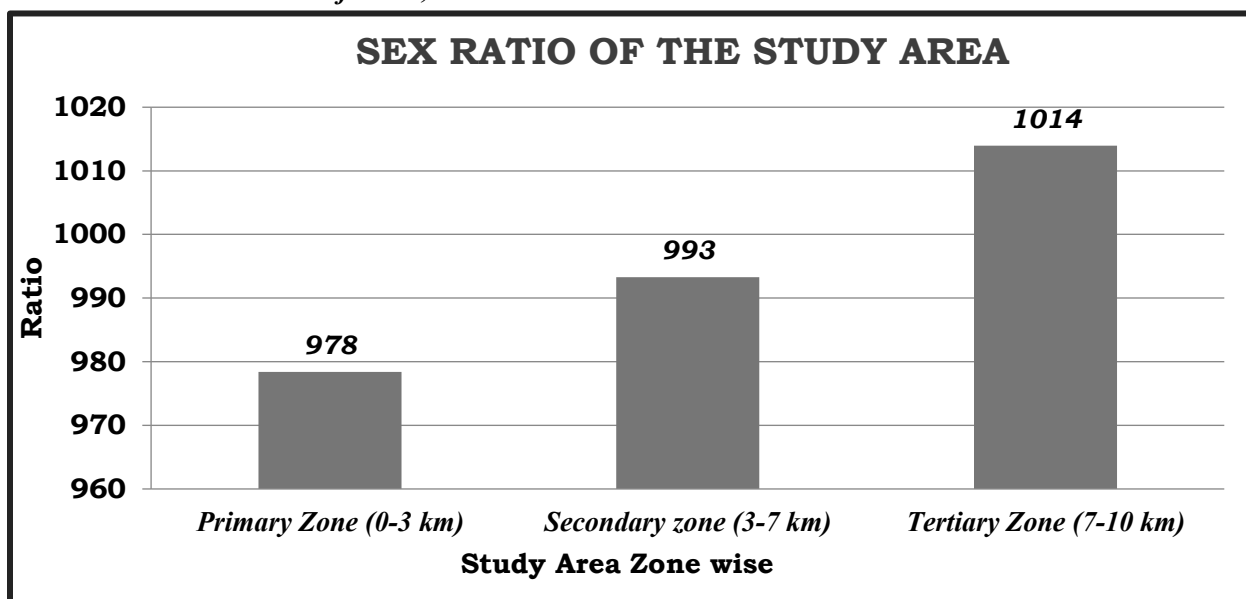
### 3.16.1 Gender and Sex Ratio

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 1002 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 19 villages lying in study area (buffer zone) as primary, secondary and tertiary zone.

**Table 3.47 Sex ratio of the study area**

S. No.	Buffer Zone	Sex Ratio of Study area Female/ 1000 Male
1	Primary Zone (0-3 km)	978
2	Secondary zone (3-7 km)	993
3	Tertiary Zone (7-10 km)	1014

*Source: Census of India, 2011*



**Figure 3.33 Sex Ratio within 10 Km study area**

### 3.16.2 Child Sex Ratio

S. No.	Buffer Zone	Sex Ratio of Study area Female/ 1000 Male
1	Primary Zone (0-3 km)	934
2	Secondary zone (3-7 km)	938
3	Tertiary Zone (7-10 km)	1021

*Source: Census of India, 2011*

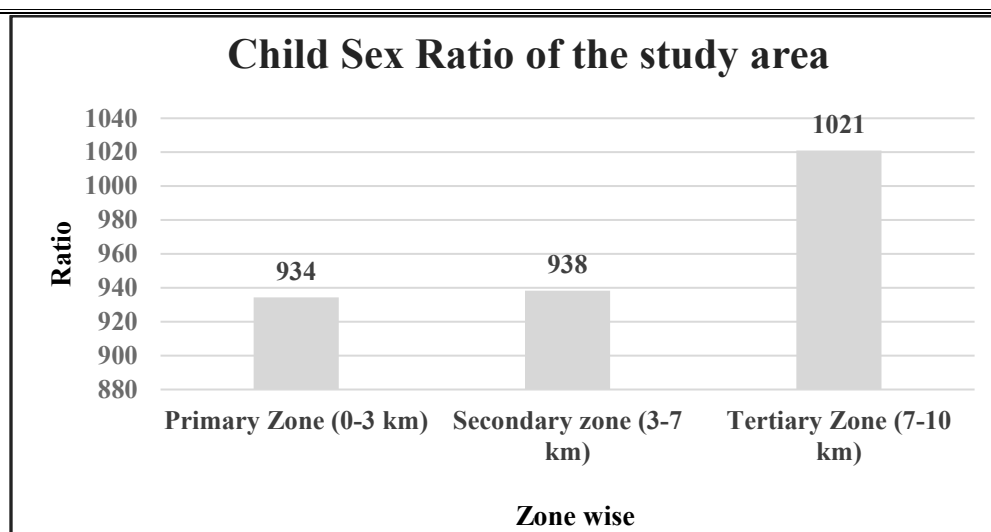


Figure 3.34 Child Sex Ratio within 10 Km study area

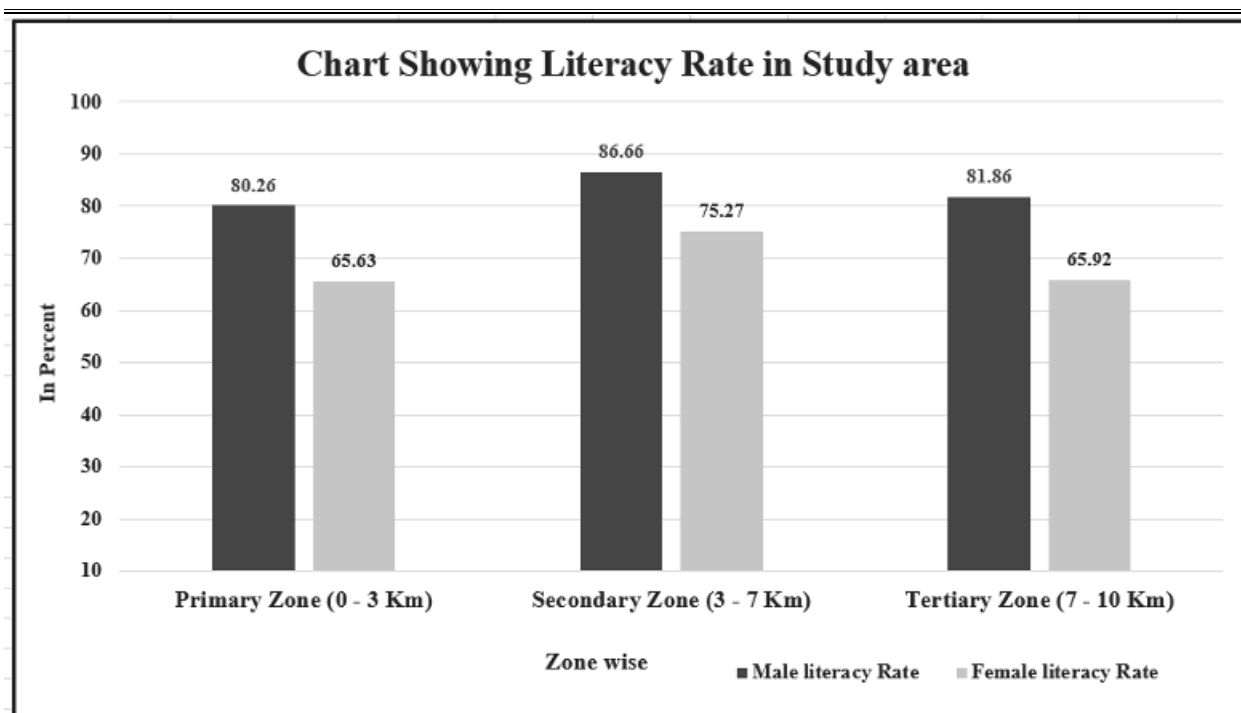
### 3.17 Literacy Rate in Study Area

Literacy Rate is the percentage of people in a country with the ability to read and write. The analysis of the literacy levels is done in the study area. The 10 km radius of study area demonstrates a literacy rate of 77.37% as per census data 2011. The male literacy rate in the study area indicates 83.96% whereas the female literacy rate, which is an important indicator for social change, is observed to be 70.76% as per the census data 2011. This needs to focus on the region and enhance further development focusing on education. (Table no 3.48).

Table 3.48 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)	5	12950	80.26	10403	65.63	23353	73.01
Secondary Zone (3 - 7 Km)	8	28232	86.66	24501	75.27	52733	80.97
Tertiary Zone (7 - 10 Km)	6	10964	81.86	8947	65.92	19911	73.84
<b>Study Area (0-10km)</b>	<b>19</b>	<b>52146</b>	<b>83.96</b>	<b>43851</b>	<b>70.76</b>	<b>95997</b>	<b>77.37</b>

Source: Census of India, 2011



**Figure 3.35 Gender wise Literacy Rate in the study area**

### 3.18 Family Size

Size of family also describes about family functioning, resource consumption, total income generated and their expenditure pattern. Census 2011 data suggests that most of these households have a family size of up to 4 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.

### 3.19 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 21.46% and Schedule Tribe population 2.07%, Other Population is 76.47% in Total study area.

**Table 3.49 vulnerable groups of the study area**

Zone	No. of Villages	Vulnerable Groups					
		SC Population	%	ST Population	%	Other Population	%
Primary Zone (0 - 3 Km)	5	8758	25.13	1537	4.41	24554	70.46
Secondary Zone (3 - 7 Km)	8	14846	20.65	171	0.24	56874	79.11
Tertiary Zone (7 - 10 Km)	6	5652	19.12	1112	3.76	22795	77.12

<b>Total area (10km)</b>	<b>19</b>	<b>29256</b>	<b>21.46</b>	<b>2820</b>	<b>2.07</b>	<b>104223</b>	<b>76.47</b>
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Source: Census of India, 2011

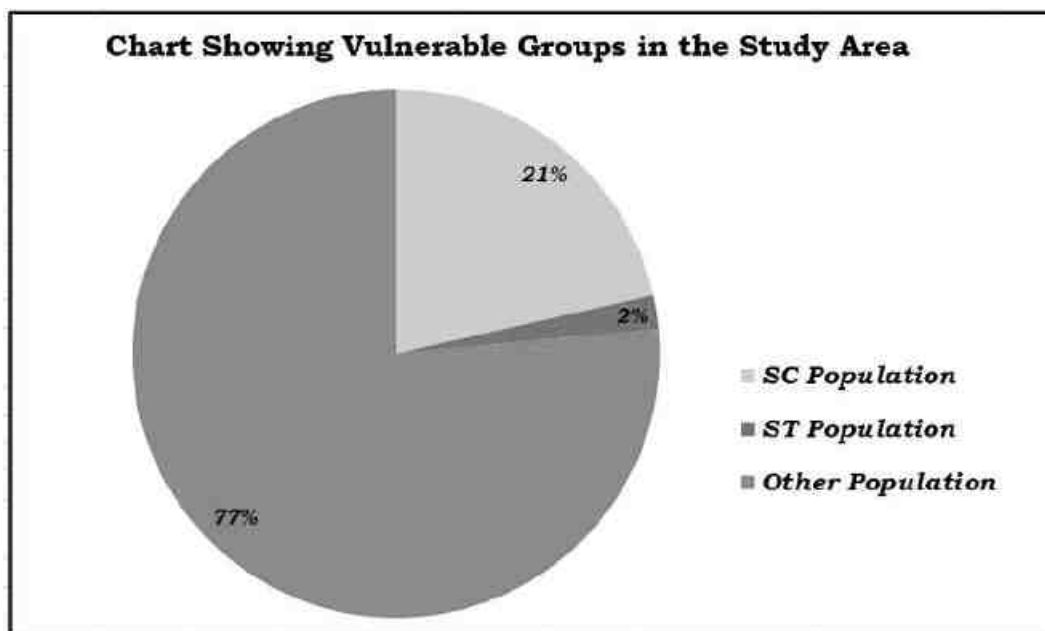


Figure 3.36 Vulnerable groups

### 3.20 Economic Activities

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

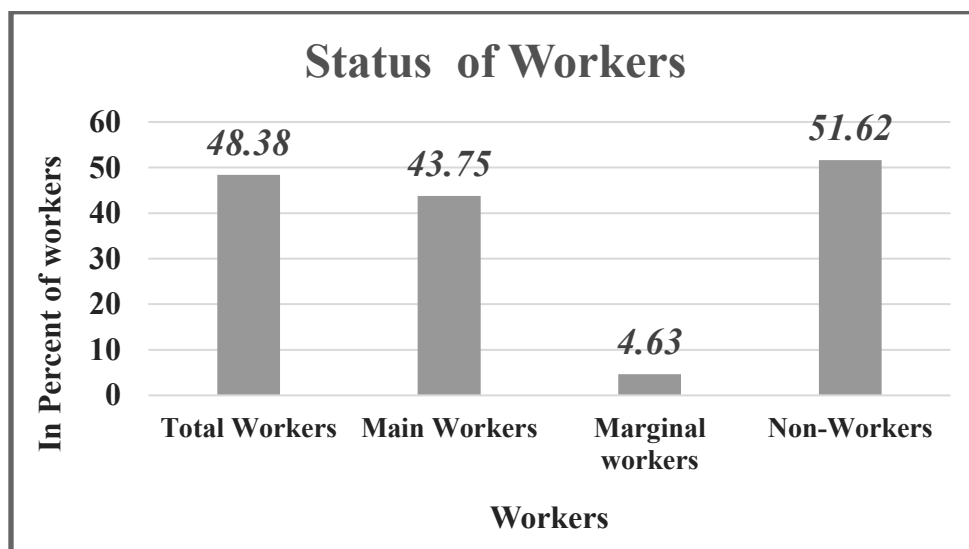
Table 3.50 shows the work force of the study area

Zone	No. of Villages	Total Workers	%	Main Workers	%	Marginal Workers	%	Non-Workers	%
Primary Zone (0 - 3 Km)	5	17342	49.76	15881	45.57	1461	4.19	17507	50.24
Secondary Zone (3 - 7 Km)	8	32635	45.40	29395	40.89	3240	4.51	39256	54.60
Tertiary Zone (7 - 10 Km)	6	15958	53.99	14348	48.54	1610	5.45	13601	46.01
<b>Study Area (10 Km)</b>	<b>19</b>	<b>65935</b>	<b>48.38</b>	<b>59624</b>	<b>43.75</b>	<b>6311</b>	<b>4.63</b>	<b>70364</b>	<b>51.62</b>

Source: Census of India, 2011

The above table shows that out of the total working population, the percentage of main workers is 43.75 % while 4.63 % are marginal workers. Number of working populations is 48.38% and non-working population is 51.62% in

the study area. As per the data obtained from the survey (as mentioned previously in occupational structure) most of these people are employed for major period of the year. Also, to mention the natural environment also restricts the people in finding stable business is performed for only certain months. Thus, proposed project will act as possible exposure for them to get enrol and earn sustain livelihood.



