DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT OF ROUGH STONE AND GRAVEL QUARRY

(As per EIA Notification, 2006 dated 14.09.2006 and its amendments)

AREA DETAILS

Extent	**–**	**3.28.0 Ha**
S.F No	**–**	**272/2A, 2B, 2C and 2D**
Village	**–**	**Chettikurichi**
Taluk	**–**	**Kayathar**
District	**–**	**Thoothukkudi**
State	**–**	**Tamil Nadu**

TERMS OF REFERENCE ISSUED BY SEAC/SEIAA

TOR Identification No. TO23B0108TN5752566N

PROJECT PROPONENT

THIRU. S.KANDASAMY
S/o Shanmugam
No.102, Anna new street,
Kalugumalai Taluk, Thoothukudi District,
Tamil Nadu.

EIA CONSULTANT

AADHI BOOMI MINING & ENVIRO TECH (P) LTD
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2024

THIRU. S.KANDASAMY
S/o Shanmugam
No.102, Anna new street,
Kalugumalai Taluk, Thoothukudi District,
Tamil Nadu.

Date:

To

District Environmental Engineer,
Tamil Nadu Pollution Control Board,
C7 & C9, SIPCOT Industrial Complex,
Meelavittan, Thoothukudi – 628 008.

Sub: Submission of **Draft Environmental Impact Assessment (EIA) Report** as per EIA Notification, 2006 dated 14.09.2006 and amendments for the proposed Rough Stone and Gravel Quarry over an extent of 3.28.0 Hectare in S.F.No: 272/2A, 2B, 2C and 2D, Chettikurichi Village, Kayathar Taluk, Thoothukkudi District, Tamil Nadu –reg.

Ref:

1) MoEF&CCOM:F.No.L-11011/175/2018-IA-II(M), dated 12.12.2018
2) Precise area letter vide Roc No. G.M.1/861/2022 dated 14.07.2023
3) Approval of Mining Plan Vide Roc No. G.M.1/861/2022 dated 01.09.2023
4) Online TOR Proposal No. SIA/TN/MIN/447362/2023 dated 07.10.2023
5) TOR Identification No. TO23B0108TN5752566N, dated 06.04.2024

Dear Sir,

With reference to the above-mentioned subject, we herewith submit the hard copy of **Draft Environmental Impact Assessment Report** as per the Terms of Reference vide TOR Identification No. TO23B0108TN5752566N with a Demand Draft of Rs. ( )
in favour of DEE, TNPCB, Thoothukudi for your kind perusal.

Hence, we kindly request you to process our application for Public Hearing as per EIA Notification, 2006 for obtaining Environment Clearance from SEIAA/SEAC, Tamil Nadu as early as possible.

Thanking You,

Yours faithfully,

S.Kandasamy
(Project Proponent)

Enclosure: 1. Draft EIA Report along with the soft copy

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THIRU. S.KANDASAMY
S/o Shanmugam
No.102, Anna new street,
Kalugumalai Taluk, Thoothukudi District,
Tamil Nadu.

Undertaking

Thiru.S.Kandasamy, as Project Proponent, hereby give this undertaking to the effect that the conditions laid down in Terms of Reference vide TOR Identification No. TO23B0108TN5752566N for our Rough Stone and Gravel Quarry over an extent of 3.28.0 Ha located in SF.No. 272/2A, 2B, 2C and 2D of Chettikurichi Village, Kayathar Taluk, Thoothukkudi District, Tamil Nadu, have been compiled with, and the data submitted and the information presented in this report are true to the best of my knowledge.

Signature and seal of the Project Proponent

Place : Salem

Date :

Declaration by the Head of the accredited consultant organization/authorized person

I, S.Suriyakumar, Managing Director of Aadhi Boomi Mining & Enviro Tech (P) Ltd, hereby confirm that the Draft EIA Report has been prepared as per the conditions laid down in Terms of Reference vide TOR Identification No. TO23B0108TN5752566N for conducting Public Hearing and obtaining Environment Clearance from SEIAA/SEAC, Tamil Nadu for proposed Rough stone and Gravel Quarry of **Thiru.S.Kandasamy,** located in S.F.No. 272/2A, 2B, 2C and 2D over an extent of 3.28.0Ha of Chettikurichi Village, Kayathar Taluk, Thoothukkudi District, Tamil Nadu.

I, hereby confirm that the mentioned experts in NABET Annexure VII prepared the Draft EIA report of **Thiru.S.Kandasamy**. I also confirm that I, the EIA Coordinator (EC) have gone through the report, and shall be fully accountable for any mis-leading information mentioned in this statement. It is certified that no unethical practices, plagiarism involved in carrying out the work and external data/text has not been used without proper acknowledgement while preparing this EIA report.

Name : **Mr.S.Suriyakumar**

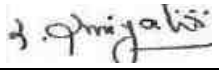
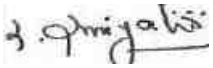
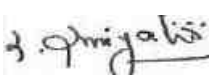
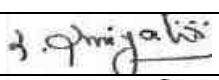
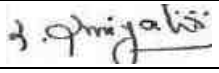
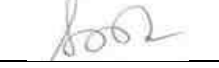
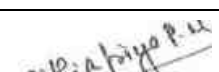
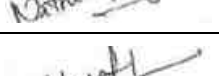
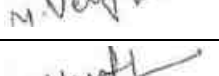
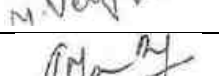
Signature :

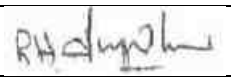
Designation : **Managing Director**

Name of the EIA Consultant Organization: Aadhi Boomi Mining & Enviro Tech Private Limited.

QCI/NABET Accredited Consultant, Certificate No: NABET/EIA/2124/RA 0228.

DECLARATION OF EXPERTS - NABET ANNEXURE – VII

S.No	Name of the Expert	Category	Functional Areas	Signature
In-House Experts				
1.	Mr.S.Suriyakumar	A	EIA Co-ordinator	
		A	Solid and Hazardous Waste SHW*- HW* only	
		A	Risk Assessment and Hazard Management (RH)	
		A	Land Use (LU)	
		A	Soil Conservation (SC)	
2.	Mrs. S. Santhi	B	Land Use (LU)	
		B	Socio Economics (SE)	
3.	Mr.K.Thirumeni	B	EIA Co-ordinator - Building and Construction	
		B	EIA Co-ordinator - Highways	
		B	Land use (LU)	
4.	R.R Prakash Babu	B	Air Pollution, Monitoring, Prevention and Control (AP)	
		B	Noise and Vibration (NV)	
5.	Dr. Nithia Priya P.M	B	Air Pollution, Monitoring, Prevention and Control (AP)	
		B	Water Pollution Monitoring, Prevention and Control (WP)	
6.	Mr. M. Venkatesh Prabhu	B	Meteorology, Air Quality Modelling & Prediction (AQ)	
		B	Noise and Vibration (NV)	
7.	Mr. K. Manuraj	B	Geology (GEO)	
			Hydrogeology (HG)	

8.	V. Sudha	B	Ecology and Biodiversity	
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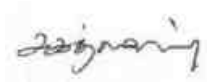
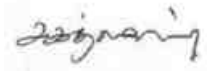
12.	Mr. S. Sagath Srikrishnan	Team Member	Solid hazardous Waste (SHW) under FAE Mr. Suriyakumar. S	
			Water Pollution Monitoring, Prevention and Control (WP) under FAE - Dr. Nithia Priya P.M	
13.	Mrs. A. Nagadevi	Team Member	Water Pollution Monitoring, Prevention and Control (WP) under FAE - Dr. Nithia Priya P.M	
			Ecology and Biodiversity (EB) under FAE – V. Sudha	
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LIST OF ABBREVIATIONS AND ACRONYMS

AQI	Air Quality Index
AAQ	Ambient Air Quality
CPCB	Central Pollution Control Board
CAPEXIL	Chemical and Allied Export Promotion Council of India
CSR	Corporate Social Responsibility
DB	Decibel
DGM	Department of Geology & Mining
DGPS	Differential Global Positioning System
EC	Environment Clearance
EMP	Environment Management Plan
EIA	Environmental Impact Assessment
EMC	Environmental Management Cell
LEQ	Equivalent Noise Level
GOVT	Government of Tamilnadu
GLC	Ground Level Concentration
HSE	Health, Safety and Environment
HA	Hectare
KLD	Kilo Litres Per -Day
KM	Kilo Meter
MOEF & CC	Ministry of Environment Forest and Climate Change
NH	National Highway
NOC	No Objection Certificate
PH	Public Hearing
R & R	Rehabilitation & Resettlement
SEIS	Seismograph
SEIAA	State Environmental Impact Assessment Authority
SEAC	State Expert Appraisal Committee
SH	State Highway
SPM	Suspended Particulate Matter
TNPCB	Tamil Nadu Pollution Control Board
TOR	Terms of Reference
WQI	Water Quality Index

Standard Terms of Reference for (Mining of minerals)

S.No.	Terms of Reference	Compliance
1.1	An EIA-EMP Report shall be prepared for peak capacity (...MTPA) operation in an ML/project area of .....ha based on the generic structure specified in Appendix III of the EIA Notification, 2006.	Yes, EIA-EMP has been prepared for peak capacity operation of 0.150839MTPA (150840MT/annum) in a project area of 3.28 Ha.
1.2	An EIA-EMP Report would be prepared for peak capacity operation to cover the impacts and environment management plan for the project specific activities on the environment of the region, and the environmental quality encompassing air, water, land, biotic community, etc. through collection of data and information, generation of data on impacts including prediction modelling for ..... MTPA of mineral production based on approved project/Mining Plan for ..... MTPA. Baseline data collection can be for any season (three months) except monsoon.	Yes, EIA-EMP has been prepared for peak capacity operation of 0.150839MTPA. It covers the impacts and environment management plan for the project specific activities on the environment of the region. The baseline data for the proposed project was collected during Winter Season i.e. 1st December, 2022 to 28th February, 2023. It includes ambient air quality, noise level, present water and soil quality, present land use and existing flora & fauna around 10km radius of the project site. Refer Page No. 50- 131 of Chapter 3 of EIA report. The baseline data of air quality and noise level was used to predict the incremental ground level concentration and noise level respectively. Air modelling is executed by using AERMOD software and Noise dispersion is by ArcGIS. Refer Page No 132 – 145 and 147 – 151 of Chapter 2
1.3	Proper KML file with pin drop and coordinate of mine at 500-1000 m interval be provided.	 Lease.kml The KML file is also included in DVD attached in the EIA report. Latitude: 9°3'50.79"N to 9°3'59.90"N Longitude: 77°43'51.47"E to 77°43'56.63" E

1.4	A Study area map of the core zone (project area) and 10 km area of the buffer zone (1: 50,000 scale) clearly delineating the major topographical features such as the land use, surface drainage pattern including rivers/streams/nullahs/canals, locations of human habitations, major constructions including railways, roads, pipelines, major industries, mines, and other polluting sources. In case of ecologically sensitive areas such as Biosphere Reserves/National Parks/WL Sanctuaries/ Elephant Reserves, forests (Reserved/Protected), migratory corridors of fauna, and areas where endangered fauna and plants of medicinal and economic importance found in the 15 km study area should be given. The above details to be furnished in tabular form also	The study area map of the core zone (project area) and 10 km area of the buffer zone (1: 50,000 scale) indicating topographical features such as the land use, surface drainage pattern including rivers/streams/nullahs/canals, locations of human habitations, major constructions including railways, roads, pipelines, major industries, mines, and other polluting sources is given in Chapter 1. Refer Fig No 1.2 in Page No.5. There are no wildlife sanctuaries and reserve forest located within 10km radius of project site.
1.5	Map showing the core zone delineating the agricultural land (irrigated and un-irrigated, uncultivable land as defined in the revenue records, forest areas (as per records), along with other physical features such as water bodies, etc should be furnished.	The lease area (3.28.0 Ha) of the proposed project is Patta land. Patta No: 2796 Land type: Punjai There are no water bodies and forest land located within 500m radius. Refer Table No 2.2 in Page No 16 of Chapter 2.
1.6	A contour map showing the area drainage of the core zone and 25 km of the study area (where the water courses of the core zone ultimately join the major rivers/streams outside the lease/project area) should also be clearly indicated in the separate map.	Uppodai River is located 2km away from project site on east side. 1st order Stream may connect the south side of lease area to the nearest Uppodai River. Refer Fig No.3.27 in Page No 126 of Chapter 3. Also Refer Fig No.4.5 (Separate map) in Page No 156 of Chapter 4.
1.7	Catchment area with its drainage map of 25 km area within and outside the mine shall be provided with names, details of rivers/ riverlet system and its respective order. The map should clearly indicate	The drainage map of 25km radius is given in Chapter 3. Refer Fig No.3.27 in Page No.126. There are two 5th order stream and three 4th streams located within 25km radius of

	drainage pattern of the catchment area with basin of major rivers. Diversion of drains/ river need elaboration in form of length, quantity and quality of water to be diverted	project site. The drainage patterns are dendric in nature. Uppodai River is located 2km away from project site on east side. There is no diversion of drains/rivers due to the proposed project.
1.8	(Details of mineral reserves, geological status of the study area and the seams to be worked, ultimate working depth and progressive stage-wise working scheme until the end of mine life should be provided on the basis of the approved rated capacity and calendar plans of production from the approved Mining Plan. Geological maps and sections should be included. The Progressive mine development and Conceptual Final Mine Closure Plan should also be shown in figures. Details of mine plan and mine closure plan approval of Competent Authority should be furnished for green field and expansion projects.	The mineral reserves, geological status of the study area, ultimate working depth, approved rated capacity and calendar plans of production from the approved mining plan is mentioned in Chapter 2. Refer Page No.24 to 26 and 32 to 45. Geological map and section are mentioned in Fig No 2.3 and 2.13 in Page No 14 and 33 respectively. The conceptual plan and progressive plan are mentioned in Fig 2.18 and 2.19 in Page No 43 and 44.
1.9	Details of mining methods, technology, equipment to be used, etc., rationale for selection of specified technology and equipment proposed to be used vis-à-vis the potential impacts should be provided.	Open cast mechanized method will be adopted for the proposed project. Refer Clause 2.6.3 in Page No 28 of Chapter 2. Technology and equipment used are mentioned in Clause 2.6.4 of Chapter 2. Refer Page No 28-30. The impact of mining activity on various environment is mentioned in Chapter 4.
1.10	Impact of mining on hydrology, modification of natural drainage, diversion and channelling of the existing rivers/water courses flowing though the ML and adjoining the lease/project and the impact on the existing users and impacts of mining operations thereon.	The water table identified in the project site through Geo-Resistivity survey is 55-60m bgl. The depth of proposed mining activity is 34bgl. So, the mining activity will not intersect ground water table. The schematic diagram of depth of mining and water table is mentioned in Fig No.4.6. Refer Page No.157 in Chapter 4.

<table>
<tr><td></td><td></td><td>There is no natural drainage, rivers crossing within the mining lease area. The impact on surface water bodies due to mining activity is mentioned in Clause 4.6.1 of Chapter 4. Refer Page 155.</td></tr>
<tr><td>1.11</td><td>A detailed Site plan of the mine showing the proposed break-up of the land for mining operations such as the quarry area, OB dumps, green belt, safety zone, buildings, infrastructure, Stockyard, township/colony (within and adjacent to the ML), undisturbed area -if any, and landscape features such as existing roads, drains/natural water bodies to be left undisturbed along with any natural drainage adjoining the lease /project areas, and modification of thereof in terms of construction of embankments/bunds, proposed diversion/re-channelling of the water courses, etc., approach roads, major haul roads, etc should be indicated.</td><td>The present and proposed land use of the mining lease is given in Table No.2.8 of Chapter 2. Refer Page No.31.

There are no water bodies located within 500m radius of the project site. So, there is no any modification in the natural drainage. Refer Page No.16

The approach road is available on the north side connecting lease area with MDR 160.

There will be no change in the existing road as only 3 tippers will be engaged for the transportation. Refer Table No.2.6 in Page No 29 of Chapter 2</td></tr>
<tr><td>1.12</td><td>Original land use (agricultural land/forest land/grazing land/waste land/water bodies) of the area should be provided as per the tables given below. Impacts of project, if any on the land use, in particular, agricultural land/forestland/grazing land/water bodies falling within the lease/project and acquired for mining operations should be analysed. Extent of area under surface rights and under mining rights should be specified.</td><td>
<table>
<tr><th>S.No</th><th>Project land use</th><th>Area under surface rights (Ha)</th><th>Area under mining rights (Ha)</th><th>Area under both (Ha)</th></tr>
<tr><td>1</td><td>Agricultural land</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>2</td><td>Forest land</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>3</td><td>Grazing land</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>4</td><td>Settlements</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>5</td><td>Others (Barren land)</td><td>3.80</td><td>3.80</td><td>3.80</td></tr>
</table>
</td></tr>
</table>

<table>
<tr>
<td></td>
<td></td>
<td>
<table>
<tr><th>S. No</th><th>Land use</th><th>Before starting the proposed quarrying activity (Ha)</th><th>At the end of quarrying activity (Ha)</th></tr>
<tr><td>1</td><td>Area under mining</td><td>---</td><td>2.42.91</td></tr>
<tr><td>2</td><td>Roads</td><td>---</td><td>0.03.10</td></tr>
<tr><td>3</td><td>Safety & Plantation area</td><td>---</td><td>0.56.19</td></tr>
<tr><td>4</td><td>Labour shed & Office</td><td>---</td><td>0.00.80</td></tr>
<tr><td>5</td><td>Waste Dump</td><td>---</td><td>0.25.00</td></tr>
<tr><td>6</td><td>Virgin</td><td>3.28.00</td><td>-</td></tr>
<tr><td colspan="2">Total</td><td>3.28.00</td><td>3.28.00</td></tr>
</table>
</td>
</tr>
<tr>
<td>1.13</td>
<td>Study on the existing flora and fauna in the study area (10km) should be carried out by an institution of relevant discipline. The list of flora and fauna duly authenticated separately for the core and study area and a statement clearly specifying whether the study area forms a part of the migratory corridor of any endangered fauna should be given. If the study area has endangered flora and fauna, or if the area is occasionally visited or used as a habitat by Schedule-I species, or if the project falls within 15 km of an ecologically sensitive area, or used as a migratory corridor then a Comprehensive Conservation Plan along with the appropriate budgetary provision should be prepared and submitted with EIA-EMP Report; and comments/observation from the CWLW of the State Govt. should also be obtained and furnished.</td>
<td>The study on the existing flora and fauna in the study area (10km) has been carried out by NABET accredited EB expert. Refer Clause 3.9.5 in Chapter 3. Refer Page No 89.

There is no reserve forest within 10km radius and no wild life sanctuary within 15km radius. The nearest sanctuary is Gangaikondan Spotted Deer Sanctuary located at the distance of 26km in south side.

No endangered flora or fauna located within the study area.</td>
</tr>
<tr>
<td>1.14</td>
<td>One-season (other than monsoon) primary baseline data on environmental</td>
<td>Winter season monitoring data for a period of three months (December 1st</td>
</tr>
</table>

	quality - air (PM10, PM2.5, SOx, NOx and heavy metals such as Hg, Pb, Cr, As, etc), noise, water (surface and groundwater), soil - along with one-season met data coinciding with the same season for AAQ collection period should be provided. The detail of NABL/ MoEF&CC certification of the respective laboratory and NABET accreditation of the consultant to be provided.	2022– February 28th 2023) on Air quality, Water quality, Noise level, Soil, Flora and Fauna in the core and buffer zones is collected and complied data wise in the EIA report (Chapter 3, Page No. 50-103). The meteorology data for the study period is taken from IMD, Kovilpatti Observatory, Thoothukudi district. All the samples were analyzed by NABL accredited laboratory. The details of NABL accredited laboratory and NABET accredited consultant engaged for the proposed project is mentioned in Chapter 12. Refer Page No. 227
1.15	Map (1: 50, 000 scale) of the study area (core and buffer zone) showing the location of various sampling stations superimposed with location of habitats, other industries/mines, polluting sources, should be provided. The number and location of the sampling stations in both core and buffer zones should be selected on the basis of size of lease/project area, the proposed impacts in the downwind (air)/downstream (surface water)/groundwater regime (based on flow). One station should be in the upwind/upstream/non-impact/non-polluting area as a control station. The monitoring should be as per CPCB guidelines and parameters for water testing for both ground water and surface water as per ISI standards and CPCB classification wherever applicable. Observed values should be provided along with the specified standards.	The sampling location of air, water, noise and soil in the study area (Core and Buffer zone are shown in Topomap (1: 50,000 scale). Refer Fig No 3.2, 3.5, 3.8, 3.13 in Page No.56, 65, 70, 84. The number and location of the sampling stations in both core and buffer zones are selected on the basis of size of lease/project area. Refer Table No 3.2, 3.4, 3.6, 3.12 in Page No 54, 66, 69, 83. All the monitoring was done as per CPCB guidelines. The observed values of water samples were compared with IS. Refer Table No.3.7 in Page No.71 of Chapter 3.

1.16	For proper baseline air quality assessment, Wind rose pattern in the area should be reviewed and accordingly location of AAMSQ shall be planned by the collection of air quality data by adequate monitoring stations in the downwind areas. Monitoring location for collecting baseline data should cover overall the 10 km buffer zone i.e. dispersed in 10 km buffer area. In case of expansion, the displayed data of CAAQMS and its comparison with the monitoring data to be provided.	Air quality monitoring stations has been selected based on the wind rose pattern of the area. Wind rose pattern of the area is analyzed by AERMOD software. Refer Fig No 3.1 in Page No. 52 of Chapter 3. The meteorology data for wind rose pattern is taken from IMD. Monitoring location for collecting baseline data has cover overall the 10 km buffer zone
1.17	A detailed traffic study along with presence of habitation in 100 mts distance from both side of road, the impact on the air quality with its proper measures and plan of action with timeline for widening of road. The project will increase the no. of vehicle along the road which will indirectly contribute to carbon emission so what will be the compensatory action plan should be clearly spell out in EIA/ EMP report.	Only three tippers are engaged for the transportation of Rough Stone and Gravel. This will not increase the traffic hence the widening of existing road is not required. Refer Table No 2.6 in Page No.29 of Chapter 2. The carbon emission from the movement of vehicles and its remediation measure are mentioned in Chapter 4. Refer Clause 4.2.1.2 in Page No.145
1.18	The socio-economic study to conducted with actual survey report and a comparative assessment to be provided from the census data should be provided in EIA/ EMP report also occupational status & economic status of the study area and what economically project will contribute should be clearly mention. The study should also include the status of infrastructural facilities and amenities present in the study area and a comparative assessment with census data to be provided and to link it with the initialization and quantification of need based survey for CSR activities to be followed.	The socio-economic study has been conducted and the details are incorporated in the EIA report. Also, the infrastructural facilities and amenities present in the Chettikurichi Village and other villages in the buffer zone are clearly mentioned in tabulated form. Refer Clause 3.10 in Chapter 3. Page No 104 – 118. The CSR activities and budget allocated are mentioned in Chapter 8. Refer Page No.188-191

1.19	The Ecology and biodiversity study should also indicate the likely impact of change in forest area for surface infrastructural development or mining activity in relation to the climate change of that area and what will be the compensatory measure to be adopted by PP to minimize the impact of forest diversion.	There are no reserve forest and wildlife sanctuary located within 10km radius of the site. The proposed mining activity will be carried out only within mining lease area. However, PP will develop green belt along the lease boundary and in public places like village roads, Government offices, college etc. Refer Table No 4.28 in Page No. 169 of Chapter 4.
1.20	Baseline data on the health of the population in the impact zone and measures for occupational health and safety of the personnel and manpower for the mine should be submitted.	During socio-economic survey, it is found that the health conditions of the surrounding people are good. The measures for occupational health and safety of the personnel and manpower are mentioned in Chapter 4. Refer Clause 4.13 in Page No 172.
1.21	Impact of proposed project/activity on hydrological regime of the area shall be assessed and report be submitted. Hydrological studies as per GEC 2015 guidelines to be prepared and submitted.	The depth of water table identified in the area is 55-60m bgl whereas proposed depth of mining is 34m bgl. Hence ground water resources will not be disturbed proposed project. No natural drainages are crossing within the ML area. During mining activity, the bottom pit will be used as sump for harvesting rain water. Stored rain water will be pumped and utilized for green belt development, improving agricultural activities in the buffer zone.
1.22	Impact of mining and water abstraction from the mine on the hydrogeology and groundwater regime within the core zone and 10 km buffer zone including long-term monitoring measures should be provided. Details of rainwater harvesting and measures for recharge of groundwater should be reflected in case there is a declining trend of groundwater availability	The depth of water table identified in the area is 55-60m bgl whereas proposed depth of mining is 34m bgl. Hence ground water resources will not be disturbed proposed project. Refer Fig No 4.6 in Page No 157 of Chapter 4. After commencing the mining activity, the ground water level in core and buffer will be continuously monitored and the

	and/or if the area falls within dark/grey zone.	reports will be attached with EC compliance while submitting to MOEFF. Details of rain water harvesting is included in EIA report. Refer Clause 7.4 in Page No.185 of Chapter 7.
1.23	Study on land subsidence including modelling for prediction, mitigation/prevention of subsidence, continuous monitoring measures, and safety issues should be carried out.	In the lease area, top soil and gravel present up to the depth of 4m and the rough stone will be excavated from the depth 4m to 34m below ground level. Five benches with depth and height of 6m will be adopted for safe mining as per approved mining plan. However, Geologist will be appointed for continuous monitoring of slope stability. After reaching the depth of 30m, the slope stability study will be conducted by NABET accredited EIA Coordinator (Mining) and FAE (Risk assessment and hazard management -RH)
1.24	Detailed water balance should be provided. The break-up of water requirement as per different activities in the mining operations, including use of water for sand stowing should be given separately. Source of water for use in mine, sanction of the Competent Authority in the State Govt. and impacts vis-à-vis the competing users should be provided.	The detailed water balance chart for the proposed mining activity is included in EIA Report. Refer Fig No. 4.4 in Page No. 154 of Chapter 4. As the total requirement of water for the proposed project is 5.0 KLD, sanction of the competent authority is not required. Water requirement for drink purpose will be sourced from Mineral water industries and for other uses will be sourced from proponent own well.
1.25	PP shall submit design details of all Air Pollution control equipment (APCEs) to be implemented as part of Environment Management Plan vis-à-vis reduction in concentration of emission for each APCEs	Wet drilling will be used to suppress the dust emission during drilling activity. Tractor mounted with water tank will be engaged to spray water along the haul road periodically to suppress the dust

		generation during transportation of minerals. All the tippers will be covered with tarpaulin to prevent the escape of dust and spillages of minerals. Refer Page No 144 in Chapter 4.
1.26	PP shall propose to use LNG/CNG based mining machineries and trucks for mining operation and transportation of mineral. The measures adopted to conserve energy or use of renewable sources shall be explored	Agreed. In upcoming days, LNG/CNG based mining machineries and trucks will be bought. Solar panels will be installed over the roof tops of labour shed to conserve energy and solar lights will be installed at the entrance and around the quarry.
1.27	PP to evaluate the greenhouse emission gases from the mine operation and corresponding carbon absorption plan	Carbon emission from the proposed mining activity and its remediation plan are given detail in EIA report. Refer Clause 4.2 in Page No.145 of Chapter 4.
1.28	Site specific Impact assessment with its mitigation measures, Risk Assessment and Disaster Preparedness and Management Plan should be provided.	A detailed Risk and Disaster Management Plan has been prepared and detailed in Chapter 7. (Pg. No: 181-183).
1.29	Impact of choice of mining method, technology, selected use of machinery and impact on air quality, mineral transportation, handling & storage/stockyard, etc, Impact of blasting, noise and vibrations should be provided.	Open cast mechanized method is adopted for proposed project. Refer Clause 2.6.3 in Page No. 28 Machineries and vehicles selected for quarrying activity is given in Chapter 2. Refer Table No. 2.4, 2.5, 2.6 in Page no.29. The impact on ambient air quality due to mining activities of drilling, blasting, loading, unloading and transportation are given in Chapter 4. Refer Clause 4.1 in Page No.132 Impact of blasting, noise and vibrations are given detail in Chapter 4. Refer Clause 4.4 and 4.5 in Page No. 147 and 152 respectively.

1.30	Impacts of mineral transportation within the mining area and outside the lease/project along with flow-chart indicating the specific areas generating fugitive emissions should be provided. Impacts of transportation, handling, transfer of mineral and waste on air quality, generation of effluents from workshop etc, management plan for maintenance of HEMM and other machinery/equipment should be given. Details of various facilities such as rest areas and canteen for workers and effluents/pollution load emanating from these activities should also be provided.	During transportation within the lease area and on the approach road, the fugitive dust will be generated and dispersed in predominant wind direction. Refer Fig No.4.1 in Page No.139. It will be mitigated by spraying water over the haul road and approach road periodically through tractor mounted with water tank. All the machineries and vehicles will be maintained and repaired in the workshop located in nearest villages or town. So, effluents will not be generated within the ML area. Toilet facilities and labor shed will be provided as per Mines Rules, 1955. Refer Clause 2.13 in Page No.46 of Chapter 2.
1.31	Details of various facilities to be provided to the workers in terms of parking, rest areas and canteen, and effluents/pollution load resulting from these activities should also be given.	All the facilities in terms of toilet, labor shed, first aid and safety equipment will be provided to workers as per Mines Rules, 1955 and DGMS guidance. Refer Clause 2.13 in Page No.46 of Chapter 2.
1.32	The number and efficiency of mobile/static water jet, Fog cannon sprinkling system along the main mineral transportation road inside the mine, approach roads to the mine/stockyard/siding, and also the frequency of their use in impacting air quality should be provided.	One tractor mounted with water tank will be engaged for spraying water along the main mineral transportation road inside the mine, approach roads. The frequency of praying water depends on the climatic condition of the area. Refer Page No 144 of Chapter 4.
1.33	Conceptual Final Mine Closure Plan and post mining land use and restoration of land/habitat to the pre- mining status should be provided. A Plan for the ecological restoration of the mined-out area and post mining land use should be prepared with detailed cost provisions. Impact and management of wastes and issues of re-handling (wherever	Conceptual mining plan is attached in EIA report. Refer Fig No 2.18 in Page 43 of Chapter 2. Before commencing mining activities, S1 type fencing will be made around lease area and green belt will be developed every year around ML boundary as per approved mining plan.

	applicable) and backfilling and progressive mine closure and reclamation should be furnished.	At the end of mining, all the rejects will be back filled and the mined-out pit will be made fit storing rain water. Refer Clause 2.11.1 in Page No.42. Cost allocated for the mine closure plan is mentioned in Table No.10.3 in Page No.202 of Chapter 10.
1.34	Adequate greenbelt nearby areas, mineral stock yard and transportation area of mineral shall be provided with details of species selected and survival rate Greenbelt development should be undertaken particularly around the transport route.	Not only within lease area, planation will be done in mineral transportation route and in public places such as village road, government schools, colleges and office etc. Refer Table No 4.28 in Page No. 169 of Chapter 4. No minerals will be stacked within the lease area. All the minerals will be directly sent to crusher making fine and coarse aggregates
1.35	Cost of EMP (capital and recurring) should be included in the project cost and for progressive and final mine closure plan.	The cost allocated EMP and mine closure plan is mentioned in Table 10.2 and 10.3 in Page No.202 of Chapter 10.
1.36	Details of R&R. Detailed project specific R&R Plan with data on the existing socio-economic status of the population (including tribals, SC/ST, BPL families) found in the study area and broad plan for resettlement of the displaced population, site for the resettlement colony, alternate livelihood concerns/employment for the displaced people, civic and housing amenities being offered, etc and costs along with the schedule of the implementation of the R&R Plan should be given.	The mining operation will not disturb/relocate any village people and hence R & R plan is not required. (Refer Chapter 7, Clause 7.3, and Page No. 185).
1.37	CSR Plan along with details of villages and specific budgetary provisions (capital and recurring) for specific activities over the life of the project should be given.	Under CSR scheme, PP will do benefits to Chettikurichi village. The CSR activities and cost allocated is given detail in Chapter 8. Refer Page No. 188 -191

1.38	Corporate Environment Responsibility:	Under CER activity, PP will do required facilities for Government High School, Chettikurichi Village. The cost allocated for CER activity is 5.0 Lakhs. Refer Clause 8.4.3 in Page No.191 of Chapter 8.
1.39	a) The Company must have a well laid down Environment Policy approved by the Board of Directors	The environment policy of the Mr.S.Kandasamy, Rough stone and Gravel quarry is mentioned in Chapter 10. Refer Clause 10.2 in Page No.193
1.40	b) The Environment Policy must prescribe for standard operating process/procedures to bring into focus any infringements/deviation/violation of the environmental or forest norms/conditions.	Environment Management Cell (EMC) will look into standard operating process/procedures to bring into focus any infringements/deviation/violation of the environmental or forest norms/conditions. Refer Clause 10.3 in Page No 193 of Chapter 10.
1.41	c) The hierarchical system or Administrative Order of the company to deal with environmental issues and for ensuring compliance with the environmental clearance conditions must be furnished.	The Administrative Order of the company to deal with environmental issues and for ensuring compliance with the environmental clearance conditions are shown in Fig 10.1 in Page No.195. The duties of environment Management Cell are mentioned in Clause 10.3.1 of Chapter 10. Refer Page No.194.
1.42	d) To have proper checks and balances, the company should have a well laid down system of reporting of non-compliances/violations of environmental norms to the Board of Directors of the company and/or shareholders or stakeholders at large.	The project proponent will engage NABET accredited EIA consultant, Mining of Minerals (Third Party) to oversee the environmental issues and for reporting of non-compliances/ violations of environmental norms.
1.43	e) Environment Management Cell and its responsibilities to be clearly mentioned in EIA/ EMP report	The duties and responsibilities of environment Management Cell are mentioned in Clause 10.3.1 of Chapter 10. Refer Page No.194.
1.44	f) In built mechanism of self-monitoring of compliance of environmental regulations should be indicated.	Third Party EIA consultant only will be engaged for monitoring of compliance of environmental regulations

<table>
<tr><td>1.45</td><td>Status of any litigations/ court cases filed/pending on the project should be provided.</td><td>Nil</td></tr>
<tr><td>1.46</td><td>PP shall submit clarification from DFO that mine does not fall under corridors of any National Park and Wildlife Sanctuary with certified map showing distance of nearest sanctuary.</td><td>Not applicable. There is no wildlife sanctuary located within 15km radius of the project.
Gangaikondan Spotted Deer Sanctuary – 26km – S. It is notified Sanctuary by MOEF&CC vide S.O.2773 (E) dated 31/07/2019.</td></tr>
<tr><td>1.47</td><td>Copy of clearances/approvals such as Forestry clearances, Mining Plan Approval, mine closer plan approval. NOC from Flood and Irrigation Dept. (if req.), etc. wherever applicable.</td><td>Forestry clearances – NA
Mining Plan Approval - Roc No. G.M.1/861/2022 dated 01.09.2023. Refer Annexure – VIII in Page No.289
NOC from Flood and Irrigation Dept - NA</td></tr>
<tr><td>1.48</td><td>Details on the Forest Clearance should be given as per the format given:
<table>
<tr><td>Total ML Project Area (Ha)</td><td>Total Forest land (Ha)</td><td>Date of FC</td><td>Extent of Forest Land</td><td>Balance area for which FC is yet to be obtained</td><td>Status of application for diversion of forest land</td></tr>
</table></td><td>Not applicable</td></tr>
<tr><td>1.49</td><td>In case of expansion of the proposal, the status of the work done as per mining plan and approved mine closure plan shall be detailed in EIA/ EMP report</td><td>Not applicable. It is newly proposed Rough Stone and Gravel Quarry in Fresh area.</td></tr>
<tr><td>1.50</td><td>Details on Public Hearing should cover the information relating to notices issued in the newspaper, proceedings/minutes of Public Hearing, the points raised by the general public and commitments made by the proponent and the time bound action proposed with budgets in suitable time frame. These details should be presented in a tabular form. If the Public Hearing is in the regional language, an authenticated English Translation of the same should be provided.</td><td>The Draft EIA report has been prepared for conducting public hearing through TNPCB, Thoothukudi.