**Figure 3.37 Working population in the study area**

### 3.21 Infrastructure Base

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

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

- Administrative offices are located in Tamil Nadu, Coimbatore district (16km-N) from site which by local transport.
- Kunitipathi River Southeast Side around 10 km from quarry lease boundary.
- Availability of Government high school Madukkarai Town & Village (NE-4.0km), Government school, Palathurai (NE-1.5km), Government school, Thirumalayam Palayam (NW-1km), Government Primary School Coimbatore (NE-13km), Government school, Kaliyapuram (W-2.5km), Government Higher Secondary school, Pichanur (SW-5km), Government Higher Secondary school, Valukkuparai (SE-4.5km), Madukkarai Taluk many Arts and Engineering college and Training institute found in study area. (Source: As per google image)
- Health facilities covered in the Core zone area Madukkarai PHC (3km), Covai Pudur Government woman and child Hospital, Palakad (7km-N), Government Sub Hospital's, Madukkarai (9.0km-NE), Government Hospital Madukkarai (4.0km-NE), Sundakkamuthur Government Hospital (9.0km-NW). some private and clinics are located in the Major district and taluks. (Source: As per google image)

Table 3.51 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)
1	Kumarapalayam	3	0	1	0	1	0	0	0
2	Palathurai	1	0	1	0	0	0	0	0
3	Kaliyapuram	3	0	3	0	1	0	0	0
4	Chettipalayam (TP)	2	3	2	1	1	1	1	0
5	Thirumalayampalayam (TP)	5	1	1	0	1	0	0	0
	<b>Total</b>	<b>7</b>	<b>0</b>	<b>5</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>0</b>
1	Kallapalayam	1	1	1	0	1	0	1	0
2	Seerappalayam	3	1	1	1	0	0	0	0
3	Nachippalayam	4	0	0	0	0	0	0	0
4	Arisippalayam	2	0	1	0	1	0	0	0
5	Valukkupparai	3	0	1	0	1	0	0	0
6	Madukkarai (TP)	6	5	5	2	2	2	1	0
7	Ettimadai (TP)	4	1	2	1	0	1	0	0
8	Malumichampatti (CT)	2	0	1	0	1	0	1	0
	<b>Total</b>	<b>25</b>	<b>8</b>	<b>12</b>	<b>4</b>	<b>6</b>	<b>3</b>	<b>3</b>	<b>0</b>
1	Theethipalayam	4	0	2	0	1	0	0	0
2	Mavuthampathi	5	0	2	0	1	0	0	0
3	Pichanur	4	0	1	0	1	0	0	0
4	Myleripalayam	3	0	1	0	0	1	0	0
5	Sokkanur	5	0	3	0	1	0	1	0
6	Sangarayapuram	1	0	0	0	0	0	0	0
	<b>Total</b>	<b>22</b>	<b>0</b>	<b>9</b>	<b>0</b>	<b>4</b>	<b>1</b>	<b>1</b>	<b>0</b>
	<b>Grant total</b>	<b>54</b>	<b>8</b>	<b>26</b>	<b>4</b>	<b>12</b>	<b>4</b>	<b>4</b>	<b>0</b>

Source: DCHB Census 2011, Tamil Nadu.

Table 3.52 Health/ Medical Facilities in the Surveyed Area

Sno	Village Name	Community Health Centre (Numbers)	Primary Health Centre (Numbers)	Primary Health 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)
1	Kumarapalayam	0	0	1	1	0	0	1	0	0
2	Palathurai	0	0	1	0	0	0	0	0	0
3	Kaliyapuram	0	1	1	1	0	1	1	1	0
4	Chettipalayam (TP)	0	0	1	1	0	0	1	0	3
5	Thirumalayampalayam (TP)	0	0	1	1	0	0	1	1	1
	<b>Total</b>	<b>0</b>	<b>1</b>	<b>5</b>	<b>4</b>	<b>0</b>	<b>1</b>	<b>4</b>	<b>2</b>	<b>4</b>
1	Kallapalayam	0	0	1	0	0	0	0	0	0
2	Seerappalayam	0	0	3	0	0	0	0	0	0
3	Nachippalayam	0	0	1	0	0	0	0	0	0
4	Arisippalayam	0	1	1	1	0	1	0	1	0
5	Valukkupparai	0	0	1	0	0	0	1	0	0
6	Madukkarai (TP)	1	1	0	1	0	0	1	0	8
7	Ettimadai (TP)	1	1	0	0	0	0	1	0	4
8	Malumichampatti (CT)	0	1	0	1	0	0	1	0	1
	<b>Total</b>	<b>2</b>	<b>4</b>	<b>7</b>	<b>3</b>	<b>0</b>	<b>1</b>	<b>4</b>	<b>1</b>	<b>13</b>
1	Theethipalayam	0	0	1	1	0	0	0	0	2
2	Mavuthampathi	0	0	0	0	0	0	0	0	1
3	Pichanur	0	0	3	0	0	0	1	0	0
4	Myleripalayam	0	1	1	1	0	1	0	1	1
5	Sokkanur	0	1	1	1	0	1	1	1	0
6	Sangarayapuram	0	0	0	0	0	0	0	0	0
	<b>Total</b>	<b>0</b>	<b>2</b>	<b>6</b>	<b>3</b>	<b>0</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>4</b>
	<b>Grant total</b>	<b>2</b>	<b>7</b>	<b>18</b>	<b>10</b>	<b>0</b>	<b>4</b>	<b>10</b>	<b>5</b>	<b>21</b>

Source: DCHB Census 2011, Tamil Nadu.



Table 3.53 Water &amp; Drainage Facilities in the Surveyed Area

Sno	Village Name	TWTS	TWUS	Covered well	Uncovered Well	Handpump	Tubewell/Borehole	Spring	R/C	T/P/L	Closed Drainage system	Open Drainage system	No Drainage system
1	Kumarapalayam	1	1	1	1	2	1	2	2	2	1	1	1
2	Palathurai	1	1	1	1	1	1	2	2	2	1	1	1
3	Kaliyapuram	1	1	1	1	1	1	2	1	2	1	1	1
4	Chettipalayam (TP)	1	1	1	1	1	1	2	2	2	1	1	1
5	Thirumalayampalayam (TP)	1	1	1	1	1	1	2	1	2	1	1	1
	<b>Total</b>	<b>3</b>	<b>3</b>	<b>1</b>	<b>3</b>	<b>1</b>	<b>2</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>5</b>	<b>5</b>	<b>5</b>
1	Kallapalayam	1	1	1	2	1	1	2	2	1	1	1	1
2	Seerappalayam	1	1	1	1	1	1	1	1	2	1	1	1
3	Nachippalayam	1	1	1	1	1	1	2	2	2	1	1	1
4	Arisippalayam	1	1	2	2	2	1	2	1	2	1	1	1
5	Valukkupparai	1	1	1	1	1	1	1	2	1	1	1	1
6	Madukkarai (TP)	1	1	1	1	1	1	2	2	2	1	1	1
7	Ettimadai (TP)	1	1	1	1	1	1	2	2	2	1	1	1
8	Malumichampatti (CT)	1	1	1	1	1	1	1	1	1	1	1	1
	<b>Total</b>	<b>8</b>	<b>8</b>	<b>7</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>8</b>	<b>8</b>	<b>8</b>
1	Theethipalayam	1	1	1	1	2	1	2	2	2	1	1	1
2	Mavuthampathi	1	1	1	1	1	1	1	1	1	1	1	1
3	Pichanur	1	1	1	1	1	1	1	2	2	1	1	1
4	Myleripalayam	1	1	1	1	1	1	2	2	2	1	1	1
5	Sokkanur	1	1	1	1	2	1	1	2	2	1	1	1
6	Sangarayapuram	1	1	1	1	1	1	2	2	2	1	1	1
	<b>Total</b>	<b>6</b>	<b>6</b>	<b>8</b>	<b>6</b>	<b>4</b>	<b>6</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>6</b>	<b>6</b>	<b>6</b>
	<b>Grant total</b>	<b>17</b>	<b>17</b>	<b>16</b>	<b>15</b>	<b>12</b>	<b>16</b>	<b>6</b>	<b>6</b>	<b>4</b>	<b>19</b>	<b>19</b>	<b>19</b>

Source: DCHB Census 2011, Tamil Nadu.

Table 3.54 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))	Public Call Office /Mobile (PCO) (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 Driven by Animals (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))	Water Bounded Macadam (Status A(1)/NA(2))	All Weather Road (Status A(1)/NA(2))	Foothpath (Status A(1)/NA(2))
1	Kumarapalayam	2	2	2	1	1	2	1	1	2	2	1	1	2	2	2	2	2	1	1	1	1	1	1	1
2	Palathurai	2	1	2	1	1	2	1	1	2	2	1	2	2	2	2	2	2	1	1	1	1	1	1	1
3	Kaliyapuram	2	1	2	1	1	2	1	1	2	2	2	1	2	2	2	2	2	2	2	2	1	1	1	1
4	Chettipalayam (TP)	1	1	1	1	1	1	1	1	1	2	1	1	1	2	2	2	2	2	2	1	1	1	1	1
5	Thirumalayampalayam (TP)	1	1	2	1	1	1	1	1	1	1	1	1	1	2	2	2	2	1	2	1	1	1	1	1
	<b>Total</b>	<b>2</b>	<b>4</b>	<b>1</b>	<b>3</b>	<b>5</b>	<b>8</b>	<b>1</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>4</b>	<b>4</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>2</b>	<b>4</b>	<b>5</b>	<b>5</b>	<b>5</b>	<b>5</b>
1	Kallapalayam	2	1	2	1	1	2	1	1	2	1	1	1	2	2	2	2	1	2	2	2	1	1	1	1
2	Seerappalayam	2	1	2	2	1	2	1	1	2	2	1	1	2	2	2	2	1	1	1	1	1	1	1	1
3	Nachippalayam	2	2	2	1	1	2	1	1	2	1	1	2	2	2	2	2	2	1	1	1	1	1	1	1
4	Arisippalayam	2	1	2	2	1	2	1	1	2	2	2	2	2	2	2	2	2	1	2	2	1	1	1	1
5	Valukkupparai	2	1	2	1	1	1	1	1	2	1	1	1	2	2	2	2	2	2	2	2	1	1	1	1
6	Madukkarai (TP)	2	1	2	1	1	1	2	1	1	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1
7	Ettimadai (TP)	2	1	2	1	1	1	1	1	1	2	2	1	1	2	2	2	2	2	1	1	2	1	1	1
8	Malumichampatti (CT)	1	2	1	1	1	1	2	1	1	2	2	1	1	2	2	2	2	2	1	1	1	1	1	1
	<b>Total</b>	<b>1</b>	<b>6</b>	<b>1</b>	<b>6</b>	<b>8</b>	<b>4</b>	<b>6</b>	<b>8</b>	<b>3</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>4</b>	<b>3</b>	<b>8</b>	<b>8</b>	<b>8</b>
1	Theethipalayam	2	1	2	1	1	2	1	1	2	1	1	1	2	2	2	2	1	1	1	1	1	1	1	1
2	Mavuthampathi	2	1	2	1	1	2	1	2	2	1	1	1	2	2	2	2	1	1	1	1	1	1	1	1
3	Pichanur	2	1	2	1	1	2	1	1	2	2	2	1	2	2	2	2	1	1	1	1	1	1	1	1
4	Myleripalayam	2	1	2	1	1	2	1	2	2	1	1	2	2	2	2	2	1	1	1	1	1	1	1	1
5	Sokkanur	2	1	2	1	1	2	1	1	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1
6	Sangarayapuram	2	2	2	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1
	<b>Total</b>	<b>0</b>	<b>5</b>	<b>0</b>	<b>6</b>	<b>6</b>	<b>0</b>	<b>5</b>	<b>3</b>	<b>0</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>5</b>	<b>5</b>	<b>5</b>	<b>6</b>	<b>6</b>	<b>6</b>	<b>6</b>
	<b>Grant Total</b>	<b>3</b>	<b>15</b>	<b>2</b>	<b>15</b>	<b>19</b>	<b>12</b>	<b>12</b>	<b>13</b>	<b>5</b>	<b>7</b>	<b>11</b>	<b>12</b>	<b>4</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>8</b>	<b>11</b>	<b>13</b>	<b>14</b>	<b>19</b>	<b>19</b>	<b>19</b>

Source: DCHB Census 2011, Tamil Nadu.

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### 3.22. Other Issues in the Study Area

1. Deforestation of Land (Cutting Trees or Plant etc.)
2. Agriculture Land decreases
3. Nearest Built-up Land increase the noise and air
4. Lack of awareness among vulnerable groups for their welfare
5. Medical/Clinic facilities and PHC need for the Core area
6. Environmental clean with solid wastage pin each village.
7. Functioning of Hospital facilities with Sub Health care centers.
8. Need proper drainage system with public toilet men and women separately.
9. Need local transport available.
10. Road condition improve the study area.

### 3.23 Interpretation

Based on the data, following inferences could be drawn:

- Total literacy rate in the study area is 77.37%.
- 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 2.07% and Scheduled Caste forms 21.46% of the total population of study area.
- The Other Population forms 76% of the total population of study area.
- The study area is well connected by National and District Road.
- The study area improves healthcare facilities of primary level.
- Considering the above facts, the proposed project will boost the socio-economic development activities in the area and hence will leave positive impact.
- The study area has mobile connectivity.

### 3.24 Recommendation and Suggestions

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

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

### **3.25 Conclusion**

The socio-economic study of surveyed villages gives a clear picture of its population, average household size, literacy rate and sex ratio etc. It is also found that a part of population is suffering from lack of permanent job to run their day-to-day life.

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

The proposed project will aim to provide preferential employment to the local people there by improving the employment opportunity in the area and in turn the social standards will improve.

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## 4. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

### 4.0 GENERAL

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

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

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

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

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

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

### 4.1 LAND ENVIRONMENT:

#### 4.1.2 Anticipated Impact from 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

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### 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

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

### 4.1.5 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 and gravel quarrying operation. The entire quarried out materials will be utilized (100%).

## 4.2 WATER ENVIRONMENT

### 4.2.1 Anticipated Impact from all 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 – P1		
*Purpose	Quantity	Source
Dust Suppression	1.5 KLD	Rainwater accumulated in Mine Pit/ Water Tanker
Green Belt development	0.7 KLD	Rainwater accumulated in Mine Pit/ Water Tanker
Domestic purpose	0.3 KLD	Water Tankers
Total	<b>2.5 KLD</b>	

\* 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 judiciously 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 all Proposed Projects

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

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

#### 4.3.1.1. Modelling of Incremental Concentration from all Proposed Projects

Wind erosion of the exposed areas and the air borne particulate matter generated by quarrying operation, and transportation are mainly PM<sub>10</sub> & PM<sub>2.5</sub> and emissions of Sulphur dioxide (SO<sub>2</sub>) & Oxides of Nitrogen (NO<sub>x</sub>) 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<sub>2</sub>), Oxides of Nitrogen (NO<sub>x</sub>) 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<sub>10</sub>) affecting Ambient Air of the area. Prediction of impacts on air environment has been carried out taking into consideration cumulative production three proposed quarries. Air environment and net increase in emissions by Open pit source modelling in AERMOD Software.

#### 4.3.2 Emission Estimation

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

The general equation for emissions estimation is:

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

Where:

E = emissions;

A = activity rate;

EF = emission factor, and

ER =overall emission reduction efficiency, %

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

##### 4.3.2.1 Frame work of Computation & Model details

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



loading and movement of vehicles during transportation and meteorological parameters such as wind speed, wind direction, temperature, rainfall, humidity and Cloud cover.

Impact was predicted over the distance of 10 km around the source to assess the impact at each receptor separately at the various locations and maximum incremental GLC value at the project site. Maximum impact of PM10 was observed close to the source due to low to moderate wind speeds. Incremental value of PM10 was superimposed on the base line data monitored at the proposed site to predict total GLC of PM10 due to combined impacts

**TABLE 4.2: ESTIMATED EMISSION RATE FOR PM<sub>10</sub>**

Activity	Source type	Value	Unit
		P1	
Drilling	Point Source	0.064251969	g/s
Blasting	Point Source	0.000264878	g/s
Mineral Loading	Point Source	0.040323424	g/s
Haul Road	Line Source	0.002488103	g/s/m
Overall Mine	Area Source	0.066742302	g/s

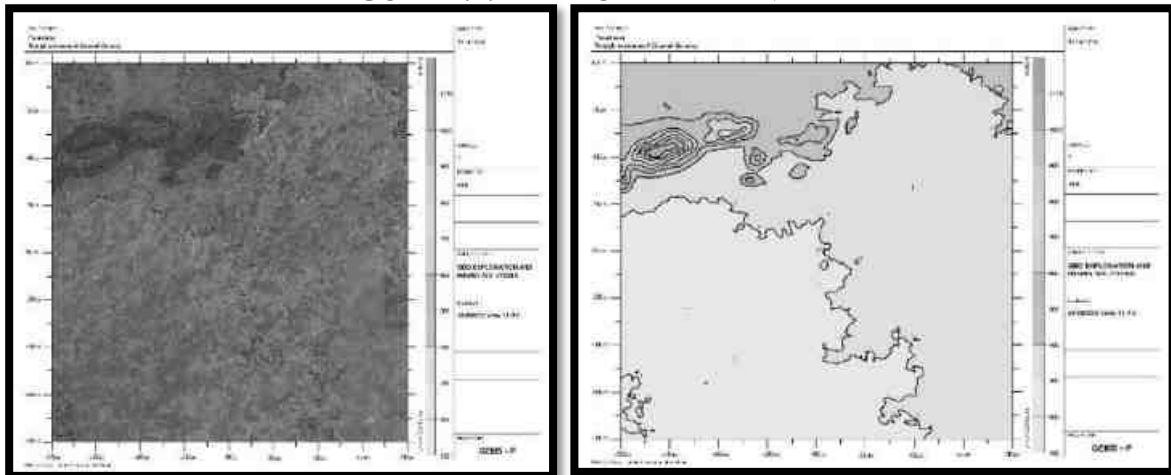
**TABLE 4.3: ESTIMATED EMISSION RATE FOR SO<sub>2</sub>**

Activity	Source type	Value	Unit
		P1	
Overall Mine	Area Source	0.000405828	g/s

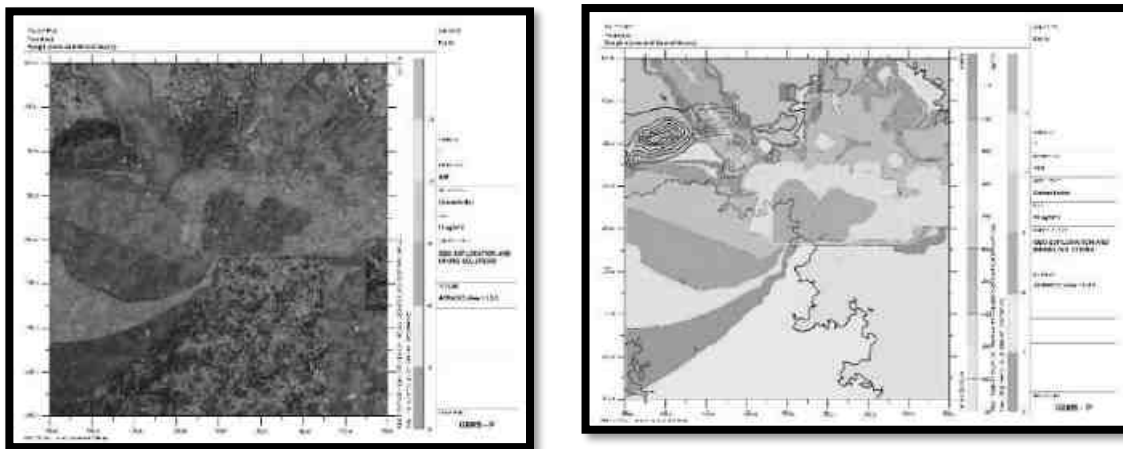
**TABLE 4.4: ESTIMATED EMISSION RATE FOR NO<sub>x</sub>**

Activity	Source type	Value	Unit
		P1	
Overall Mine	Area Source	0.000033057	g/s

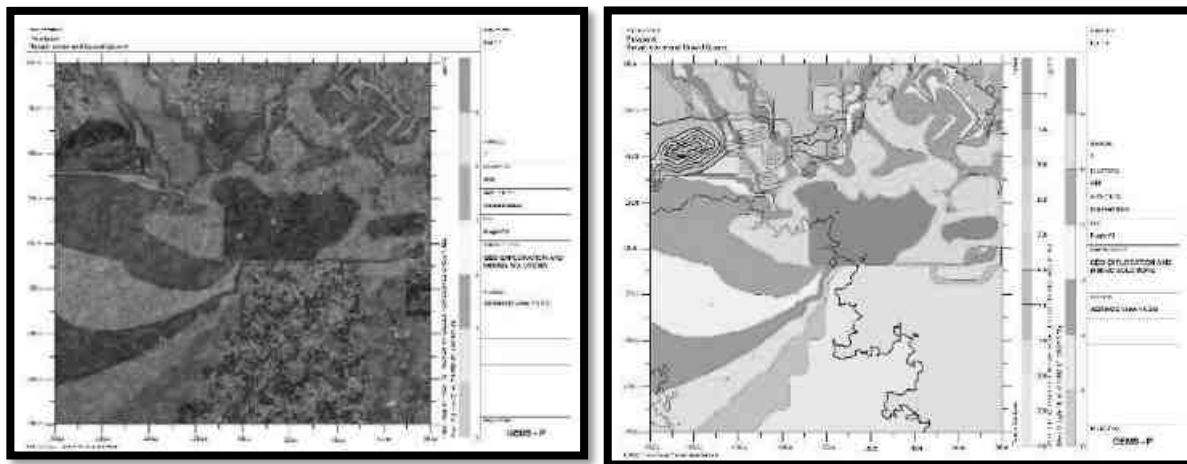
**FIGURE 4.1: AERMOD TERRAIN MAP**



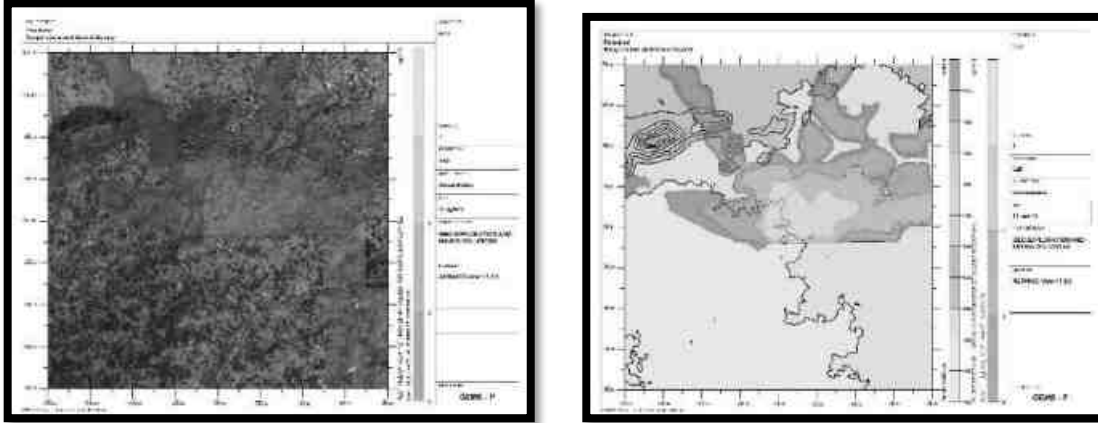
**FIGURE 4.2: PREDICTED INCREMENTAL CONCENTRATION OF PM<sub>10</sub>**



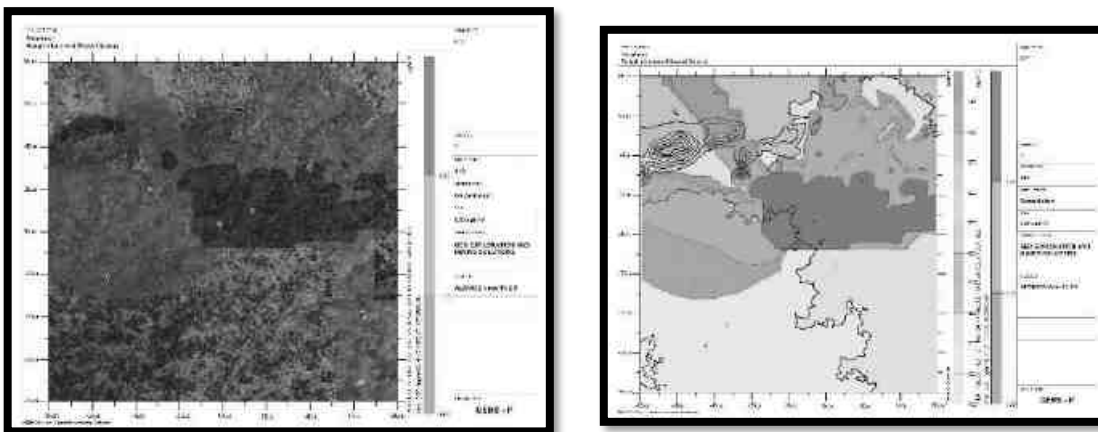
**FIGURE 4.3: PREDICTED INCREMENTAL CONCENTRATION OF PM<sub>25</sub>**



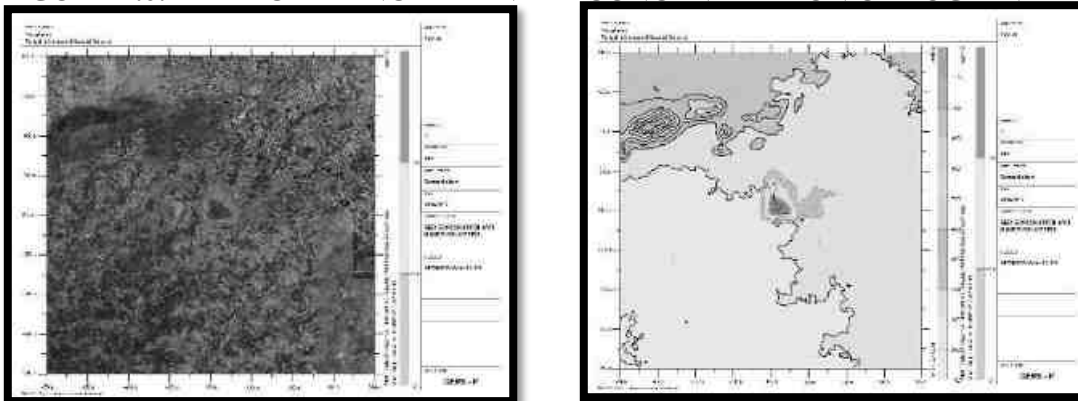
**FIGURE 4.4: PREDICTED INCREMENTAL CONCENTRATION OF NO<sub>x</sub>**



**FIGURE 4.5: PREDICTED INCREMENTAL CONCENTRATION OF SO<sub>2</sub>**



**FIGURE 4.6: PREDICTED INCREMENTAL CONCENTRATION OF FUGITIVE DUST**



### 4.3.2.2 Model Results

The post project Resultant Concentrations of PM<sub>10</sub>, PM<sub>2.5</sub>, SO<sub>2</sub>& NO<sub>x</sub> (GLC) is given in Table below:

**TABLE 4.5: INCREMENTAL & RESULTANT GLC OF PM<sub>10</sub>**

Station Code	Location	X Coordinate (m)	Y Coordinate (m)	Average Baseline PM <sub>10</sub> (µg/m <sup>3</sup> )	Incremental value of PM <sub>10</sub> due to mining (µg/m <sup>3</sup> )	Total PM <sub>10</sub> (µg/m <sup>3</sup> )
AAQ1	10°52'29.61"N 76°56'17.86"E	-125	3	42.3	15.91	58.2
AAQ2	10°52'50.46"N 76°57'5.93"E	1347	656	42.3	15.13	57.5
AAQ3	10°51'10.65"N 76°53'29.55"E	-5268	-2429	42.0	7.00	49.0
AAQ4	10°51'40.49"N 76°57'45.94"E	2569	-1500	42.5	0	42.5
AAQ5	10°53'56.36"N 76°58'32.04"E	3973	2692	41.6	13.82	55.4
AAQ6	10°51'41.09"N 76°56'25.54"E	109	-1487	41.6	0	41.6
AAQ7	10°53'23.96"N 76°54'32.08"E	-3354	1689	45.3	11.30	56.6
AAQ8	10°50'0.35"N 76°54'31.46"E	-3375	-4601	46.1	1.49	47.6

**TABLE 4.6: INCREMENTAL & RESULTANT GLC OF PM<sub>2.5</sub>**

Station Code	Location	X Coordinate (m)	Y Coordinate (m)	Average Baseline PM <sub>2.5</sub> (µg/m <sup>3</sup> )	Incremental value of PM <sub>2.5</sub> due to mining (µg/m <sup>3</sup> )	Total PM <sub>2.5</sub> (µg/m <sup>3</sup> )
AAQ1	10°52'29.61"N 76°56'17.86"E	-125	3	22.3	8.88	31.2
AAQ2	10°52'50.46"N 76°57'5.93"E	1347	656	22.7	8.20	30.9
AAQ3	10°51'10.65"N 76°53'29.55"E	-5268	-2429	22.9	3.52	26.4
AAQ4	10°51'40.49"N 76°57'45.94"E	2569	-1500	21.5	0	21.5
AAQ5	10°53'56.36"N 76°58'32.04"E	3973	2692	41.6	7.60	49.2
AAQ6	10°51'41.09"N 76°56'25.54"E	109	-1487	43.6	0.17	43.8
AAQ7	10°53'23.96"N 76°54'32.08"E	-3354	1689	22.0	5.06	27.1
AAQ8	10°50'0.35"N 76°54'31.46"E	-3375	-4601	22.0	1.71	23.7