After conducting PH, all the said detail will be included in Final EIA report and submit SEAC/SEIAA, TN for appraisal</td></tr>
</table>

1.51	PP shall carry out survey through drone highlighting the ground reality for at least 10 minutes	Agreed. Drone survey of project site and its buffer zone for 10 minutes will be conducted and video will be attached in Final EIA report.
1.52	Detailed Chronology of the project starting from the first lease deed allotted/Block allotment/ Land acquired to its No. of renewals, CTO /CTE with details of no. renewals, previous EC(s) granted details and its compliance details, NOC details from various Govt bodies like Forest NOC(s), CGWA permissions, Power permissions, etc as per the requisites respectively to be furnished in tabular form	Not applicable. It is a fresh lease rough stone and gravel quarry
1.53	The first page of the EIA/ EMP report must mention the peak capacity production, area, detail of PP, Consultant (NABET accreditation) and Laboratory (NABL / MOEF & CC certification)	The details of peak capacity production, area, detail of PP, Consultant and Laboratory are mentioned in Cover Page.
1.54	The compliances of ToR must be properly cited with respective chapter section and page no in tabular form and also mention sequence of the respective ToR complied within the EIA-EMP report in all the chapters section.	Yes, ToR has been complied with proper Section No, Page No, Fig No and Table No. of the EIA report.

Specific Terms of Reference

1. SEAC Standard Conditions

S.No.	Terms of Reference	Compliance
	ANNEXURE - I	
1.	In case of existing/operating mines, a letter obtained from the concerned AD (Mines) shall be submitted and it shall include the following. (i) Original pit dimension (ii) Quantity achieved Vs EC approved Quantity (iii) Balance Quantity as per Mineable Reserve calculated (iv) Mined out Depth as on date Vs EC permitted depth (v) Details of Illegal/Illicit mining (vi) Violation in the quarry during the past working (vii) Quantity of material mined out outside the mine lease area (viii) Condition of safety zone/benches (ix) Revised/Modified Mining plan showing the benches of not exceeding 6m height and ultimate depth of not exceeding 50m	Not applicable. This is newly proposed rough stone and gravel quarry in fresh area
2.	Details of habitations around the proposed mining area and latest VAO certificate regarding the location of habitations within 300m radius from the periphery of the site.	The latest VAO certificate regarding the location of habitations within 300m radius from the periphery of the site has been attached in Draft EIA report. Refer Annexure X and XI in Page No 295 and 296.
3.	The PP shall submit a detailed hydrological report indicating the impact of proposed quarrying operations on the water bodies like lake; water tanks, etc are located within 1 km of the proposed quarry.	The hydro geology study has been conducted within the study area of project site. Refer Page No 74- 82 in Chapter 3. The details of water bodies in the study area are given chapter 2. Refer Table no 2.2 in Page no 16.

4.	The Proponent shall carry out Bio-diversity study through reputed Institution and the same shall be included in EIA report.	The baseline study on Ecology and Biodiversity are given detail in Chapter 3. Refer Clause 3.9.5 in Page No 89. The impact on Ecology and Biodiversity are given in Chapter 4. Refer Clause 4.10 in Page No 163.
5.	The DFO letter stating that the proximity distance of Reserve Forests, Protected Areas, Sanctuaries, Tiger reserve etc., up to a radius of 25 km from the proposed site.	It is under process. It will be submitted during appraisal of EC application.
6.	In the case of proposed lease in an existing (or old) quarry where the benches are non-formed (or) partially formed critical of the bench geometry approved in the Mining plan, the Project Proponent (PP) shall carry out the scientific studies to assess the slope stability of the working benches to be constructed and existing quarry wall, by involving any one of the reputed Research and Academic Institutions – CSIR – Central Institute of Mining & Fuel Research/Dhanbad, NIRM/Bangalore, Division of Geotechnical Engineering – IIT – Madras, Nit- Dept of Mining Engg, Surathkal and Anna University Chennai – CEG Campus. The PP shall submit a copy of the aforesaid report indicating the stability status of the quarry wall and possible mitigation measures during the time of appraisal for obtaining the EC.	Not applicable. This is newly proposed rough stone and gravel quarry in fresh area
7.	However, in case of the fresh/virgin quarries, the Proponent shall submit a conceptual 'Slope Stability plan' for the proposed quarry indicating the proposed stabilizing measures during the appraisal while obtaining the EC, when the depth of the working is extended beyond 30 m below ground level.	The ultimate depth of the proposed projects is 34m bgl. So the 'Slope Stability plan' for the proposed project is under preparation. It will be submitted during EC appraisal by SEAC.

8.	The PP shall furnish the affidavit stating that the blasting operation in the proposed quarry is carried out by the statutory competent person as per the MMR 1961 such as blaster, mining mate, mine foreman, II/I Class mines manager appointed by the proponent.	Agreed. The affidavit stating that the blasting operation in the proposed quarry is carried out by the statutory competent person as per the MMR 1961 will be attached in Final EIA report
9.	The PP shall present a conceptual design for carrying out only controlled blasting operation involving line drilling and muffle blasting in the proposed quarry such that the blast-induced ground vibrations are controlled as well as no fly rock travel beyond 30m from the blast site.	The drilling and blasting pattern for the proposed quarry is mentioned in Chapter 2. Refer Page No. 28 and 29.
10.	The EIA Coordinators shall obtain and furnish the details of quarry/quarries operated by the proponent in the past, either in the same location or elsewhere in the state with video and photographic evidences.	The drone survey will be conducted for this project. The video and photographs will be attached in Final EIA report.
11.	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.	No. This is newly proposed rough stone and gravel quarry in fresh area. No mining activity was carried out in the proposed lease area.
12.	What were the period or the operation and stoppage of the earlier mines with last work permit issued by the AD/DD mines?	Not applicable.
13.	Quantity of minerals mined out. • Highest production achieved in any one year. • Detail of approved depth of mining. • Actual depth of the mining achieved earlier. • Name of the person already mined in that leases area. • If EC and CTO already obtained, the copy of the same shall be submitted.	Not applicable.

	• Whether the mining was carried out as per the approved mine plan (or EC if issued) with stipulated benches.	
14.	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).	The Toposheet showing location of the lease area is attached in Chapter 1. Refer 1.2 in Page No.5 The geology and geomorphology of the 10km radius of proposed area is given in Chapter 2. Refer Fig No 2.12 in Page No 27. The land use/land cover image is given Chapter 3. Refer Page No 122.
15.	The PP shall carry out Drone video survey covering the cluster, green belt, fencing etc.	The drone survey will be conducted for this project. The video and photographs will be attached in Final EIA report
16.	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.	The fencing and green belt development along the periphery is under process. The photographs will be attached in Final EIA Report.
17.	The Project Proponent shall provide the details of mineral reserves and mineable reserves, planned production capacity, and proposed working methodology with justifications, the anticipated impacts of the mining on the surrounding environment and the remedial measures for the same.	The details of reserves, production capacity and methodology are given in Chapter – 2. Refer Page No 28-44 & the impacts on surrounding environment due to mining activity are given in Chapter 4. Refer Page No 132-176.
18.	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.	The employment potential of proposed project is given in Chapter 2. Refer Page No 46.

19.	The project proponent shall conduct the 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) 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 be clearly be shown whether working will intersect groundwater. Necessary data and documentation in this regard may be provided.	The hydro geology study has been conducted within the study area of project site. Refer Page No 74-82 in Chapter 3. The details of water bodies in the study area are given chapter 2. Refer page no 16. The depth of water table identified by Geo resistivity survey is 55-60m bgl whereas the proposed depth of mining is 34m bgl. Therefore, the mining activity will not intersect ground water table. The schematic diagram is given in chapter 4. Refer Page No 157.
20.	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.	The baseline data for the environmental and ecological parameters were collected. Refer Chapter 3.
21.	The Proponent shall carry out the Cumulative impact study due to mining operations carried out in the quarry specifically with reference to the specific environment in terms of soil health, biodiversity, air pollution, water pollution, climate change and flood control & health impacts. Accordingly, the Environment management plan should be prepared keeping the concerned quarry and the surrounding habitations in the mind.	The anticipated cumulative impact on various environments such as air, water, soil and noise etc due to proposed mining activity are given in Chapter 4 with appropriate mitigation measures. The environmental management plan is given in Chapter 10.
22.	Rain water harvesting management with recharging details along with water balance (both monsoon & non-monsoon) is submitted.	The studies on rain water harvesting are given in Chapter 7. Refer Page No 185.
23.	Land use of the study area delineating forest area, agricultural land, grazing land, wildlife sanctuary, national park, migratory routes of	The land use/land covers of 10km radius of proposed mining lease area are given in

	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.	Chapter 3. Refer Fig No 3.25 in Page No 122.
24.	Details of the land for storage of Overburden/Waste Dumps (or) Rejects outside the mine lease, such as extent of land area, distance from mine lease, its land use, R&R issues, if any, should be provided.	Not applicable. All waste and rejects shall be dumped within the mining lease area of 3.28.0 Ha of Thiru.S.Kandasamy.
25.	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.	No. There is no boundary of critically polluted area found within 10km radius proposed mining lease area.
26.	Description of water conservation measures proposed to be adopted in the Project should be given. Details of rainwater harvesting proposed in the project, if any, should be provided.	At the end of mining, the quarried-out pit will be used for storing rain water which will enhance agricultural activity around the lease area. The rain harvesting plan is given detail in Chapter 7. Refer Page No 185.
27.	Impact on local transport infrastructure due to the project should be indicated.	No. The existing roads are available to withstand the traffic generated due to proposed project. Refer Fig No.2.6 in Page No 19 of Chapter 2.
28.	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.	Only trees such as coconut trees, palm trees, Prosopis juliflora are found within 500m radius.

29.	A detailed mine closure plan for the proposed project which should be site specific.	The mine closure plan for the proposed project is included in the EIA report. Refer Fig No 2.18 in Chapter 2. (Page No 43)
30.	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.	Agreed. The EIA coordinator will educate the local students on the importance of preserving local flora and fauna during public hearing meeting.
31.	The purpose of green belt around the project is to capture the fugitive emissions, carbon sequestration and to attenuate the noise generated, in addition to improving the aesthetics. A wide range of indigenous plant species should be planted as given in the appendix-I in consultation with the DFO, State Agriculture University. The plant species with dense/moderate canopy of native origin should be chosen. Species of small/medium/tall trees alternating with shrubs should be planted in a mixed manner.	Agreed. In consultation with the DFO, State Agriculture University, the green belt will be made around the boundary of lease area to capture the fugitive emissions, carbon sequestration and to attenuate the noise generated
32.	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	Agreed. Taller/one year old Saplings will be planted as per the advice of local forest authorities/botanist/ Horticulturist with regard to site specific choices.
33.	A Disaster management Plan shall be prepared and included in the EIA/EMP Report for the complete life of the proposed quarry (or) till the end of the lease period.	The Disaster management Plan has been prepared and included in the EIA report. Refer Clause 7.2 in Page No 182 of Chapter 7.
34.	A Risk Assessment and management Plan shall be prepared and included in the EIA/EMP Report for the complete life of the	Risk Assessment and management Plan has been prepared and included in the EIA

	proposed quarry (or) till the end of the lease period.	report. Refer Clause 7.2 in Page No 182 of Chapter 7.
35.	Occupational Health impacts of the Project should be anticipated and the proposed preventive measures spelt out in detail. Details of pre-placement medical examination and periodical medical examination schedules should be incorporated in the EMP. The project specific occupational health mitigation measures with required facilities proposed in the mining area may be detailed.	An occupational Health impact of the Project has been anticipated and the appropriate mitigation measures are given in Chapter 4 of EIA report. Refer Clause 4.13 in Page No.172.
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.	Yes, it is given in EIA report. Refer Clause 4.13.3 in Page No.172 of EIA report
37.	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.	The study on Socio-economic for the proposed project is mentioned in Clause 3.10 of Chapter 3. Refer Page No 104 of EIA report.
38.	Details of litigation pending against the project, if any, with direction /order passed by any Court of Law against the Project should be given.	Nil
39.	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.	The benefits of the proposed project are given detail in Chapter 8. Refer Page No 188-191.
40.	If any quarrying operations were carried out in the proposed quarrying site for which now	Not applicable

	the EC is sought, the Project Proponent shall furnish the detailed compliance to EC conditions given in the previous EC with the site photographs which shall duly be certified by MoEF&CC, Regional Office, Chennai (or) the concerned DEE/TNPCB.	
41.	The PP shall prepare the EMP for the entire life of mine and also furnish the sworn affidavit stating to abide the EMP for the entire life of mine.	The EMP for the proposed project is mentioned in Chapter 10 along with EMP cost. The affidavit stating to abide the EMP for the entire life of mine will be attached in final EIA report.
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.	Agreed.

2.SEAC Mining Conditions- Site Specific

S.No.	Terms of Reference	COMPLIANCE
1	The PP shall furnish ownership details of all survey numbers in EIA report.	The lease area is patta land. The patta is in the name of project proponent, S.Kandasmy. Patta No: 2796. Refer Annexure No.VI in Page No. 284 of EIA report. The land purchase detail is attached as Annexure -III. Refer Page No.246.
2	The PP shall submit the 'Action Plan' on the issues raised during the Public Hearing with budgetary provisions for the same.	Agreed. After conducting public hearing, the 'Action Plan' on the issues raised during the Public Hearing with budgetary provisions will be included in Final EIA report.
3	The PP shall submit the controlled blasting measures for reducing the impacts due to the blasting operation in the proposed quarries within 1 km of the proposed quarry.	Controlled blasting will be adopted for the proposed project. Refer Page No. 30 in Chapter 2 of EIA report.
4	The PP shall submit a 'Conceptual Mining Plan' indicating the accessible ramp from the surface to the pit bottom keeping the benches intact for the dimension as stipulated in the Approved Mining Plan.	CMP is annexed in Plate –X of the approved Mining plan. Refer Page No.43 of EIA report.
5	The PP shall submit the nature of buildings/structures, occupants and their profession, etc located within 500 m radius of the proposed quarry.	There are no habitations located within 500m radius of the project site. Temporary shed of crusher unit - 260m – SW. Refer Page No.15 of Chapter 2.

3. SEIAA Standard Conditions

S.No.	Terms of Reference	COMPLIANCE
Cluster Management Committee		
1	Cluster Management Committee shall be framed which must include all the proponents in the cluster as member including the existing as well as proposed quarry.	Agreed. The Cluster Management Committee will be formed as per SEIAA guidance.
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.,	Agreed. After forming CMC, the all the members will implement environment management plan effectively. Effective plan has been given in Chapter – 4
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.	Agreed. The List of members of the committee formed will be submitted to AD/Mines before commencing the quarry activity.
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.	Certified Blaster will be engaged for blasting having adequate knowledge in Environmental safety aspects. Plan will be included in Final EIA report. The usage of haul roads by the individual quarry is attached in EIA report. Refer Fig No 2.6 in page No 19 of 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.	Risk Management is elaborated in Chapter 7 of the Draft EIA report
6	The Cluster Management Committee shall form Environmental Policy to practice sustainable mining in a scientific and systematic manner in accordance with the law. The role played by the committee in	Agreed. The CMC will form Environmental Policy to practice sustainable mining in a scientific and systematic manner. The same shall be displayed within the cluster area.

	implementing the environmental policy devised shall be given in detail.	
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.	The conceptual plan for the quarry lease area 3.28.0 Ha is attached in draft EIA report. Refer Fig No 2.18 in page No 43 of Chapter 2. After forming CMC, the restoration strategy of individual quarry will be submitted to AD Mines, Thoothukkudi.
8	The committee shall furnish the Emergency Management plan within the cluster.	Agreed. After forming CMC, the committee will furnish the Emergency Management plan to AD Mines, Thoothukkudi.
9	The committee shall deliberate on the health of the workers/staff involved in the mining as well as the health of the public.	Occupational safety and Health care of the workers are included in Chapter – 4 in draft EIA report
10	The committee shall furnish an action plan to achieve sustainable development goals with reference to water, sanitation & safety.	Agreed. After forming CMC, the committee will furnish the action plan to achieve sustainable development goals with reference to water, sanitation & safety to AD Mines, Thoothukkudi.
11	The committee shall furnish the fire safety and evacuation plan in the case of fire accidents.	Agreed. After forming CMC, the committee will furnish fire safety and evacuation plan to AD Mines, Thoothukkudi.
Impact study of mining		
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. b) Climate change leading to Droughts, Floods etc.	Impact on Soil Health, biodiversity, carbon emission and impact on water environment including aquatic ecosystem and on agricultural environment are discussed in detail in Chapter 4.

	c) Pollution leading to release of Greenhouse gases (CHG), rise in Temperature, & Livelihood of the local people. d) Possibilities of water contamination and impact on aquatic ecosystem health. e) Agriculture, Forestry & Traditional practices. f) Hydrothermal/Geothermal effect due to destruction in the Environment. g) Bio-geochemical processes and its foot prints including environmental stress. h) Sediment geochemistry in the surface streams.	
Agriculture & Agri - Biodiversity		
13	Impact on surrounding agricultural fields around the proposed mining area.	The impact on surrounding agricultural fields is given in chapter 4. Refer Clause 4.14 in page No.173.
14	Impact on soil flora & vegetation around the project site.	The impact on ecology and biodiversity including soil flora & vegetation around the project site is mentioned in Chapter 4. Refer Page No.163.
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 the EMP.	Only few shrubs are present within the lease area. It will be cleared before the commencement of quarry activity. The PP has planned to plant 30 tree sapling per annum along the boundary of mining lease area.
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.	The impact on ecology and biodiversity including the soil micro flora, fauna and soil seed banks around the project site is mentioned in Chapter 4. Refer Page No.163 -169.
17	Action should specifically suggest for sustainable management of the area and	At the end of mining, the quarried-out pit will be used as water storage pond

	restoration of ecosystem for flow of goods and services.	which improves the agricultural activity in the buffer zone. Refer Page No 42in Chapter 2. The afforestation plan for five years is given in Chapter 4. Refer Table No 4.28 in Page No.169.
18	The project proponent shall study and furnish the impact of project on plantations in adjoining patta lands, horticulture, Agriculture and livestock.	Anticipated impact on Agriculture, Horticulture and livestock is given Chapter 4. Refer Clause 4.14.2 in Page No 174.
Forests		
19	The project proponent shall detail study on impact of mining on reserve forests free ranging wildlife.	There are No reserve forests located within 10km radius of the project site. There are no wildlife sanctuaries within 10km radius. Refer Table 2.3 in Page No 156 of Chapter 2. The impact on reserve forest and wild life sanctuary is given in Chapter 4. Refer Clause 4.10 in page No 163.
20	The Environmental Impact Assessment should study on impact on forest, vegetation, endemic, vulnerable and endangered indigenous flora and fauna.	There is no endangered species found within 10km radius study area.
21	The Environmental Impact Assessment should study impact on standing trees and the existing trees should be numbered and action suggested for protection.	There are no trees present within the lease area. As the mining activity is carried out only within the lease area, the impacts on trees present in buffer zone will be negligible.
22	The Environmental Impact Assessment should study impact on protected areas, Reserve Forests, National Parks, Corridors and Wildlife pathways, near project site.	There are no protected areas, National Parks, Corridors and Wildlife pathways within 10km radius of the project site. There is no reserve forest located within 10km radius. The impact on reserve forest is given in Chapter 4. Refer Clause 4.10 in page No 163.
Water Environment		
23	Hydro-geological study considering the contour map of the water table detailing	The hydro geology study has been conducted within the study area of

	the number of ground water pumping & open wells, and surface water bodies such as rivers, tanks, canals, ponds etc. Within 1km (radius) so as to assess the impacts on the nearby water bodies due to mining activity. Based on actual monitored data, it may clearly be shown whether working will intersect groundwater. Necessary data and documentation in this regard may be provided, covering the entire mine lease period.	project site. Refer Page No 74 in Chapter 3. The details of water bodies in the study area are given chapter 2. Refer page no 16. The depth of water table identified by Geo resistivity survey is 55-60m bgl whereas the proposed depth of mining is 34m bgl. Therefore, the mining activity will not intersect ground water table. The schematic diagram is given in chapter 4. Refer Page No 157.
24	Erosion Control measures.	To control the erosion, the tree sapling will be planted along the mining lease boundary. Garland drainage will be developed around the dump to control the washout of dump due to hydrostatic pressure.
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.	The impact of mining on the nearby villages and water bodies are given detail in chapter 4.
26	The Project proponent shall study impact on fish habitats and the food WEB/ food chain in the water body and Reservoir.	The detailed study of impact on fish habitation and food WEB/ food chain in the water body and reservoir is given in Chapter 4. Refer Table 4.27, Page No 168.
27	The Project Proponent shall study and furnish the details on potential fragmentation impact on natural environment, by the activities.	The detailed impact studies are given in Chapter 4.
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	The study and the impact on aquatic plants and animals in water bodies are mentioned in Chapter 4. Refer Clause 4.10 in Page No 163.

	caves, heritage site, and archaeological site possible land form changes visual and aesthetic impacts.	There are no caves, heritage site, and archaeological site found within 10km radius of project site.
29	The terms of reference should specifically study impact on soil health, soil erosion, the soil physical, chemical components and microbial components.	The impact study on soil health and erosion is given in Clause 4.7 in Chapter 4. Refer Page no 161. The soil physical, chemical components and microbial components are given in Chapter 3. Refer Page No.86.
30	The Environmental Impact Assessment should study on wet lands, water bodies, rivers, streams, lakes and farmer sites.	The impact study on surface water bodies and agricultural land is given in Chapter 4. Refer Page No 155 and 173 respectively.
Energy		
31	The measures taken to control Noise, Air, Dust control and steps adopted to efficiently utilise the energy shall be furnished.	The mitigation measure for air pollution and noise pollution is given in chapter 4. Refer Page No 132- 151.
Climate change		
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.	The carbon emission due to proposed mining activity and its mitigation measures are given in Chapter 4. Refer Clause 4.2 in Page No 145.
33	The Environmental Impact Assessment should study impact on climate change, temperature rise, pollution and above soil & below soil carbon stock.	The carbon emission due to proposed mining activity and its mitigation measures are given in Chapter4. Refer Clause 4.2 in Page No 145.
Mine closure plan		
34	Detailed Mine Closure Plan covering the entire mine lease period as per precise area communication order issued.	Detailed Mine Closure Plan covering the entire mine lease period as per precise area communication order issued is given in Chapter 2, pg. No. 41-45.
EMP		
35	Detailed Environmental Management Plan along with adaption, mitigation &	Detailed environmental management plan is given in Chapter 10, pg. No. 193.

	remedial strategies covering the entire mine lease period as per precise area communication order issued.	
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.	The environmental management plan is given chapter 10. The cost for green belt development is mentioned in Table 10.2 in Chapter 10. Refer Page No 202. Budget for mine closure plan is given in Table 10.3 in Page No 202 of Chapter 10. The disaster management plan is given in Chapter 7. Refer page no 181
Risk Assessment		
37	To furnish risk assessment and management plan including anticipated vulnerabilities during operational and post operational phases of mining.	Disaster management plan is given in Chapter 7, pg. No. 181
Disaster Management Plan		
38	To furnish disaster management plan and disaster mitigation measures in regard to all aspects to avoid/reduce vulnerability to hazards & to cope with disaster/untoward accidents in & around the proposed mine lease area due to the proposed method of mining activity & its related activities covering the entire mine lease period as per precise area communication order issued.	Details are furnished in Table 7.1 in chapter 7, pg. No. 182
Others		
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.	The letter regarding approved habitations, schools, Archaeological sites, Structures, railway lines, roads, water bodies such as streams, odai, vaari, canal, channel, river, lake, pond, tank within 300m radius has been obtained from VAO. Refer Annexure X in Page No 295.

40	As per the MoEF&CC office memorandum F.No22-65/2017-IA.III dated. 30.09.2020 and 20.10.2020 the proponent shall address the concerns raised during the public consultation and all the activities proposed shall be part of the Environment Management Plan.	Draft EIA is been prepared for conducting public hearing. The points raised in PH and funds allocated will be included in Final EIA report.
41	The project proponent shall study and furnish the possible pollution due to plastic and micro plastic on the environment. The ecological risks and impacts of plastic & micro plastics on aquatic environment and fresh water systems due to activities, contemplated during mining may be investigated and reported.	The study on pollution due to plastic and micro plastic and its ecological risk is mentioned in Chapter 7. Refer Clause 7.5 in Page no 187.

4. SEIAA Specific Condition

S.No	Terms of Reference	Compliance
4.1	The Authority noted that the subject was appraised in the 443rd SEAC meeting held on 08.02.2024. After detailed discussions, the Authority accepts the recommendation of SEAC and decided to grant Terms of Reference (ToR) along with Public Hearing under cluster for undertaking the combined Environment Impact Assessment Study and preparation of separate Environment Management Plan subject to the conditions as recommended by SEAC & normal conditions and conditions	The Environment Impact Assessment Study has been conducted and separated environment management plan has been prepared as per Standard TOR and specific TOR prescribed by SEIAA/SEAC vide. TOR Identification No.TO23B0108TN5752566N.

CHAPTER – 1: INTRODUCTION

1.1 PURPOSE OF THE REPORT

The Applicant, **Thiru. S.Kandasamy** S/o. Shanmugam, residing at No. 120, Anna New Street, Kalugumalai Taluk, Thoothukudi District, Tamil Nadu has applied for grant of permission for quarrying Rough Stone & Gravel over an Extent of 3.28.0 Ha located in S.F. No. 272/2A, 2B, 2C and 2D, Chettikurichi Village, Kayathar Taluk, Thoothukkudi District, Tamil Nadu for the period of five years.

The Assistant Director, Department of Geology and Mining, Thoothukudi has directed the applicant, **Thiru. S.Kandasamy** S/o. Shanmugam, vide his precise area communication letter Roc No. G.M.1/861/2022 dated 14.07.2023 to get approved mining plan and obtain Environmental clearance from the State Environment Impact Assessment Authority (SEIAA) as per the EIA Notification, 2006 and its amendments for grant of lease to Rough Stone & Gravel quarry over an Extent of 3.28.0 Ha located in S.F. No. 272/2A, 2B, 2C and 2D, Chettikurichi Village, Kayathar Taluk, Thoothukkudi District, Tamil Nadu for the period of five years.

The mining plan is prepared as per the Assistant Director's precise area communication letter, Roc No. G.M.1/861/2022 dated 14.07.2023 under Rule 41& 42 of Tamil Nadu Minor Minerals Concession Rules, 1959 for quarrying Rough Stone & Gravel and it is approved by Assistant Director, Department of Geology and Mining, Thoothukudi vide letter Roc No. G.M.1/861/2022 dated 01.09.2023. The project cost is about Rs. 81.0 lakhs and EMP cost is Rs. 6.75 lakhs.

The proposed area comes under cluster classification, based on the letter issued by Assistant Director, Thoothukudi vide Roc.No. G.M.1/861/2022 dated 01.09.2023. So, this project has to obtain Terms of Reference for conducting EIA studies. There are three existing quarries namely Shree Selvi Chambers with an extent of 4.63.50Ha, Tmt. Kasthuri with an extent of 2.32.20Ha & Thiru. S.K.P Murugan with an extent of 2.61.00Ha and one newly proposed quarry namely Thiru.S.Kandasmy with an extent of 3.28Ha located within the 500m radius from the lease boundary of the proposed project. The total cluster area is 9.56.7 Ha.

As per MoEF&CC OM: F.No.L-11011/175/2018-IA-II(M), dated 12.12.2018, the EIA/EMP report has to be prepared for the cluster area based on ToR recommended by SEIAA. Therefore, the applicant applied for ToR through PARIVESH Portal vide online proposal no. SIA/TN/MIN/447362/2023 Dated 07.10.2023. The ToR proposal was appraised in the 443rd SEAC meeting held on 08.02.2024. After detailed discussions, the Authority accepts the recommendation of SEAC and granted Terms

of Reference (ToR) along with Public Hearing vide TOR Identification No. TO23B0108TN5752566N. The EIA report has been prepared based on the recommended Standard ToR and Specific ToR.

1.2. IDENTIFICATION OF PROJECT AND PROJECT PROPONENT

1.2.1. IDENTIFICATION OF PROJECT

The applicant, **Thiru. S.Kandasamy**, proposed to start new Rough Stone and Gravel quarry over an Extent of 3.28.0 Ha at S.F. No. 272/2A, 2B, 2C and 2D, Chettikurichi Village, Kayathar Taluk, Thoothukkudi District, Tamil Nadu. The Assistant Director, Department of Geology and Mining, Thoothukkudi District has directed the applicant, Thiru. S.Kandasamy vide his precise area communication letter Roc No. G.M.1/861/2022 dated 14.07.2023 to get AMP and obtain EC form SEIAA as per the EIA Notification, 2006 for grant of permission for quarrying activities.

As the mining plan is approved, the EIA report has been planned to prepare as per Terms of Reference issued by SEIAA/SEAC for conducting public hearing (PH) and for obtaining environmental clearance from SEAC/SEIAA.

1.2.2. IDENTIFICATION OF PROJECT PROPONENT

Table. 1.1 Identification of Project	
Particulars	**Details**
Applicant	**S.Kandasamy**
Lease Area	3.28.0Hectares (Patta Land)
Site Location	Chettikurichi Village, Kayathar Taluk, Thoothukudi District, Tamil Nadu
Precise Area Communication Letter	Roc No. G.M.1/861/2022 dated 14.07.2023
Period of Lease	5 Years (To be granted)
Mining Plan Approval Details	Mining plan approved by AD, Dept of Geology and Mining, Vide Roc No. G.M.1/861/2022 dated 01.09.2023
Table. 1.2 Identification of Project Proponent	
Address of the Project Proponent	**Thiru. S.Kandasamy** S/o Shanmugam No.102, Anna new street, Kalugumalai Taluk, Thoothukudi District, Tamil Nadu.
Status	Individual

Table No: 1.3 Land Particulars

State & District	Taluk	Village	S.F.No.	Area (Ha)	Ownership/ Occupancy
Tamil Nadu & Thoothukudi	Kayathar	Chettikurichi	272/2A, 2B, 2C & 2D	3.28.0	Patta land
			TOTAL	**3.28.0**	

1.3. BRIEF DESCRIPTION OF THE PROJECT

1.3.1. Nature and Size of the Project

Open cast Mechanized mining shall be adopted to raise the production in this area and transportation of ore and waste. The excavated rough stone is used as raw materials for construction of buildings, bridges, culverts, barrages and for laying of roads in and around the districts etc. The M-Sand and P-Sand are manufactured from crushing of rough stone.

Geological resources of Rough Stone & Gravel is estimated as **9,78,900m³** and mineable reserves is estimated as **5,10,300m³** of rough stone and **1,08,616m³** of Topsoil and Gravel up to a depth of 34m (Top soil and Gravel - 0 to 4m, Rough stone – 4 to 34m) after leaving necessary safety distance from the lease boundary.

Production Schedule is proposed as **3,01,678m³ (95%)** of Rough Stone for five years & **80,448m³** of Topsoil and Gravel for three years and average production of rough stone is **60,336m³** per annum or 201m^3 per Day. Average Production of Topsoil and Gravel will be **26,816m³** per annum by open cast mining. The above said reserves and productions are as per Approved mining plan.

1.3.2. LOCATION OF THE PROJECT

The area is accessible from Kovilpatti Town. By travelling from Kovilpatti Town via NH 44 (Kovilpatti to Kanyakumari), the Gopalapuram Village is arrived at the distance of 9.5km. From the Gopalapuram Village, by travelling via Gopalapuram – Chettikurichi Village Road, Chettikurichi Village is reached at the distance of 11km. From the Chettikurichi Village, by travelling Via MDR 160 (Chettikurichi to Kalugumalai road), upto 1.5km and travel via gravel road on left side for 1.3km, the project site is reached.

The area is represented by Survey of India Toposheet No. 58 G/12. It is given fig no 1.2. The location map is given in fig no 1.1. The area lies in the northern latitude of 9°3'50.79"N to 9°3'59.90"N and eastern longitude of 77°43'51.47"E to 77°43'56.63" E.

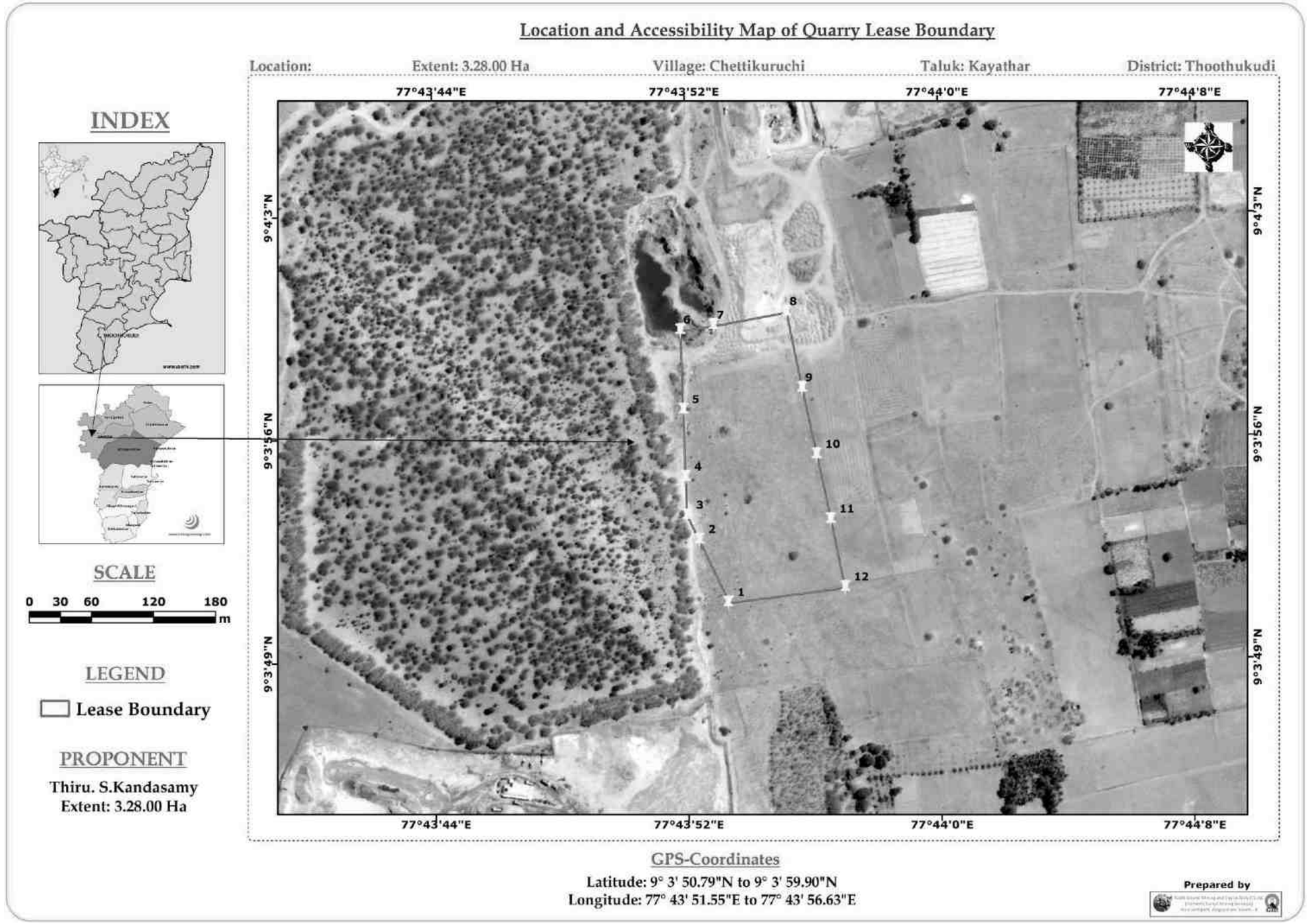


Fig.No.1.1: Google earth image showing Location and route map of Proposed quarry lease area

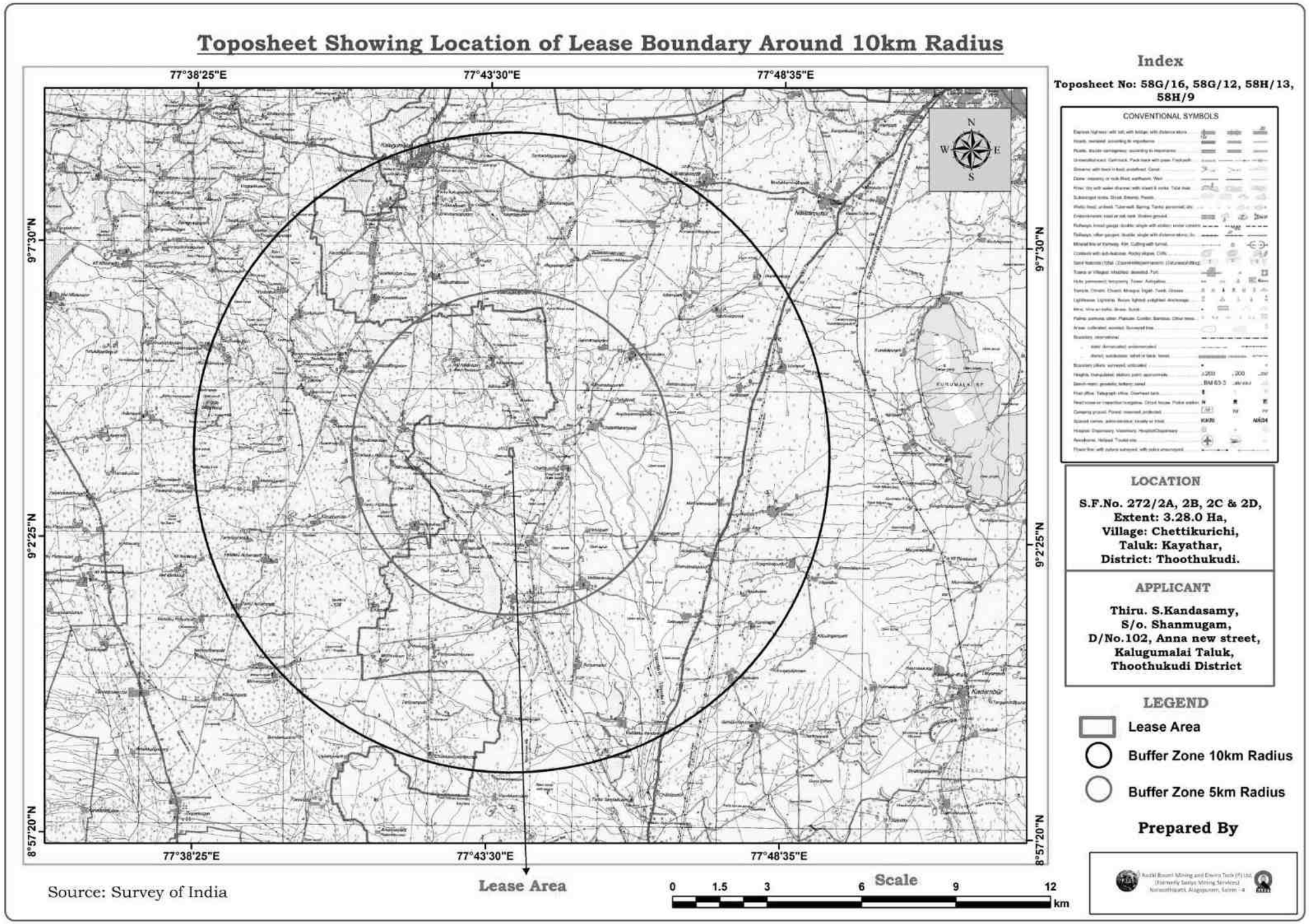


Fig.No.1.2: Toposheet showing Location of the Quarry with 10km radius study area

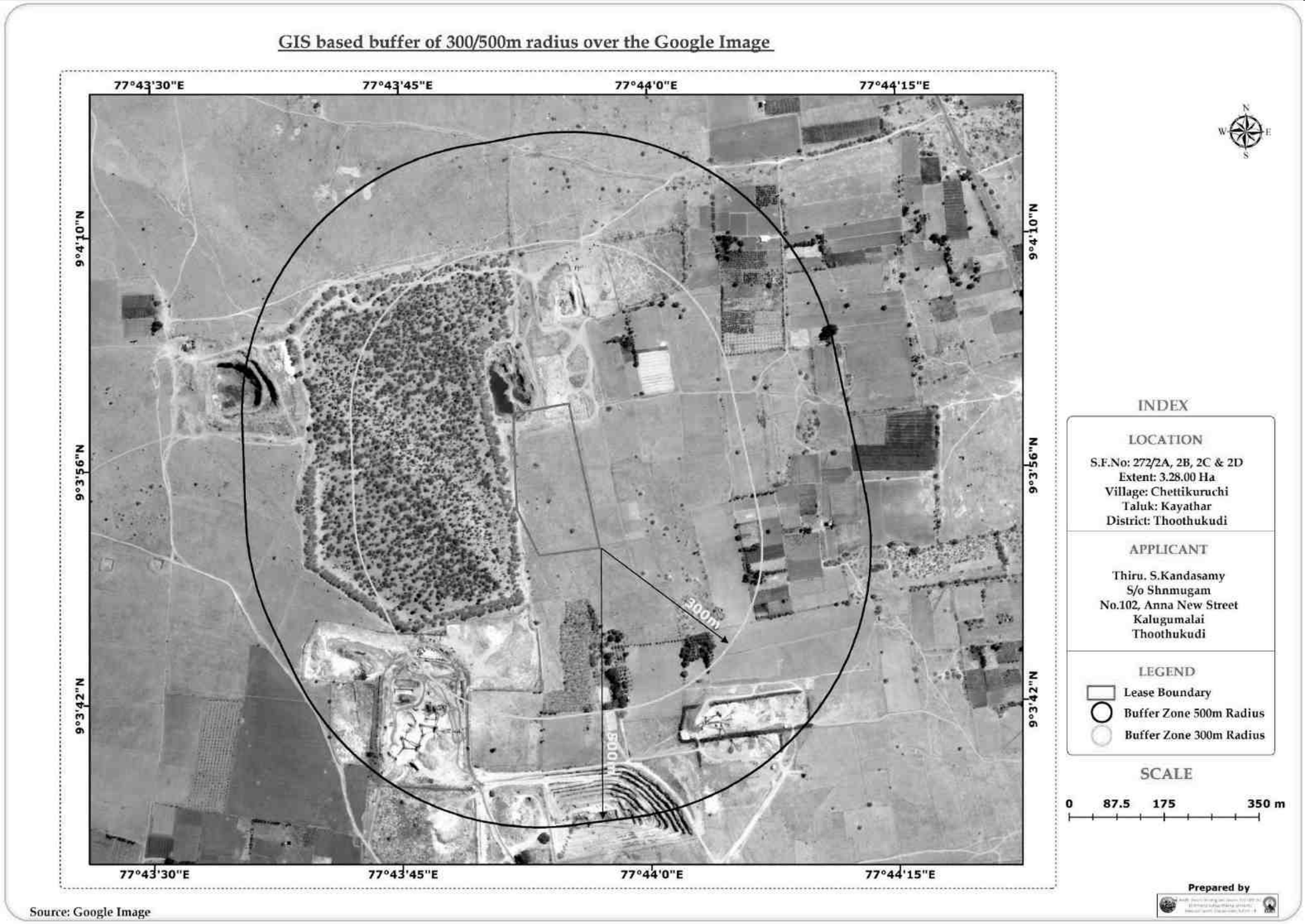


Fig.No.1.3: Google Earth Image showing 300m and 500m radius around mining lease area

1.4. SCOPE OF THE PROJECT

The proposal for Environment Clearance of Rough Stone and Gravel quarry lease of **Thiru S.Kandasamy**, requires Combined Environmental Impact Assessment (EIA) study to be carried out as per Standard, Specific and additional TOR specified by the SEAC. Based on the documents furnished for TOR, the Committee observed that the project falls under the category B1(Cluster) and schedule 1(a) of the EIA Notification, 2006 as the cluster area is greater than 5 Ha and less than 250 Ha. This is primarily to ascertain the potential impacts of the mining activity on environmental components, prediction and evaluation of environmental impacts to delineate Environment Management Plan.

The EIA/EMP report also includes an independent chapter prepared by an Accredited Consultant. The collection and analysis of air, water and soil sample required for preparation of EIA report data will be done by an Environmental Laboratory duly notified under the Environment (Protection) Act, 1986, accredited by NABET/NABL.

The scope of the study includes a detailed characterization of the environment in an area of 10km radius from the mine lease Area. The EIA covers one season baseline environmental data, as per the standard generic model given by the MoEFCC, New Delhi.

In order to assess the likely impacts arising out of this project on the surrounding environment and evaluating the quantum of likely negative impacts, if any, from this mine, the proponent has selected Aadhi Boomi Mining and Enviro Tech Pvt. Ltd., Salem as their EIA consultant for this project. ABM prepared an Environmental Impact Assessment (EIA) report and made an effective Environment management Plan (EMP) for various environmental components likely to be affected.

The scope covers all the conditions along with the specific and additional TOR prescribed by SEAC/SEIAA, Tamil Nadu vide TOR Identification No. TO23B0108TN5752566N.

1.5 METHODOLOGY OF EIA STUDY

The EIA study includes detailed baseline data generation and characterization of existing status of environment in an area of 10km radius with the project as its Centre for various environmental components viz. air, noise, water, land, geo-hydrology, Noise & Vibration, biological and socio-economic components and other parameters of interest. The envisaged scope of EIA is as follows:

- To assess the present status of air, biota, water, land, biological and socio-economic components of environment within 10km radius of study area from the project site.
- To identify and quantify the significant positive and negative impacts due to various mining operation in various components of the environment through identification and prediction of impacts
- To identify the impact and description of the impact with quantitative and qualitative data
- To prepare a detailed Environment Management Plan for implementation of mitigate measures
- To suggest a monitoring program to evaluate the effectiveness of mitigate measures
- Post-project environmental quality monitoring program to be followed

The baseline monitoring study has been carried out during the 1st December, 2022 to 28th February, 2023 for various environmental components so as to assess the anticipated impact on the environment and suggest suitable mitigation measures for likely adverse impacts due to the project. Environmental attributes, source and frequency of monitoring are outlined in Table No 1.4.

Table: 1.4 Environment Attributes

S. No	Attributes	Parameters	Source and Frequency
1	Meteorology	Temperature, Wind Speed, Wind Direction, Rain fall, Relative Humidity,	Secondary sources of IMD station, Tirunelveli. Hourly recorded data for the period of 3months.
2	Ambient Air Quality	PM_{10}, $PM_{2.5}$, SO_2, NO_x	8 hour samples twice in a week for three months at 5 locations.
3	Water Quality	Physical, Chemical and Biological parameters	Grab sampling at 5 locations once during study period.
4	Noise levels	Noise levels in dB(A)	At 5 locations data monitored once in a Month for three months for 24 hours during EIA study.
5	Soil Characteristics	Physical and Chemical parameters	Once at 5 locations during study period
6	Hydrogeology	Drainage area and pattern, nature of streams, aquifer characteristics, recharge and	Based on data collected through field investigation devices once in a study.

		discharge areas	
7	Land use	Existing land use for different categories	Based on Survey of India Toposheet and Google Earth imagery
8	Ecology and Biodiversity	Existing terrestrial flora and fauna within 10Km radius	Field observation and utilization of Secondary data.
9	Socio–Economic aspects	Socio–economic and demographic characteristics, worker characteristics	Based on collection of primary data through questionnaire analyses and utilization of Secondary data from census records (2001 –2011), statistical hand books, topo sheets, health records and relevant official records.
10	Risk assessment and Disaster Management Plan	Identify areas where disaster can occur by fires and explosions and release of toxic substances if any	Based on the findings of risk associated with explosives, landslides, slips and fire/explosion during blasting etc..,

The impacts of the project activities on environmental components can be quantified through EIA Studies within the impact zone of the project activities. The results of EIA Studies form the basis for the preparation of a viable EMP for mitigation of the adverse impacts.

CHAPTER – 2: PROJECT DESCRIPTION

2.1. NEED FOR THE PROJECT

The applicant, **Thiru S.Kandasamy** residing at Door No.102, Anna new street, Kalugumalai Taluk, Thoothukudi District, Tamil Nadu has applied for Rough Stone and Gravel quarry lease in a Patta Land over an area of 3.28.0 hectares, located in S.F.No: 272/2A, 2B, 2C & 2D Chettikurichi Village, Kayathar Taluk, Thoothukkudi District, Tamil Nadu.

The mining plan was approved by Assistant Director, Department of Geology and Mining, Thoothukudi vide letter Rc No.G.M.1/861/2022, dated 01.09.2023. The proposed rate of production of Rough Stone is about 3,01,678m^3 for five years up to the depth of 34m bgl. The ultimate depth of mining is 34m bgl.

Rough stone is one of the important materials for the building construction. The rough stone is used as both as coarse aggregate and fine aggregate after the proper sizing of stone. The coarse and fine aggregate are essential for preparing concrete which is used in foundation, beam, column, roof slab work of the buildings. The infrastructure is the sign of development of nation. So it is very need to excavate the rough stone for economic and infrastructure development of our Nation.

2.2 DEMAND – SUPPLY GAP

The coarse and fine aggregate are the basic raw material for the building construction and the road formation. It takes place in all villages, towns, cities and metropolitan cities. There is great demand in availability of rough stone. So it is necessary to fulfill the demand by starting the proposed rough stone quarry.

2.3 LOCATION

The area is represented by Survey of India Topo sheet No. 58 G/12. The lease boundary with Geo Co-ordinates is shown in Fig no 2.1. The area lies in the northern latitude of 9°3'50.79"N to 9°3'59.90"N and eastern longitude of 77°43'51.47"E to 77°43'56.63" E. Latitude and Longitude of all boundary Pillars are given below,

Table No-2.1 Co-ordinates of Quarry lease Boundary Pillars

P.No	Latitude	Longitude
1	9° 3' 50.79"N	77° 43' 52.94"E
2	9° 3' 52.77"N	77° 43' 52.03"E
3	9° 3' 53.53"N	77° 43' 51.66"E
4	9° 3' 54.74"N	77° 43' 51.61"E
5	9° 3' 56.86"N	77° 43' 51.55"E
6	9° 3' 59.35"N	77° 43' 51.47"E
7	9° 3' 59.50"N	77° 43' 52.53"E
8	9° 3' 59.90"N	77° 43' 54.84"E
9	9° 3' 57.51"N	77° 43' 55.32"E
10	9° 3' 55.42"N	77° 43' 55.76"E
11	9° 3' 53.38"N	77° 43' 56.19"E
12	9° 3' 51.25"N	77° 43' 56.63"E

- No Trees will be uprooted due to this quarrying operation.
- The existing road from the main road to quarry is in good condition and the same will be maintained and utilized for Transportation of Rough stone & Gravel.
- There will be no Export of this quarrying rough stone

Google Image Showing Lease Boundary with Coordinates

Coordinates of Pillars

P.No	Latitude	Longitude
1	9° 3' 50.79"N	77° 43' 52.94"E
2	9° 3' 52.77"N	77° 43' 52.03"E
3	9° 3' 53.53"N	77° 43' 51.66"E
4	9° 3' 54.74"N	77° 43' 51.61"E
5	9° 3' 56.86"N	77° 43' 51.55"E
6	9° 3' 59.35"N	77° 43' 51.47"E
7	9° 3' 59.50"N	77° 43' 52.53"E
8	9° 3' 59.90"N	77° 43' 54.84"E
9	9° 3' 57.51"N	77° 43' 55.32"E
10	9° 3' 55.42"N	77° 43' 55.76"E
11	9° 3' 53.38"N	77° 43' 56.19"E
12	9° 3' 51.25"N	77° 43' 56.63"E

INDEX

LOCATION

S.F.No: 272/2A, 2B, 2C & 2D
Extent: 3.28.00 Ha
Village: Chettikuruchi
Taluk: Kayathar
District: Thoothukudi

APPLICANT

Thiru. S.Kandasamy
S/o Shnmugam
No.102, Anna New Street
Kalugumalai
Thoothukudi

LEGEND

Lease Boundary

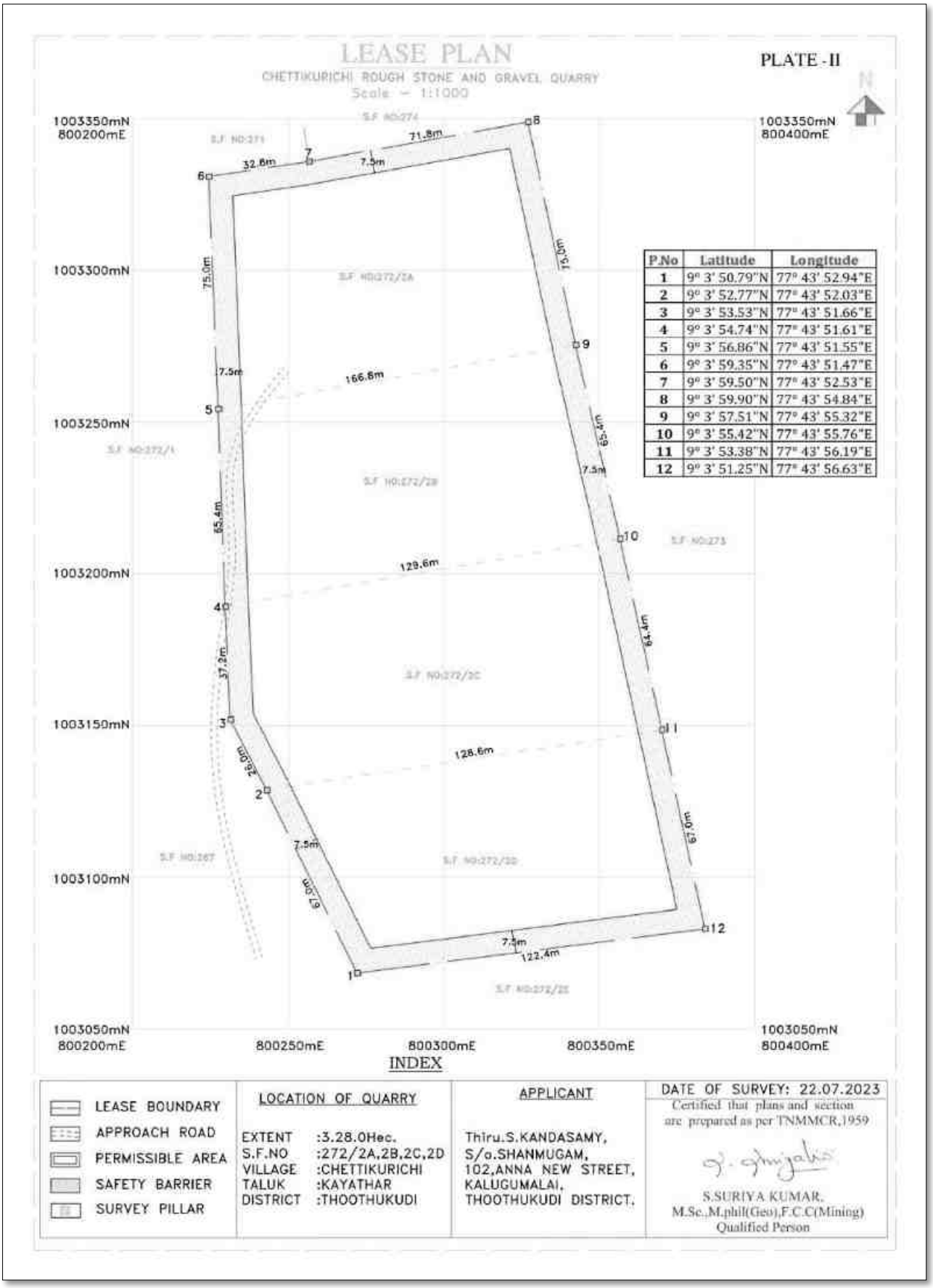
SCALE

0 45 90 180 m

Prepared by

Source: Google Image

Fig.No.2.1: Google image showing lease boundary and Coordinates of the Quarry



P.No	Latitude	Longitude
1	9° 3' 50.79"N	77° 43' 52.94"E
2	9° 3' 52.77"N	77° 43' 52.03"E
3	9° 3' 53.53"N	77° 43' 51.66"E
4	9° 3' 54.74"N	77° 43' 51.61"E
5	9° 3' 56.86"N	77° 43' 51.55"E
6	9° 3' 59.35"N	77° 43' 51.47"E
7	9° 3' 59.50"N	77° 43' 52.53"E
8	9° 3' 59.90"N	77° 43' 54.84"E
9	9° 3' 57.51"N	77° 43' 55.32"E
10	9° 3' 55.42"N	77° 43' 55.76"E
11	9° 3' 53.38"N	77° 43' 56.19"E
12	9° 3' 51.25"N	77° 43' 56.63"E

INDEX

LEASE BOUNDARY
APPROACH ROAD
PERMISSIBLE AREA
SAFETY BARRIER
SURVEY PILLAR

LOCATION OF QUARRY

EXTENT :3.28.0Hec.
S.F.NO :272/2A,2B,2C,2D
VILLAGE :CHETTIKURICHI
TALUK :KAYATHAR
DISTRICT :THOOTHUKUDI

APPLICANT

Thiru.S.KANDASAMY,
S/o.SHANMUGAM,
102,ANNA NEW STREET,
KALUGUMALAI,
THOOTHUKUDI DISTRICT.

DATE OF SURVEY: 22.07.2023
Certified that plans and section are prepared as per TNMMCR,1959

S.SURIYA KUMAR,
M.Sc.,M.phil(Geo),F.C.C(Mining)
Qualified Person

Fig.No.2.2: Lease Plan

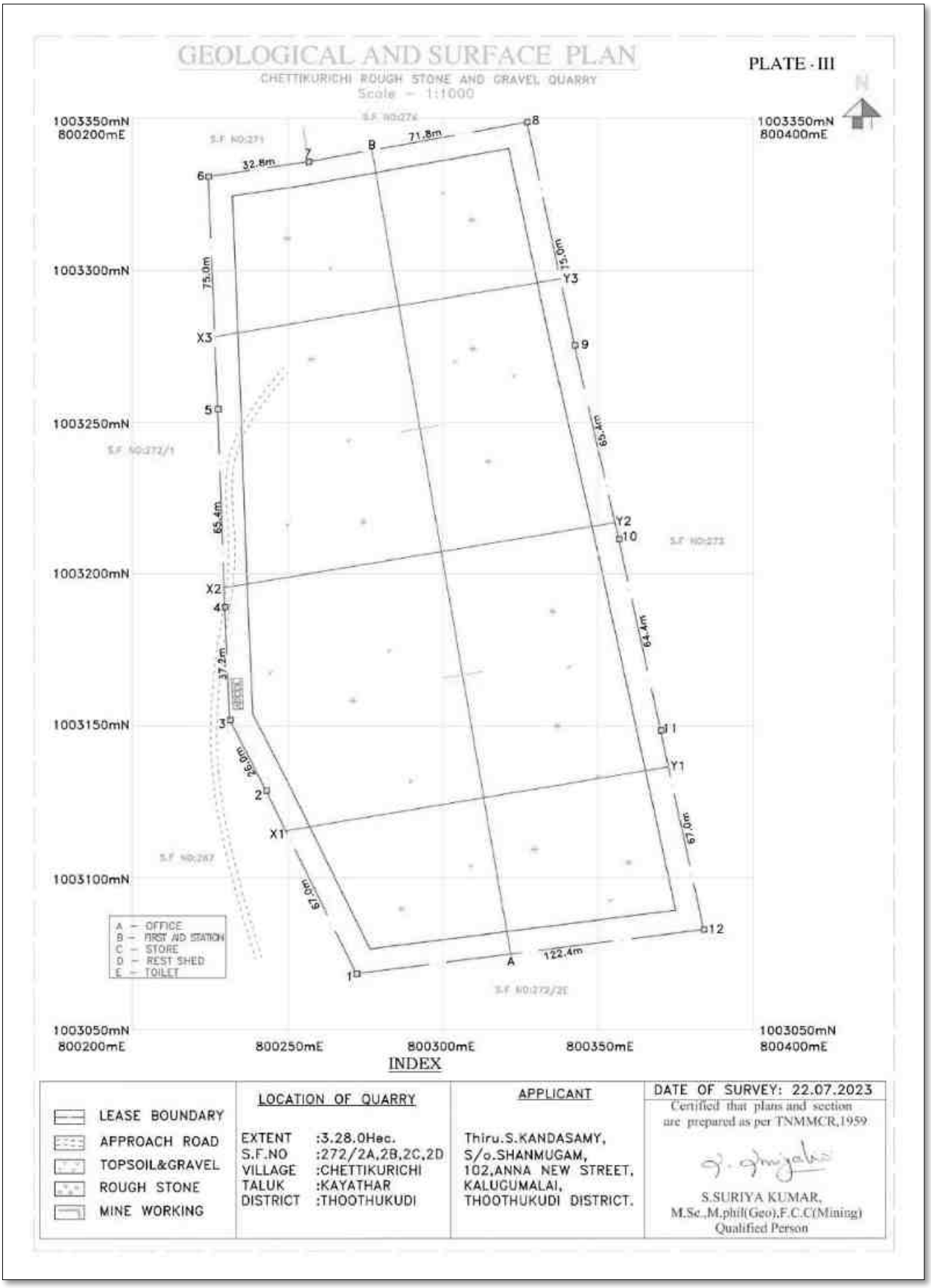


Fig.No.2.3: Geological & Surface Plan

Fig No. 2.4 Photograph shows general view of lease area and GPS coordinates taken at Pillars

Table 2.2.: Environmental Settings

Project Details				
Proponent	**Thiru. S.Kandasamy**			
Total Mine Lease Area	3.28.0 Ha - Rough Stone & Gravel quarry			
Survey No.	272/2A, 2B, 2C & 2D			
Site Location	Chettikurichi Village, Kayathar Taluk, Thoothukkudi District, Tamil Nadu			
Geographical Co-ordinates	Latitude: 9°3'50.79"N to 9°3'59.90"N Longitude: 77°43'51.47"E to 77°43'56.63" E			
Toposheet No.	58G/12			
Elevation	Elevation of the area is 114m above MSL			
Accessibility				
Nearest Habitation	Temporary shed of crusher unit - 260m - SW			
Nearest Village	Chettikurichi – 1.3km - SE			
PMHC	Kazhugumalai Government Primary Hospital – 9.0 km - NNW			
Nearest Settlement	**Name of Village**	**Direction**	**Distance from Mines**	**Population**
	Chettikurichi	SE	1.6 km	3420

	Cithamparampatti	NE	2.8 km	1421
	Kattarankulam	NE	4.6 km	1850
	Vellalankottai	SE	4.5 km	1819
Nearest Town	Kalugumalai – 9.4km – NW Kayathar – 14km - SE Kovilpatti – 18km – NE			
Nearest Roadway	NH 44 – 7.1km – E (Kashmir to Kanyakumari) SH 76– 8.6km - N (Nallatinputhur to Puliyangudi) MDR 160m – 860m – E (Kayathar to Kalugumalai) Village road – 1.6km – E (Chettikurichi to Gopalapuram) Approach road is available near to this project site.			
Nearest Railway station	Kumarapuram Railway Station – 11.7km – NE Kadambur Railway Station – 16km – SE			
Nearest Airport	Thoothukudi Airport–50km – SE			
Environmental Sensitiveness				
Interstate Boundary	There is no interstate boundary within 15km radius. Tamil Nadu – Kerala Interstate boundary is located 52 km away from mining lease area in west side.			
Coastal Zone	Bay of Bengal is located 53 km away from lease area in SE direction.			
Reserve Forest	The project site is not a forest land, it is patta land. There is no Reserve forest and Protected forest found within 10km radius. Kurumalai R.F – 13km – E Uthumalai R.F – 17km -SW The proposed project site does not attract Forest Conservation Act, 1980.			
Wildlife sanctuary	Nil within 10km radius. Gangaikondan Spotted Deer Sanctuary – 26km – S. It is notified Sanctuary by MOEF&CC vide S.O.2773 (E) dated 31/07/2019. The Proposed project site does not attract the Wildlife (Protection) Act, 1972.			
Water bodies	1. A small lake – 740m – N 2. Nalanthula lake – 1.3km - NNW 3. Mel Nalanthula lake – 1.8km - NNW 4. North Konarkottai lake I – 988m – SW 5. North Konarkottai lake II – 1.5km – S 6. Uppodai River – 2.0km - E 7. Water body with weir across River Uppodai – 1.9km – ENE 8. A odai – 2.0km - SW			

	9. Olaikulam lake I – 2.7km – SSW 10. Olaikulam lake II– 2.9km – SSW 11. Vellappaneri lake – 3.8km – SW 12. Karisalkulam lake – 3.6km – NW 13. A odai – 4.7km – NE 14. Water body with weir across Odai – 4.7km - NE
Defense Installations	Nil within 10km radius
Critically Polluted area	Nil within 10km radius
Quarries around 500m radius	Three existing quarries and one present proposed quarry are located within the 500m radius from the lease boundary of the proposed project site. Total Cluster area : 9.56.7 Ha AD Cluster Letter: Roc No.G.M.1/861/2022, dated 01.09.2023
Seismic zone	Zone-II, Low damage risk zone as per BMTPC, Vulnerability atlas Seismic zone of India IS: 1893-2002

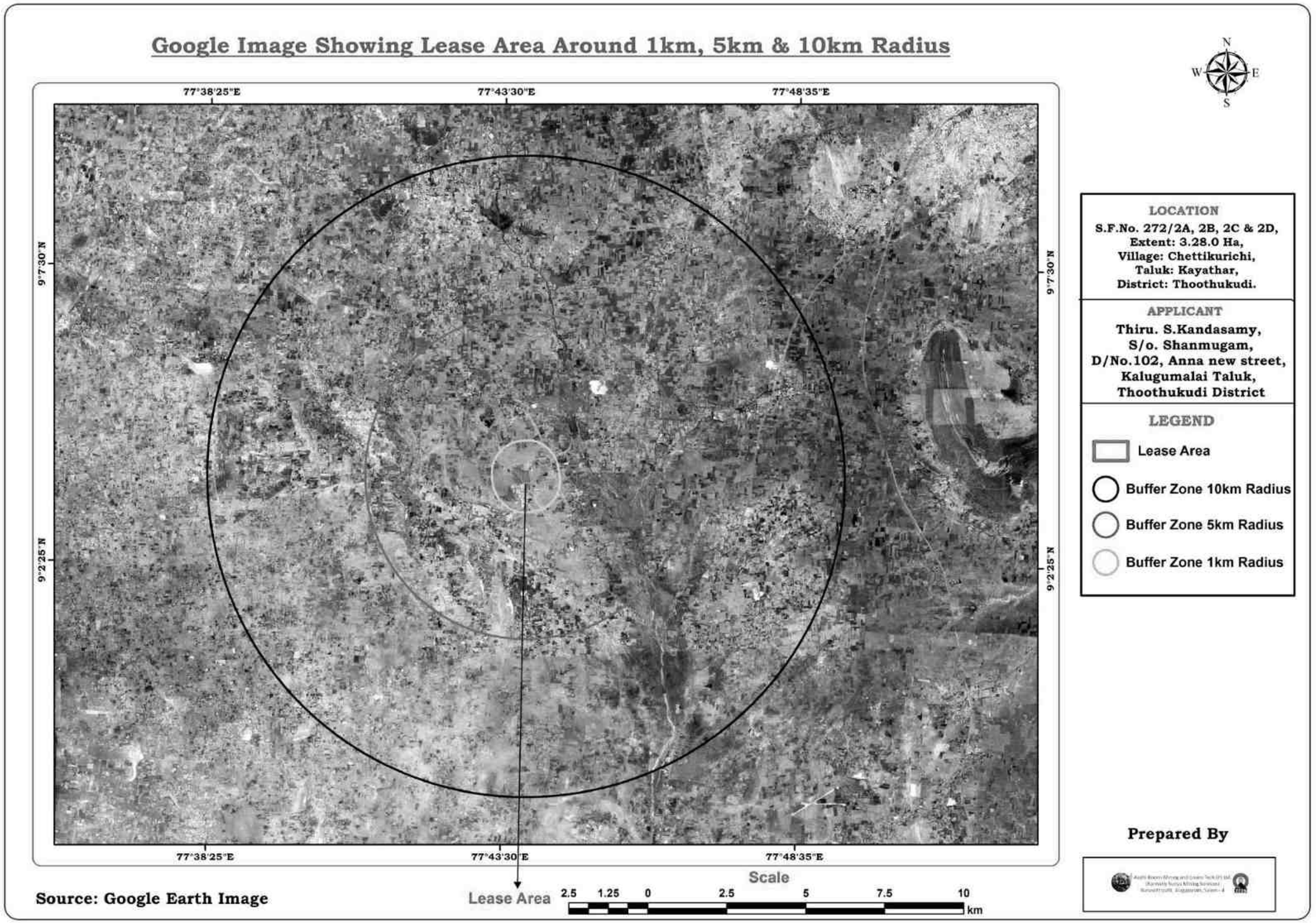


Fig No.2.5: Google Earth Image showing 1km, 5km and 10 km radius around Proposed Project site

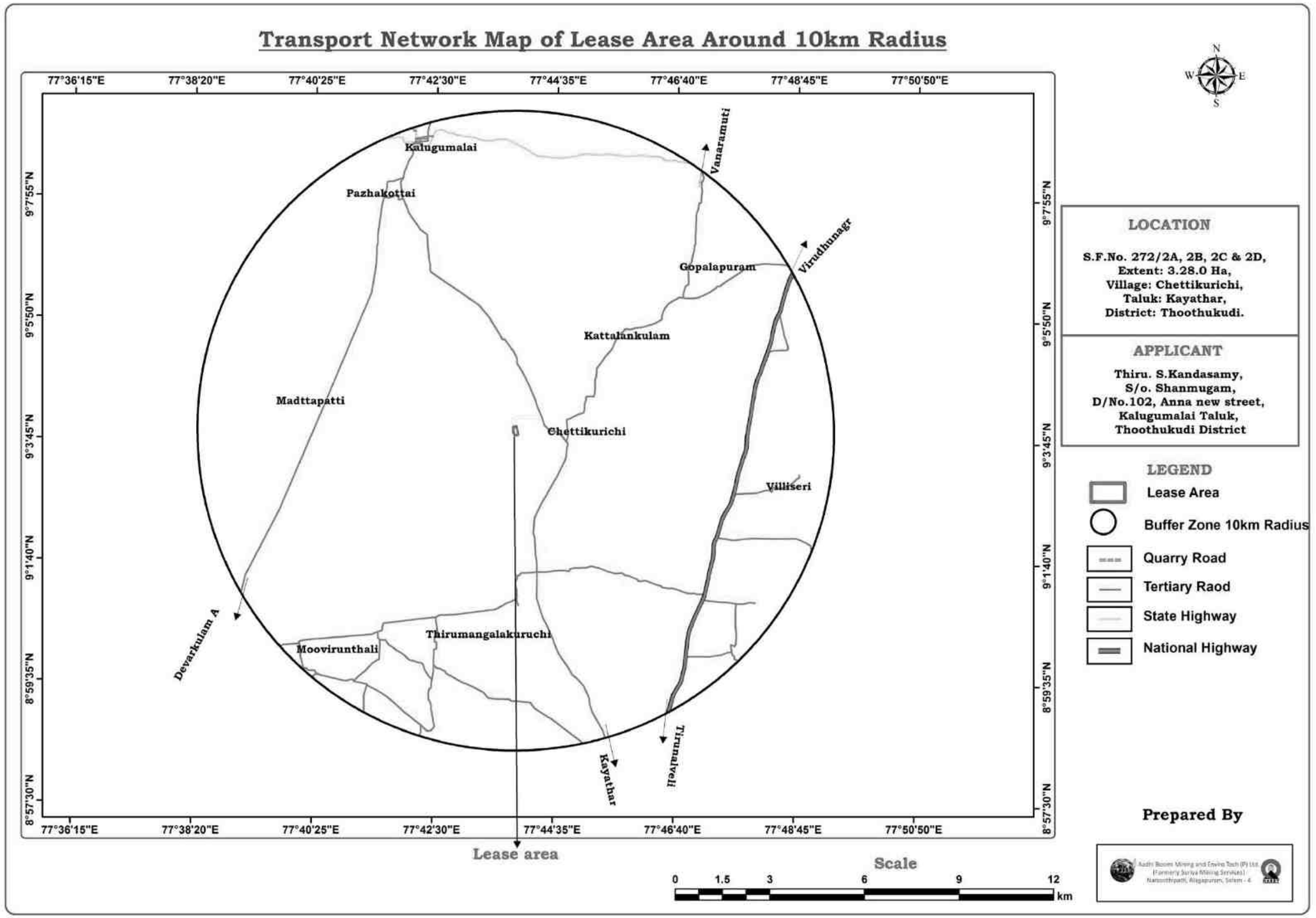


Fig.No.2.6: Google Earth Image showing Transport Network of 10 km radius around Proposed Project Site

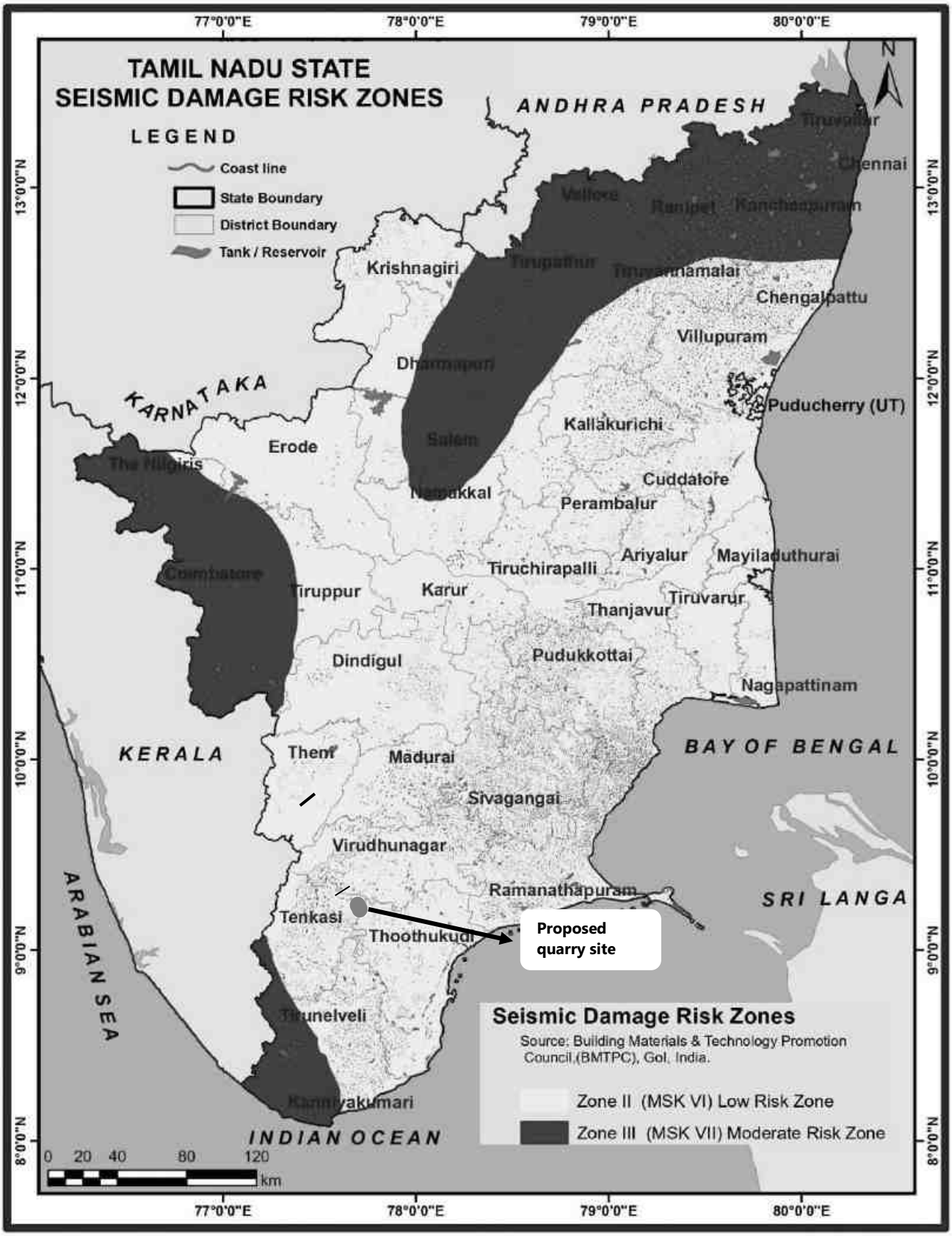


Fig No: 2.7 Earthquake Hazard Map

The area falls under Zone-II, Low damage risk zone as per BMTPC, Vulnerability atlas Seismic zone of India IS: 1893-2002.