**TABLE 4.7: INCREMENTAL & RESULTANT GLC OF SO<sub>2</sub>**

Station Code	Location	X Coordinate (m)	Y Coordinate (m)	Average Baseline SO <sub>2</sub> (µg/m <sup>3</sup> )	Incremental value due to mining (µg/m <sup>3</sup> )	Total SO <sub>2</sub> (µg/m <sup>3</sup> )
AAQ1	10°52'29.61"N 76°56'17.86"E	-125	3	7.2	2.29	9.5
AAQ2	10°52'50.46"N 76°57'5.93"E	1347	656	7.1	2.25	9.3
AAQ3	10°51'10.65"N 76°53'29.55"E	-5268	-2429	6.7	0.41	7.1
AAQ4	10°51'40.49"N 76°57'45.94"E	2569	-1500	6.8	0	6.8
AAQ5	10°53'56.36"N 76°58'32.04"E	3973	2692	6.3	2.20	8.5
AAQ6	10°51'41.09"N 76°56'25.54"E	109	-1487	6.9	0	6.9
AAQ7	10°53'23.96"N 76°54'32.08"E	-3354	1689	6.8	1.84	8.6
AAQ8	10°50'0.35"N 76°54'31.46"E	-3375	-4601	7.1	0	7.1

**TABLE 4.8: INCREMENTAL & RESULTANT GLC OF NO<sub>x</sub>**

Station Code	Location	X Coordinate (m)	Y Coordinate (m)	Average Baseline NO <sub>x</sub> (µg/m <sup>3</sup> )	Incremental value due to mining (µg/m <sup>3</sup> )	Total NO <sub>x</sub> (µg/m <sup>3</sup> )
AAQ1	10°52'29.61"N 76°56'17.86"E	-125	3	24.0	11.73	35.8
AAQ2	10°52'50.46"N 76°57'5.93"E	1347	656	24.6	11.16	35.7
AAQ3	10°51'10.65"N 76°53'29.55"E	-5268	-2429	22.0	0	22.0
AAQ4	10°51'40.49"N 76°57'45.94"E	2569	-1500	23.0	0	23.0
AAQ5	10°53'56.36"N 76°58'32.04"E	3973	2692	23.6	9.44	33.0

AAQ6	10°51'41.09"N 76°56'25.54"E	109	-1487	23.5	0	23.5
AAQ7	10°53'23.96"N 76°54'32.08"E	-3354	1689	21.4	1.00	22.4
AAQ8	10°50'0.35"N 76°54'31.46"E	-3375	-4601	23.7	0	23.7

**TABLE 4.9: INCREMENTAL & RESULTANT GLC OF FUGITIVE DUST**

Station Code	Location	X Coordinate (m)	Y Coordinate (m)	Average Baseline Fugitive ( $\mu\text{g}/\text{m}^3$ )	Incremental value due to mining ( $\mu\text{g}/\text{m}^3$ )	Total Fugitive Dust ( $\mu\text{g}/\text{m}^3$ )
AAQ1	10°52'29.61"N 76°56'17.86"E	-125	3	62.36	26	88.4
AAQ2	10°52'50.46"N 76°57'5.93"E	1347	656	62.13	0	62.1
AAQ3	10°51'10.65"N 76°53'29.55"E	-5268	-2429	63.35	0	63.4
AAQ4	10°51'40.49"N 76°57'45.94"E	2569	-1500	63.05	0	63.1
AAQ5	10°53'56.36"N 76°58'32.04"E	3973	2692	62.79	0	62.8
AAQ6	10°51'41.09"N 76°56'25.54"E	109	-1487	64.27	0	64.3
AAQ7	10°53'23.96"N 76°54'32.08"E	-3354	1689	64.70	0	64.7
AAQ8	10°50'0.35"N 76°54'31.46"E	-3375	-4601	63.23	0	63.2

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  $\mu\text{g}/\text{m}^3$  for PM10, SO2 & NOX respectively. By adopting suitable mitigation measures, the pollutant levels in the atmosphere can be further being controlled.

#### 4.3.3. Common Mitigation Measures for Respective Individual Proposed Projects

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

##### Advantages of Wet Drilling: -

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

##### Blasting –

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

##### Haul Road & Transportation –

- Water will be sprinkled on haul roads twice a day to avoid dust generation during transportation
- Transportation of material will be carried out during day time and material will be covered with tarpaulin
- 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. These activities will not cause any problem to the inhabitants of this area because there is no human settlement in close proximity to the project area. Noise modelling has been carried out considering blasting and compressor operation (drilling) and transportation activities.

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

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

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

$$L_{p2} = L_{p1} - 20 \log (r_2/r_1) - A_{e1,2}$$

Where:

$L_{p1}$  &  $L_{p2}$  are sound levels at points located at distances  $r_1$  &  $r_2$  from the source.

$A_{e1,2}$  is the excess attenuation due to environmental conditions. Combined effect of all sources can be determined at various locations by logarithmic addition.

$$L_{p \text{ total}} = 10 \log \{10^{(L_{p1}/10)} + 10^{(L_{p2}/10)} + 10^{(L_{p3}/10)} + \dots\}$$

#### 4.4.1 Anticipated Impact from all Proposed Projects

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

- Source data
- Receptor data
- Attenuation factor

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

**TABLE 4.10: ACTIVITY AND NOISE LEVEL PRODUCED BY MACHINERY**

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

\*50 feet from source = 15.24 meters

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

The total noise to be produced by mining activity is calculated to be 95.8 dB (A). Generally, most mining operations produce noise between 100-109 dB (A). We have considered equipment and operation noise levels (max) to be approx. 109 dB (A) for noise 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)	51.7	57	56.2	49.1	48.2	47.2	52	51
Incremental Value dB(A)	47.30	38.52	25.29	31.16	27.04	37.18	28.97	25.61
Total Predicted Noise level dB(A)	46.30	57.06	56.20	49.17	48.23	47.61	52.02	51.01

The incremental noise level is found within the range of 47.3dB (A) in Core Zone and 25.29 – 38.52 dB (A) in Buffer zone. The noise level at different receptors in buffer zone is lower due to the distance involved and other topographical features adding to the noise attenuation. The resultant Noise level due to monitored values and calculated values at the receptors are based on the mathematical formula considering attenuation due to Green Belt as 4.9 dB (A) the barrier effect. From the above table, it can be seen that the ambient noise levels at all the locations are within permissible limits of Industrial area (core zone) & Residential area (buffer zone) as per THE NOISE POLLUTION (REGULATION AND CONTROL) RULES, 2000 (The Principal Rules were published in the Gazette of India, vide S.O. 123(E), dated 14.2.2000 and subsequently amended vide S.O. 1046(E), dated 22.11.2000, S.O. 1088(E), dated 11.10.2002, S.O. 1569 (E), dated 19.09.2006 and S.O. 50 (E) dated 11.01.2010 under the Environment (Protection) Act, 1986.).

#### 4.4.2 Common Mitigation Measures for Respective Individual Proposed Projects

The following noise mitigation measures are proposed for control of Noise

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

#### 4.4.3 Ground Vibrations

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

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

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

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

Where –

V = peak particle velocity (mm/s)

K = site and rock factor constant

Q = maximum instantaneous charge (kg)

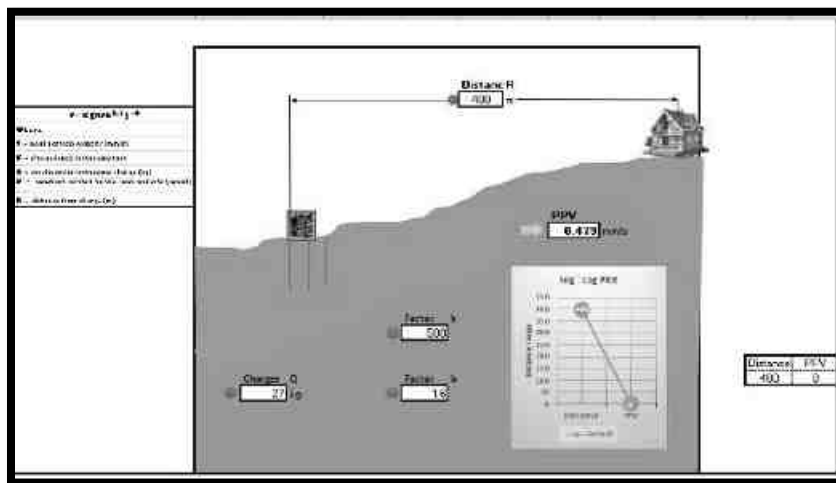
B = constant related to the rock and site (usually 1.6)

R = distance from charge (m)

**TABLE 4.12: PREDICTED PPV VALUES DUE TO BLASTING**

Location ID	Maximum Charge in kgs	Nearest Habitation in m	PPV in m/ms
P1	27	400	0.479

**FIGURE 4.7: GROUND VIBRATION PREDICTION**



From the above graph, the charge per blast of 27 kg is well below the Peak Particle Velocity of 8 mm/s as per Directorate General of Mines Safety for safe level criteria through Circular No. 7 dated 29/8/1997. But the all the project proponents ensure that the charge per blast shall be less than 85 kg and carry out blasting twice or thrice a day based on the onsite conditions under the supervision of competent person employed. However, as per statutory requirement control measures will be adopted to avoid the impacts due to ground vibrations and fly rocks due to blasting.



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#### 4.4.3.1 Common Mitigation Measures for Respective Individual Proposed Projects

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

#### 4.5. IMPACT ON THE BIOLOGICAL ENVIRONMENT

The developmental programs, policies, and projects operated or managed by government or private bodies can cause potentially significant changes in the physical, biological, and socio-economic environment. In some cases, the changes may be beneficial while in others they may be detrimental to the environment. Accordingly, environmental impact studies are required for systematic identification, qualification, and interpretation of the anticipated changes.

##### 4.5.1. Impact Identification and Evaluation

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

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

##### 4.5.2. Impact on Flora

The proposed mine lease area is flat terrain and it is Patta land which is not fit for cultivation. It is mostly devoid of any considerable vegetation. The proposed mine lease area (core zone) does not encompass any designated forest land within it. The vegetation is very sparse and scanty. So, there will be no impact on flora from the mining

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operation. There will not be much contamination of soil or any other materials from the mining operation. No threatened plant species were reported in the core and buffer study area during the field survey.

#### **4.5.2.1. Anticipated Impact on agricultural land associated with flora**

1. There are no impacts on the nearby agricultural land due to this mining activity.
2. None of the plants will be cut during the operational phase of the mine.
3. There shall be negligible air emissions or effluents from the project site. During the loading of the truck, dust generation will be likely. This shall be a temporary effect and not anticipated to affect the surrounding vegetation significantly.

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

### **4.5.3 Mitigation Measures**

#### **4.5.3.1. General Guidelines for Green Belt Development**

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

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

#### **4.5.3.2. Proposed Green Belt**

Extensive green belt development will be started during the construction phase, which will continue till the operation of the plant. About 1500-2000 trees will be planted per hectare all around the plant, approach roads, and township premises. Locally available types of trees that are resistant to pollutants will be planted. In addition to the above, all open spaces available within the premises will be developed as nurseries, parks, gardens, and other forms of greenery. 5 m wide greenbelt will be developed along the plant premises, as per land available.

#### **4.5.3.3. Guidelines & Techniques for Green Belt Development**

An extensive survey of the project area was undertaken to observe the structure and composition of vegetation. Hence a combination of plants is selected depending upon the topographical suitability and species selected as per the SPCB Guideline and ToR. The soil characteristics were kept in mind. Based on this survey and environmental conditions suitable native plant species have been proposed for the green belt development plan.

#### **4.5.3.4. Development of Green Belt**

The plantation matrix adopted for the green belt development includes pit of 0.3 m x 0.3 m in size with a spacing of 2 m x 2 m. In addition, earth filling and manure may also be required for the proper nutritional balance and nourishment of the sapling. It is also recommended that the plantation has to be taken up randomly and the landscaping aspects could be taken into consideration. Multi-layered plantations comprising of medium height trees (7 m to 10 m) and shrubs (5 m height) are proposed for the green belt.

A greenbelt is a set of rows of trees planted in such a fashion, to create an effective barrier between the project and its surroundings. The greenbelt helps to capture fugitive emissions, attenuate the noise levels in the existing project, and simultaneously improve aesthetics of the surroundings.

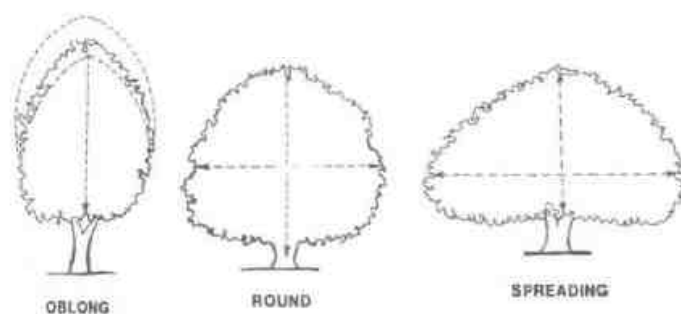
#### **4.5.3.5. Design of Green Belt**

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The present plan comprises the details of field investigations. Plant species for greenbelt development are selected as per CPCB guidelines. The green belt will be developed along the periphery of the Proposed Rough stone and gravel quarry. The greenbelt development plan has been formulated considering the parameters such as climate, soil types, topography, etc.

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

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



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

**Table No 4.13. List of plant species proposed for Greenbelt development**

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

(\*Source: Term of Reference-ToR)

**Table No 4.14 Species suitable for abatement of noise and dust pollution**

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

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

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

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

#### **Some of the important aspects to be considered are:**

- ✓ Planting of trees in each row will be in staggered orientation.
- ✓ In the front row, shrubs will be grown.
- ✓ Since the trunks of the tall trees are generally devoid of foliage, it will be useful to have shrubs in front of the trees so as to give coverage to this portion.
- ✓ The spacing between the trees will be maintained slightly less than the normal spaces, so that the trees may grow vertically and slightly increase the effective height of the green belt.

#### **4.5.4. Anticipated Impact on Fauna**

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

##### **4.5.4.1. Measures for protection and conservation of wildlife species**

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

#### **4.5.5. Impact on Aquatic Biodiversity**

Mining activities will not disturb the aquatic ecology as there is no effluent discharge proposed from the Rough stone and gravel quarry. There is no natural perennial surface water body within the mine lease area, like wetlands, rivers streams, Odai, Vaari, Canal, Channel, lakes, ponds, tanks, and farmer sites. There is no impact on fish habitats and the food WEB/ food chain in the water body and Reservoir. There are no nearby water bodies. Aquatic biodiversity is not observed in the study area. 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 4.15: GREENBELT DEVELOPMENT PLAN**

PROPOSAL – P1					
Year	No. of trees proposed to be planted	Area to be covered in m2	Name of the species	Survival rate expected in %	No. of trees expected to be grown
I	1900	The safety zone along the boundary barrier has been identified to be utilized for Greenbelt development.	Neem, Pongamia Pinnata, Casuarina etc.,	80	1500

**TABLE 4.16: BUDGET FOR GREENBELT DEVELOPMENT PLAN**

ACTIVITY		YEAR					RATE	COST (Rs.)
		I	II	III	IV	V		
Plantation under safety zone	Nos.	66	66	66	66	66	@100 Rs Per sapling	33,000/-
	Cost	6600	6600	6600	6600	6600		
Plantation in the quarried out top benches, approach road and panchayat road	Nos.	40	40	40	40	40	@100 Rs Per sapling	20,000/-
	Cost	4000	4000	4000	4000	4000		
Wire Fencing (In Mtrs) 900 Mtrs		2,70,000	-	-	-	-	@300 Rs Per Meter	2,70,000/-
Garland drain (In Mtrs) 860 Mtrs		2,58,000	-	-	-	-	@300 Rs Per Meter	2,58,000/-
<b>TOTAL</b>								<b>5,81,000/-</b>

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.

#### 4.5.5.1. 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.

#### 4.5.5.2. Measures for protection and conservation of wildlife species

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

#### 4.5.5.3. Mitigation Measures

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

#### 4.5.5.4. 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.

#### 4.5.5.5 Impact Assessment on Biological Environment

A detail of impact and assessments was mentioned in Table No 4.17

**TABLE 4.17: ECOLOGICAL IMPACT ASSESSMENTS**

SI.No	Attributes	Assessment
1	Proximity to national park/wildlife sanctuary/reserve forest /mangroves/coastline/estuary/sea	Bolvampatti R.F 2.8Km North West Indira Gandhi (Anamalai) wildlife sanctuary -36km-S
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 4.18: 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
<b>Pre-Mining Phase</b>					
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.		
<b>Mining phase</b>					
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	Impact on surrounding agriculture and associated fauna due to deposition of dust and Emission of CO. (Indirect impact)	Impact is less as the agricultural land far from core area.	Less severe	All vehicles will be certified for appropriate Emission levels. More plantation have been suggested Upgrade the vehicles with alternative fuel such biodiesel, methanol and

SO <sub>2</sub> ,NO <sub>2</sub> ,CO etc.				biofuel around the mining area.
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## 4.6 SOCIO ECONOMIC

### 4.6.1 Anticipated Impact from all 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

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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.

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## **5. ANALYSIS OF ALTERNATIVES (TECHNOLOGY AND SITE)**

### **5.0 INTRODUCTION**

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

### **5.1 FACTORS BEHIND THE SELECTION OF PROJECT SITE**

Palathurai Rough Stone Quarry Project at Palathurai Village is a mining project for excavation of Rough Stone, which is site specific. All the proposed mining lease areas have following advantages: -

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

### **5.2 ANALYSIS OF ALTERNATIVE SITE**

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

### **5.3 FACTORS BEHIND SELECTION OF PROPOSED TECHNOLOGY**

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

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

### **5.4 ANALYSIS OF ALTERNATIVE TECHNOLOGY**

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

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## 6. ENVIRONMENTAL MONITORING PROGRAMME

### 6.0 GENERAL

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

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

### 6.1 METHODOLOGY OF MONITORING MECHANISM

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

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

The responsibilities of this cell will be:

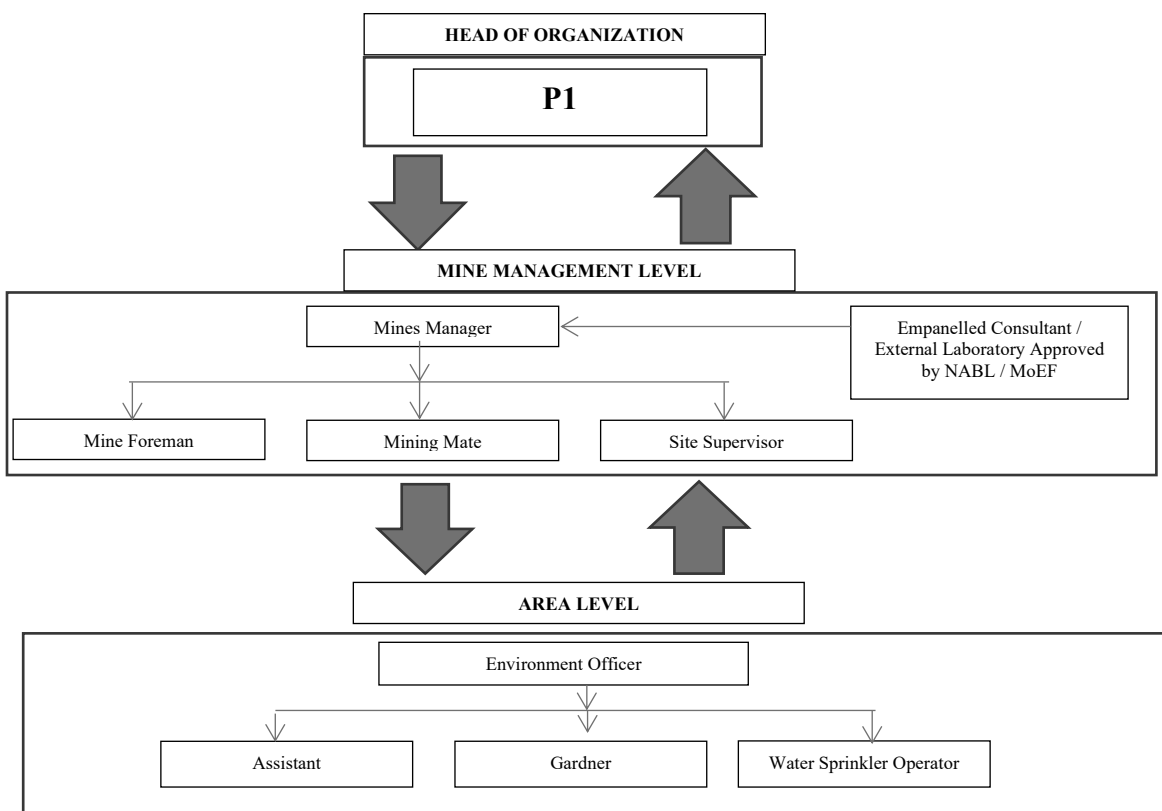
- Implementation of pollution control measures
- Monitoring programme implementation
- Post-plantation care
- To check the efficiency of pollution control measures taken
- Any other activity as may be related to environment
- Seeking expert's advice when needed.

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

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

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

**FIGURE 6.1: PROPOSED ENVIRONMENTAL MONITORING CELL P1 TO P5**



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

**6.2 IMPLEMENTATION SCHEDULE OF MITIGATION MEASURES**

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

**TABLE 6.1 IMPLEMENTATION SCHEDULE FOR ALL PROPOSED PROJECTS**

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

**6.3 MONITORING SCHEDULE AND FREQUENCY**

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

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

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

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

The details of monitoring are detailed in Table 6.2

**TABLE 6.2: PROPOSED MONITORING SCHEDULE POST EC FOR P1**

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

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

#### 6.4 BUDGETARY PROVISION FOR EMP

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

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

**TABLE 6.3 ENVIRONMENT MONITORING BUDGET**

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

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 31<sup>st</sup> 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	<p>Improper and unsafe practices</p> <p>Due to high pressure of compressed air, hoses may burst</p> <p>Drill Rod may break</p>	<p>Safe operating procedure established for drilling (SOP) will be strictly followed.</p> <p>Only trained operators will be deployed.</p> <p>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,</p> <p>Drilling shall not be carried on simultaneously on the benches at places directly one above the other.</p> <p>Periodical preventive maintenance and replacement of worn-out accessories in the compressor and drill equipment as per operator manual.</p> <p>All drills unit shall be provided with wet drilling shall be maintained in efficient working in condition.</p> <p>Operator shall regularly use all the personal protective equipment.</p>
4	Blasting	<p>Fly rock, ground vibration, Noise and dust.</p> <p>Improper charging, stemming &amp; Blasting/fining of blast holes</p> <p>Vibration due to movement of vehicles</p>	<p>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.</p> <p>SOP for Charging, Stemming &amp; Blasting/Firing of Blast Holes will be followed by blasting crew during initial stage of operation</p> <p>Shots are fired during daytime only.</p> <p>All holes charged on any one day shall be fired on the same day.</p> <p>The danger zone will be distinctly demarcated (by means of red flags)</p>
5	Transportation	<p>Potential hazards and unsafe workings contributing to accident and injuries</p> <p>Overloading of material</p> <p>While reversal &amp; overtaking of vehicle</p> <p>Operator of truck leaving his cabin when it is loaded.</p>	<p>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.</p> <p>Not allow any unauthorized person to ride on the vehicle nor allow any unauthorized person to operate the vehicle.</p> <p>Concave mirrors should be kept at all corners</p> <p>All vehicles should be fitted with reverse horn with one spotter at every tipping point</p> <p>Loading according to the vehicle capacity</p> <p>Periodical maintenance of vehicles as per operator manual</p>
6	Natural calamities	Unexpected happenings	<p>Escape Routes will be provided to prevent inundation of storm water</p> <p>Fire Extinguishers &amp; Sand Buckets</p>
7	Failure of Mine Benches and Pit Slope	Slope geometry, Geological structure	Ultimate or over all pit slope shall be below 60° and each bench height shall be 5m height.

Source: Analysed and Proposed by FAE & EC

### 7.3 DISASTER MANAGEMENT PLAN FOR P1

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

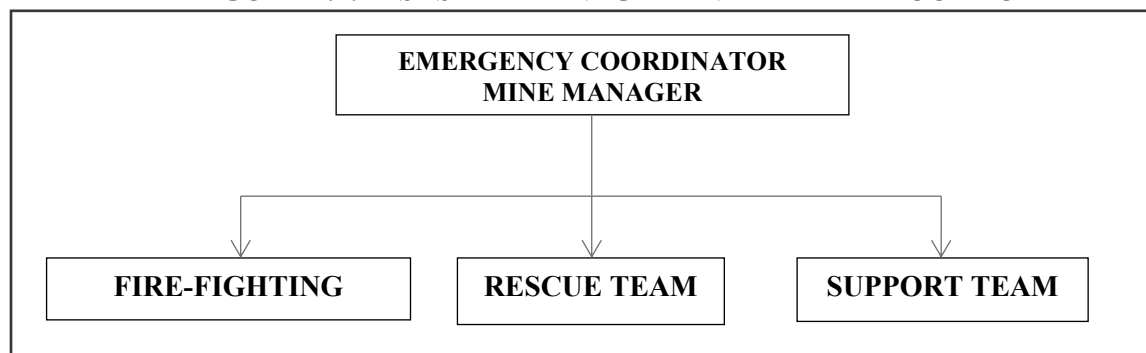
The Disaster Management Plan is aimed to ensure safety of life, protection of environment, protection of installation, restoration of production and salvage operations in this same order of priorities.

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

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

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

**FIGURE 7.1: DISASTER MANAGEMENT TEAM LAYOUT FOR P1**



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

**TABLE 7.2: PROPOSED TEAMS TO DEAL WITH EMERGENCY SITUATION**

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

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### **Roles and responsibilities of emergency team –**

**(a) Emergency coordinator (EC)**

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

**(b) Incident controller (IC)**

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

**(c) Communication and advisory team**

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

**(d) Roll call coordinator**

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

**(e) Search and rescue team**

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

**(f) Emergency security controller**

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

### **Emergency control procedure –**

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

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

### **Proposed fire extinguishers at different locations –**

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

**TABLE 7.3: PROPOSED FIRE EXTINGUISHERS AT DIFFERENT LOCATIONS IN P1**

<b>LOCATION</b>	<b>TYPE OF FIRE EXTINGUISHERS</b>
Electrical Equipment's	CO <sub>2</sub> type, foam type, dry chemical powder type

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Fuel Storage Area	CO <sub>2</sub> type, foam type, dry chemical powder type, Sand bucket
Office Area	Dry chemical type, foam type

### Alarm system to be followed during disaster –

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

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

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

## 7.4 CUMULATIVE IMPACT STUDY

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

**TABLE 7.4: LIST OF QUARRIES WITHIN 500 METER RADIUS**

PROPOSED QUARRIES					
CODE	Name of the Owner	Village	S.F. Nos	Extent in Ha	Status
P1	Tmt.V. Thulasiammal	Palathurai	34/1	3.86.5	LrNo.SEIAA-TN/F.No.9171/ToR-1392/2022 Dated: 21.03.2023
P2	Thiru.A.Senthilkumar	Palathurai	67 (P)	3.00.0	-

<b>P3</b>	Tmt.V.Thulasiammal	Palathurai	30/2B3	2.58.20	LrNo.SEIAA- TN/F.No.7998/SEAC/ToR-897/2020 Dated:16.03.2021
<b>TOTAL EXTENT</b>				<b>9.44.7</b>	
<b>Existing Quarry</b>					
<b>CODE</b>	<b>Name of the Owner</b>	<b>Village</b>	<b>S.F. Nos</b>	<b>Extent in Ha</b>	<b>Status</b>
E1	Thiru.G.Murali	Palathurai	30/1 (P), 30/2A (P)	4.41.0	08.11.2017 to 07.11.2022
<b>TOTAL EXTENT</b>				<b>4.41.0</b>	
<b>TOTAL CLUSTER EXTENT</b>				<b>13.85.7</b>	