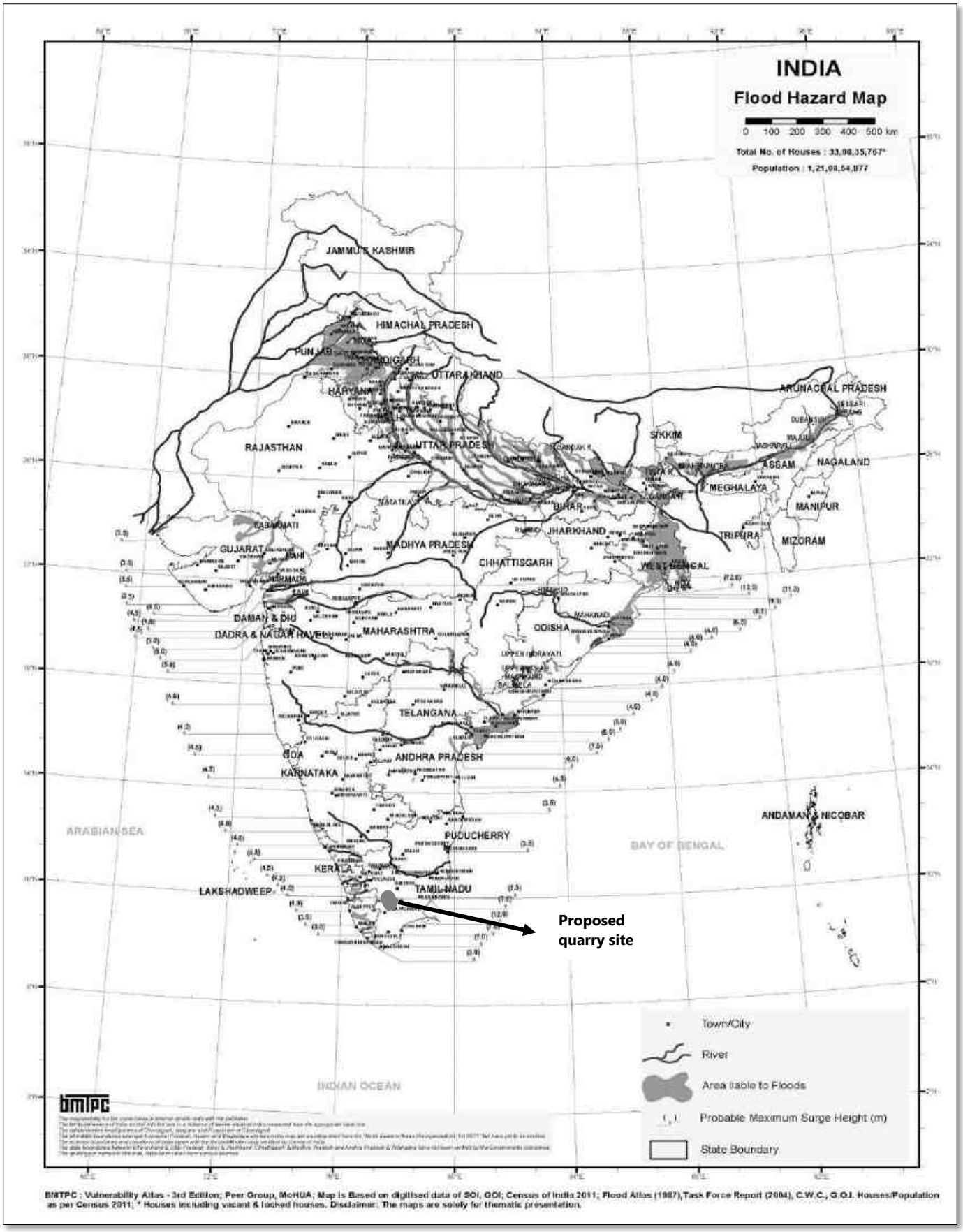


Fig No: 2.8 Flood Hazard Map

The area is not liable to floods.

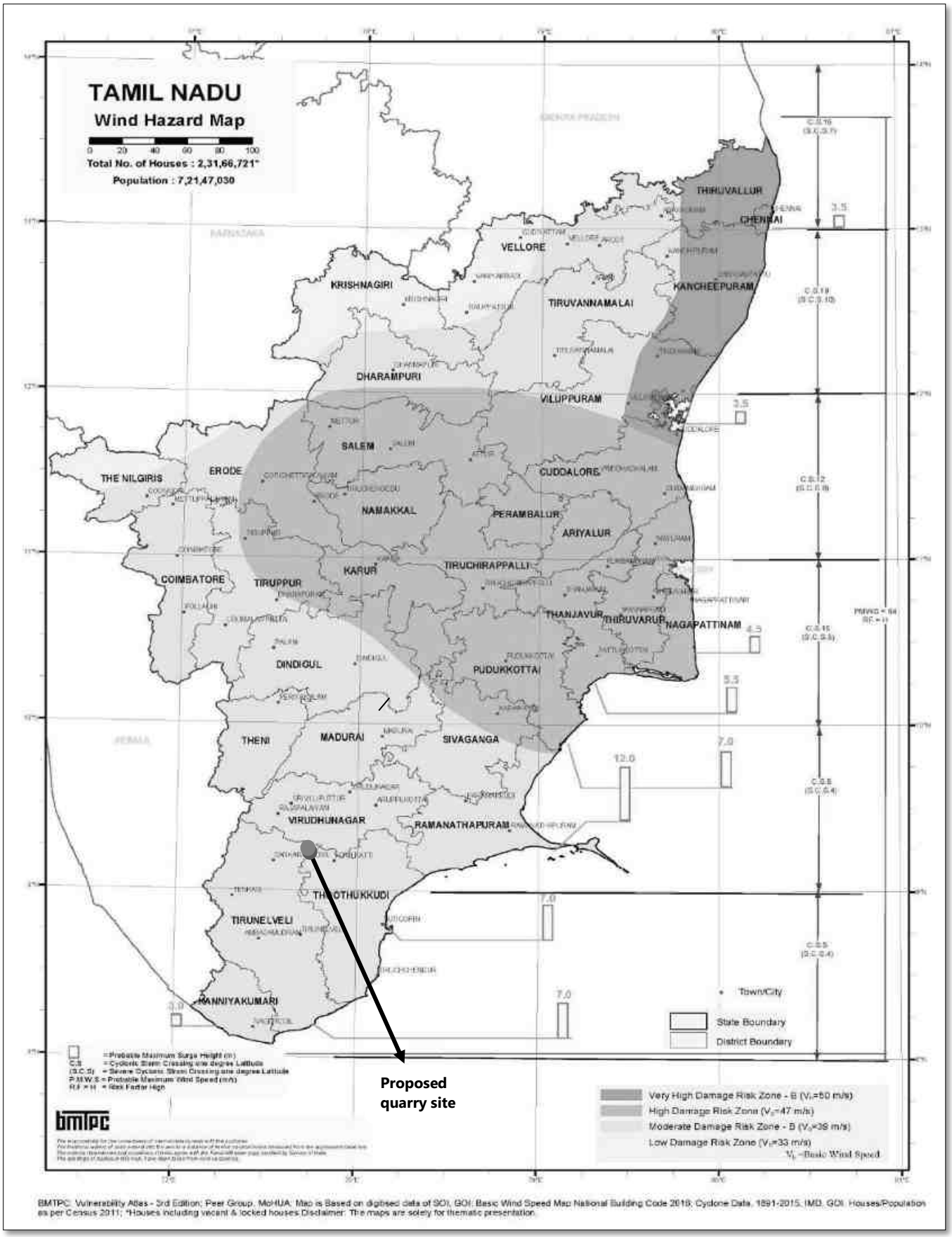


Fig No: 2.9 Wind Hazard Map

The area falls under Moderate Damage Risk Zone-B (V_b = 39 m/s).

2.4 Size or Magnitude of Operation

Table 2.3: Mining Details

Particulars	Details
Method of Mining	Open cast Mechanized method of mining
Geological resources	9,78,900m^3
Mineable reserves	5,10,300m^3 of Rough Stone & 1,08,616m^3 of Top soil and Gravel
Production (95%)	Rough stone – 3,01,678m^3 for five years or 60,336m^3 per annum(Avg) Top soil & Gravel – 80,448m^3 for three years or 26,816m^3 per annum
Reject (5%)	15878 m^3
Top soil	Top soil & Gravel – 80,448m^3
Ore: Waste ratio	1: 0.05
Depth of Mining	34m bgl (Ultimate Depth) 0-4m - Top soil & Gravel 4-34m – Rough stone
Water Table	55-60m bgl
Road design	1: 10 inside the pit and ramp 1:16 for transport
Overall Pit Slope	45°
Period of Lease	5 Years from the date of execution

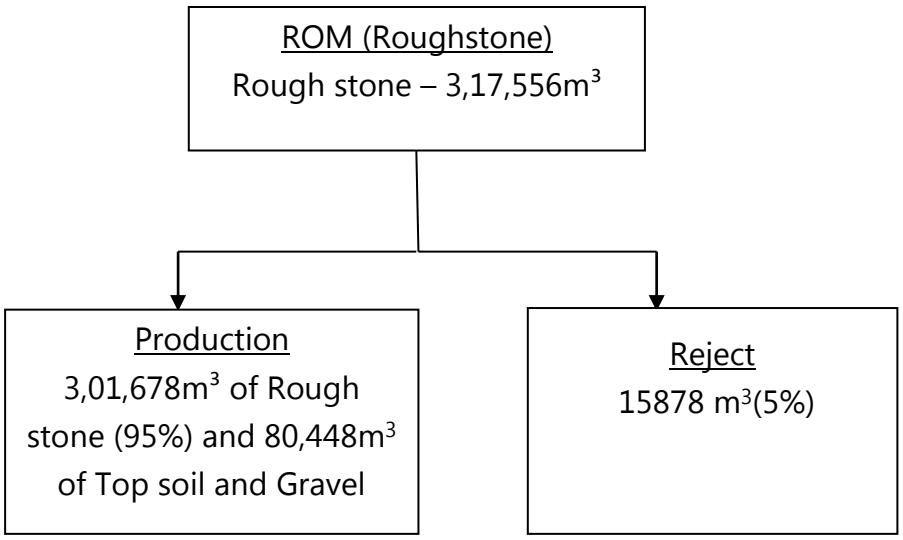


Fig.2.10: Material Balance

2.5 Proposed schedule for approval and implementation

The proposed activity will be commenced only after obtaining Environment Clearance from SEAC/SEIAA, Tamil Nadu and CTE/CTO from TNPCB and other necessary clearance from concerned departments.

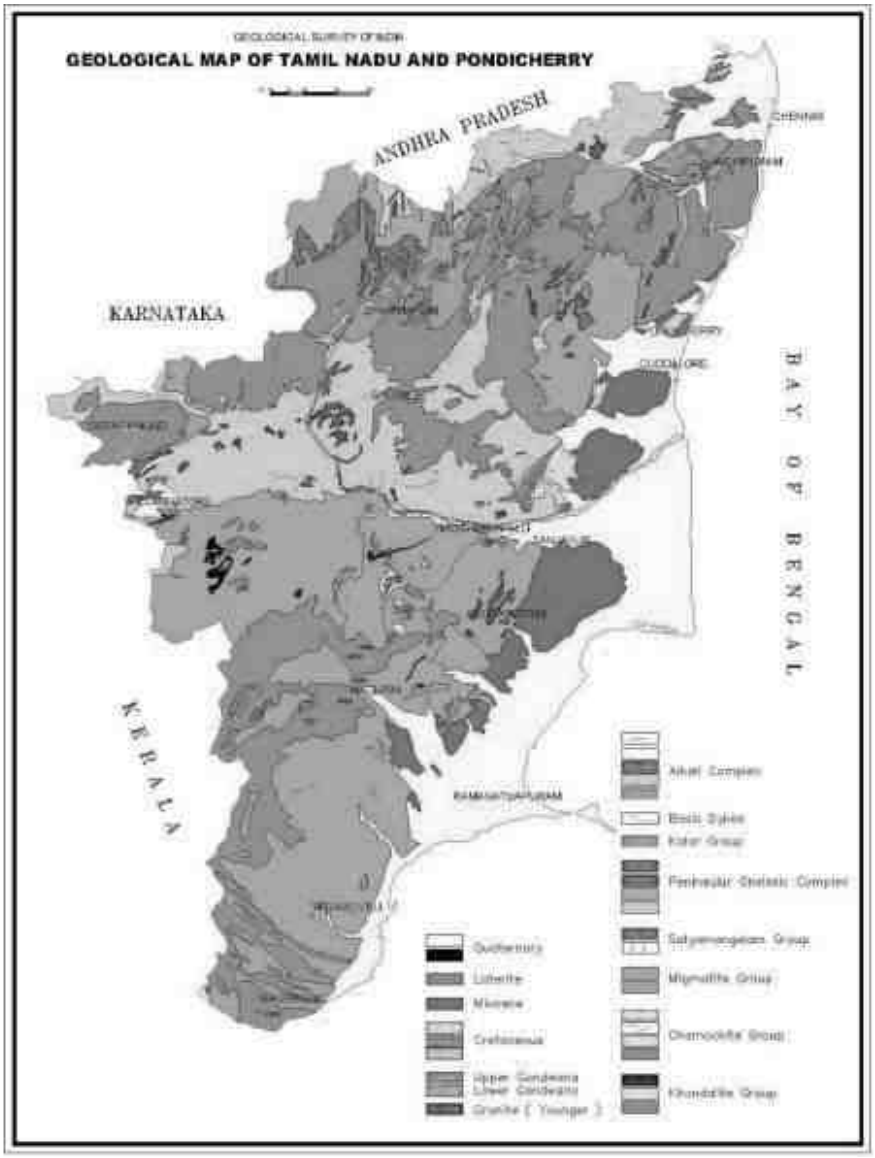
2.6 Technology and process description

2.6.1 Regional Geology

Thoothukudi district represents a well-developed lithopackage of meta-sedimentary sequence inter banded with charnockite Group of rocks. The rock types exposed are of quartzite, calc-granulite, garnet-biotite-sillimanite gneiss, garnet quartzo-feldspathic gneiss and garnet-biotite-cordierite gneiss belonging to Khondalite Group of rock. Charnockite and pyroxene Granulite are the Charnockite Group. Hornblende-biotite gneiss belongs to Migmatitic Complex. Besides, basic intrusive (pyroxenite) and acid intrusive (granite) are noticed. The younger intrusive are represented by pegmatite and quartz veins.

Evidence of development of incipient / patchy charnockite along the shear plane is noticed in the district along the Western Ghats high hills. Rock type found in the area belong to the Khondalite and Charnockite groups and Migmatite Complex of Easter Ghats Super group (Archaean Age),which are unconformably overlain by Tertiary and Quaternary sediments. Garnet-biotie-sillimanite gneiss, quartzite, calc-granulite and limestone of Khondalite group with epidiorite occurring as narrow linear bands. Charnockite group is represented by acid variants. These rock types occur as xenoliths within the Migmatite Complex occupies a major part of the area, comprising medium grained 11 District Survey Report - Thoothukudi District hornblende-biotite gneiss and garnet - biotitegneiss.

Gypsum, limestone, beach sand, kankar and shell limestone are the Economic minerals of the district. Hard Rocks - 73% Sedimentary Rocks - 27% Crystalline Limestone, Multi color dimension stone, Rough stone/gravel, garnet and ilmenite sand are notable economic importance minerals of found in Thoothukudi District. Minor occurrences of Quartzite are also reported in the district. Mining activities based on Rough stone (mostly charnockite) are majorly concentrated in Thoothukudi, Kovilpatti, Ettayapuram, Sathankulam, Ottapidaram Taluks in the district under operation for production of construction materials and earth fill as gravel.



2.6.2. Geology of the lease area

The "charnockite" or Hypersthene granite rock commercially called as Rough stone or Blue metal contains Hypersthene, Quartz and feldspar identified by grayish white in colour, pearly luster on cleavage faces. This rock is suitable for construction purposes because of its high strength, colour, high density, low porosity etc. The proportion of quartz shall be more than ortho feldspar and thereby chemical resistance resist weathering and uniformly grained materials of sand and grits are useful for making aggregates.

It is mainly used in Stone crushing units and size reduced in to ½, ¾ and 1½ inches Jelly which are mainly used in road and building construction purpose. The gravel/Topsoil deposited above the rock formation about 1m thick and, the formation is weathered up to 1m. Top of the formation is weathered while depths it is massive and hard.

Age		Rock formation
Recent age	-	Top soil/Gravel (3m thick)
Archaean age	-	Charnockite rock

2.6.2.1 Exploration

The proposed area is a fresh lease area and the area falls under cluster situation. So, the geology of the area is considered to be a homogeneous body, no explorations in the form of boreholes or trenches were carried out. The geological and mineable resources were estimated based on the nearby quarries and geophysical surveys.

Fig No 2.11 Nearby existing quarries photo showing geology of the surrounding area

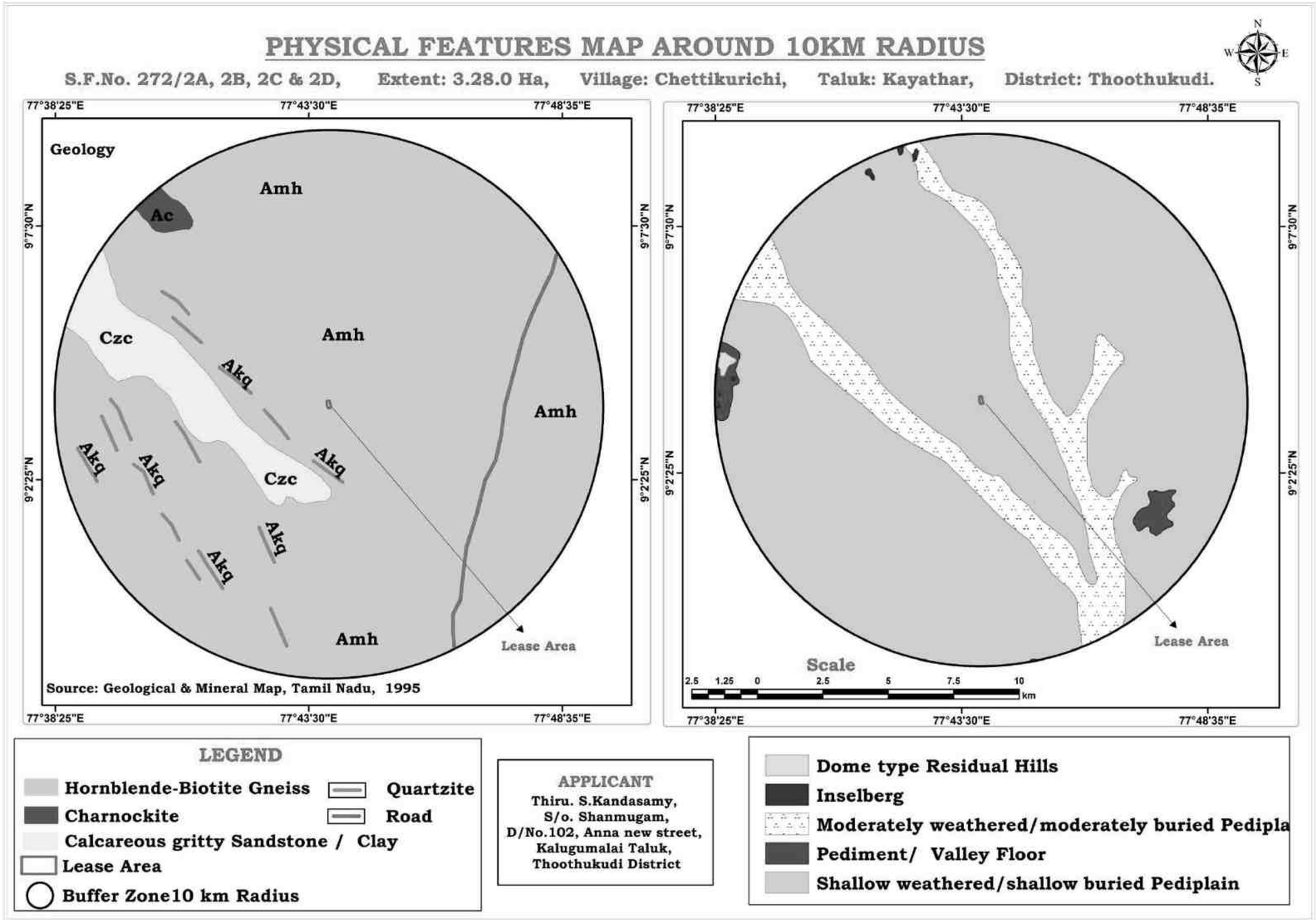


Fig.No.2.12: Regional Geology and Geomorphology Map

2.6.3 Method of Mining

a) Open cast working:

Opencast Mechanized quarrying method will be adopted for exploiting the rough stone. Before opening a mine, several aspects should be considered like construction of semi-permanent structures, planning for the development / production works, formation of faces, lying of approach road to various benches for movement of dumpers, recruitment of man power, deployment of machinery, selection of dump sites, stacking yards etc.

Hydraulic excavators and tippers in combination will be utilized to recover the sizeable rough lumps and deliver to the crushing plant to get the required size of M. Sand, ½, ¾, 1½ inches and Jelly chips, etc. Bench height is designed as 6m based on boom height of excavator (8.5m) and permitted additional height of 1.5m for hard formations as per Reg. 106 (2) (b) of MMR, 1961. The bench slope will be maintained at 45°. S1 fencing shall be constructed at the top of high benches in order to safe guard the unauthorized entry of men and machinery.

Gravel will be removed and sold it for filling purposes in the construction sector. The top soil will be preserved along the lease boundary in the form of bund and used it for afforestation purposes.

b) Mode of working:

The quarry operation involves drilling, muffle blasting, excavation, loading and transportation of rough stone and gravel to the needy crusher/other buyers. The production of rough stone and gravel in this quarry involves the following method which is typical for rough stone and gravel quarrying in contrast to other major mineral mining.

Splitting of rock mass of considerable volume from the parent rock is done by jackhammer drilling and blasting and hydraulic excavators are used for loading the rough stone from pit head to the needy crusher/other buyers.

2.6.4 Extent of Mechanization

The following machinery is proposed to be exclusively for the development and production work at this quarry. The machinery is proposed to be purchased or engaged on hire basis.

i) Drilling equipment:

Drilling of shot-holes will be carried out using compressor and Jack Hammers combination on hire basis. Depth of holes shall be 1-2m.The spacing shall be 0.75m and burden shall be 0.60m from the preface. To achieve a correct blasting geometry certain amount of trial blast is prerequisite to effect a perfect pre-determined fragmentation and fly rock control. In case of heavy blasting qualified mine manager has to be appointed for proper calculation of powder factor and control blasting sequencing and arrangement of explosives etc. Details of drilling equipment's are below as

Table No 2.4: Details of drilling equipment

Type	Nos	Dia.of hole	Capacity	Make	Motive Power	H.P
Jack Hammer	3	32mm	Hand held	Atlas copco	Air	60
Hydraulic Breaker	1		Tata Ex 200	Tata	Diesel	180
Compressor	1	-	-	Atlas copco	Diesel	80

ii) Loading Equipment:

Loading of rough stone and rejects shall be done by excavator into 15 tonnes tippers from the working place periodically. The applicant is proposed to engage one hydraulic excavator with 1.2m^3 bucket capacity and two tippers of 15tonnes capacity for internal transport of rejects from the working face to the dumps. Details of loading equipment are tabulated below,

TABLE NO-2.5: Details of loading equipment

Type	Nos	Bucket capacity (m^3)	Make	Motive Power	H.P
Hydraulic excavator	1	1.20m^3	Hitachi	Diesel	EX 200

iii) Transportation:

Transport of Rough stone, Rejects and waste shall be done by Tippers of 15 tonne capacity,

TABLE NO-2.6: Details of transportation vehicle

Type	Nos	Size/Capacity(m^3)	Make	Motive Power	H.P
Tipper	3	15M.T	Ashok Leyland & TATA	Diesel	120

iii) Blasting Pattern

The massive formation shall be broken into pieces of portable size by jack hammer drilling and shot hole blasting. Powder factor of explosives for breaking such hard rock shall be in the order of 7 tons per Kg of explosives. Blasting parameter proposed to be adopted for shot holes shall be,

Depth (m) * Burden (m) *Spacing (m)	= Volume (m^3)
1.00 x 0.60 x 0.75	= 0.45 m^3
Quantity of broken rock per hole	= 0.45 x 2.6 = 1.17 MT
Blasting efficiency @90%	= 1.17 x 90% = 1.05 MT/hole
Charge per hole	= 140 gm of 25 mm dia. cartridge.
Quantity of rock broken per day	= 212m^3 or 530 MT
Requirement of explosives per day	= 75 Kg (@7 M.T. per Kg explosives)
No. of holes to be drilled per day	= 530 MT/1.05= 505Holes

iv) Types of Explosives

Following explosives are recommended for efficient blasting with safe practice.

TABLE NO- 2.7: Explosives Details

Description	Class/Division	Type	Size
Slurry	Class – 3	Nitro compound	25 x 200
Detonators OD, Delay & E.D	Class – 6	Ordinary and electric types	6.5 X 32

Nitrate mixture explosives/ slurry explosives of 25mm dia initiated by detonating Cord and blue sump fuse with ordinary/electric detonators with delay arrangements.

The following steps shall be adopted to control ground vibration during blasting.

- Geometry of blasting pattern like burden, spacing and inclination of hole should be

  Burden (m)* Spacing (m) Inclination
  0.60 x 0.75 70°

- High strength explosives like slurry in the form of cartridge should be used. ANFO mixture for shot holes should not be used which may cause huge fly rock fragments in view of critical diameter problem.

- To control vibration abatement, use delay or relay arrangements with specific charges.

- Charge per hole should exceed the powder factor designed for each hole based on quantum of blasting, strength of rocks, fracture pattern etc.

- In case any objection from the public, a long trench in the direction of blasting near lease boundary may be opened to a depth of 2m to control longitudinal waves (P-waves) to arrest any damage to infrastructures.
- If any building lies within 50m, muffle blasting practice may be followed in addition to the regular safety procedures and the charge per blast hole shall not exceed 2kg as specified by DGMS.
- Any other method of safety measures shall be advised to the Applicant as and when required by the qualified Mine Manager.

v) Storage of explosives

The Applicant is advised to store the explosives as per the Indian Explosives Act, 1958 and the Explosive Rules, 1983. Necessary permissions should be obtained from the Joint Controller of Explosives to store and uses of explosives in the quarry in the magazine permit under Form -23 or Agreement shall be made with holder of Form-22 who can supply and fire explosives as per safety practices. However, blasting in the quarry shall be done as per MMR 1961 under the supervision of Mines Blasting certificate holder appointed under Reg160 of Metalliferous Mines Regulations, 1961.

2.7 Land Use Pattern of the Core Zone

The proposed area is flat terrain and it is virgin without any disturbances. The table indicating the land use of lease area before initiating the quarry activity and land use at the end of quarry activity are given below.

Table No 2.8: Computation of present and proposed land use pattern

S. No	Land use	Before starting the proposed quarrying activity (Ha)	% of Use	At the end of quarrying activity (Ha)	% of Use
I)	Area under mining	---	--	2.42.91	74%
II)	Roads	---	--	0.03.10	1%
III)	Safety & Plantation area	---	--	0.56.19	17%
IV)	Labour shed & Office	---	--	0.00.80	0.5%
V)	Waste Dump	---	--	0.25.00	7.5%
VI)	Virgin	3.28.00	100%	-	-
Total		**3.28.00**	**100%**	**3.28.00Ha**	**100%**

2.8 ESTIMATION OF RESERVES

a) GEOLOGICAL RESOURCES

The geological resources is estimated by cross sectional method as 9,78,900m^3 of Rough Stone, Gravel and Top Soil up to a depth of 34m from the surface, having considered the depth of mining, recovery, safety barriers etc. A detail of estimation of geological resources is given in the Table no –2.9.

TABLE NO-2.9: Computation of Geological Resources and Reserves

SECTION	L(M)	W(M)	D(M)	VOLUME (M^3)	RESERVE @95%(M3)	REJECT @5%(M3)
AB-X1Y1	93	125	30	348750	331313	17437
AB-X2Y2	82	128	30	314880	299136	15744
AB-X3Y3	93	113	30	315270	299507	15763
TOTAL				**978900**	**929956**	**48944**

Total Geological resources up to a depth of 34m = 978900m^3

Recoverable Geological reserves @ 95% = 929956m^3

Total Reject @ 5% = 48944m^3

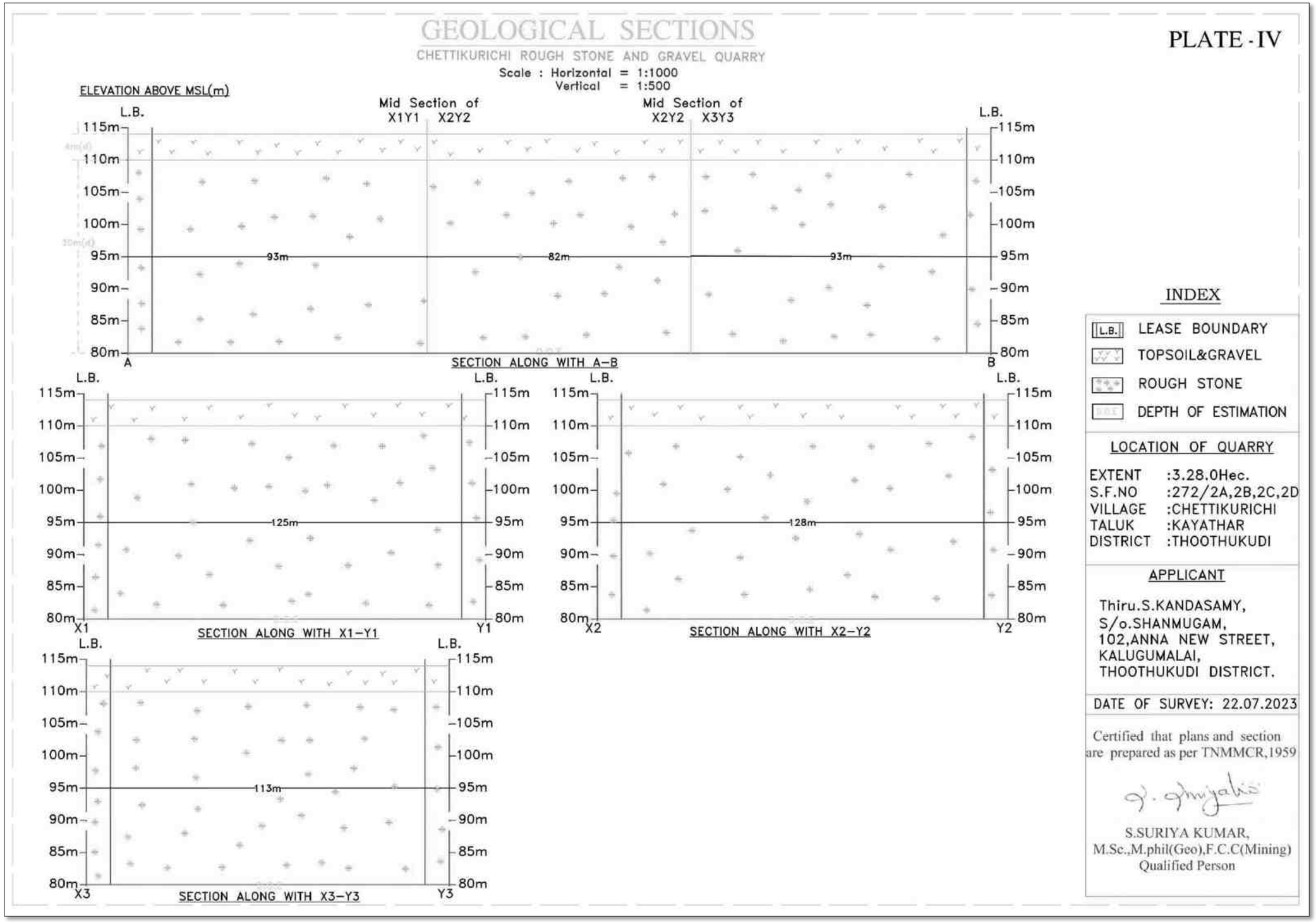


Fig.No.2.13: Geological Cross Section (Plate – IV)

b) MINEABLE/RECOVERABLE RESERVES:

The mineable\recoverable reserves is estimated by cross-sectional method having considered the recovery factor, depth of mining, safety barriers etc. The mineable reserves are estimated as 5,10,300m^3 of Rough Stone & 1,08,616m^3 of Top soil & Gravel to a depth of 34m from the surface. Details of estimation of mineable reserves are given in Table no. 2.10

Table No-2.10: Computation of Mineable/Recoverable Reserves

SECTION	BENCH	L (m)	W (m)	D (m)	Volume (m^3)	RESERVE @95% (m3)	Reject @ 5% (m3)	Topsoil & Gravel (m3)
AB-X1Y1	I	86	110	4				37840
	II	82	102	6	50184	47675	2509	
	III	76	90	6	41040	38988	2052	
	IV	70	78	6	32760	31122	1638	
	V	64	66	6	25344	24077	1267	
	VI	58	54	6	18792	17852	940	
AB-X2Y2	I	82	113	4				37064
	II	82	105	6	51660	49077	2583	
	III	82	93	6	45756	43468	2288	
	IV	82	81	6	39852	37859	1993	
	V	82	69	6	33948	32251	1697	
	VI	82	57	6	28044	26642	1402	
AB-X3Y3	I	86	98	4				33712
	II	82	90	6	44280	42066	2214	
	III	76	78	6	35568	33790	1778	
	IV	70	66	6	27720	26334	1386	
	V	64	54	6	20736	19699	1037	
	VI	58	42	6	14616	13885	731	
TOTAL					510300	484785	25515	108616

Note:

Total Rom Mineable reserves to a depth of 34m = **510300 m^3**

Total Mineable Rough Stone reserves @ 95% = **484785 m^3**

Total Rough Stone Reject @ 5% = **25515 m^3**

Total Top soil & Gravel = **108616 m^3**

Total Waste Ratio for Rough Stone = **25515/484785 m^3**

= **1:0.05**

The recovery factor is taken as 95% from the top bench up to the bottom of the mine. The life of the mine is computed as 5 years at an average production rate of **60336m³** per annum for the depth up to 34m from the surface. Reserves located below this level are expected to significantly extend the life of the mine.