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

**TABLE 7.5: SALIENT FEATURES OF PROPOSAL “P1”**

Name of the Project	Tmt.V. Thulasiammal Rough Stone & Gravel Quarry	
Land type	It is a Patta land (Barren land) which is not fit for vegetation/ Cultivation	
Land owner details	Registered in the name of the applicant (Tmt.V. Thulasiammal). Refer the Patta No.983.	
Previous lease details	1. The quarry lease was previously granted in the favour of Tvl. Century 21 Crushers, The lessee has obtained Environmental Clearance from the State Level Environment Impact Assessment Authority, Tamil Nadu vide letter No. SEIAA-TN/F.No.1720/EC/1(a)/2432/2015, Dated: 15.09.2015. 2. The applicant has applied a quarry lease on 22.10.2021, over an extent of 3.86.5 hectares of Patta land in S.F.No. 34/1 of Palathurai Village, Madukkarai Taluk, Coimbatore District for the period of five years.	
Toposheet No	58-B/13	
Latitude between	<b>10°52'26.31"N to 10°52'31.53"N</b>	
Longitude between	<b>76°56'16.72"E to 76°56'27.48"E</b>	
Highest Elevation	294m AMSL	
Mining Plan period	5 years	
Proposed Depth of Mining	47 m bgl (2 m Gravel + 45 m Rough Stone)	
Geological Resources	Rough Stone in m <sup>3</sup>	Gravel m <sup>3</sup>
	16,56,933	48,172
Mineable Reserves	Rough Stone in m <sup>3</sup>	Gravel m <sup>3</sup>
	6,27,086	35,234
Yearwise Production	Rough Stone in m <sup>3</sup>	Gravel m <sup>3</sup>
	93,316	35,234
Existing Pit Dimension	Pit-I: 117m (L) x 54m (W) x 15m(D) bgl Pit-II: 95m (L) x 45m (W) x 1m(D) bgl	
Ultimate Pit Dimension	302m (L) x 112m (W) x 47m(D) bgl	
Water Level in the surrounding areas	70 – 65 m bgl	
Method of Mining	Opencast Mechanized Mining Method involving small drilling and Controlled blasting using Slurry Explosives	
Topography	The lease applied area is exhibits plain terrain. The area has gentle sloping towards Southwestern side. The altitude of the area is 294 m (max) above mean sea level. The area is covered by 2 m thickness of Gravel Formation. Massive Charnockite is clearly inferred from the nearby existing quarrying pit.	
Machinery proposed	Jack Hammer	3 Nos
	Compressor	1 Nos
	Hydraulic Excavator	1 No
	Tippers	2 Nos
Blasting Method	Controlled Blasting Method by shot hole drilling and small dia of 25mm slurry explosive are proposed to be used for shattering and heaving effect for removal and winning of Rough Stone. No deep hole drilling is proposed.	
Proposed Manpower Deployment	18 Nos	
Project Cost	Rs. 66,52,000/-	
EMP Cost	Rs. 3,80,000/-	
CER Cost	Rs. 5,00,000,-/	
Nearby Water Bodies	Odai	220m West
	Odai	570m SW
	Varattar Stream	960m SE
	Sengulam	8km North
	Walayar Lake	9km SW
	Kurichikulam	9.5km NE

Greenbelt Development Plan	As per Mining plan it is Proposed to plant 330 trees in the 7.5 m Safety Zone, approach road and panchayat roads.
Proposed Water Requirement	2.5 KLD
Nearest Habitation	400m -West

Source: Approved Mining Plan

**TABLE 7.6: SALIENT FEATURES OF PROPOSAL “P2”**

Name of the Project	Thiru.A. Senthilkumar Rough stone and Gravel quarry		
Area & Extent	S.F.no 67 (P), Extent 3.00.0 Ha		
Village and Taluk	Palathurai Village & Madukkarai		
Land type	It is a Patta land (Barren land) which is not fit for vegetation/ Cultivation		
Land owner details	Registered in the name of the applicant (Shri Vijayalakshmi Charitable trust Managing trustee Thiru.A.Senthilkumar). Refer the Patta No.336		
Toposheet No	58-B/13		
Latitude between	10 <sup>o</sup> 52'27.62" N to 10 <sup>o</sup> 52'35.91" N		
Longitude between	76 <sup>o</sup> 56'41.03" E to 76 <sup>o</sup> 56'46.31" E		
Highest Elevation	301m AMSL		
Proposed Depth of Mining	47m bgl (2 m Gravel + 45m Rough Stone)		
Geological Resources	Rough Stone in m <sup>3</sup>	Weathered Formation m <sup>3</sup>	Gravel m <sup>3</sup>
	10,92,574	-	43,836
Mineable Reserves	Rough Stone in m <sup>3</sup>	Weathered Formation m <sup>3</sup>	Gravel m <sup>3</sup>
	4,63,889	-	34,312
Yearwise production recommended in ToR	Rough Stone in m <sup>3</sup>	Weathered Formation m <sup>3</sup>	Gravel m <sup>3</sup>
	4,63,889	-	34,312
Existing pit Dimension	NIL		
Environmental Clearance	It is a fresh quarry		
Consent to Operate (CTO) from TNPCB	It is a fresh quarry		
Existing Pit Dimension	124m (L) x 110m (W) x 35m (D)		
Ultimate Pit Dimension	220m (L) x 132m (W) x 47m (D)		
Water Level measured in the surrounding area	65-70m bgl		
Method of Mining	Opencast Mechanized Mining Method involving drilling and blasting		
Topography	The lease applied area is flat terrain. The area has gentle sloping towards Western side. The altitude of the area is 301m (max) above mean sea level. The area is covered by 2m thickness of Gravel Massive Charnockite is found after 4m (2m Gravel) which is clearly inferred from the nearby existing quarrying pit.		
Machinery proposed	Jack Hammer	11 Nos	
	Compressor	3 No	
	Hydraulic Excavator	3No	
	Tippers	5 No	
Blasting method and type of Explosives proposed	Controlled Blasting Method by shot hole drilling (35-32mm dia hole) and small dia of 25mm slurry explosive are proposed to use for winning of Rough Stone. No deep hole drilling is proposed.		
Proposed Manpower Deployment	44 Nos		
Project Cost	Rs.65,46,000/-		
CER Cost	Rs.5,00,000/-		

Greenbelt Development Plan	As per Mining plan it is Proposed to plant 1500 trees in the 7.5 m Safety Zone, approach road & panchayat roads.
Proposed Water Requirement	4.0 KLD
Nearest Habitation	480m-SW

Source: Approved Mining Plan

**TABLE 7.7: SALIENT FEATURES OF PROPOSAL “P3”**

Name of the Project	Tmt.V. Thulasiammal Rough stone and Gravel quarry		
Area & Extent	S.F.no 30/2B3 (P), Extent 2.58.20 Ha		
Village and Taluk	Palathurai Village & Madukkarai		
Land type	It is a Patta land (Barren land) which is not fit for vegetation/ Cultivation		
Land owner details	Registered in the name of the applicant (Tmt. Tmt.V. Thulasiammal). Refer the Patta No.930		
Toposheet No	58-B/13		
Latitude between	10 <sup>o</sup> 52'20.19" N to 10 <sup>o</sup> 52'26.03" N		
Longitude between	76 <sup>o</sup> 56'30.87" E to 76 <sup>o</sup> 56'36.31" E		
Highest Elevation	294m AMSL		
Proposed Depth of Mining	19m bgl (2 m Gravel + 2m Weather rock+ 15m Rough Stone)		
Geological Resources	Rough Stone in m <sup>3</sup>	Weathered Formation m <sup>3</sup>	Gravel m <sup>3</sup>
	3,87,300	51,640	51,640
Mineable Reserves	Rough Stone in m <sup>3</sup>	Weathered Formation m <sup>3</sup>	Gravel m <sup>3</sup>
	2,28,940	37,700	41,072
Yearwise production recommended in ToR	Rough Stone in m <sup>3</sup>	Weathered Formation m <sup>3</sup>	Gravel m <sup>3</sup>
	2,28,940	37,700	41,072
Existing pit Dimension	NIL		
ToR Obtained	LrNo.SEIAA-TN/F.No.7998/SEAC/ToR-897/2020 Dated:16.03.2021		
Ultimate Pit Dimension	151m (L) x 136m (W) x 19m (D)		
Water Level measured in the surrounding area	70-65m bgl		
Method of Mining	Opencast Mechanized Mining Method involving drilling and blasting		
Topography	The lease applied area is flat terrain. The area has gentle sloping towards Western side. The altitude of the area is 294m (max) above mean sea level. The area is covered by 2m thickness of Gravel, 2m thickness of weathered rock and followed by Massive Charnockite is found after 4m (2m Gravel) which is clearly inferred from the nearby existing quarrying pit.		
Machinery proposed	Jack Hammer	7 No	
	Compressor	2 No	
	Hydraulic Excavator	2No	
	Tippers	4 No	
Blasting method and type of Explosives proposed	Controlled Blasting Method by shot hole drilling (35-32mm dia hole) and small dia of 25mm slurry explosive are proposed to use for winning of Rough Stone. No deep hole drilling is proposed.		
Proposed Manpower Deployment	32 Nos		
Project Cost	Rs.60,43,000/-		
EMP cost	3,80,000/-		
CER Cost	Rs.5,00,000/-		
Nearby Water Bodies	Odai	220m West	
	Odai	570m SW	



	Varattar Stream	960m SE
	Sengulam	8km North
	Walayar Lake	9km SW
	Kurichikulam	9.5km NE
Greenbelt Development Plan	As per Mining plan it is Proposed to plant 1300 trees in the 7.5 m Safety Zone, approach road & panchayat roads.	
Proposed Water Requirement	3.0 KLD	
Nearest Habitation	1000m-SE	

Source: Approved Mining Plan

**TABLE 7.8: BRIEF DESCRIPTION OF THE PROJECT – E1**

Name of the Project	Thiru.G.Murali, Rough stone and Gravel quarry		
Area & Extent	S.F.no 30/1 (P), 30/2A (P), Extent 4.41.0Ha		
Village and Taluk	Palathurai Village & Madukkarai		
Toposheet No	58-B/13		
Latitude between	10°52'23.00" N to 10°52'27.21" N		
Longitude between	76°56'12.82" E to 76°56'30.26" E		
Proposed Depth of Mining	42m bgl (2 m Gravel + 40m Rough Stone)		
Geological Resources	Rough Stone in m <sup>3</sup>	Weathered Formation m <sup>3</sup>	Gravel m <sup>3</sup>
	14,11,896	-	90,460
Mineable Reserves	Rough Stone in m <sup>3</sup>	Weathered Formation m <sup>3</sup>	Gravel m <sup>3</sup>
	3,91,410	-	7,680
ToR Obtained	LrNo.SEIAA-TN/F.No.7998/SEAC/ToR-897/2020 Dated:16.03.2021		
Existing Pit Dimension	Pit I: 217m (L) x 55m (W) x 13m (D) Pit II: 216m (L) x 78m (W) x 13m (D)		
Ultimate Pit Dimension	502m (L) x 83m (W) x 42m (D)		
Method of Mining	Opencast Mechanized Mining Method involving drilling and blasting		
Machinery proposed	Jack Hammer	2 No	
	Compressor	1 No	
	Hydraulic Excavator	1No	
	Tippers	1 No	
Blasting method and type of Explosives proposed	Controlled Blasting Method by shot hole drilling small dia of 25mm slurry explosive are proposed to use for winning of Rough Stone. No deep hole drilling is proposed.		
Proposed Manpower Deployment	11 Nos		
Project Cost	Rs.79,32,000/-		
EMP cost	3,80,000/-		
CER Cost	Rs.5,00,000/-		
Greenbelt Development Plan	As per Mining plan it is Proposed to plant 2,200 trees in the 7.5 m Safety Zone, approach road & panchayat roads.		
Proposed Water Requirement	3.0 KLD		
Nearest Habitation	450m-SE		

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

#### **Air Environment –**

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

**TABLE 7.9: CUMULATIVE PRODUCTION LOAD OF ROUGH STONE**

Quarry	Production for five-year plan period	Per Year Production in m <sup>3</sup>	Per Day Production in m <sup>3</sup>	Number of Lorry Load Per Day
P1	93,316	18663	62	10
P2	4,25,654	85,131	284	47
P3	2,28,940	45,788	153	26
<b>Total</b>	<b>747910</b>	<b>149582</b>	<b>499</b>	<b>83</b>
E1	3,91,410	78,282	261	43
<b>Total</b>	<b>3,91,410</b>	<b>78,282</b>	<b>261</b>	<b>43</b>
<b>Grand Total</b>	<b>11,39,320</b>	<b>2,27,864</b>	<b>760</b>	<b>126</b>

**TABLE 7.10: CUMULATIVE PRODUCTION LOAD OF GRAVEL**

Quarry	Production for five year plan period	Per Year Production in m <sup>3</sup>	Per Day Production in m <sup>3</sup>	Number of Lorry Load Per Day
P1	35,234	11,745	39	7
P2	34,312	11,437	38	6
P3	41,072	13,691	46	8
<b>Total</b>	<b>1,10,618</b>	<b>36,873</b>	<b>123</b>	<b>21</b>
E1	7,680	2,560	8	1
<b>Total</b>	<b>7,680</b>	<b>2,560</b>	<b>8</b>	<b>1</b>
<b>Grand Total</b>	<b>118298</b>	<b>39433</b>	<b>131</b>	<b>22</b>

**TABLE 7.11: CUMULATIVE PRODUCTION LOAD OF WEATHERED ROCK**

Quarry	Production during five year plan period	Per Year Production in m <sup>3</sup>	Per Day Production in m <sup>3</sup>	Number of Lorry Load Per Day
P1	-	-	-	-
P2	-	-	-	-
P3	37,700	9,425	31	5
<b>Total</b>	<b>37,700</b>	<b>9,425</b>	<b>31</b>	<b>5</b>

On a cumulative basis considering the proposed quarries, it can be seen that the overall production of Rough Stone is 760m<sup>3</sup> per day and overall production of Gravel is 131 m<sup>3</sup> per day with a capacity of 126 trips of Rough Stone per day and 22 Trips per day of Gravel from the cluster.

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

Based on the above production quantities the emissions due to various activities in all the 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 7.18.

**TABLE 7.12: EMISSION ESTIMATION FROM QUARRIES WITHIN 500 METER RADIUS**

EMISSION ESTIMATION FOR QUARRY "P1"				
Estimated Emission Rate for PM <sub>10</sub>	Activity	Source type	Value	Unit
	Drilling	Point Source	0.064251969	g/s
	Blasting	Point Source	0.000264878	g/s
	Mineral Loading	Point Source	0.040323424	g/s
	Haul Road	Line Source	0.002488103	g/s/m
	Overall Mine	Area Source	0.066742302	g/s
Estimated Emission Rate for SO <sub>2</sub>	Overall Mine	Area Source	0.000405828	g/s
Estimated Emission Rate for NO <sub>x</sub>	Overall Mine	Area Source	0.000033057	g/s
EMISSION ESTIMATION FOR QUARRY "P2"				
Estimated Emission Rate for PM <sub>10</sub>	Activity	Source type	Value	Unit
	Drilling	Point Source	0.101029381	g/s

	Blasting	Point Source	0.002545968	g/s
	Mineral Loading	Point Source	0.044568643	g/s
	Haul Road	Line Source	0.002498333	g/s/m
	Overall Mine	Area Source	0.062788606	g/s
Estimated Emission Rate for SO <sub>2</sub>	Overall Mine	Area Source	0.001130475	g/s
Estimated Emission Rate for NO <sub>x</sub>	Overall Mine	Area Source	0.000075271	g/s
<b>EMISSION ESTIMATION FOR QUARRY "P3"</b>				
	<b>Activity</b>	<b>Source type</b>	<b>Value</b>	<b>Unit</b>
Estimated Emission Rate for PM <sub>10</sub>	Drilling	Point Source	0.081740952	g/s
	Blasting	Point Source	0.000882700	g/s
	Mineral Loading	Point Source	0.042137887	g/s
	Haul Road	Line Source	0.00249139	g/s/m
	Overall Mine	Area Source	0.057560999	g/s
Estimated Emission Rate for SO <sub>2</sub>	Overall Mine	Area Source	0.000631003	g/s
Estimated Emission Rate for NO <sub>x</sub>	Overall Mine	Area Source	0.000036064	g/s
<b>EMISSION ESTIMATION FOR QUARRY "E1"</b>				
	<b>Activity</b>	<b>Source type</b>	<b>Value</b>	<b>Unit</b>
Estimated Emission Rate for PM <sub>10</sub>	Drilling	Point Source	0.096009181	g/s
	Blasting	Point Source	0.001973233	g/s
	Mineral Loading	Point Source	0.043718680	g/s
	Haul Road	Line Source	0.0024955	g/s/m
	Overall Mine	Area Source	0.072496766	g/s
Estimated Emission Rate for SO <sub>2</sub>	Overall Mine	Area Source	0.000979799	g/s
Estimated Emission Rate for NO <sub>x</sub>	Overall Mine	Area Source	0.000091650	g/s

Source: Emission Calculation

**TABLE 7.13: INCREMENTAL & RESULTANT GLC WITHIN CLUSTER**

<b>PM<sub>10</sub> in µg/m<sup>3</sup></b>	
Background	42.3
Incremental	15.91
Resultant	58.2
NAAQ Norms	<b>100 µg/m<sup>3</sup></b>
<b>PM<sub>2.5</sub> in µg/m<sup>3</sup></b>	
Background	22.3
Incremental	8.88
Resultant	31.2
NAAQ Norms	<b>60 µg/ m<sup>3</sup></b>
<b>So<sub>2</sub> in µg/m<sup>3</sup></b>	
Background	7.2
Incremental	2.29
Resultant	9.5
NAAQ Norms	<b>80 µg/ m<sup>3</sup></b>
<b>No<sub>2</sub> in µg/m<sup>3</sup></b>	
Background	24.0
Incremental	11.73
Resultant	35.8
NAAQ Norms	<b>80 µg/ m<sup>3</sup></b>

**Noise Environment –**

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

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

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

Where:

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

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

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

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 7.14: 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	51.7	47.3	46.3	55
Habitation Near P2	36.6	45.8	46.3	
Habitation Near P3	36.8	50.0	50.2	
Habitation Near E1	35.4	47.0	47.3	

Source: Lab Monitoring Data

The incremental noise level is found within the range of 45.8 – 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), dated 19.09.2006 and S.O. 50 (E) dated 11.01.2010 under the Environment(Protection) Act, 1986).

### Ground Vibrations

Ground vibrations due to mining activities in the all the 4 Mines within cluster are anticipated due to operation of Mining Machines like Excavators, drilling and blasting, transportation vehicles, etc. However, the major source of ground vibration from the all the 4 mines is blasting. The major impact of the ground vibrations is observed on the domestic houses located in the villages nearby the mine lease area. The kuchha houses are more prone to cracks and damage due to the vibrations induced by blasting whereas RCC framed structures can withstand more ground vibrations. Apart from this, the ground vibrations may develop a fear factor in the nearby settlements.

nearby the mining areas and may cause injury to persons or damage to the structures. Nearest Habitations from 4 mines respectively are as in below Table 7.15.

**TABLE 7.15: NEAREST HABITATION FROM EACH MINE**

Location ID	Distance & Direction
Habitation Near P1	400m-W
Habitation Near P2	520m -SW
Habitation Near P3	320m -SE
Habitation Near E1	450m-W

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

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

Where –

V = peak particle velocity (mm/s)

K = site and rock factor constant

Q = maximum instantaneous charge (kg)

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

R = distance from charge (m)

**TABLE 7.16: GROUND VIBRATIONS AT 4 MINES**

Location ID	Maximum Charge in kgs	Nearest Habitation in m	PPV in m/ms
P1	27	400m -W	0.479
P2	97	520m -SW	0.887
P3	49	320m-SE	1.104
E1	82	450m-SE	0.966

Source: Blasting Calculations

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

#### **Socio Economic Environment –**

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

**TABLE 7.17: SOCIO ECONOMIC BENEFITS FROM 4 MINES**

Location ID	Project Cost	CER
P1	Rs. 66,52,000/-	Rs.5,00,000
P2	Rs.69,26,000/-	Rs.5,00,000
P3	Rs.64,23,000/-	Rs.5,00,000
<b>Total</b>	<b>Rs. 20,001,000/-</b>	<b>Rs.15,00,000</b>
E1	Rs.79,32,000/-	Rs.5,00,000
<b>Total</b>	<b>Rs.79,32,000/-</b>	<b>Rs.5,00,000</b>
<b>Grand Total</b>	<b>Rs. 27,933,000/-</b>	<b>Rs.20,00,000/-</b>

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

- Proposed Projects shall fund towards CER – **Rs 15,00,000/-**
- Existing Projects shall fund towards CER – **Rs.5,00,000/-**
- Projects in Cluster shall fund towards CER – **Rs 20,00,000/-**

**TABLE 7.18: EMPLOYMENT BENEFITS FROM 4 MINES**

Description	Employment
P1	18
P2	44
P3	32
<b>Total</b>	<b>94</b>
E1	11
<b>Total</b>	<b>11</b>
<b>Grand Total</b>	<b>105</b>

A total of 94 people will get employment due to 3 proposed mines in cluster and 11 people are already employed at existing mines.

**TABLE 7.19: GREENBELT DEVELOPMENT BENEFITS FROM 4 MINES**

CODE	No of Trees proposed to be planted	Survival %	Area Covered Sq.m	Name of the Species	No. of Trees expected to be grown
P1	330	80%	2,930	Neem, Casuarina	264
P2	330	80%	2,920	Neem, Casuarina	264
P3	220	80%	1,950	Neem, Casuarina	176
<b>Total</b>	<b>880</b>	<b>80%</b>	<b>7,800</b>	<b>Neem, Casuarina</b>	<b>704</b>
E1	300	80%	5,000	Neem, Casuarina	240

<b>Total</b>	<b>300</b>	<b>80%</b>	<b>5000</b>	<b>Neem, Casuarina</b>	<b>240</b>
<b>G.Total</b>	<b>1180</b>		<b>12,800</b>		<b>944</b>

**Source: approved Mining Plan**

Based on the Proposed Mining Plans it's anticipated that there shall growth of native species of Neem, Casuarina, etc in the Cluster at a rate of 1,180 Trees Planted over a period of 5 Years with Survival Rate of 80% and expected growth is around 944Trees over an area of 12,800 Sq.m. in Proposed Quarries.

## 7.5 PLASTIC WASTE MANAGEMENT PLAN

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 7.20: 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

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## 8.PROJECT BENEFITS

### 8.0 GENERAL

The Proposed Projects for Quarrying Rough Stone and gravel at Palathurai Village aims to produce cumulatively 93,316m<sup>3</sup> Rough Stone over a period of 5 Years and Gravel 35,234m<sup>3</sup> for period of 3 years. This will enhance the socio-economic activities in the adjoining areas and will result in the following benefits

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

### 8.1 EMPLOYMENT POTENTIAL

It is proposed to provide employment to about 18 persons for carrying out mining operations and give preference to the local people in providing employment in the three proposed quarries in the cluster. In addition, there will be opportunity for indirect employment to many people in the form of contractual jobs, business opportunities, service facilities etc. the economic status of the local people will be enhanced due to mining project.

### 8.2 SOCIO-ECONOMIC WELFARE MEASURES PROPOSED

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

### 8.3 IMPROVEMENT IN PHYSICAL INFRASTRUCTURE

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

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

### 8.4 IMPROVEMENT IN SOCIAL INFRASTRUCTURE

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

### 8.5 OTHER TANGIBLE BENEFITS

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

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

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

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

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

### CSR Cost Estimation

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

## CORPORATE ENVIRONMENT RESPONSIBILITY

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

As per para 6 (II) of the office memorandum, all the mines being a green field project & Capital Investment is  $\leq$  100 crores, they shall contribute 2% of Capital Investment towards CER.

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

**TABLE 8.1 CER – ACTION PLAN**

Code	CER
P1	Rs 5,00,000/-

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



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## **9. ENVIRONMENTAL COST BENEFIT ANALYSIS**

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

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## **10.B ENVIRONMENTAL MANAGEMENT PLAN – P1**

### **10.0. GENERAL**

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

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

### **10.1. ENVIRONMENTAL POLICY**

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

#### **The Proponent Tmt.V. Thulasiammal will –**

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

#### **Description of the Administration and Technical Setup –**

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

The said team will be responsible for:

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

## 10.2. LAND ENVIRONMENT MANAGEMENT –

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

**TABLE 10.1. PROPOSED CONTROLS FOR LAND ENVIRONMENT – P1**

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

Source: Proposed by FAE's & EIA Coordinator

## 10.3. SOIL MANAGEMENT

There is no overburden or waste anticipated from proposed project.

**TABLE 10.2: PROPOSED CONTROLS FOR SOIL MANAGEMENT – P1**

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

Source: Proposed by FAE's & EIA Coordinator

## 10.4 WATER MANAGEMENT

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

**TABLE 10.3: PROPOSED CONTROLS FOR WATER ENVIRONMENT – P1**

CONTROL	RESPONSIBILITY
To maximize the reuse of pit water for water supply	Mines Foreman
Temporary and permanent garland drain will be constructed to contain the catchments of the mining area and to divert runoff from undisturbed areas through the mining areas	Mines Manager
Natural drains/nallahs/brooklets outside the project area should not be disturbed at any point of mining operations	Mines Manager
Ensure there is no process effluent generation or discharge from the project area into water bodies	Mines Foreman
Domestic sewage generated from the project area will be disposed in septic tank and soak pit system	Mines Foreman
Monthly or after rainfall, inspection for performance of water management structures and systems	Mines Manager
Conduct ground water and surface water monitoring for parameters specified by CPCB	Manager Mines

Source: Proposed by FAE's & EIA Coordinator

### 10.5. AIR QUALITY MANAGEMENT

The proposed quarrying activity would result in the increase of particulate matter concentrations due to fugitive dust. Daily water sprinkling on the haul roads, approach roads in the vicinity would be undertaken and will be continued as there is possibility for dust generation due to truck mobility. It will be ensured that vehicles are properly maintained to comply with exhaust emission requirements

**TABLE 10.4: PROPOSED CONTROLS FOR AIR ENVIRONMENT – P1**

CONTROL	RESPONSIBILITY
Generation of dust during excavation is minimized by daily (twice) water sprinkling on working face and daily (twice) water sprinkling on haul road	Mines Manager
Wet drilling procedure /drills with dust extractor system to control dust generation during drilling at source itself is implemented	Mines Manager
Maintenance as per operator manual of the equipment and machinery in the mines to minimizing air pollution	Mines Manager
Ambient Air Quality Monitoring carried out in the project area and in surrounding villages to access the impact due to the mining activities and the efficacy of the adopted air pollution control measures	Mines Manager
Provision of Dust Mask to all workers	Mines Manager
Greenbelt development all along the periphery of the project area	Mines Manager

Source: Proposed by FAE's & EIA Coordinator

### 10.6. NOISE POLLUTION CONTROL

There will be intermittent noise levels due to vehicular movement, trucks loading, drilling and blasting and cutting activities. No mining activities are planned during night time.

**TABLE 10.5: PROPOSED CONTROLS FOR NOISE ENVIRONMENT – P1**

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

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

Source: Proposed by FAE's & EIA Coordinator

### 10.7. GROUND VIBRATION AND FLY ROCK CONTROL

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

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

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

Source: Proposed by FAE's & EIA Coordinator

### 10.8. BIOLOGICAL ENVIRONMENT MANAGEMENT

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

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

- Greenbelt development all along the safety barrier of the project area
- It is also proposed to implement the greenbelt development programme and post plantation status will be regularly checked for every season.
- The main attributes that retard the survival of sapling is fugitive dust, this fugitive dust can be controlled by water sprinkling on the haul roads and installing a sprinkler unit near the newly planted area.
- Year wise greenbelt development will be recorded and monitored
  - Based on the area of plantation.
  - Period of plantation
  - Type of plantation
  - Spacing between the plants
  - Type of manuring and fertilizers and its periods
  - Lopping period, interval of watering

- Survival rate
- Density of plantation
- The ultimate reclamation planned leaves a congenial environment for development of flora & immigration of small fauna through green belt and water reservoir. The green belt and water reservoir developed within the Project at the end of mine life will attract the birds and animals towards the project area in the post mining period.

#### 10.8.1. Green Belt Development Plan

About 1900nos. 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 – P1**

Year	No. of trees proposed to be planted	Area to be covered in m <sup>2</sup>	Name of the species	Survival rate expected in %	No. of trees expected to be grown
I	1900	Plantation along 7.5m safety distance, along approach road.	Neem, Pongamia Pinnata, Casuarina etc.,	80	1500

Source: Approved Mining plan

The objectives of the greenbelt development plan are –

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

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

#### 10.8.2. Species Recommended for Plantation

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

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

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

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

Source: Proposed by FAE's & EIA Coordinator

### 10.9. OCCUPATIONAL SAFETY & HEALTH MANAGEMENT

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

### 10.9.1. Medical Surveillance and Examinations –

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

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

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

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

**TABLE 10.9: MEDICAL EXAMINATION SCHEDULE – P1**

Sl.No	Activities	1 <sup>st</sup> Year	2 <sup>nd</sup> Year	3 <sup>rd</sup> Year	4 <sup>th</sup> Year	5 <sup>th</sup> Year
1	Initial Medical Examination (Mine Workers)					
A	Physical Check-up					
B	Psychological Test					
C	Audiometric Test					
D	Respiratory Test					
2	Periodical Medical Examination (Mine Workers)					
A	Physical Check – up					
B	Audiometric Test					
C	Eye Check – up					
D	Respiratory Test					
3	Medical Camp (Mine Workers & Nearby Villagers)					
4	Training (Mine Workers)					

Medical Follow ups:- Work force will be divided into three targeted groups age wise as follows:-		
Age Group	PME as per Mines Rules 1955	Special Examination
Less than 25 years	Once in a Three Years	In case of emergencies
Between 25 to 40 Years	Once in a Three Years	In case of emergencies
Above 40 Years	Once in a Three Years	In case of emergencies

Medical help on top priority immediately after diagnosis/ accident is the essence of preventive aspects.