2.9 Year Wise Production and Development

The five years period of production and the generation of rejects are described in Table no-2.11. **The five years production is designed up to a depth of 14m**. The year-wise development/production plan is shown in Plate no- V-VB (Fig No: 2.14-2.16) and the composite Plan of year-wise sections is given in Plate VI (Fig No 2.17).

Table No: 2.11. Computation of year wise production

YEARS	SECTION	BENCH	L (m)	W (m)	D (m)	Volume (m^3)	RESERVE @95% (m3)	Reject @ 5% (m3)
I YEAR	AB-X3Y3	**I**	**83**	**98**	**4**			
	AB-X3Y3	**II**	75	90	6	40500	**61150**	2025
	AB-X3Y3	**III**	51	78	6	23868		1193
II YEAR	AB-X2Y2	**I**	**53**	**113**	**4**			
	AB-X2Y2	**II**	53	105	6	33390	**59816**	1669
	AB-X2Y2	**III**	53	93	6	29574		1479
III YEAR	AB-X2Y2	**I**	**53**	**113**	**4**			
	AB-X2Y2	**II**	53	105	6	33390	**59816**	1669
	AB-X2Y2	**III**	53	93	6	29574		1479
IV YEAR	AB-X3Y3	**IV**	62	66	6	24552	**59798**	1228
	AB-X2Y2		79	81	6	38394		1920
V YEAR	AB-X2Y2	**V**	71	69	6	29394	**61098**	1470
	AB-X3Y3		54	54	6	17496		875
	AB-X3Y3	**VI**	42	42	6	10584		529
	AB-X2Y2		20	57	6	6840		342
	TOTAL					**317556**	**301678**	**15878**

TOPSOIL & GRAVEL						
YEAR	**SECTION**	**BENCH**	**L (m)**	**W(m)**	**D(m)**	**Volume**
I YEAR	AB-X3Y3	I	83	98	4	32536
II YEAR	AB-X2Y2	I	53	113	4	23956
III YEAR	AB-X2Y2	I	53	113	4	23956
TOTAL						**80448**

Total production of Rough stone for the five years	=	317556m^3
Total Recovery of Rough stone for the five years@95%	=	301678m^3
Total Rejects @ 5%	=	15878m^3
Total top soil + weathered rock	=	80448m^3
Rough Stone to waste ratio	=	25515/484785 m^3
	=	1:0.05

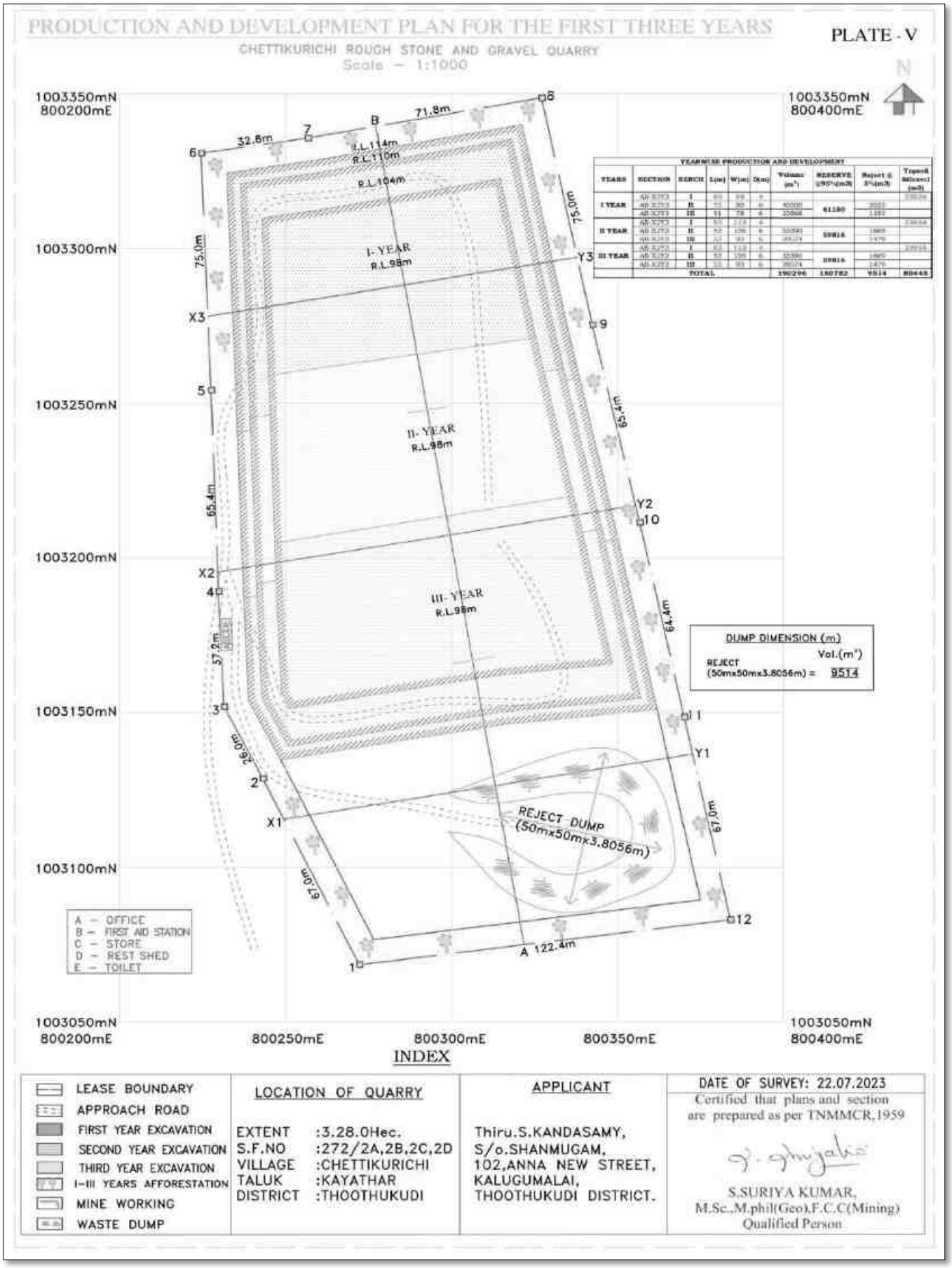


Fig.No.2.14: Year Wise Development and Production Plan for the first three years

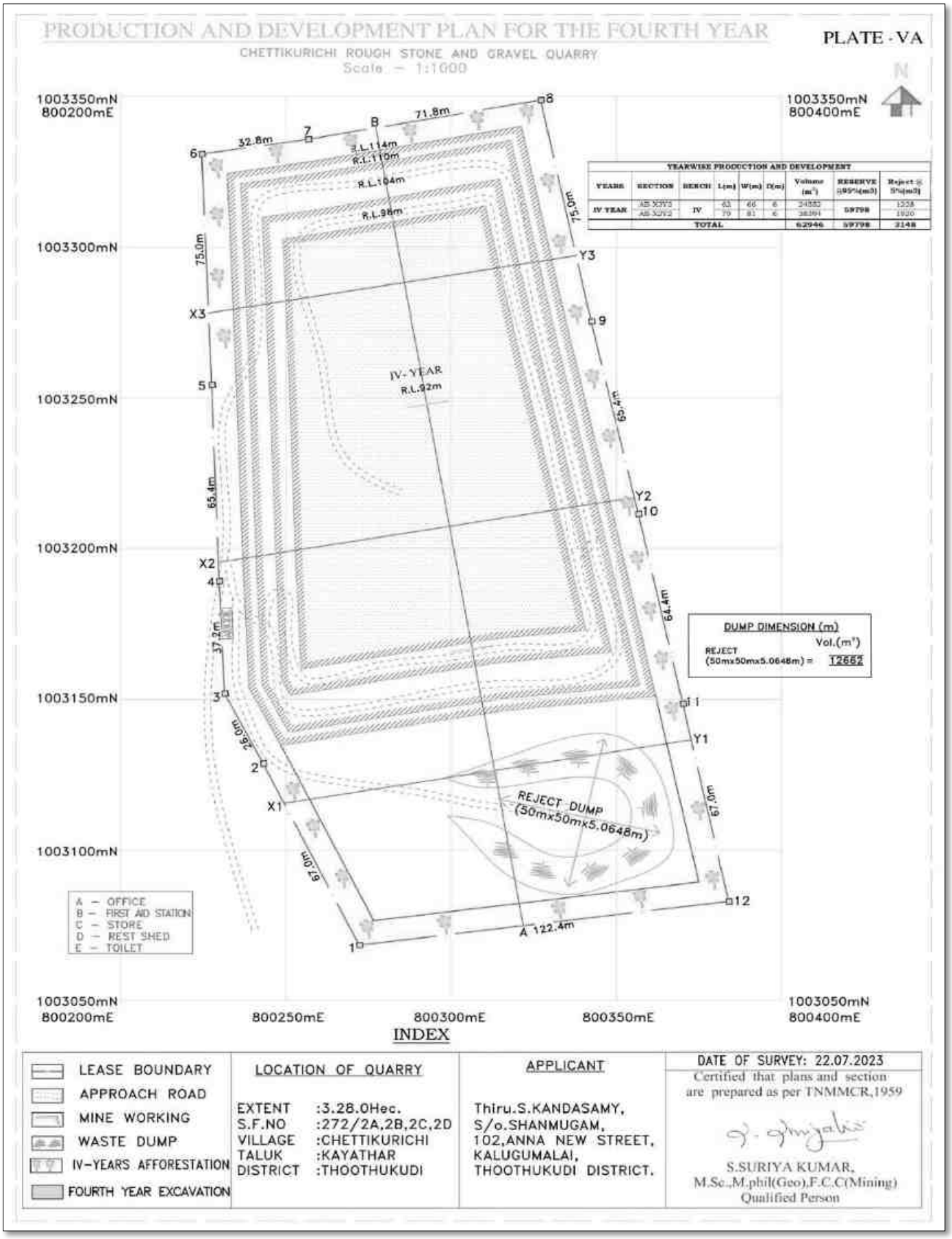


Fig.No.2.15: Year Wise Development and Production Plan for the fourth year

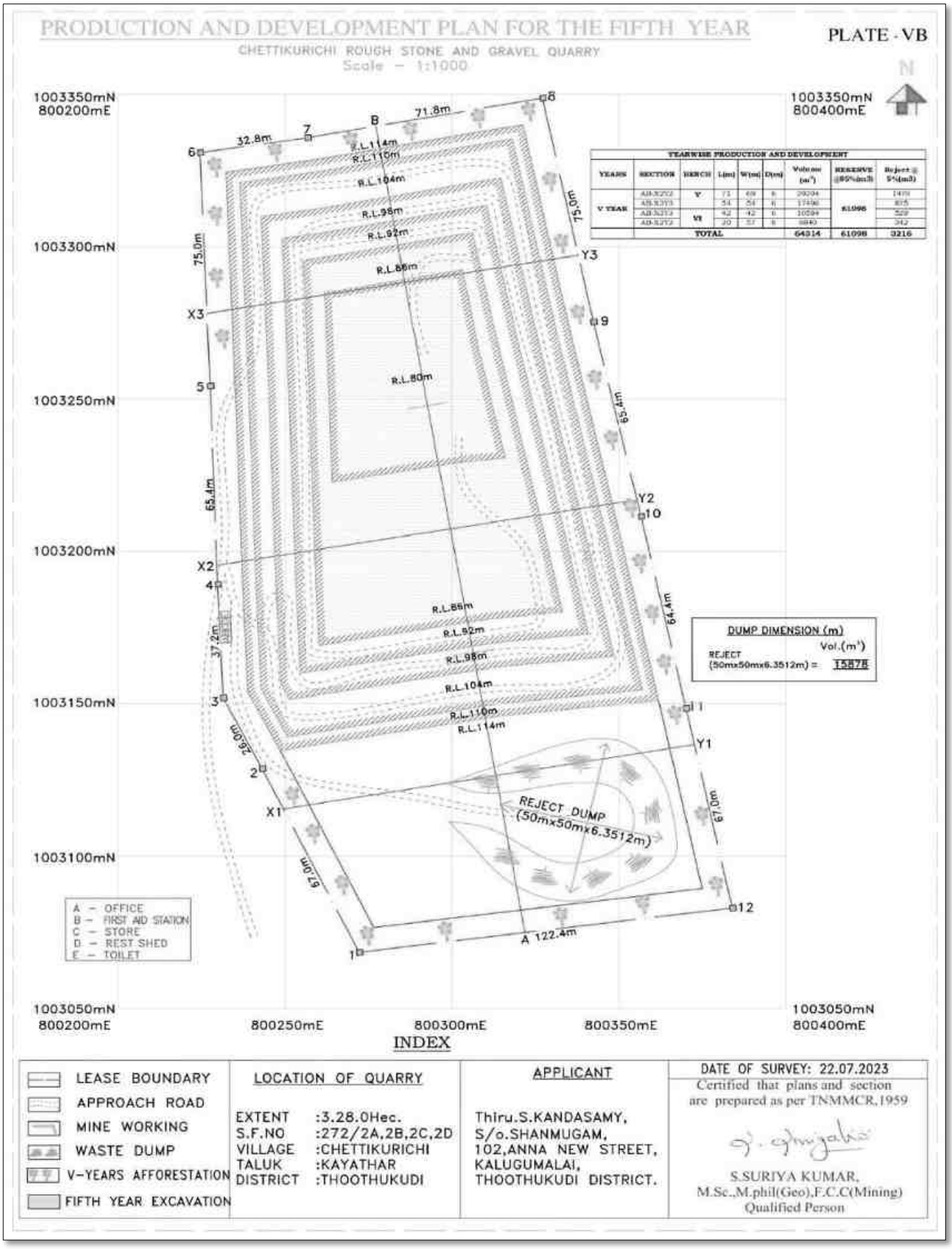


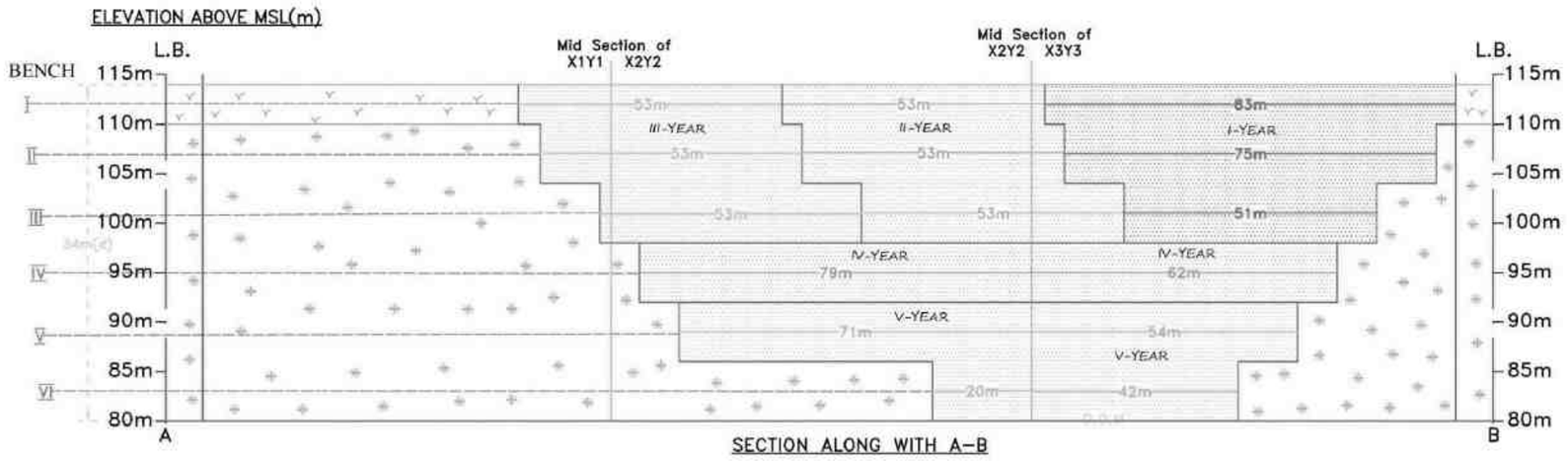
Fig.No.2.16: Year Wise Development and Production Plan for the fifth year

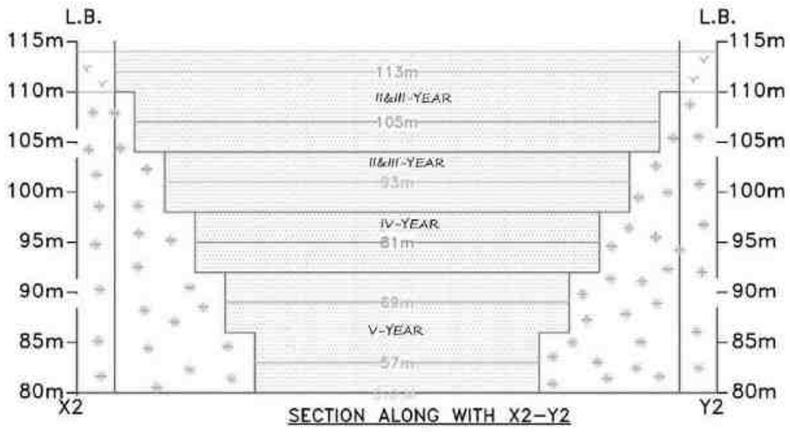
SECTIONS OF PRODUCTION AND DEVELOPMENT PLAN

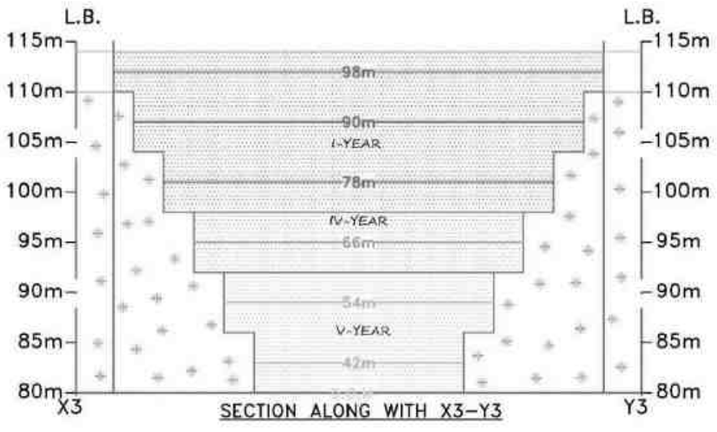
PLATE - VI

CHETTIKURICHI ROUGH STONE AND GRAVEL QUARRY

Scale : Horizontal = 1:1000
Vertical = 1:500







INDEX

- L.B. — LEASE BOUNDARY
- TOPSOIL&GRAVEL
- ROUGH STONE
- D.O.M — DEPTH OF MINING

LOCATION OF QUARRY

EXTENT :3.28.0Hec.
S.F.NO :272/2A,2B,2C,2D
VILLAGE :CHETTIKURICHI
TALUK :KAYATHAR
DISTRICT :THOOTHUKUDI

APPLICANT

Thiru.S.KANDASAMY,
S/o.SHANMUGAM,
102,ANNA NEW STREET,
KALUGUMALAI,
THOOTHUKUDI DISTRICT.

DATE OF SURVEY: 22.07.2023

Certified that plans and section are prepared as per TNMMCR,1959

S.SURIYA KUMAR,
M.Sc.,M.phil(Geo),F.C.C(Mining)
Qualified Person

Fig.No.2.17: Section of Production and Development Plan (Plate – VI)

2.10 Stacking of Mineral Rejects and Disposal of Waste

Rough Stone rejects which amounts to 5% of the total excavation; about **15878m^3** will be generated for mining up to 34m depth from surface. It is revealed in the final mine closure plan showing the ultimate depth of mining and ultimate pit configuration. Total generation of rejects and top soil, gravel for five year plan period is given in below table.

Table No 2.12: Computation of rejects materials

Year	Topsoil & gravel (m^3)	Rough Stone Reject (m^3)
First year	32536	3218
Second year	23956	3148
Third year	23956	3148
Fourth year	--	3148
Fifth year	--	3216
Total	**80448**	**15878**

Top soil will be removed and stacked separately along lease boundary as earth bund which will be used for afforestation purposes. All the rejects will be dumped within the lease area in south side. At the end of mining, the rejects will be backfilled in excavated pit.

Table No2.13:Year-Wise Dump Dimension (m^3)

Description		Volume (m^3)
Reject (50m x 50m x 6.3512m)	=	**15878m^3**

2.11 Conceptual Mining Plan/ Final Mine Closure Plan

Conceptual Mining Plan is prepared to determine the ultimate pit limits, depth of mining and final slope angle adapted with an object of long-term and systematic development of bench lay-outs, selection of permanent dump(s), avoidance of re-handling, selection of sites for construction of infrastructures, lying of roads. Kindly refer Table No-2.14 and Fig.No: 2.18.

The ultimate pit size is so designed based on certain practical factors such as the economical depth of mining, safety zones followed, available area for mining. The Ultimate pit size of the mine in bench-wise arrived and calculated as hereunder

Table No 2.14: Computation of ultimate pit dimension

Bench	Length(m)	Width(m)	Depth(m)
I	253	113	4
II	245	105	6
III	233	93	6
IV	221	81	6
V	209	69	6
VI	197	57	6
	Total		**34m**

However, mining with 6m vertical bench and slope of bench not exceeding 45° from horizontal during extraction of blocks will be maintained for safety and scientific point of view.

The quantum of mineable reserves of the applied area is estimated as **5,10,300m³** up to a depth of 34m from the surface. Out of which, the generated rejects is estimated to be **25,515m³**. All rejects materials are dumped along lease boundary and backfilled at the end of mine life.

Description		Volume (m^3)
Reject	=	25515
Total	**=**	**25515**

2.11.1 Restoration, Reclamation of already mined out area.

As the rate of production of rough stone is 95% for the five years, only 5% rejects are available to backfill in the quarried-out pit. The quarried-out pit will be used as water storage pond which improves the agricultural activity in the buffer zone.

The quarried pit will be fenced by using Barbed wire fencing to prevent inherent entry of public and cattle.

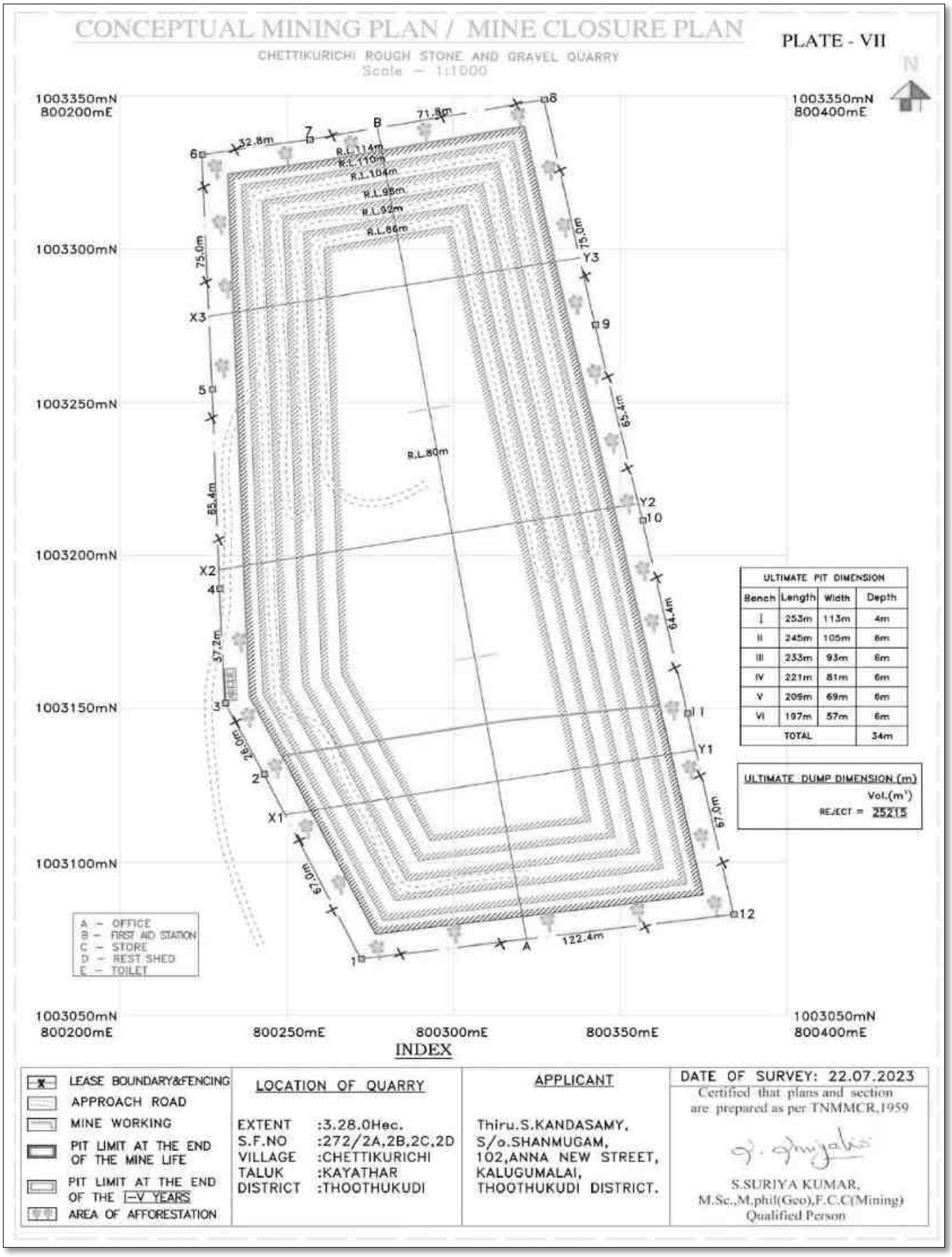


Fig No 2.18 Conceptual Plan

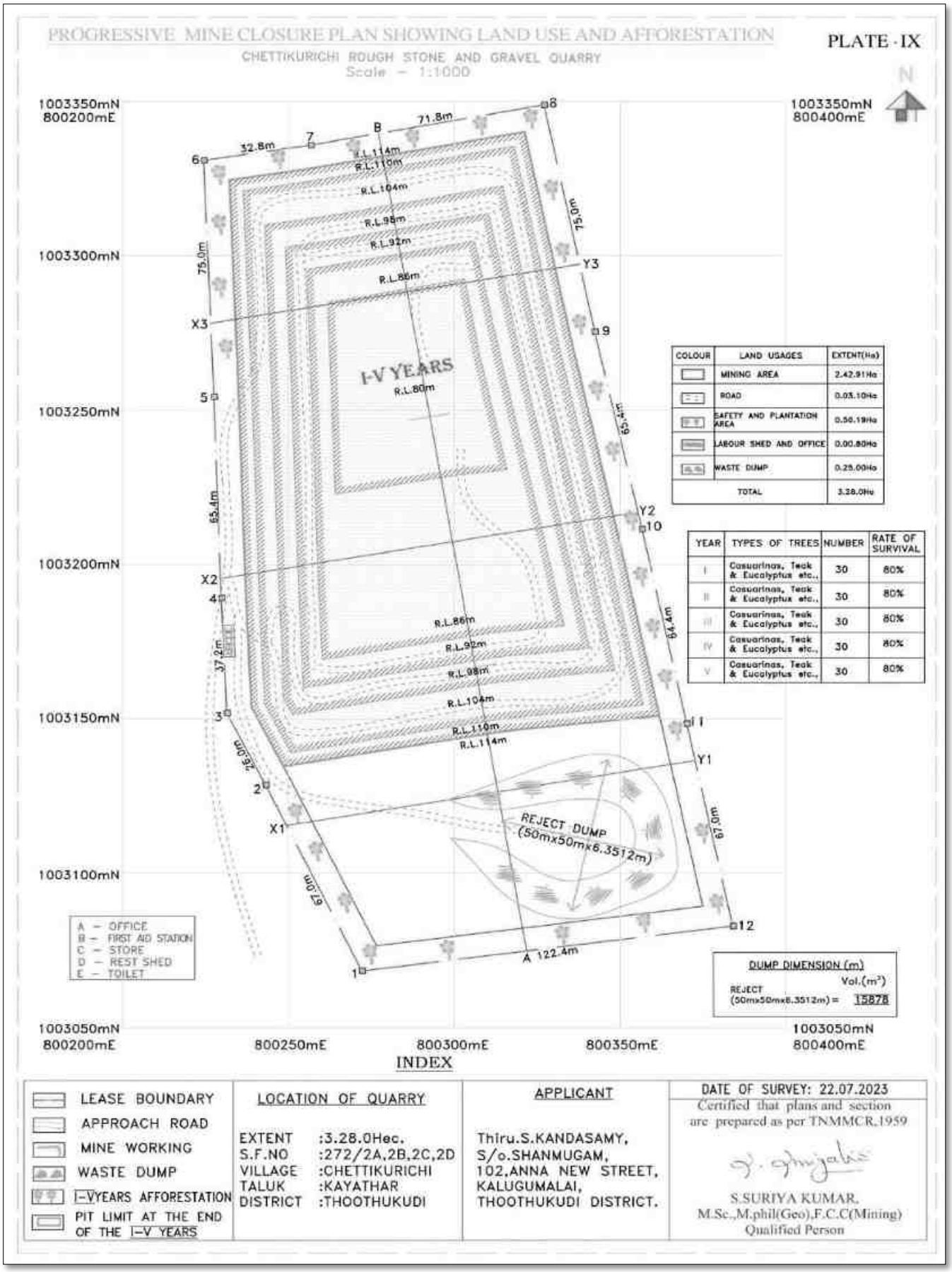


Fig. 2.19: Progressive Mine Closure Plan

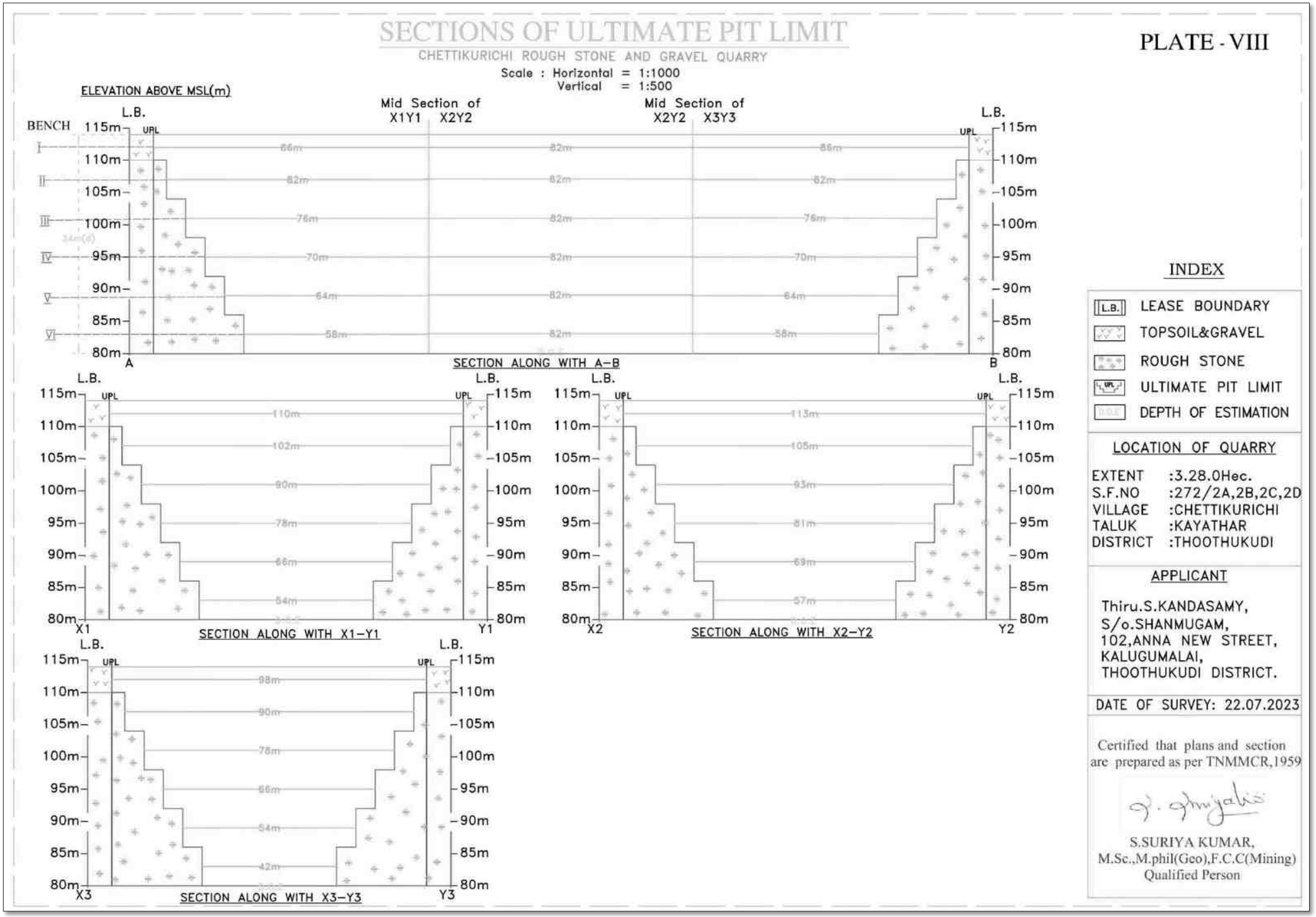


Fig. 2.20: Section of Ultimate Pit Limit

2.12 Employment Potential (Management & Supervisory personal)

Table No 2.15: Employment Potential of Thiru S.Kandasamy, Rough stone & Gravel quarry

Management and supervisory personal	Mines manager	1 no
	Foreman	1 no
	Mate	1 no
	Register keeper (Workman cadre)	1 no
Skilled	Operator	2 No
Semi-skilled	Driver	2 No
Unskilled	Musdoors/Labours	10 No
	Cleaners	2 No
	Register Keeper	1 No
Total		**21 Nos**

Table No 2.16: Water Requirements (5.0 KLD)

Domestic & Sanitary	Drinking Water - 0.5KLD Domestic Purposes - 1.0KLD
Dust suppression & Green Belt	Green belt purpose - 1.0KLD water sprinkling on haul roads - 2.0KLD Wet drilling operation - 0.5KLD
Source	Drinking water - Mineral water industries by water canes. Dust suppression, Green belt - Proponents own well

2.13 Amenities

2.13.1 Sanitary facilities

Semi-permanent latrines & urinals shall be maintained at convenient places for use of labours as per the provisions of Rule (33) of the main rules, 1955 separately for males and Females. Washing facilities shall also be arranged as per rule (36) of the mines Rules, 1955.