### 10.9.2 Proposed Occupational Health and Safety Measures –

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

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

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





### 10.9.3: Health and Safety Training Programme

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

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

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

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

### 10.9.4.: Budgetary Provision for Environmental Management –

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

**TABLE 10.11: EMP BUDGET FOR PROPOSED PROJECT – P1**

	Mitigation Measure	Provision for Implementation	Capital	Recurring
<b>Air Environment</b>	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	38650	38650
	Fixed Water Sprinkling Arrangements + Water sprinkling by own water tankers	Fixed Sprinkler Installation and New Water Tanker Cost for Capital; and Water Sprinkling (thrice a day) Cost for recurring	800000	50000
	Muffle blasting – To control fly rocks during blasting	Blasting face will be covered with sand bags / steel mesh / old tyres / used conveyor belts	0	5000
	Wet drilling procedure / latest eco-friendly drill machine with separate dust extractor unit	Dust extractor @ Rs. 25,000/- per unit deployed as capital & @ Rs. 2500 per unit recurring cost for maintenance - 3 Units	75000	7500
	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 Governors @ Rs. 5000/- per Tipper/Dumper deployed - 2 Units	10000	500
	Regular monitoring of exhaust fumes as per RTO norms	Monitoring of Exhaust Fumes by Manual Labour	0	5000
	Regular sweeping and maintenance of approach roads for at least about 200 m from ML Area	Provision for 2 labours @ Rs.10,000/labour (Contractual) per Hectare	0	77300
	Installing wheel wash system near gate of quarry	Installation + Maintenance + Supervision	50000	20000
<b>Noise Environment</b>	Source of noise will be during operation of transportation vehicles, HEMM for this proper maintenance will be done at regular intervals.	Provision made in Operating Cost	0	0
	Oiling & greasing of Transport vehicles and HEMM at regular interval will be done	Provision made in Operating Cost	0	0
	Adequate silencers will be provided in all the diesel engines of vehicles.	Provision made in Operating Cost	0	0
	It will be ensured that all transportation vehicles carry a fitness certificate.	Provision made in Operating Cost	0	0

	Safety tools and implements that are required will be kept adequately near blasting site at the time of charging.	Provision made in OHS part	0	0
	Line Drilling all along the boundary to reduce the PPV from blasting activity and implementing controlled blasting.	Provision made in Operating Cost	0	0
	Proper warning system before blasting will be adopted and clearance of the area before blasting will be ensured.	Blowing Whistle by Mining Mate / Blaster / Compentent Person	0	0
	Provision for Portable blaster shed	Installation of Portable blasting shelter	50000	2000
	NONEL Blasting will be practiced to control Ground vibration and fly rocks	Rs. 30/- per 6 Tonnes of Blasted Material	0	242622
<b>Waste Management</b>	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
<b>Mine Closure</b>	1. Progressive Closure Activity - Surface Runoff managment	Provision for garland drain @ Rs. 10,000/- per Hectare with maintenance of Rs. 5,000/- per annum	38650	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	773000	10000
	3. Progressive Closure Activity Green belt development - 500 trees per one hectare - Proposal for 1930Trees - (900 Inside Lease Area & 1000 Outside Lease Area)	Site clearance, preparation of land, digging of pits / trenches, soil amendments, transplantation of saplings @ 200 per plant (capital) for plantation inside the lease area and @ 30 per plant maintenance (recurring)	180000	27000
		Avenue Plantation @ 300 per plant (capital) for plantation outside the lease area and @ 30 per plant maintenance (recurring)	300000	30000

	4. Implementation of Final Mine Closure Activity 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	87150	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 Budget and not necessarily implemented in the Project Site	550564	0
<b>Implementation of EC, Mining Plan &amp; DGMS Condition</b>	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) - 18 Employees	72000	18000
	Health check up for workers will be provisioned	IME & PME Health check up @ Rs. 1000/- per employee	0	18000
	First aid facility will be provided	Provision of 2 Kits per Hectare @ Rs. 2000/-	0	7730
	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	193250	10000

	Installation of CCTV cameras in the mines and mine entrance	Camera 4 Nos, DVR, Monitor with internet facility	30000	5000
	Implementation as per Mining Plan and ensure safe quarry working	Mines Manager (1 <sup>st</sup> Class / 2 <sup>nd</sup> 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
<b>CER</b>	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
<b>TOTAL</b>			<b>3140550</b>	<b>1449301.6</b>

\*Marked cost is already discussed in the mining plan hence that is not included in the total Environmental Management plan cost Total Cost for the five years

Year	Total Cost
1 <sup>st</sup>	4589851.6
2 <sup>nd</sup>	1521766.7
3 <sup>rd</sup>	1597855
4 <sup>th</sup>	1677747.8
5 <sup>th</sup>	1848785.2
<b>Total</b>	112 Lakhs

Cost inflation 5% per annum

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

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**10.10.: CONCLUSION –**

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

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## 11. SUMMARY AND CONCLUSION

The Palathurai Rough Stone and Gravel Cluster (Extent – 3.86.5 ha) consisting of 3 Proposed, 1 Existing Quarries falls under “B” category as per MoEF & CC Notification S.O. 3977 (E).

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

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

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

The main scope of the EIA study is to quantify the cumulative impact in the study area due to cluster quarries and formulate the effective mitigation measures for each individual leases. A detailed account of the emission sources, emissions control equipment, background Air quality levels, Meteorological measurements, Dispersion model and all other aspects of pollution like effluent discharge, Dust generation etc., have been discussed in this report. The baseline monitoring study has been carried out during the months March 2023– May 2023 for various environmental components so as to assess the anticipated impacts of the cluster quarry projects on the environment and suitable mitigation measures for likely adverse impacts due to the proposed project is suggested individually for the respective proposed project under Chapter 10.

The project proponent ensures to obtain necessary clearances and quarrying will be carried out as per rules and regulations. The Mining Activity will be carried out in a phased manner as per the approved mining plan after obtaining EC, CTO from TNPCB, execution of lease deed and obtaining DGMS Permission and working will be carried out under the supervision of Competent Persons employed.

Overall, the EIA report has predicted that the project will comply with all environment standards and legislation after commencement of the project and operational stage mitigation measures are implemented.

Mining operations has positive impact on environment and socio economy such as landscape improvement, water as by-product, economy development and better public services, providing and supply of Rough Stone as per market demand.

Sustainable and modern mining leads us to see positive impact of mining operation and providing consistent employment for nearly 18 people directly in the proposed projects and indirectly around 100 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 Palathurai Rough Stone and Gravel Cluster Quarries (Extent – 3.86.5 ha).

## 12. DISCLOSURE OF CONSULTANT

The Project Proponents –

### 1. Tmt.V. Thulasiammal

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

Name and address of the consultancy:

#### GEO EXPLORATION AND MINING SOLUTIONS

No 17, Advaita Ashram Road,

Alagapuram, Salem – 636 004

Tamil Nadu, India

Email: [infogeoexploration@gmail.com](mailto:infogeoexploration@gmail.com)

Web: [www.gemssalem.com](http://www.gemssalem.com)

Phone: 0427 2431989.

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

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

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



## DECLARATION BY EXPERTS CONTRIBUTING TO THE EIA/EMP

Declaration by experts contributing to the Cluster EIA/EMP for Tmt.V. Thulasiammal Rough Stone & Gravel Quarry Project over an Extent of 3.86.5 ha in Palathurai Village of Madukkarai Taluk, Coimbatore District of Tamil Nadu. It is also certified that information furnished in the above EIA study are true and correct to the best of our knowledge.

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

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

Designation: **EIA Coordinator**

Date & Signature:




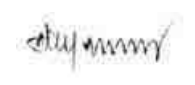

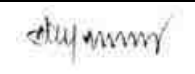








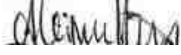





Period of Involvement: **January 2019 to till date**

### Associated Team Member with EIA Coordinator:

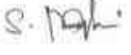
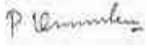



1. Mr. S. Nagamani
2. Mr.P. Viswanathan
3. Mr. M. Santhoshkumar
4. Mr. S. Ilavarasan






### FUNCTIONAL AREA EXPERTS ENGAGED IN THE PROJECT

Sl. No.	Functional Area	Involvement	Name of the Expert/s	Signature
1	AP	<ul style="list-style-type: none"> <li>▪ Identification of different sources of air pollution due to the proposed mine activity</li> <li>▪ Prediction of air pollution and propose mitigation measures / control measures</li> </ul>	Mr. A. Jagannathan	
2	WP	<ul style="list-style-type: none"> <li>▪ Suggesting water treatment systems, drainage facilities</li> <li>▪ Evaluating probable impacts of effluent/waste water discharges into the receiving environment/water bodies and suggesting control measures.</li> </ul>	Dr. M. Ifthikhar Ahmed	
			Mr. N. Senthilkumar	
3	HG	<ul style="list-style-type: none"> <li>▪ Interpretation of ground water table and predict impact and propose mitigation measures.</li> <li>▪ Analysis and description of aquifer Characteristics</li> </ul>	Dr. P. Thangaraju	
4	GEO	<ul style="list-style-type: none"> <li>▪ Field Survey for assessing the regional and local geology of the area.</li> <li>▪ Preparation of mineral and geological maps.</li> <li>▪ Geology and Geo morphological analysis/description and Stratigraphy/Lithology.</li> </ul>	Dr. M. Ifthikhar Ahmed	
			Dr. P. Thangaraju	
5	SE	<ul style="list-style-type: none"> <li>▪ Revision in secondary data as per Census of India, 2011.</li> <li>▪ Impact Assessment &amp; Preventive Management Plan</li> <li>▪ Corporate Environment Responsibility.</li> </ul>	Mrs. K. Anitha	
6	EB	<ul style="list-style-type: none"> <li>▪ Collection of Baseline data of Flora and Fauna.</li> <li>▪ Identification of species labelled as Rare, Endangered and threatened as per IUCN list.</li> <li>▪ Impact of the project on flora and fauna.</li> <li>▪ Suggesting species for greenbelt development.</li> </ul>	Mrs. Amirtham	
			Mr. Alagappa Moses	

7	RH	<ul style="list-style-type: none"> <li>▪ Identification of hazards and hazardous substances</li> <li>▪ Risks and consequences analysis</li> <li>▪ Vulnerability assessment</li> <li>▪ Preparation of Emergency Preparedness Plan</li> <li>▪ Management plan for safety.</li> </ul>	Mr. N. Senthilkumar	
			Mr. S. Pavel	
			Mr. J. R. Vikram Krishna	
8	LU	<ul style="list-style-type: none"> <li>▪ Construction of Land use Map</li> <li>▪ Impact of project on surrounding land use</li> <li>▪ Suggesting post closure sustainable land use and mitigative measures.</li> </ul>	Mr. A. Allimuthu	
9	NV	<ul style="list-style-type: none"> <li>▪ Identify impacts due to noise and vibrations</li> <li>▪ Suggesting appropriate mitigation measures for EMP.</li> </ul>	Mr. A. Jagannathan	
10	AQ	<ul style="list-style-type: none"> <li>▪ Identifying different source of emissions and propose predictions of incremental GLC using AERMOD.</li> <li>▪ Recommending mitigations measures for EMP</li> </ul>	Mr. N. Senthilkumar	
11	SC	<ul style="list-style-type: none"> <li>▪ Assessing the impact on soil environment and proposed mitigation measures for soil conservation</li> </ul>	Dr. M. Ifthikhar Ahmed	
12	SHW	<ul style="list-style-type: none"> <li>▪ Identify source of generation of non-hazardous solid waste and hazardous waste.</li> <li>▪ Suggesting measures for minimization of generation of waste and how it can be reused or recycled.</li> </ul>	Mr. A. Jagannathan	
			Mr. J. R. Vikram Krishna	

**LIST OF TEAM MEMBERS ENGAGED IN THIS PROJECT**

Sl.No.	Name	Functional Area	Involvement	Signature
1	Mr. S. Nagamani	AP; GEO; AQ	<ul style="list-style-type: none"> <li>▪ Site Visit with FAE</li> <li>▪ Provide inputs &amp; Assisting FAE with sources of Air Pollution, its impact and suggest control measures</li> <li>▪ Provide inputs on Geological Aspects</li> <li>▪ Analyse &amp; provide inputs and assist FAE with meteorological data, emission estimation, AERMOD modelling and suggesting control measures</li> </ul>	
2	Mr. Viswathanan	AP; WP; LU	<ul style="list-style-type: none"> <li>▪ Site Visit with FAE</li> <li>▪ Provide inputs &amp; Assisting FAE with sources of Air Pollution, its impact and suggest control measures</li> <li>▪ Assisting FAE on sources of water pollution, its impacts and suggest control measures</li> <li>▪ Assisting FAE in preparation of land use maps</li> </ul>	
3	Mr. Santhoshkumar	GEO; SC	<ul style="list-style-type: none"> <li>▪ Site Visit with FAE</li> <li>▪ Provide inputs on Geological Aspects</li> <li>▪ Assist in Resources &amp; Reserve Calculation and preparation of Production Plan &amp; Conceptual Plan</li> <li>▪ Provide inputs &amp; Assisting FAE with soil conservation methods and identifying impacts</li> </ul>	
4	Mr. Umamahesvaran	GEO	<ul style="list-style-type: none"> <li>▪ Site Visit with FAE</li> <li>▪ Provide inputs on Geological Aspects</li> <li>▪ Assist in Resources &amp; Reserve Calculation and preparation of Production Plan &amp; Conceptual Plan</li> </ul>	
5	Mr. A. Allimuthu	SE	<ul style="list-style-type: none"> <li>▪ Site Visit with FAE</li> </ul>	

			<ul style="list-style-type: none"> <li>▪ Assist FAE with collection of data's</li> <li>▪ Provide inputs by analysing primary and secondary data</li> </ul>	
6	Mr. S. Ilavarasan	LU; SC	<ul style="list-style-type: none"> <li>▪ Site Visit with FAE</li> <li>▪ Assisting FAE in preparation of land use maps</li> <li>▪ Provide inputs &amp; Assisting FAE with soil conservation methods and identifying impacts</li> </ul>	
7	Mr. E. Vadivel	HG	<ul style="list-style-type: none"> <li>▪ Site Visit with FAE</li> <li>▪ Assist FAE &amp; provide inputs on aquifer characteristics, ground water level/table</li> <li>▪ Assist with methods of ground water recharge and conduct pump test, flow rate</li> </ul>	
8	Mr. D. Dinesh	NV	<ul style="list-style-type: none"> <li>▪ Site Visit with FAE</li> <li>▪ Assist FAE and provide inputs on impacts due to proposed mine activity and suggest mitigation measures</li> <li>▪ Assist FAE with prediction modelling</li> </ul>	
9	Mr. Panneer Selvam	EB	<ul style="list-style-type: none"> <li>▪ Site Visit with FAE</li> <li>▪ Assist FAE with collection of baseline data</li> <li>▪ Provide inputs and assist with labelling of Flora and Fauna</li> </ul>	
10	Mrs. Nathiya	EB	<ul style="list-style-type: none"> <li>▪ Site Visit with FAE</li> <li>▪ Assist FAE with collection of baseline data</li> <li>▪ Provide inputs and assist with labelling of Flora and Fauna</li> </ul>	

**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 Tmt.V. Thulasiammal Rough Stone & Gravel Quarry Project over an Extent of 3.86.5 ha in Palathurai Village of Madukkarai Taluk, Coimbatore District of Tamil Nadu. It is also certified that information furnished in the EIA study are true and correct to the best of our knowledge.

Signature& Date:



Name:

**Dr. M. Ifthikhar Ahmed**

Designation:

**Managing Partner**

Name of the EIA Consultant Organization:

**M/s. Geo Exploration and Mining Solutions**

NABET Certificate No & Issue Date:

**NABET/EIA/2225/RA 0276 Dated: 20-2-2023**

Validity:

**Valid till 06.08.2025**