2.13.2 First Aid facility

First Aid station as per provisions under Rule (44) of the Mines Rules, 1955 will be provided and First aid kits kept in mines office room, the qualified first aid personnel should be appointed or nominated to attend emergency first aid treatment.

In case of eventuality, the victim will be given first aid immediately at the site and the injured person will be taken to the hospital located in Kayathar, Kalugumalai and

Kovilpatti. The competent and statutory of Foreman / Mate / Permit Manager will be incharge of the First aid.

2.13.3 Labour Health

Periodic medical examination has to be made for occupational health once in a year in addition to attending medical treatment of occupational injuries under Rule 45(A).

2.13.4 Precautionary safety measures to the Labourers

Safety provisions like helmet, goggles, safety belt, safety shoes etc have to be provided as per the circulars and amendments made for Mine labours under guidance of DGMS.

Necessary training will be conducted once in a year to all the employees with the help of qualified and experienced officers to train about the safe and systematic quarrying operation

2.13.5 The Child labor Employment

As per the Mines Act, 1952, no child labors below 18 years of old were engaged for any work in the quarry.

2.14 Project Cost

Proposed financial estimate / budget for (EMP) Environment Management

a) Project cost / investment

i)	Land Cost	=	Rs 30,00,000
ii)	Machinery to be used	=	Rs 45,00,000*
iii)	Building & Welfare amenities	=	Rs 5,00,000
iv)	Fencing of the lease boundary	=	Rs 1,00,000
	Total	**=**	**Rs 81, 00,000**

(* Part of machineries shall be hired)

b) EMP Cost

i)	Personal protective equipment	=	Rs 75,000
ii)	Environmental Monitoring	=	Rs 1,50,000
iii)	Occupation Health	=	Rs 1,00,000
iv)	Green Belt & Dust suppression	=	Rs 3,50,000
	Total	**=**	**Rs 6.75lakhs.**

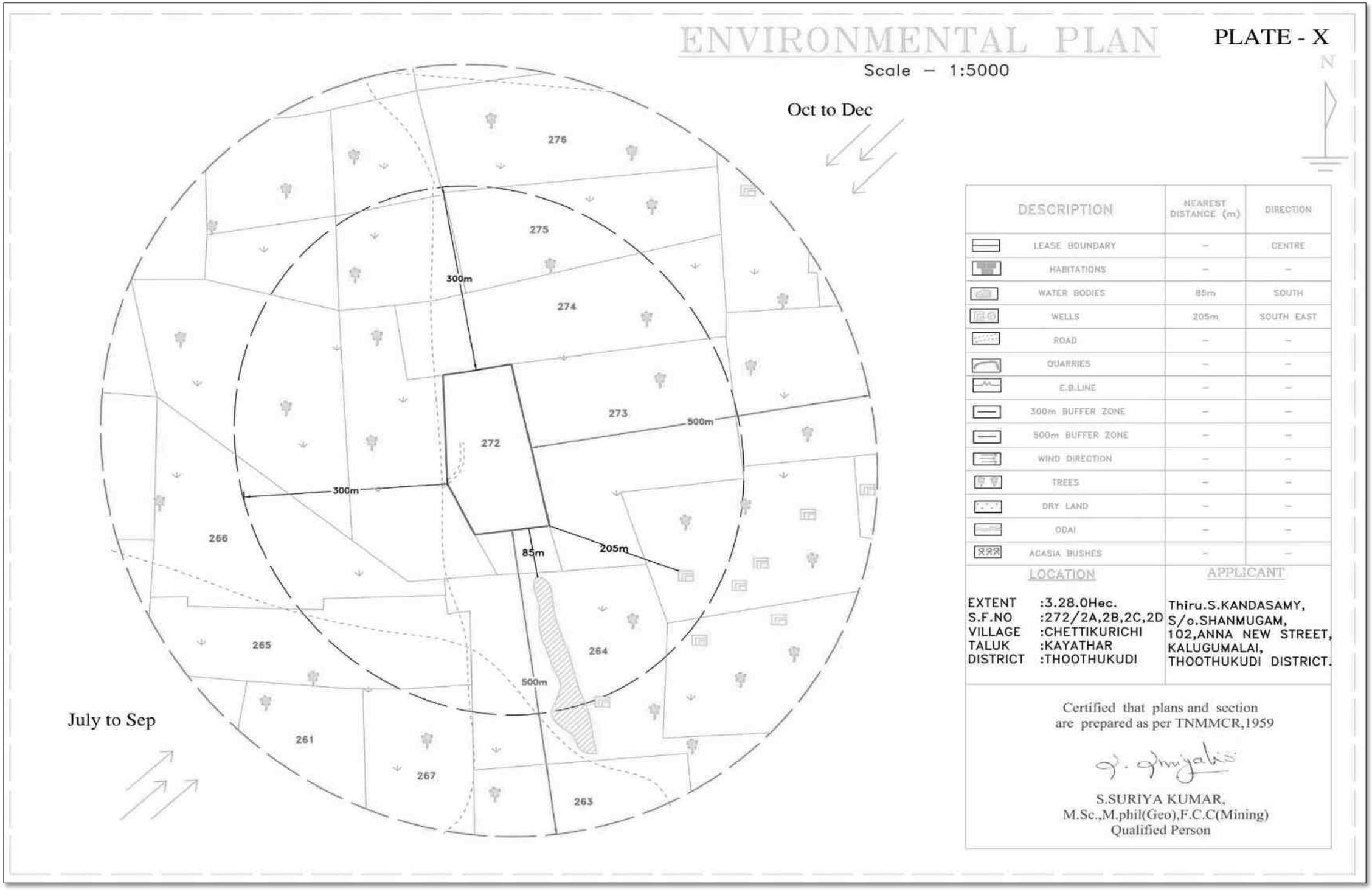


Fig.No.2.21: Environmental Plan

2.15 End Use

The excavated Rough stone & gravel is used for building's basement stones and other infrastructure development work in and around the district.

CHAPTER – 3: DESCRIPTION OF THE ENVIRONMENT

3.0 BASELINE ENVIRONMENTAL STATUS

3.1 INTRODUCTION

The chapter describes the existing environmental settings in the study area and is based upon the secondary information collected from the published sources, reconnaissance survey, primary socio-economic and environmental monitoring of air, noise, soil, ground and surface water in the study area.

For the purpose of EIA studies, mine lease area was considered as the core zone and area outside the mine lease boundary up to 10km radius from the lease boundary was considered as buffer zone. Collection of base line data is an integral part of the preparation of environmental impact assessment reports. The baseline monitoring study has been carried out during Dec 1st, 2022 – Feb 28th, 2023 to assess the existing environmental scenario in this area.

The Various environmental components studied as a part of the baseline study are discussed in the following project activities are:

- Air Environment
- Noise Environment
- Soil Environment
- Water Environment
- Flora and Fauna
- Socio-economic
- Land Environment

3.2 METHODOLOGY

The guiding factors of the present baseline study are the requirements laid down by the Central Pollution Control Board (CPCB) and guidelines as per the Environmental Impact Assessment Notification.

- In order to assess the Ambient Air Quality (AAQ), samples of ambient air were collected by installation of Respirable Dust Sampler and Fine Particulate Matter Sample at different locations within the study area and analyzed to find out the existing status of air quality.
- Ground water samples were collected from the existing tube wells, while samples for surface water were collected from river & small ponds. The samples were analyzed for parameters necessary to determine water quality (based on IS: 10500

criteria) and those, which are relevant from environmental impact point of view of the proposed river bed mining project.

- Soil samples were collected and analyzed for relevant physical and chemical characteristics in order to assess the impact of the proposed mining on soil.
- Inventory of flora and fauna species present in the area was made through field visits and survey by ecologists.
- Socio-economic data was collected from primary sources through village – level surveys and household visits.
- The land use patterns of the study area were assessed through latest satellite imaging and topographical sheets of Survey of India.

Appropriate methodologies have been followed in preparing the EIA-EMP report. The methodology adopted for the study is outlined below. The sampling locations were selected on the basis of the following:

- Predominant wind directions recorded by the India Meteorology Department (AWS- Automatic Weather Station) station, Kovilpatti Observatory, Thoothukudi district.
- Existing topography;
- Drainage pattern and location of existing surface water bodies like lakes/ponds, rivers and streams;
- Location of villages/towns/sensitive areas, and;
- Areas, which represent baseline conditions;

3.3 METEOROLOGICAL DATA RECORDED AT IMD (AWS- AUTOMATIC WEATHER STATION) STATION, KOVILPATTI OBSERVATORY, THOOTHUKUDI DISTRICT

The meteorology of the project area plays very important role in dispersion of pollutants and build-up of pollution within the air atmosphere. In the present study, in the month of Dec 1st, 2022 – Feb 28th, 2023 meteorological data for site specific has been taken to find the dispersion of pollutant concentration. The mixing height, which is an important parameter to express the dispersive potential of atmosphere, has been taken from the atlas of hourly mixing height and capacity of atmosphere in India.

Table 3.1 Summary of the Meteorological data for the study period

S. no	Parameters	Months	Dec 2022	Jan 2023	Feb 2023
1	Temperature (°C)	Max	29	29	30
		Min	24	23	23
		Average	26	26	27
2	Rainfall (mm)	Total Average Rainfall	123	50.9	37.57
		No. of rainy days	7	2	2
3	Humidity (%)	Average	75	69	69
4	Wind speed (mps)	Average	4.58	6.02	5.13
5	Cloud (%)	Average	48	29	23

3.3.1 Wind Rose

Wind speed and wind direction data is useful in identifying the influence of meteorology on the air quality of the area. The observed wind pattern during the study period is described below. In the present study, in the month of Dec, 2022 to Feb, 2023 meteorological data has been taken to find the dispersion of pollutant concentration. Wind-rose diagram for the study period is shown given below in Fig No. 3.1.

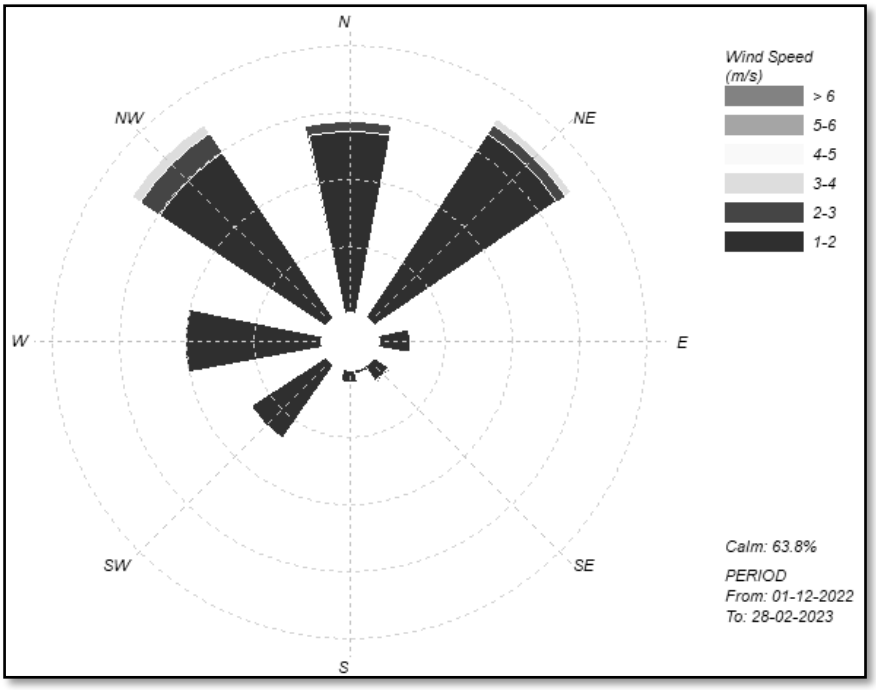


Fig No 3.1 Wind Rose Pattern for the Study period

3.4 AIR ENVIRONMENT

Prevailing air environment i.e. baseline conditions in an area is primarily governed by many factors activities going on in that area. The pollutant level in atmosphere is also governed by the meteorology, topography, natural settings in terms of plantation, forest cover, vegetation etc. The various sources of air pollution in the lease region are dust rising from unmetalled roads, domestic fuel burning, vehicular traffic, agricultural activities etc, as these factors in combination with each other are responsible for dispersion, diffusion, transportation and assimilation of pollutants in the local air atmosphere.

3.4.1 Ambient Air Monitoring

The prime objective of baseline air quality study (10km radius) is to assess the existing air quality of the area to form base line information. The design of monitoring network in the air quality surveillance program has been based on the following considerations

a) Representations of Mine lease area.
b) Representation of the down wind direction and up wind direction.
c) Representation of residential area.
d) Representation of regional background levels.
e) Meteorological conditions (predominant wind direction and wind speed).
f) Topography of the study area.

Ambient Air Quality Monitoring (AAQM) stations for monitoring were carried out at 6 locations. The details about sampling locations are mentioned below in Fig No. 3.2, 3.3 and presented in Table 3.2.

The existing Ambient Air Quality status (AAQ) has been monitored for parameters PM_{10}, $PM_{2.5}$, SO_2 and NO_X. Ambient air quality monitoring was carried out at a frequency of two days per week at each location for three months for 8 hours continuously. Respirable dust samplers have been used for monitoring the existing PM_{10} status and fine dust samplers are used for monitoring $PM_{2.5}$ status in the study area. Methodologies adopted for sampling and analysis were carried out, as per the approved methods of Central Pollution Control Board (CPCB).

Table 3.2 Ambient Air Quality Monitoring Locations

S. No	Sample Location	Station Code	Direction/ Distance (w.r.t. mine)	Core Zone/ Buffer Zone	Latitude	Longitude
1	Core Zone	AAQ-1	--	Core	9° 3'58.61"N	77°43'54.43"E
2	Chettikurichi	AAQ-2	1.36 (SE)	Buffer	9° 3'37.82"N	77°44'39.16"E
3	Cithamparampatti	AAQ-3	2.59 (NE)	Buffer	9° 4'19.82"N	77°45'17.16"E
4	Nalanthula	AAQ-4	1.99 (N)	Buffer	9° 5'4.53"N	77°43'49.61"E
5	Ramiyapatti	AAQ-5	3.69 (W)	Buffer	9° 3'39.81"N	77°41'51.82"E
6	Vadakku Konarkottai	AAQ-6	1.27 (S)	Buffer	9° 3'10.26"N	77°43'44.65"E

3.4.2 Monitoring Result

Monitoring station-wise minimum and statistical analysis (minimum, maximum, arithmetic mean) for measured levels of PM_{10}, $PM_{2.5}$, SO_2, NO_x in study area for the monitoring period are shown parameter wise in Table 3.3 and graphical representation of concentration pollutants are showing in Fig No 3.4.

Table 3.3 Summaries of Ambient Air Quality Results

Location		Code	$PM_{10}(\mu g/m^3)$				$PM_{2.5}(\mu g/m^3)$			
			Max	Min	Avg	98%	Max	Min	Avg	98%
Core Zone		A_1	51	42	49	51	30	19	27	30
Buffer zone	Chettikurichi	A_2	50	43	44	48	30	15	28	30
	Cithamparampatti	A_3	54	42	48	53	31	18	24	27
	Nalanthula	A_4	51	39	46	49	34	20	29	33
	Ramiyapatti	A_5	54	40	47	52	36	25	31	35
	Vadakku Konarkottai	A_6	54	40	45	49	34	20	30	33
NAAQS			**100**				**60**			

Location		Code	$SO_2(\mu g/m^3)$				$NO_x(\mu g/m^3)$			
			Max	**Min**	**Avg**	**98%**	**Max**	**Min**	**Avg**	**98%**
Core Zone		A_1	19	10	15	18	28	15	22	27
Buffer zone	Chettikurichi	A_2	17	10	12	14	30	12	25	29
	Cithamparampatti	A_3	14	9	11	13	25	11	21	23
	Nalanthula	A_4	19	11	16	18	27	15	23	25
	Ramiyapatti	A_5	17	9.7	13	16	27	12	24	27
	Vadakku Konarkottai	A_6	18	10	14	17	25	12	20	23
NAAQS			**80**				**80**			

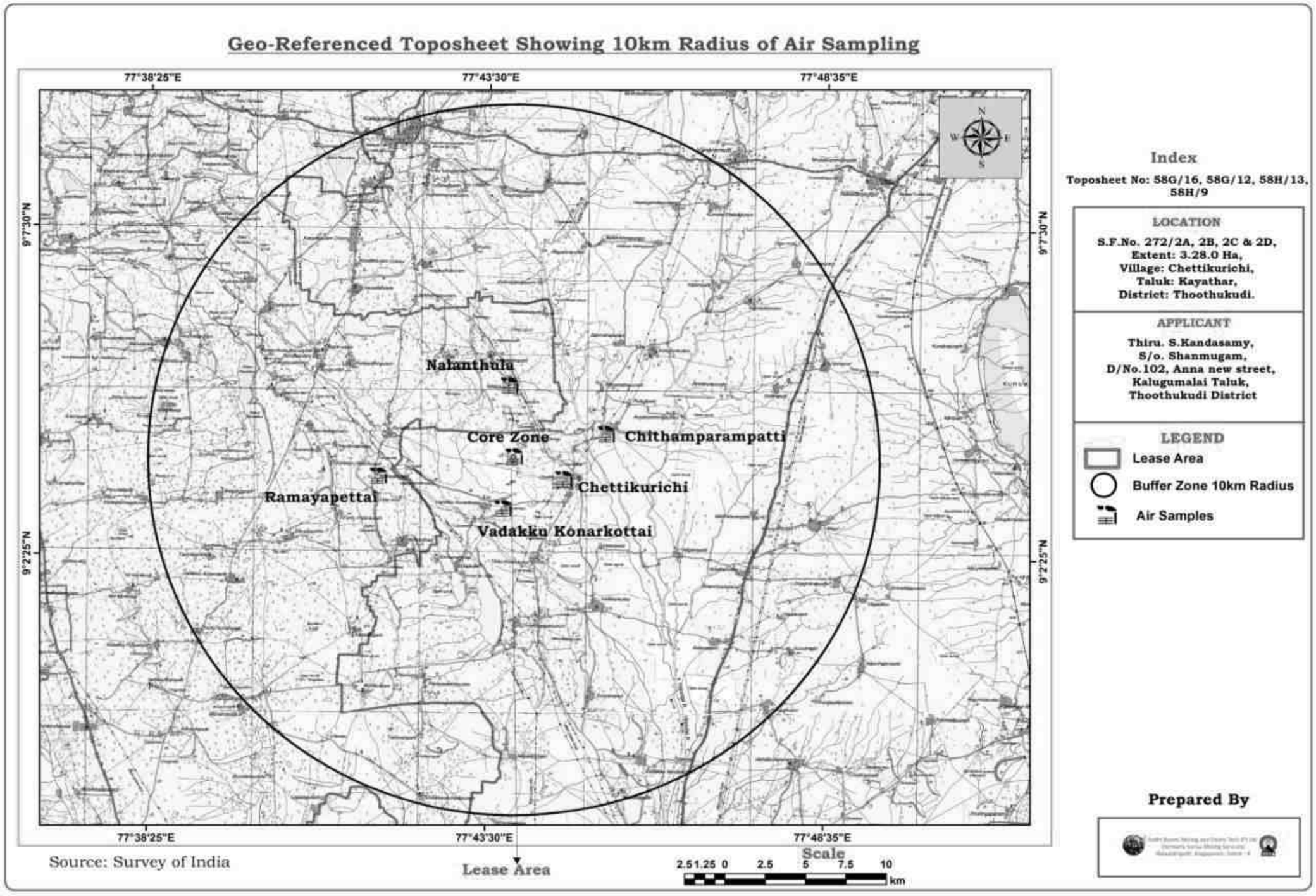
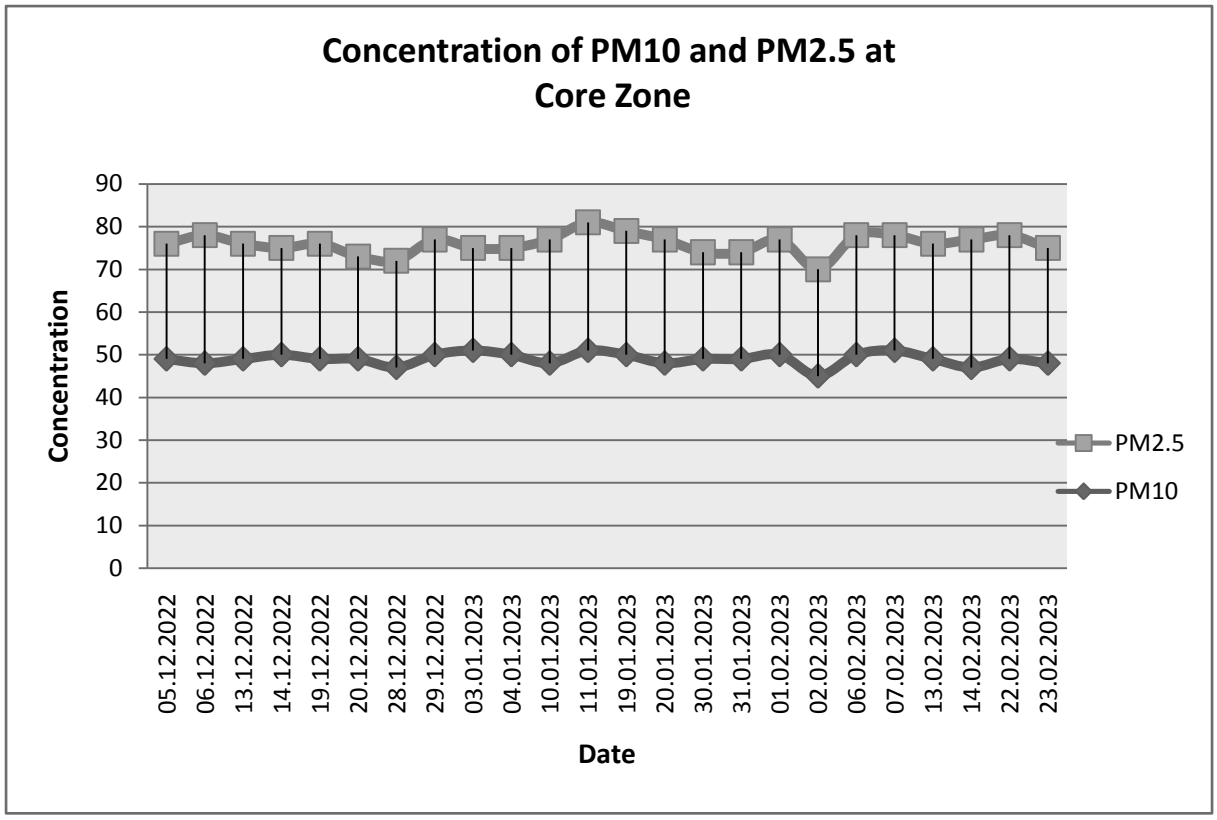


Fig No 3.2 Geo Referenced Toposheet showing Air Sampling station around 10km radius

Fig No 3.3 Air Monitoring locations at Core and Buffer Zone


Concentration of PM10 and PM2.5 at Core Zone
Concentration
90
80
70
60
50
40
30
20
10
0
05.12.2022
06.12.2022
13.12.2022
14.12.2022
19.12.2022
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29.12.2022
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04.01.2023
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01.02.2023
02.02.2023
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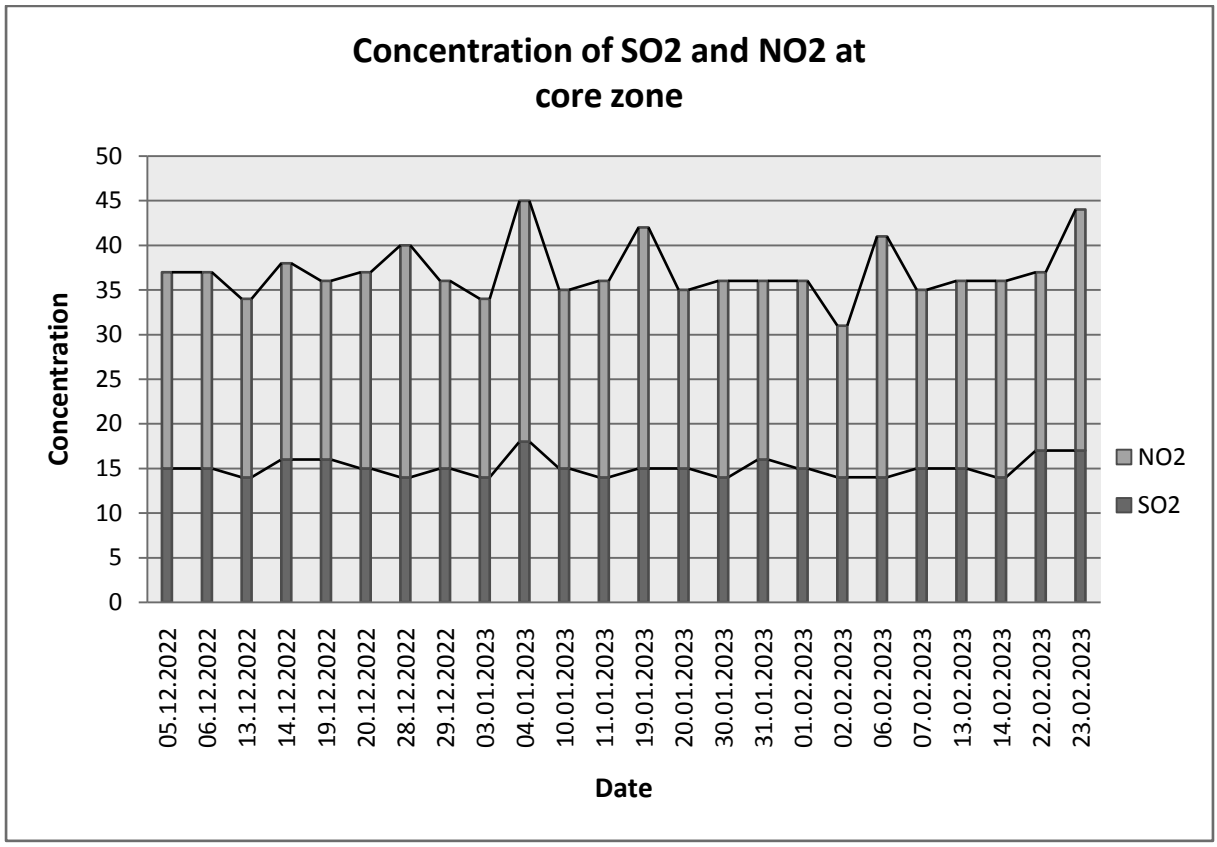
23.02.2023
Date
PM2.5
PM10


Concentration of SO2 and NO2 at core zone
Concentration
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35
30
25
20
15
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5
0
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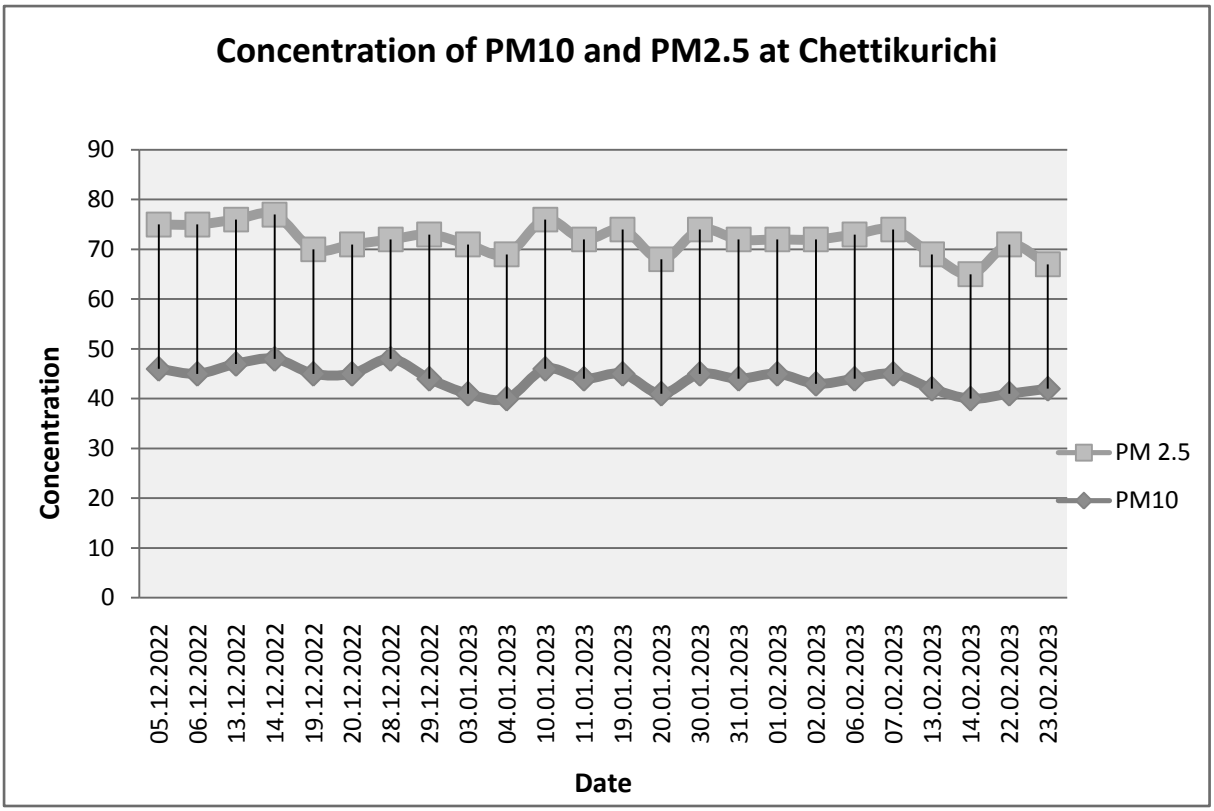
23.02.2023
Date
NO2
SO2


Concentration of PM10 and PM2.5 at Chettikurichi
Concentration
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70
60
50
40
30
20
10
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06.12.2022
13.12.2022
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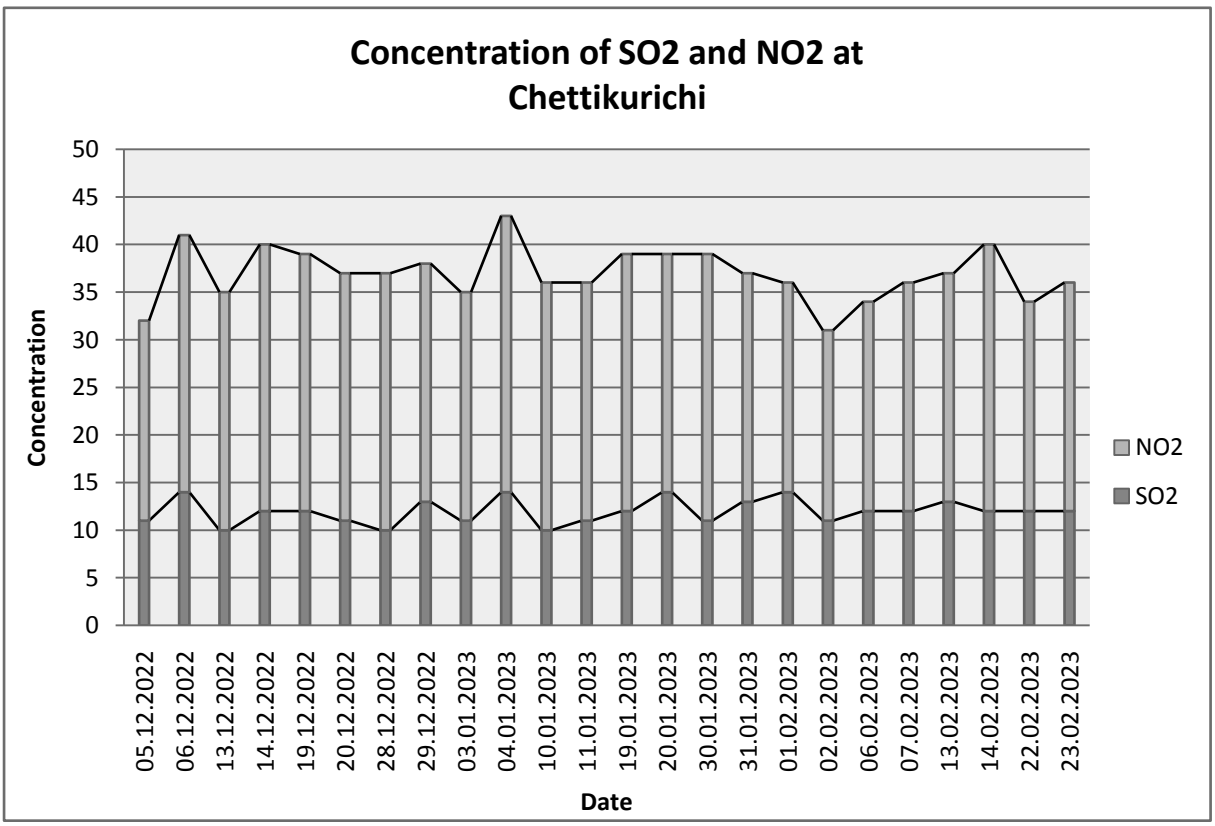
23.02.2023
Date
PM 2.5
PM10


Concentration of SO2 and NO2 at Chettikurichi
Concentration
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35
30
25
20
15
10
5
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06.12.2022
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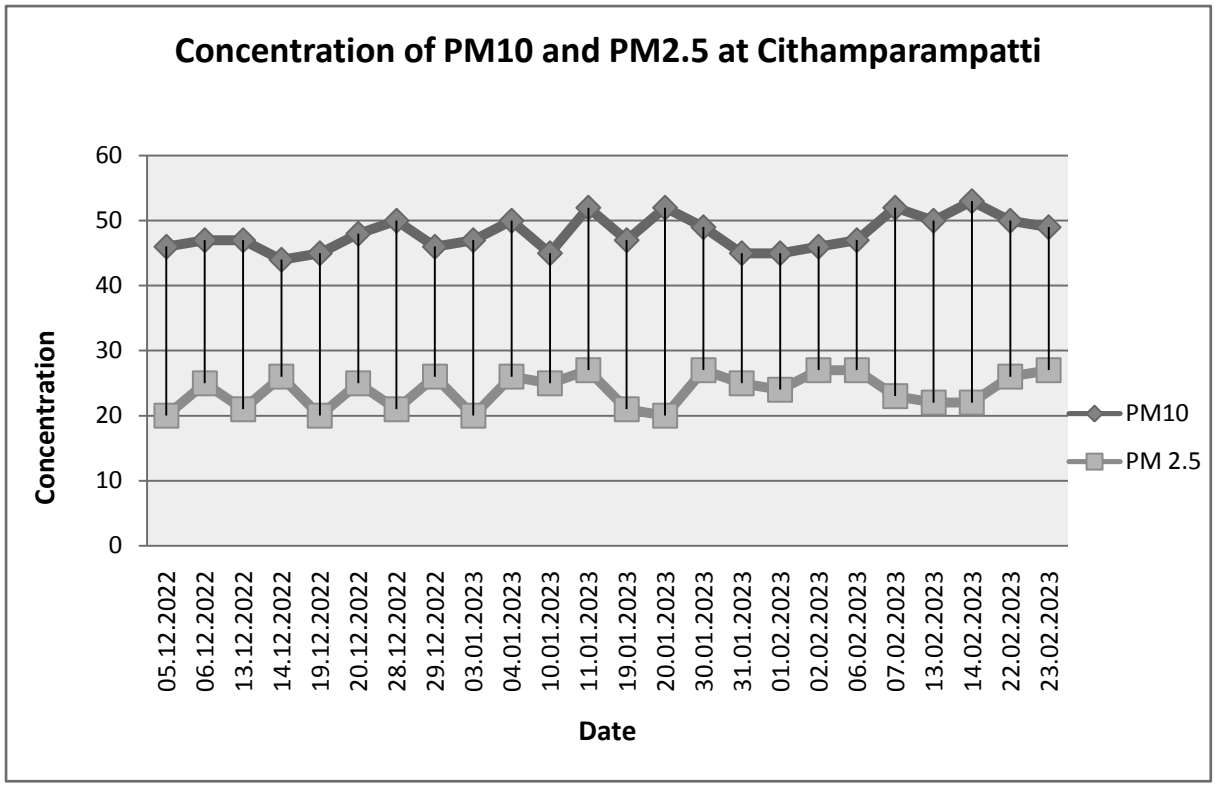
Date
NO2
SO2


Concentration of PM10 and PM2.5 at Cithamparampatti
Concentration
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40
30
20
10
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06.12.2022
13.12.2022
14.12.2022
19.12.2022
20.12.2022
28.12.2022
29.12.2022
03.01.2023
04.01.2023
10.01.2023
11.01.2023
19.01.2023
20.01.2023
30.01.2023
31.01.2023
01.02.2023
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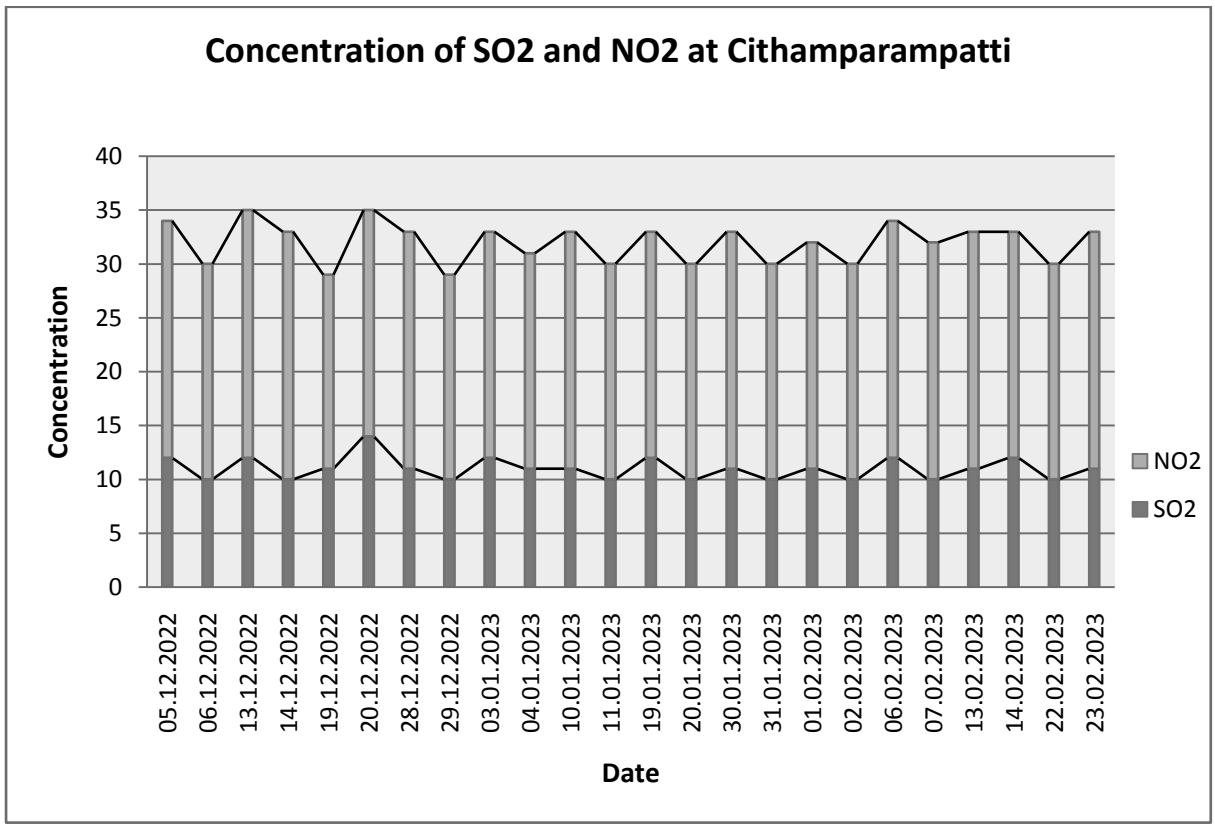
22.02.2023
23.02.2023
Date
PM10
PM 2.5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30
25
20
15
10
5
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13.12.2022
14.12.2022
19.12.2022
20.12.2022
28.12.2022
29.12.2022
03.01.2023
04.01.2023
10.01.2023
11.01.2023
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31.01.2023
01.02.2023
02.02.2023
06.02.2023
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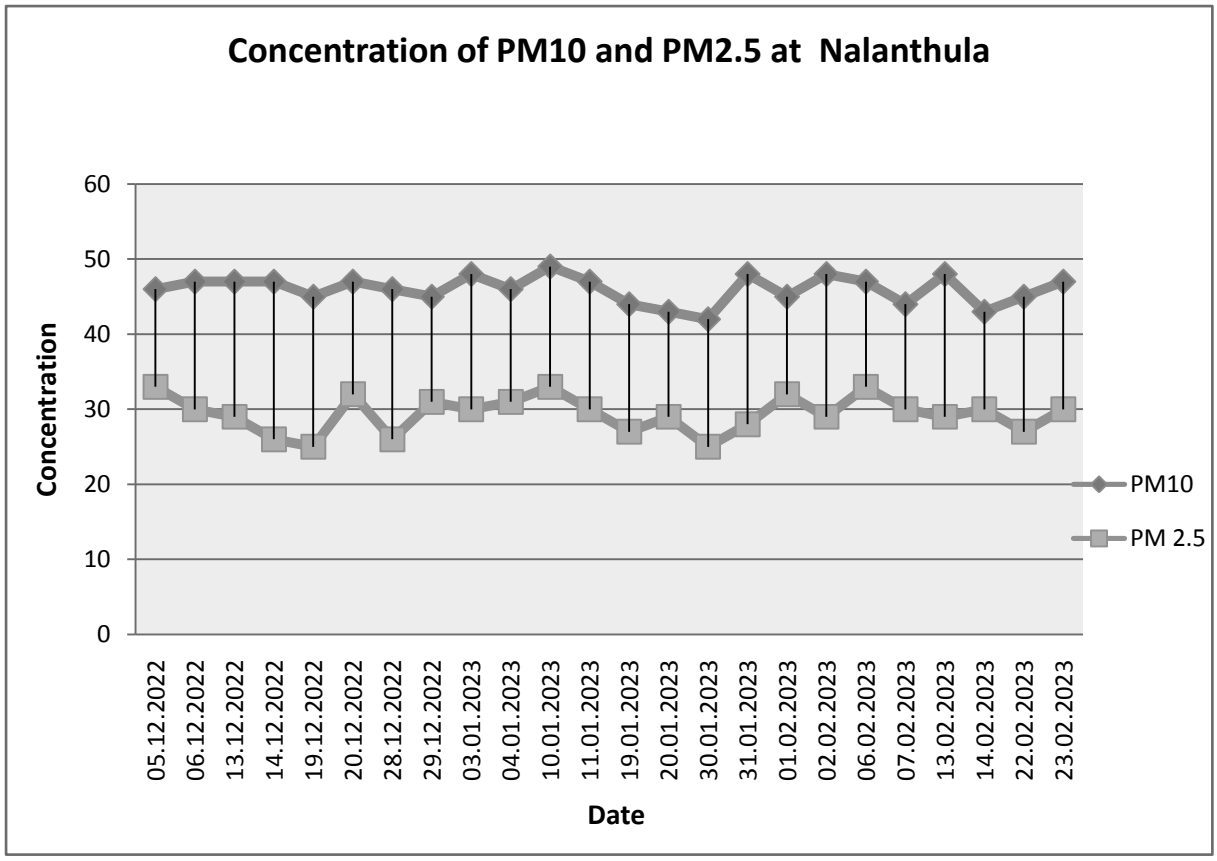
14.02.2023
22.02.2023
23.02.2023
Date
NO2
SO2


Concentration of PM10 and PM2.5 at Nalanthula
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30
20
10
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14.12.2022
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20.12.2022
28.12.2022
29.12.2022
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04.01.2023
10.01.2023
11.01.2023
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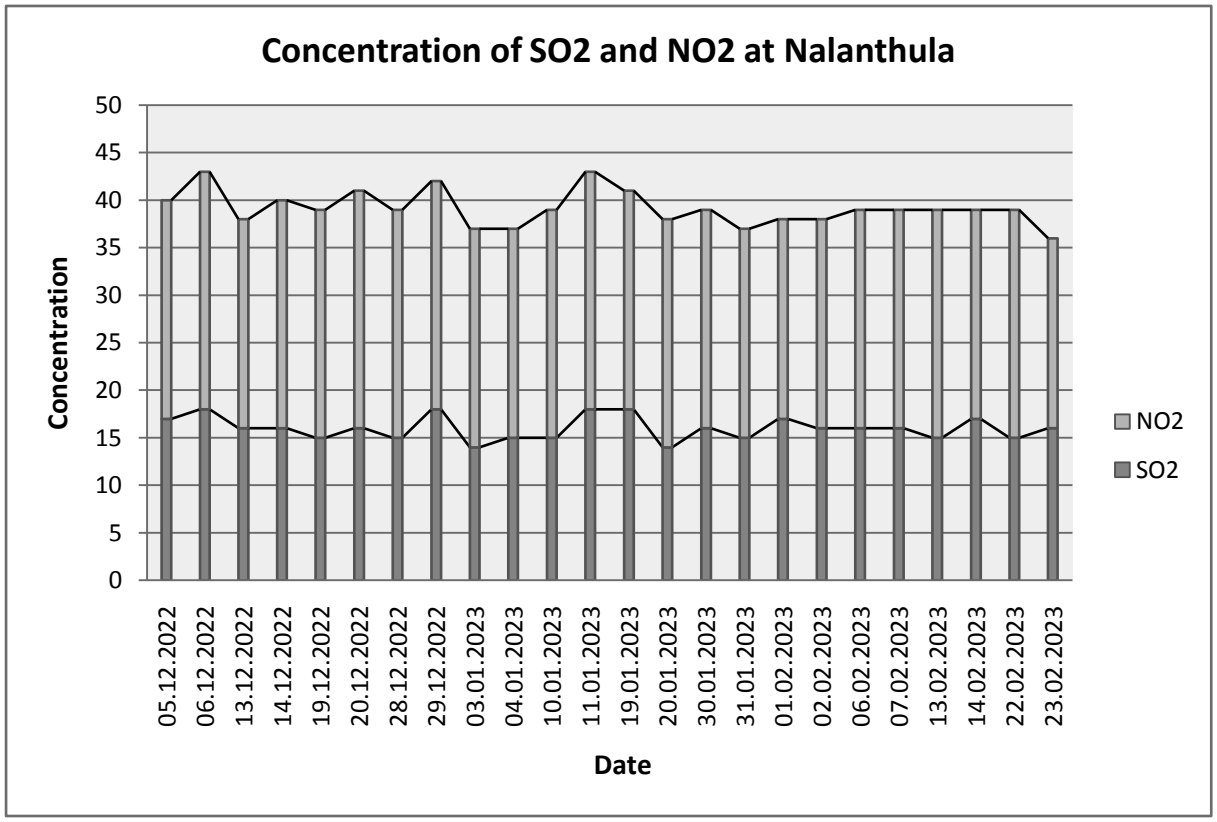
22.02.2023
23.02.2023
Date
PM10
PM 2.5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30
25
20
15
10
5
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13.12.2022
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19.12.2022
20.12.2022
28.12.2022
29.12.2022
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01.02.2023
02.02.2023
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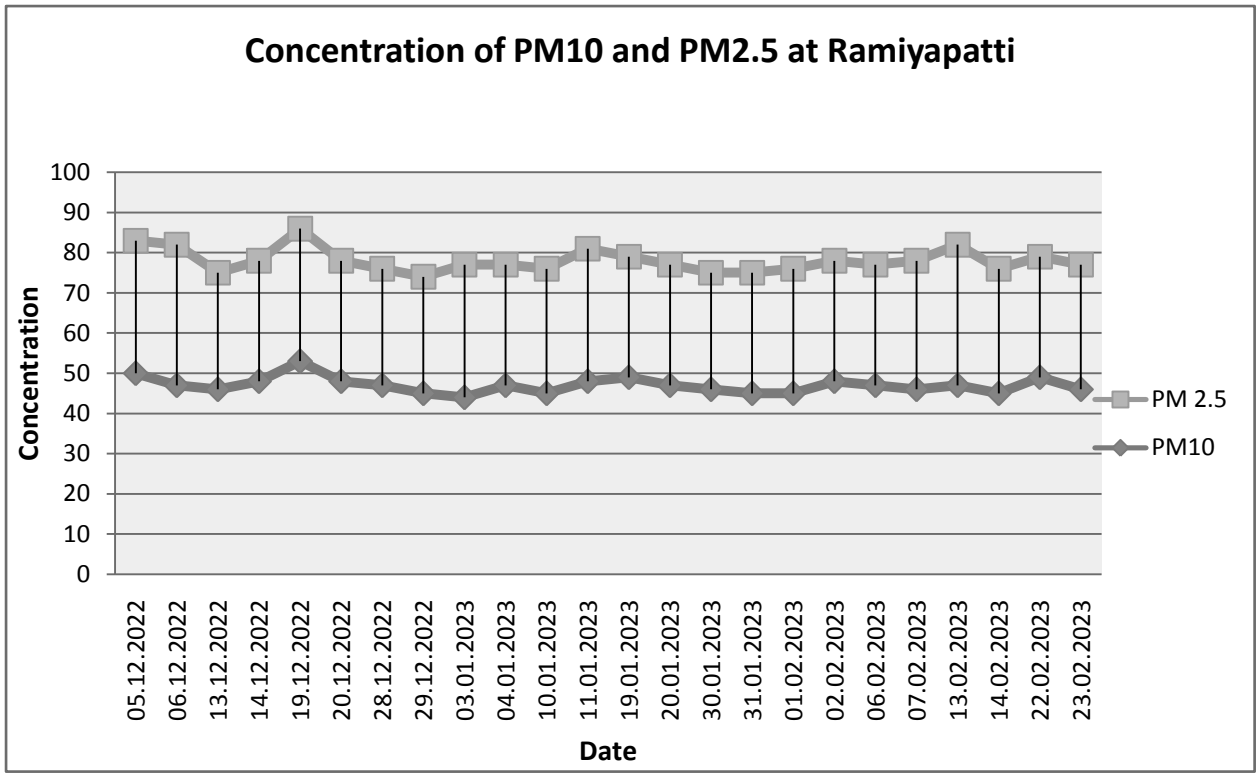
22.02.2023
23.02.2023
Date
NO2
SO2


Concentration of PM10 and PM2.5 at Ramiyapatti
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50
40
30
20
10
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19.12.2022
20.12.2022
28.12.2022
29.12.2022
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04.01.2023
10.01.2023
11.01.2023
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01.02.2023
02.02.2023
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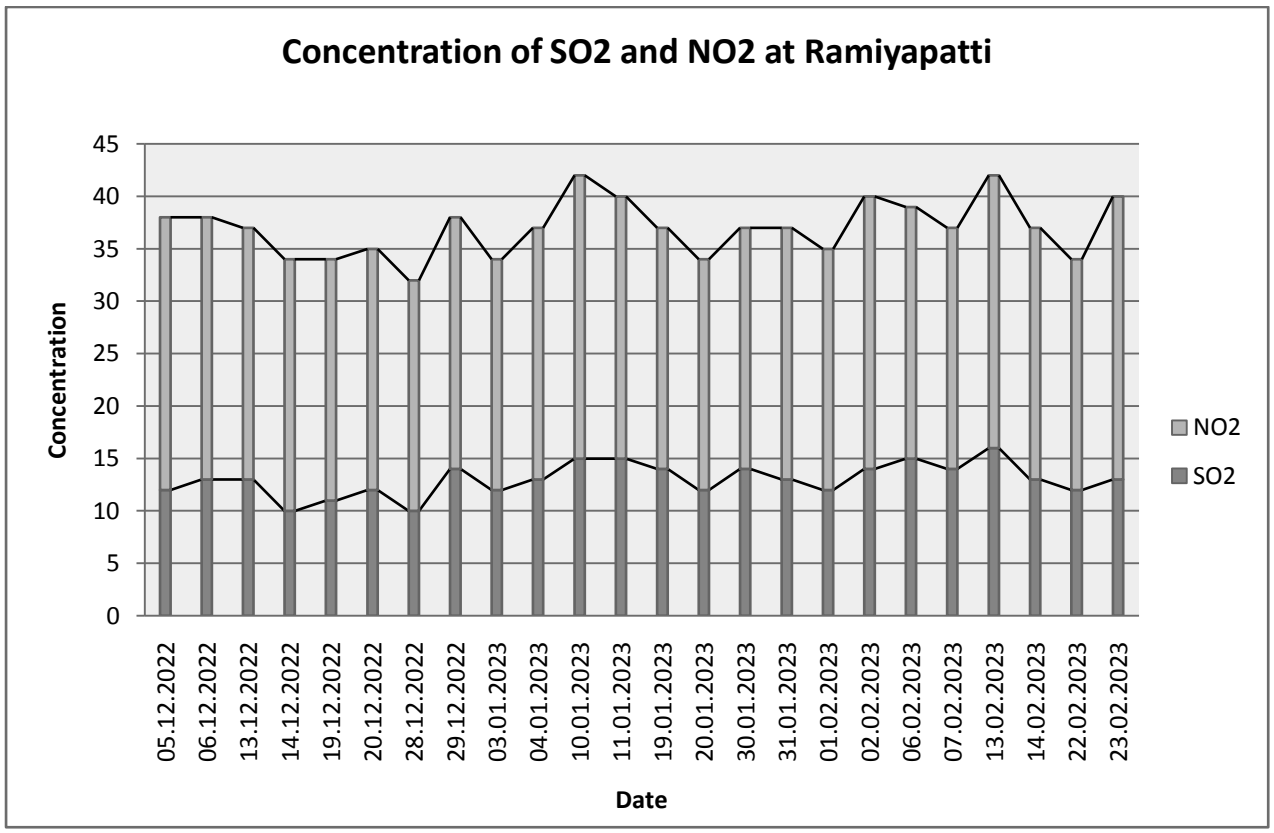
14.02.2023
22.02.2023
23.02.2023
Date
PM 2.5
PM10


Concentration of SO2 and NO2 at Ramiyapatti
Concentration
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35
30
25
20
15
10
5
0
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06.12.2022
13.12.2022
14.12.2022
19.12.2022
20.12.2022
28.12.2022
29.12.2022
03.01.2023
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10.01.2023
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31.01.2023
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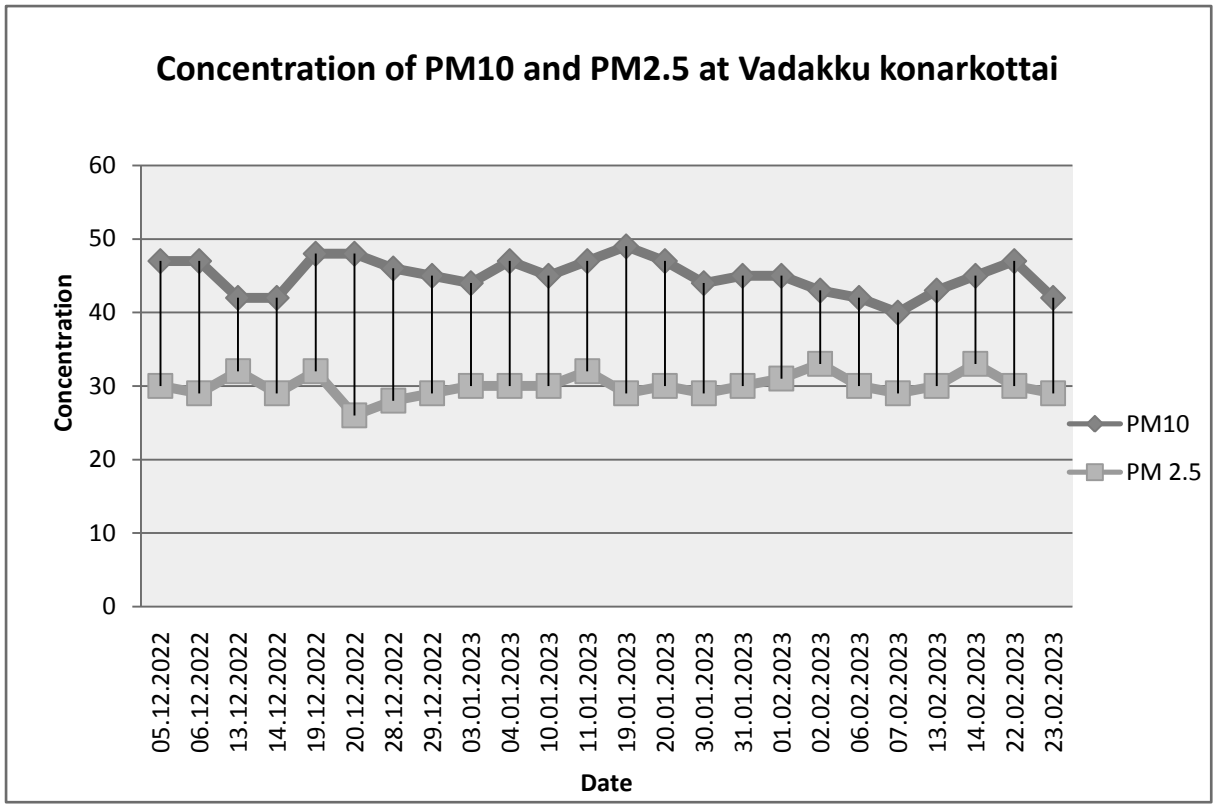
14.02.2023
22.02.2023
23.02.2023
Date
NO2
SO2



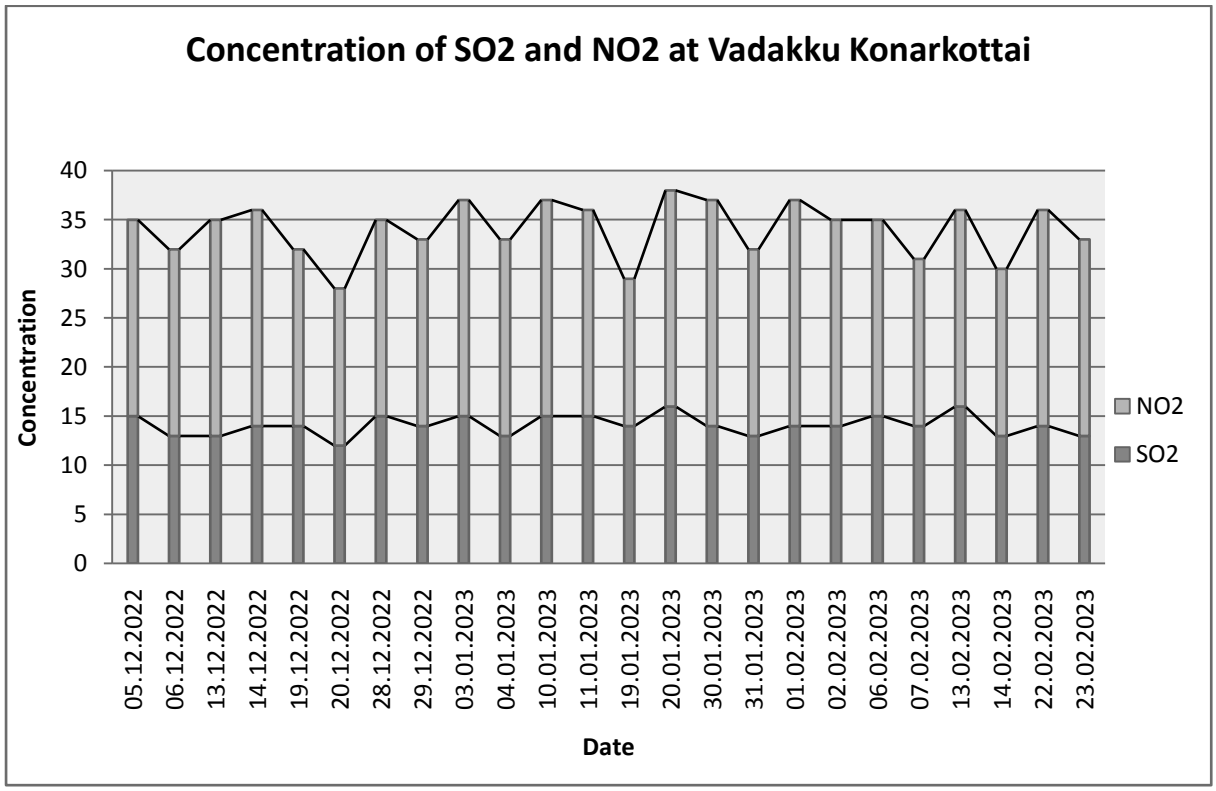


Fig No 3.4 Variation in Concentration of air pollutants

3.4.3 Observations of Primary Data

The area generally has low levels of pollutants in ambient air, which is well within the National Ambient Air Quality Standards for industrial or rural areas. This is due to the absence of any major pollution generating source in the vicinity.

- Ambient Air Quality Monitoring (AAQM) reveals that the minimum concentration of PM_{10} for all the 6 stations was found to be 39µg/m^3 at Nalathula village. The maximum concentration was observed in Ramiyapatti and Vadakku Konarkottai as 54µg/m^3. The average PM_{10} level at all stations varies from 44µg/m^3 to 49µg/m^3
- The average $PM_{2.5}$ level at all stations varies from 24µg/m^3 to 31µg/m^3. The minimum concentrations of $PM_{2.5}$ for all the 6 stations were found to be at Chettikurichi as 15µg/m^3. The maximum concentration was found to be 36µg/m^3 at Ramiyapatti village.
- The maximum concentrations of SO_2 were found to be 19µg/m^3 at Core and Nalathula village. The minimum concentration was found to be 9µg/m^3 in Cithamparampatti. The average SO_2 level at all stations varies from 11µg/m^3 to 16µg/m^3
- The minimum NOx concentrations were recorded as 11µg/m^3 at Cithamparampatti. The maximum concentration was found to be 30µg/m^3 at Chettikurichi. The average NOx level at all stations varies from 23µg/m^3 to 29µg/m^3. The concentration levels of the above pollutants were observed to be well within the limits of AAQS prescribed by CPCB.

3.5 NOISE ENVIRONMENT

The Noise levels within the study area were recorded using Sound Level Meter and noise monitoring results were compared with the Ambient Noise Quality Standard notified under Environmental Protection Act, 1986. A preliminary reconnaissance was undertaken to identify the major noise generating sources in the area. High grade Sound level meter which has an additional circuit (filters) is used for monitoring noise. This sound meter modifies the received signal and replicates the sound signal as received by the human ear and the magnitude of sound level in this scale is denoted as dB (A). Ten locations (Core Zone & Buffer Zone) were identified based on the activities in the study area, traffic and sensitive areas like hospitals and schools. The noise monitoring locations are shown in Fig No. 3.5 & 3.6. The sampling locations are shown in Table No. 3.4.

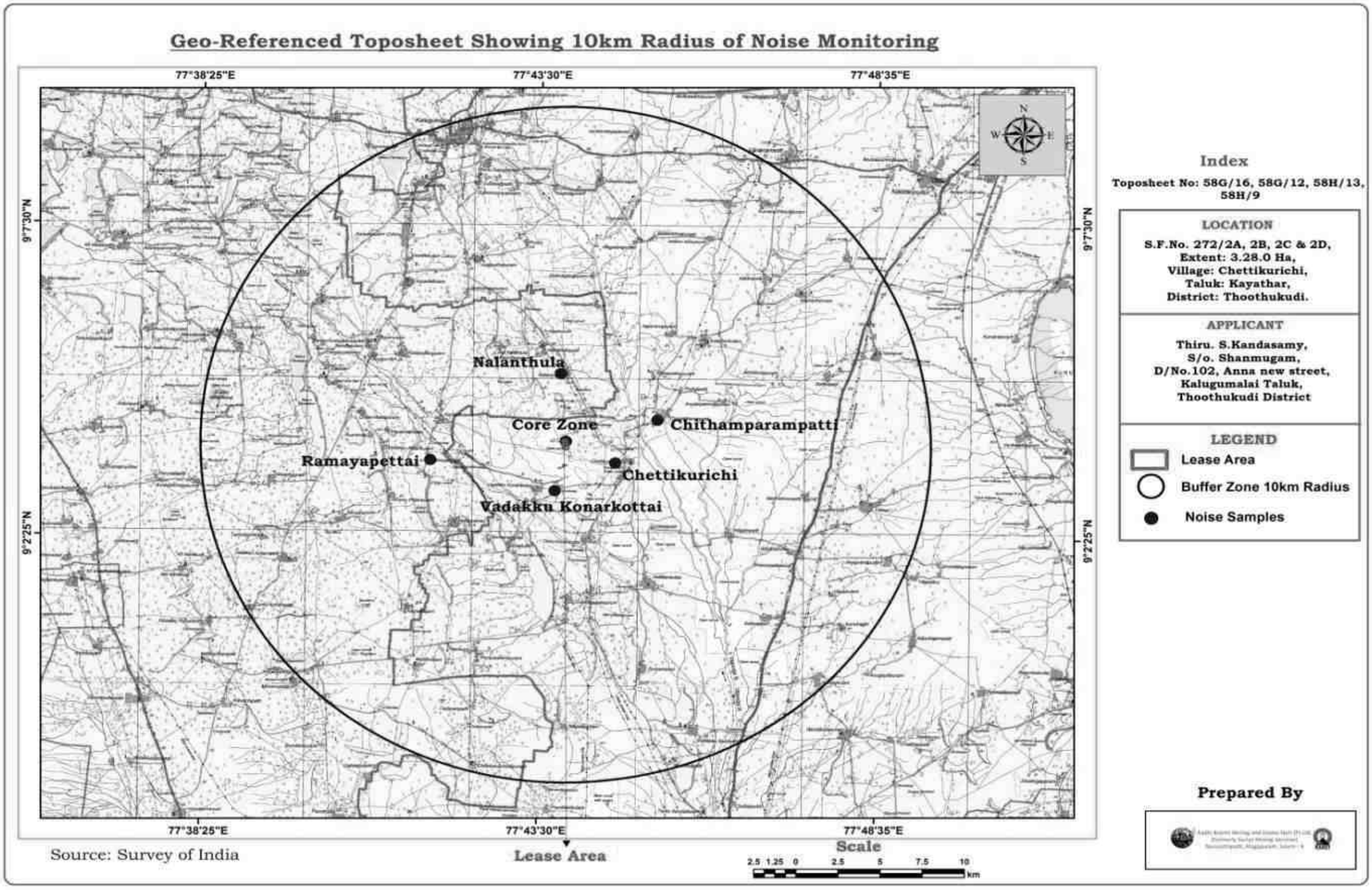


Fig No 3.5 Geo Referenced Toposheet showing Noise sampling stations around 10km radius

Table 3.4 Noise level Monitoring Stations

Sl. No	Location	Station code	Distance (km)	Direction
1	Core area	NQ1	--	--
	Lease boundary pillar (North)	NQ2	0.1	N
	Lease boundary pillar (South)	NQ3	0.1	S
	Lease boundary pillar (East)	NQ4	0.1	E
	Lease boundary pillar (West)	NQ5	0.1	W
2	Chettikurichi	NQ6	1.36	SE
3	Cithamparampatti	NQ7	2.59	NE
4	Nalanthula	NQ8	1.99	N
5	Ramiyapatti	NQ9	3.69	W
6	Vadakku Konarkottai	NQ10	1.27	S

3.5.1 Method of Monitoring

The readings were taken for every hour for 24 hrs. The day time noise levels were monitored during 6 am to 10 pm and night time levels during 10 pm to 6 am at all the monitoring locations within the study area (Table 3.5).

Measured noise level displayed as a function of time provides a useful scheme for describing the acoustical climate of a community. Noise levels recorded at each station are computed for equivalent noise levels. Equivalent noise level is a single number descriptor for describing time varying noise levels. Noise levels during night time generally drop, but night time high noise levels are judged more annoying compared to the day time.

Table 3.5 Noise Monitoring Results in Core and Buffer Zone

Sample code	Location	Decibel dB (A)		TNPCB Standards
		Day Time	Night Time	
NQ1	Core area	44.1	38.3	<u>Industrial</u> Day Time- 75 dB(A) Night Time – 70 dB(A) <u>Residential</u> Day Time - 55 dB(A)
NQ2	Lease boundary pillar (North)	42.9	36.2	
NQ3	Lease boundary pillar (South)	39.9	32.4	
NQ4	Lease boundary pillar (East)	44.5	38.1	
NQ5	Lease boundary pillar (West)	47.2	39.5	
NQ6	Chettikurichi (SE)	45.1	39.7	
NQ7	Cithamparampatti (NE)	43.4	37.8	

NQ8	Nalanthula (N)	42.3	36.4	Night Time - 45 dB (A)
NQ9	Ramiyapatti (W)	42.6	35.6	
NQ10	Vadakku Konarkottai (S)	39.5	31.8	
Remarks	Day Time	Leq (6.00 AM to 10.00 PM)		
	Night Time	Leq (10.00 PM to 6.00 AM)		

Fig No 3.6 Noise Monitoring stations at Core & Buffer Zone

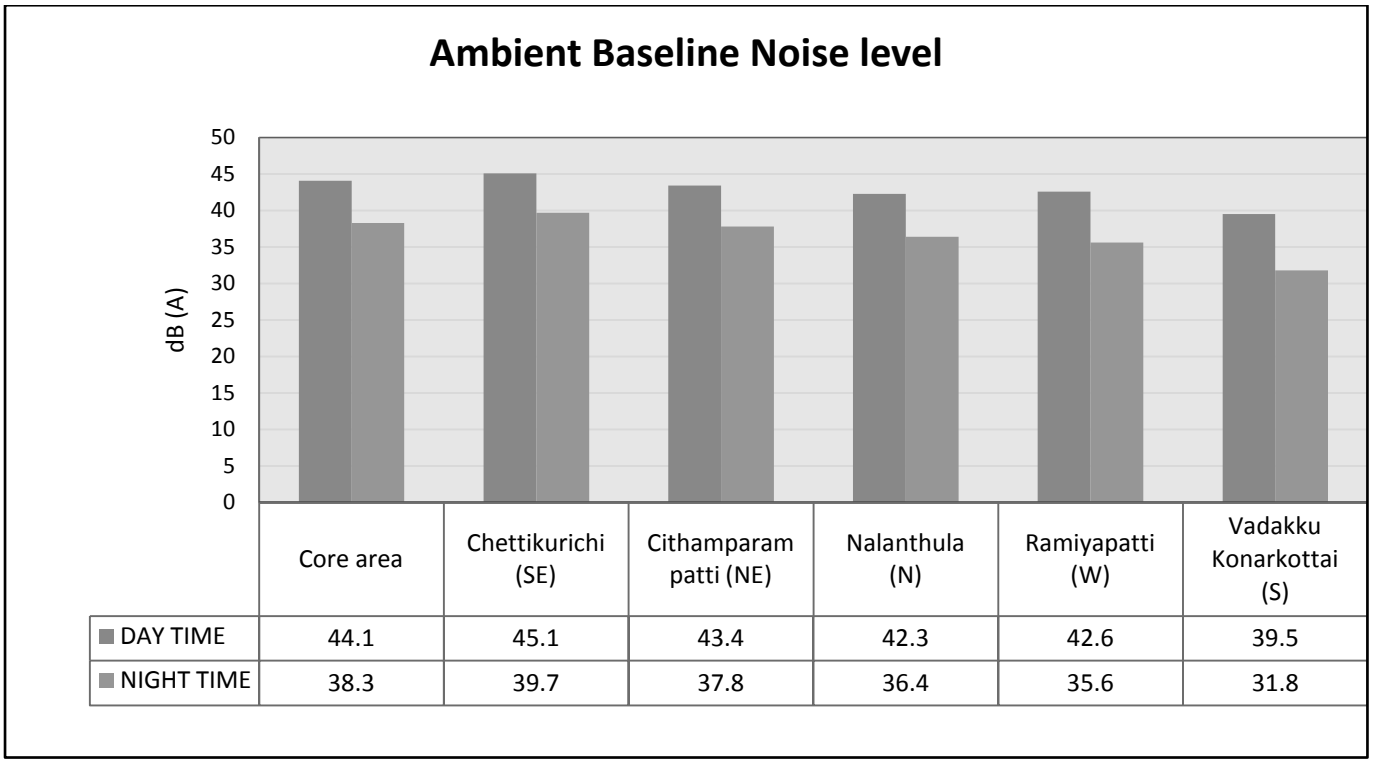
3.5.2 Observations

3.5.2.1 Day Time Noise Levels

Noise Monitoring reveals that the maximum & minimum noise levels at day time were recorded as 45.1 (A) at Chettikurichi (NQ-6) & 39.5 dB (A) at Vadakku Konarkottai (NQ-10) respectively in buffer zone. The maximum and minimum noise level at core is 47.2 dB (A) and 39.9 dB (A). The Noise level measured is found within the permissible limits during day time as specified by CPCB Standard.

3.5.2.2 Night Time Noise Levels

The night time noise levels, the maximum & minimum noise levels at were recorded as 39.7 dB (A) at Chettikurichi (NQ-6) & 31.8 dB (A) at Vadakku Konarkottai (NQ-10) respectively in buffer zone. The maximum and minimum noise level at core is 39.5 dB (A) and 32.4 dB (A). The Noise level measured is found within the permissible limits during night time as specified by CPCB Standard.



	Core area	Chettikurichi (SE)	Cithamparam patti (NE)	Nalanthula (N)	Ramiyapatti (W)	Vadakku Konarkottai (S)
DAY TIME	44.1	45.1	43.4	42.3	42.6	39.5
NIGHT TIME	38.3	39.7	37.8	36.4	35.6	31.8

Fig No 3.7 Noise Level of the Study Area

3.6 Water Environment

Assessment of baseline data on Water environment includes:

a) Identification of surface and ground water sources

b) To evaluate the water quality characteristics for critical parameters

c) Study the impacts on agriculture, Habitation conditions etc.

d) Predict the likely impact on water quality due to the mining and other related activities, the anticipated impact on water quality is discussed in following chapter.

3.6.1 Selection of Sampling Stations

The samplings were taken from the identified monitoring locations within the 10km radius of the study area. Water samples were collected to study the water quality of the study area.

3.6.2 Water Quality

Water samples from various locations in and around the project site within 10 km radius were collected for assessment of the physico-chemical and bacteriological quality to know the baseline status of water quality. Parameters for analysis of water quality were selected based on the utility of the particular source of water as per MoEF & CC guidance. Methodologies adopted for sampling and analysis of water in according to the Bureau of Indian Standards. The parameters thus analyzed were compared with IS10500:2012. Details of water sampling locations are present in Table 3.6. In addition, water quality details are given in the Table 3.7. The following image of Geo referenced Topomap showing locations of water samples are given in the Figure No.3.8. Locations of Core and Buffer Zone water samples are given in the Figure No.3.9.

Table 3.6 Water Sampling Locations

Sampling Code	Location	Surface/ Ground water	Latitude	Longitude	Distance (km)	Direction
WQ1	Core Zone	Ground Water	9°4'9.30"N	77°43'56.41"E	0.29	N
WQ2	Chettikurichi		9°3'36.03"N	77°44'43.05"E	1.50	SE
WQ3	Cithamparampatti		9°4'20.75"N	77°45'19.66"E	2.67	NE
WQ4	Nalanthula		9°5'5.71"N	77°43'48.95"E	2.03	N
WQ5	Ramiyapatti		9°3'40.92"N	77°41'51.25"E	3.70	W
WQ6	Vadakku Konarkottai		9°3'8.61"N	77°43'42.80"E	1.33	S

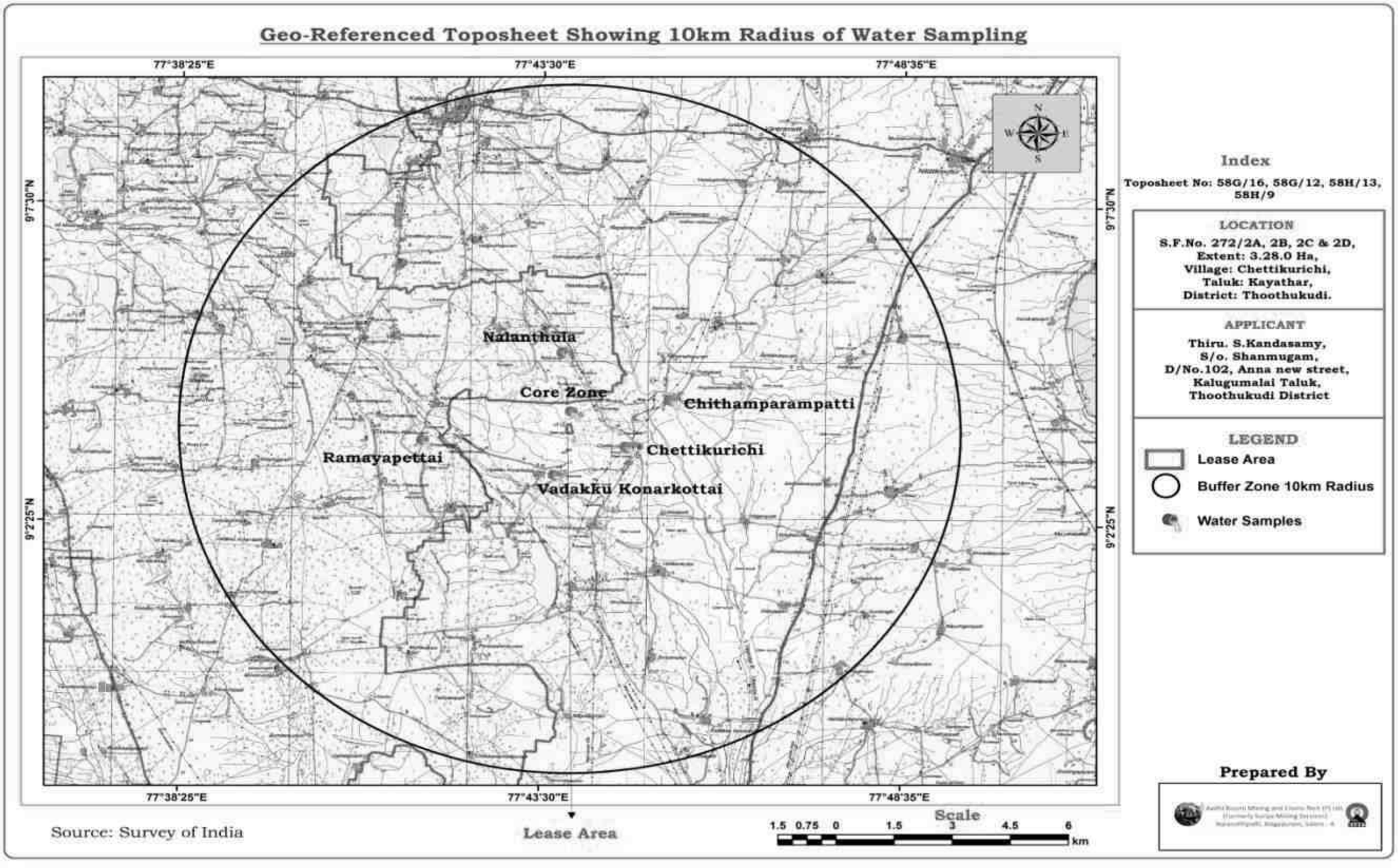


Fig No 3.8 Geo Referenced Toposheet showing water sampling station around 10km radius

Fig No 3.9 Water Sample collection at Core & Buffer Zone

Table 3.7 Result of Water Quality Analysis

Parameters	Units	As per IS 10500:2012		PROTOCOL: IS Methods	Core Zone	Buffer Zone				
		Requirement (Acceptable limit)	Permissible limit in the absence of alternate source			Chetti kurichi	Cithampa-rampatti	Nalanthula	Ramiyapatti	Vadakku Konarkottai
pH value at 25°C	-	6.5 – 8.5	6.5 – 8.5	IS 3025:P.11: 1983:R.2019	7.36	7.48	7.83	7.53	7.15	7.89
Electrical conductivity at 25°C	Micro mhos/ cm	-	-	IS 3025:P.14: 1984:R.2019	1666	1221	1720	1445	1353	1198
Turbidity	NTU	1	5	IS 3025:P.10: 1984:R.2017	BDL (DL:0.1)	BDL (DL:0.1)	BDL (DL:0.1)	BDL (DL:0.1)	BDL (DL:0.1)	BDL (DL:0.1)
Temperature	^{0}C	-	-	IS 3025:P.09: 1984:R.2017	25.2	25.4	25	25	25.5	27
Total Suspended Solids (TSS)	mg/l	-	-	IS 3025:P.17: 1984:R.2017	1	1	2	1	2	2
Total Dissolved Solids (TDS)	mg/l	500	2000	IS 3025:P.16: 1984:R.2012	1032	734	1064	864	820	700
Total Hardness as $CaCO_3$	mg/l	200	600	IS 3025:P.21: 2009:R.2019	330	200	390	290	385	423
Calcium as Ca	mg/l	75	200	IS 3025:P.40: 1991:R.2019	210	110	240	180	134	132
Magnesium as Mg	mg/l	30	100	IS 3025:P.46: 1994:R.2019	120	90	150	110	4	14

Chloride as Cl^-	mg/l	250	1000	IS 3025:P.32: 1988:R.2019	360	240	430	330	222	376
Total Alkalinity as $CaCO_3$	mg/l	200	600	IS 3025:P.23: 1986:R.2019	240	120	290	210	100	100
Carbonate	mg/l	-	-	IS 3025:P.51: 1986:R.2017	BDL (DL:1)	BDL (DL:1)	BDL (DL:1)	BDL (DL:1)	BDL (DL:1)	BDL (DL:1)
Bicarbonate	mg/l	-	-	IS 3025:P.51: 1986:R.2017	240	120	290	210	100	100
Sulphate	mg/l	200	400	IS 3025:P.24: 1986:R.2019	74	54	90	62	19	16
Iron	mg/l	0.3	0.3	IS 3025:P.53: 1984:R.2017	0.04	0.03	0.04	0.06	0.08	0.07

3.6.3 Interpretation of Water Quality Data

Water Quality results were compared with acceptable limits for Drinking Water as per the Standard IS 10500:2012.

- pH of the water samples ranged from 7.15-7.89. pH in water samples collected from the locations is within the permissible limit between 6.5-8.5.
- EC of the water samples ranged from 1198 to 1720 Micro mhos/cm in the samples collected.
- Turbidity from the water samples collected from both core and buffer area was observed to be in below detectable limit BDL (DL: 0.1).
- Total suspended solids are observed as 1-2 mg/l in all the water samples collected from both core and buffer area.
- Total Dissolved Solids found in the range of 700-1064 mg/l. In all the samples TDS was found beyond the acceptable limit of 500mg/l and maximum value of 1064 mg/l was recorded at Cithamarampatti Village. Minimum value was observed in 700 mg/l in Vadakku konarkottai but still exceeds the acceptable limit.
- Total Hardness of water sample of all the locations including core and buffer zone was found exceeding the acceptable limit of 200 mg/l except Chettikurichi (200 mg/l). The maximum value of 423mg/l was recorded at Vadakku konarkottai.
- Calcium values observed in core & buffer locations were in the range of 110-134mg/l. All other locations exceed the permissible limit.
- Magnesium values recorded in all locations were found to be above the acceptable limit such as 30 mg/l except Ramiyapatti (4 mg/l) & Vadakku konarkottai (14 mg/l).
- Chlorides in water samples collected from core and buffer areas was found to be above the acceptable limit such as 250 mg/l except Chettikurichi (240 mg/l) & Ramiyapatti village (222 mg/l).
- Iron & Sulfates in water samples collected from both core and buffer location were observed to be well within the limits.

3.7 Hydro Geology

3.7.1 Geophysical Survey to Locate Ground Water Table

Geo –Physical Resistivity survey has been conducted by Vertical Electrical Sounding (VES) method to probe ground water table, fracture zones, sub-surface conditions of the area andfinally to find the direct and indirect effects of mining on the ground water conditions.

3.7.2. Geophysical Investigation Method

A variety of methods are available to assist in the assessment of sub-surface geological conditions. The main emphasis of the field work undertaken was to determine the thickness and composition of the sub-surface formations and to identify water-bearing zones. This information was principally obtained in the field using vertical electrical soundings (VES). The VES probes the resistivity layering below the site of measurement. This method is described below

When carrying out a resistivity sounding, current is led into the ground by means of two electrodes. With two other electrodes, situated near the centre of the array, the potential field generated by the current is measured. From the observations of the current strength and the potential difference and taking into account the electrode separations, the ground resistivity can be determined.

During a resistivity sounding, the separation between the electrodes is step-wise increased (in what is known as a Schlumberger Array), thus causing the flow of current to penetrate greater depths. When plotting the observed resistivity values against depth on a graph sheet, a resistivity graph is formed, which shows the variation of resistivity with depth. This graph can be interpreted with the aid of a computer and the actual resistivity layering of the subsoil is obtained. The depths and resistivity values provide the hydro geologist with information on the geological layering and thus the occurrence of groundwater.

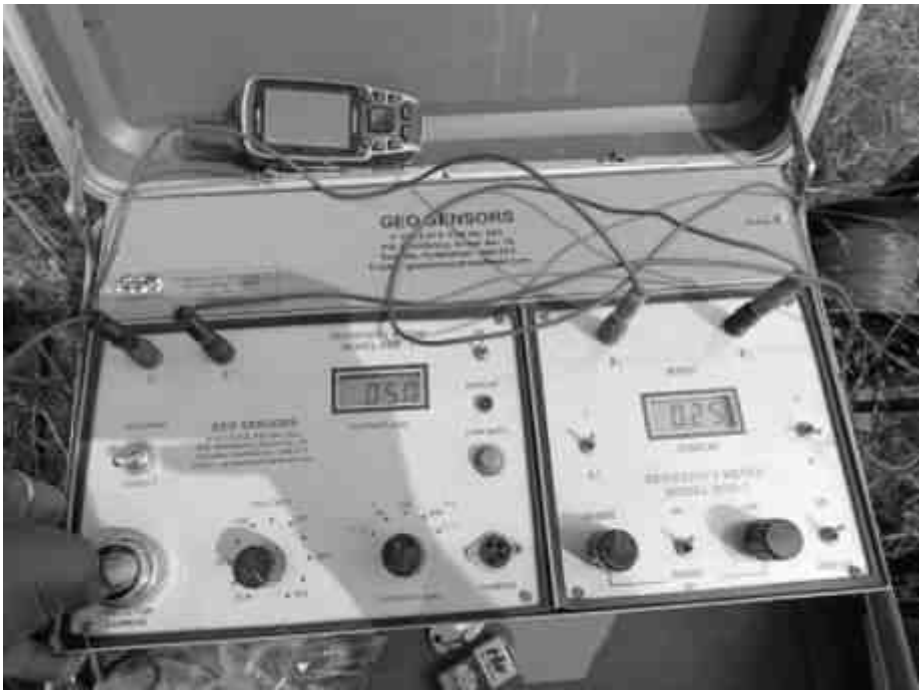


Fig No: 3.10 DDR 3 Resistivity Meter

3.7.3. Field Study

Electrical Resistivity survey by Schlumberger configuration was conducted to interpret various geological formation and possibility of water spring touch at various depths by Inverse slope method.

Geophysical prospecting by Resistivity survey has been conducted by Vertical Electrical Sounding (VES) method for S. Kandasamy Rough Stone & Gravel quarry, over an extent of 3.28.0 Hectares in S.F.No: 272/2A, 2B, 2C & 2DChettikurichi Village, Kayathar Taluk, Thoothukkudi District, Tamil Nadu to locate the depth of ground water table and springs adjacent to the Rough stone quarry to decipher the hydro geological condition of the area and to sink a tube wells to tap ground water for use and also use bore hole for recharging under Rain water harvesting scheme.

Fig No: 3.11 Geophysical Survey in S. Kandasamy Rough Stone & Gravel quarry

Aadhi Boomi Mining and Enviro Tech (P) LTD,
QCI/NABET ACCREDITED CONSULTANT OPGANIZATION
Groundwater Exploration - Salem & Tamil Nadu
(ELECTRICAL RESISTIVITY METHOD BY SCHLUMBERGER CONFIGURATION SURVEY)

Location : Chettikurichi Village, Kayathar Taluk, Thoothukkudi District, TN,
Date of Survey : 04.01.2023
Applicant Name : S. Kandasamy,
GPS Location : 9° 03' 56.83"N to 77° 43' 54.11" E.

AB/2 Depth (m)	MN/2 (m)	R VALUE	K CONST	R x k = ρA	$A\sqrt{\rho A}$ App. Resistivity	Difference	True Resistivity (OHMS)
1.5	0.5	17.89	6.3	112.70	0.14	0.14	114
3	0.5	10.50	27.5	288.75	0.17	0.03	2500
6	0.5	6.25	112.3	701.87	0.23	0.06	2500
9	0.5	4.64	253.6	1176.70	0.26	0.03	1000
12	0.5	3.78	451.4	1706.29	0.29	0.07	1826
12	2	9.73	109.9	1069.32	0.37		
15	2	4.18	173.5	725.23	0.56	0.23	170
20	2	3.0	310.9	932.7	0.65	0.09	3086
25	2	2.33	487.5	1135.87	0.74	0.09	3086
30	2	1.65	703.4	1160.61	0.88	0.18	771
30	6	4.26	226.1	963.18	0.96		
35	6	3.31	311.1	1029.74	1.09	0.17	295
40	6	2.55	409.2	1043.46	1.24	0.15	1111
45	6	1.99	520.5	1035.79	1.39	0.15	1111
50	6	1.69	644.7	1089.54	1.51	0.12	1736
60	6	1.24	932.6	1156.42	1.76	0.25	400
60	10	1.72	549.5	945.12	1.95		
70	10	1.08	753.6	813.80	2.45	0.60	277
80	10	0.92	989.1	909.10	2.65	0.20	2500
90	10	0.35	1256	1067	2.75	0.10	10000
100	10	0.73	1554.3	1134	2.96	0.21	2267
100	20		753.6				
110	20		918.5				
120	20		1099				
130	20		1295.3				
140	20		1507.2				
150	20		1734.9				
160	20		1978.2				
170	20		2237.3				
180	20		2512				
190	20		2802				
200	20		3108.6				

Low resistivity values observed in the top level, Medium value is observed at 4-30m between massive rocks. There is no weak zone observes around this Mines. The various geological formations and water touch as interpreted is given as below.

Table No: 3.8 Summaries of Resistivity survey

Layer	Depth (m)	Nature of formation	Resistivity Value
h1	0–6m	Top Soil & Weathered Rock	Low value ('Ω)
h2	7-55m	Massive formation	Medium value ('Ω)
h3	55m	Fracture Zone	Medium value ('Ω)
h4	>55	Massive formation	High value('Ω)

3.7.4 Pump Test

The site is located in flat terrain and small pit with massive rocks. There are few bore wells in the 10 km radius buffer zone. One of the bore well is located in the Chettikurichivillage which is reported to be 600 feet in depth and gives moderate yield. The bore well is fitted with 5 HP submergible pumps and water is pumped at intervals for M. Sand washing and dust suppression in roads.

The bore well recorded static water level of 56m and pumping level goes below 90m in 2 hours pumping. In order to avoid dry run of bore and ensure sustainability of yield, the bore well is pumped at intervals. The discharge of the well is measured by volumetric method from the time taken to fill the ground level sump and the estimated discharge is 37 litres per minute (Lpm). The pumping test is conducted in the bore well on 4th Jan 2023 and the drawdown and recovery data are given in Table 3.9 and 3.10

$$\textbf{Discharge Volume} = \frac{\textbf{200 (barrel)}}{\textbf{321(seconds)}} \times 60 = \textbf{37 Lpm}$$

The pumping head is more than 200m and the water level sounder with cable length of 105m were used for recording the fluctuation in water level during pumping and recovery period. The observed recovery data is used to get aquifer characteristics by applying the recovery formula. The semi-log plot is given in Figure no: 3.12 and the estimated Transimissivity value of 0.32m^2/day.

$$\textbf{Transimissivity} = \frac{2.303 \times Q}{4\pi\Delta S} = \frac{2.303 \times 37 \times 60 \times 8/1000m^3}{4x3.14x10} = \frac{40.90}{125.6} = \textbf{0.32m}^{\textbf{2}}\textbf{/day}$$

Table 3.9 Pump Test

Site name with coordinates	Chettikurichi Rough stone and Gravel Quarry Coordinates: 9° 03' 56.83"N to 77° 43' 54.11" E.			
Location details	S. Kandasamy Rough Stone & Gravel quarry, Chettikurichi Village, Kayathar Taluk, Thoothukkudi District, Tamil Nadu.			
Block	Kayathar			
District &State	Thoothukkudi & Tamil Nadu			
Type of well	Bore well : 850 feet depth (259.08m)			
Date of test & start time	04.01.2023 ; 10.00 hours			
Diameter of well(mm)	165			
Distance from the observation well(mm)	No observation well			
Capacity of the pump	5 HP			
Discharge (Ipm)	37LPM			
Measuring point (m)	Ground level			
SWL in m below measuring point	55.75 m			
Clock Time (HH/MM)	**Time since pumping started (Mints)**	**Pumping Water Level (m bmp)**	**Draw down (m)**	**Remarks**
10.00	0	55.75	0	**Pump started**
10.01	1	57.25	1.5	
10.02	2	60.95	5.2	
10.03	3	61.46	5.71	
10.04	4	63.63	7.88	37Lpm
10.05	5	65.4	9.65	
10.06	6	67.52	11.77	
10.07	7	70.78	15.03	
10.08	8	73.55	17.8	
10.09	9	76.25	20.5	
10.10	10	79.46	23.71	
10.12	12	79.68	23.93	
10.14	14	79.93	24.18	37Lpm
10.16	16	80.55	24.80	

10.18	18	80.95	25.2	
10.20	20	81.85	26.1	
10.25	25	82.65	26.9	
10.30	30	83.48	27.73	
10.35	35	84.25	28.5	
10.40	40	84.86	29.11	37Lpm
10.45	45	85.41	29.66	
10.50	50	85.96	30.21	
10.55	55	86.72	30.97	
11.00	60	87.8	32.05	
11.10	70	88.7	32.95	
11.20	80	89.05	33.3	
11.30	90	90.69	34.94	
11.40	100	93.45	37.7	**Pump stopped**

Table-3.10 Recuperation Test

Time in Hours	Time since pump stopped (min) (t')	Time since starting of pumping (min)(t)	Water Level (m bmp)	Residual Drawdown RDD (m)	t/t'
11.40	0	100	93.45	37.7	0
11.41	1	101	90.6	34.85	101.00
11.42	2	102	90.0	34.25	51.00
11.43	3	103	89.51	33.76	34.33
11.44	4	104	88.97	33.22	26.00
11.45	5	105	88.44	32.69	21.00
11.46	6	106	87.43	31.68	17.67
11.47	7	107	87.23	31.48	15.29
11.48	8	108	87.00	31.25	13.50
11.49	9	109	86.87	31.12	12.11
11.50	10	110	86.32	30.57	11.00
11.52	12	112	85.78	30.03	9.33
11.54	14	114	85.25	29.5	8.14
11.56	16	116	84.90	29.15	7.25
11.58	18	118	84.15	28.4	6.56
12.00	20	120	83.90	28.15	6.00

12.05	25	125	83.05	27.3	5.00
12.10	30	130	82.50	26.75	4.33
12.15	35	135	81.96	26.21	3.86
12.20	40	140	81.43	25.68	3.50
12.25	45	145	80.87	25.12	3.22
12.30	50	150	80.32	24.57	3.00
12.40	60	160	79.78	24.03	2.67
12.50	70	170	79.25	23.5	2.43
13.00	80	180	78.70	22.95	2.25
13.10	90	190	78.15	22.4	2.11
13.20	100	200	77.20	21.45	2.00
13.40	120	220	76.21	20.46	1.83
13.00	140	240	75.24	19.49	1.71
14.20	160	260	74.28	18.53	1.63
14.40	180	280	73.30	17.55	1.56

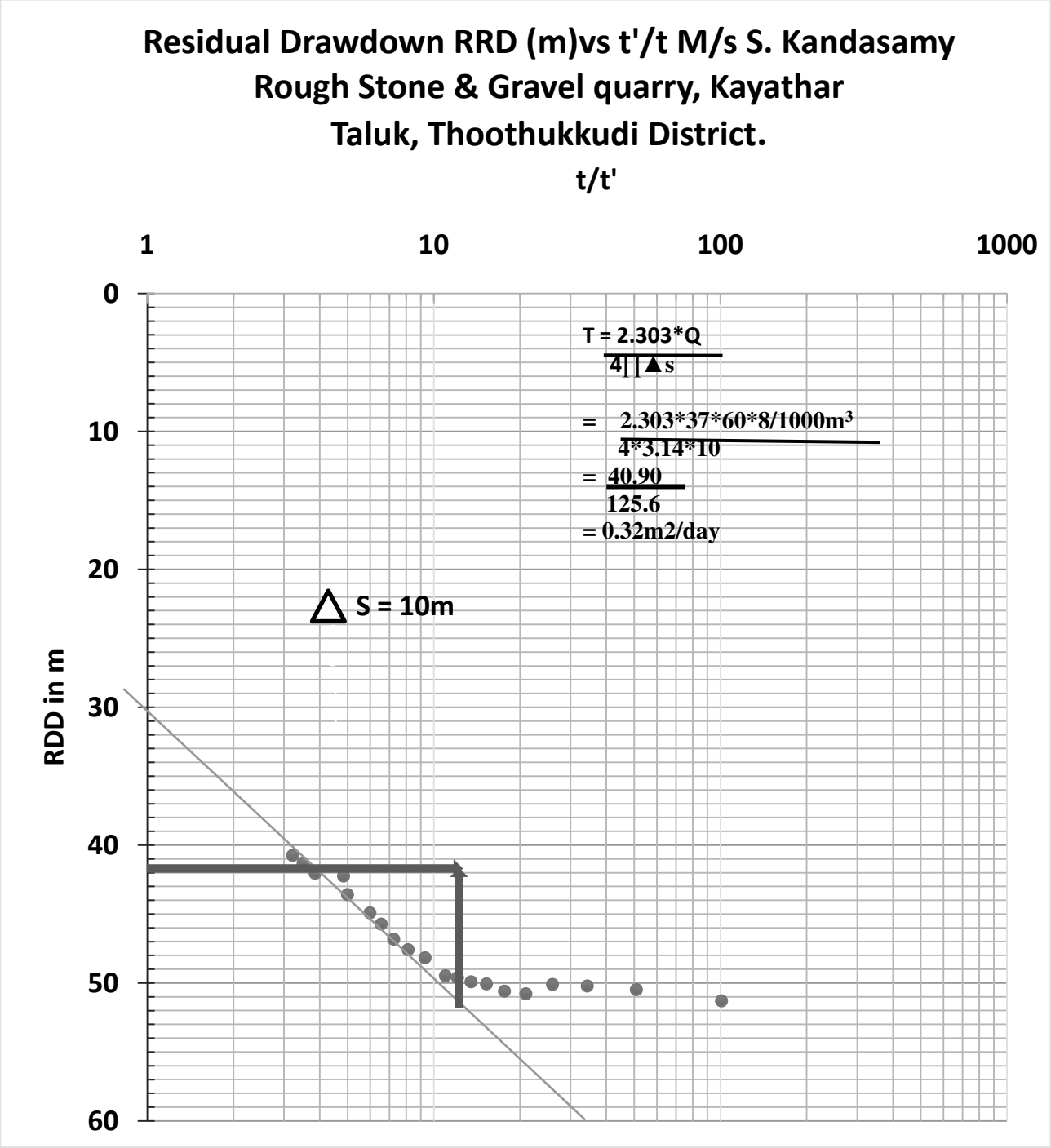


Fig. 3.12: Pump Test – Draw down/Recuperation measurements

3.8 Soil Environment

The type of soil is an important factor for the growth of plants and crops in any area. The soil system has various criteria to classify the soils of a region such as geology, humidity, rainfall pattern, soil texture, soil salinity etc.

Soil quality study has been carried out at the site and in the study area of 10 km radius around the project site to understand the physical-chemical nature of the soil. Soil sampling was carried out at 6 selected locations.

The frequency and methodology of soil quality sampling process is given in Table No.3.11. Moreover, Georeferenced soil map of around 10 km radius is given in Fig No.3.13. Table 3.12 presents the soil quality monitoring locations of the study area. The sampling was carried out once in the study period.

Table 3.11 Frequency and Methodology for Soil sampling & monitoring

S.No	Particulars	Details
1	Frequency	One sample from each station— once during the Study Period
2	Methodology	Soil Sample has been collected as per the CPCB standard

3.8.1 Methodology of Soil Environment

Soil samples were collected from different depth below the surface. The samples were filled in polythene bags, labeled in the field with number and site name and sent to laboratory for analysis. The samples were homogenized and the quality was reduced using the coning and quartering method to provide a respective sample for analysis. The samples were analyzed as per Indian Standards IS: 2720 (Revised Parts).

- To determine the baseline soil characteristics of the study area
- To determine the impact of the project on soil characteristics and
- To determine the impact on soils more importantly loss of fertility from agricultural productivity point of view.

Table 3.12 Soil Sampling Locations

CODE	Place	Latitude (N)	Longitude (E)	Distance w.r.t Mine Site	Direction w.r.t Mine Site
SQ1	Core Zone	9°4'8.93"N	77°43'56.73"E	0.28	N
SQ2	Chettikurichi	9°3'35.81"N	77°44'42.77"E	1.48	SE
SQ3	Cithamparampatti	9°4'20.75"N	77°45'19.66"E	2.67	NE
SQ4	Nalanthula	9°5'4.76"N	77°43'47.11"E	2.00	N
SQ5	Ramiyapatti	9°3'41.08"N	77°41'52.27"E	3.67	W
SQ6	Vadakku Konarkottai	9°3'8.61"N	77°43'42.80"E	1.33	S

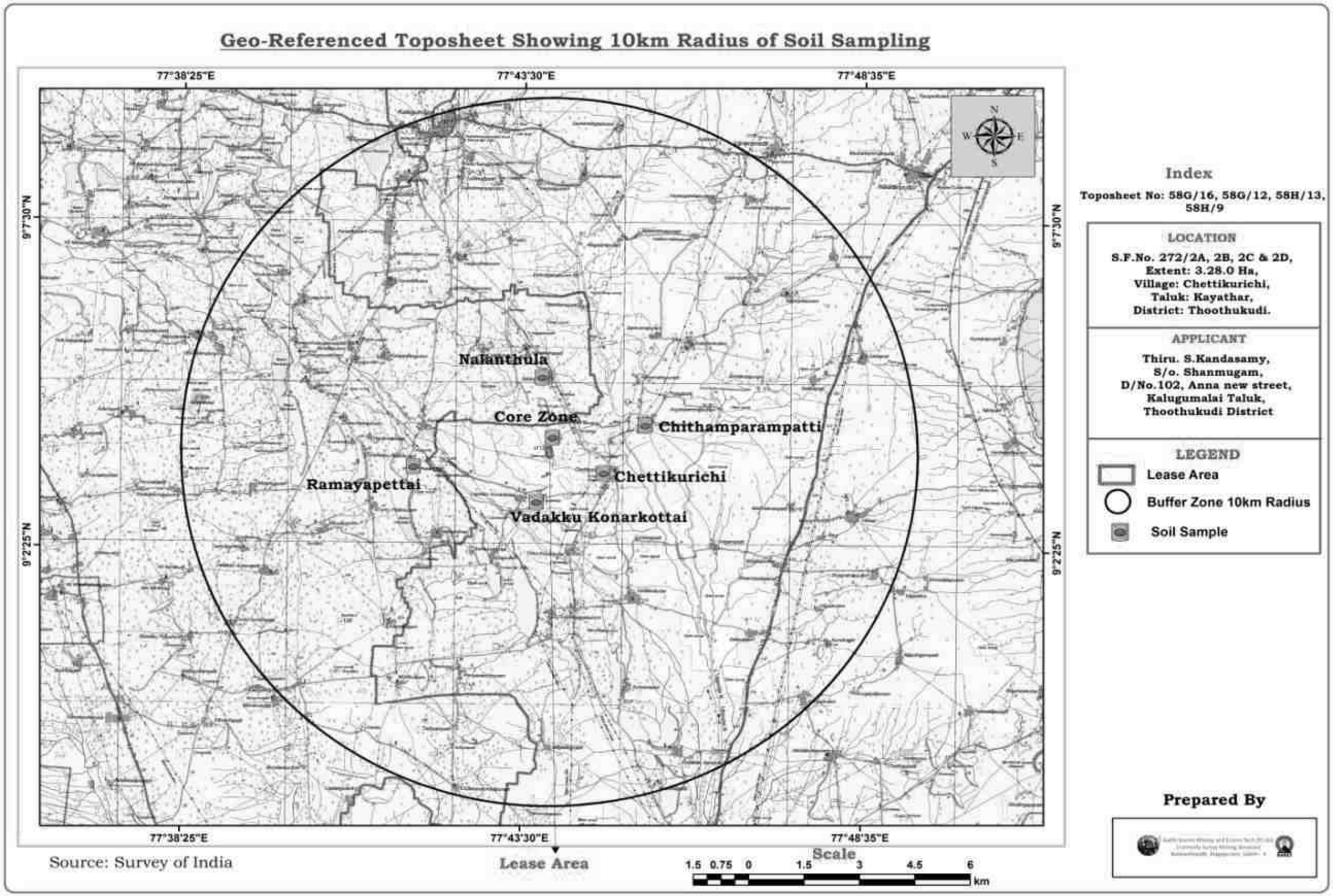


Fig No 3.13 Geo referenced Toposheet showing Soil sampling Locations around 10km radius

Fig No 3.14 Soil Sampling at Core and Buffer Zone

Table 3.13 Result of Soil Sample Analysis

S.No	Parameters		Core Zone	Buffer Zone				
				Chettikurichi	Cithamparampatti	Nalanthula	Ramiyapatti	Vadakku Konarkottai
	Physical Parameters							
1	pH Value		7.12	8.05	8.2	8.15	7.18	7.24
2	EC@25C (Micromhos/cm)		187	226	240	270	190	197
3	Moisture %		2.03	3.2	4.4	3.5	2.5	2.08
4	Bulk density g/cc		1.03	1.15	1.18	1.22	1.02	1.05
5	Water Holding capacity %		48	68	64	68	56	54
6	Texture %	Sand	48	54	37.1	29.4	48	52
		Silt	32	24	33.3	32.3	24	28
		Clay	20	22	29.6	30.2	28	20
			Sandy Loam	Sandy Clay Loam	Clay Loam	Clay Loam	Sandy Clay Loam	Sandy Loam
	Chemical Parameters							
7	Organic Matter %		0.88	1.46	1.55	1.32	0.78	0.85
8	Calcium %		0.003	0.003	0.002	0.002	0.004	0.003
9	Magnesium %		BDL(DL:0.1)	BDL(DL:0.1)	BDL(DL:0.1)	BDL(DL:0.1)	BDL(DL:0.1)	BDL(DL:0.1)
10	Chlorides %		0.005	0.004	0.003	0.004	0.005	0.004
	BDL = Below Detectable Limit: DL = Detection Limit							

3.8.2 Observations

Soil characteristics were delineated through specific parameters viz. moisture, bulk density, texture, water holding capacity, organic matter and other parameters as depicted in Table 3.9.

pH is an important parameter indicative of alkaline or acidic nature of soil. It greatly affects the microbial population as well as solubility of metal ions and regulates nutrient availability. The pH varies from 7.12 to 8.2 in the soil samples. The pH value was found neutral in nature.

Electrical conductivity (EC), a measure of soluble salts in the soil was in the range of 187 µS/cm to 270 µS/cm.

Regular cultivation practices increase the **bulk density** of soils thus inducing compaction. This results in reduction in water percolation rate and penetration of roots through soils. The soils with low bulk density have favorable physical conditions whereas those with high bulk density exhibit poor physical conditions for agriculture crops. The bulk density of the soil samples are in the range of 1.02g/cc to 1.22g/cc respectively, which indicate favorable physical condition for plant growth.

Water holding capacity was found to be in the range of 48% to 56% in all the soil samples collected from core and buffer villages.

Organic matter present in soil influences its physical and chemical properties and is responsible for stability of soil aggregates. Organic matter was found to be in the range of 0.78- 1.55%. This shows that soil was deficient in organic matter content.

Available Chlorides content range of between 0.003-0.005 mg/kg in both core and buffer villages. **Magnesium** level of soil sample in the core zone and buffer zone was found to be BDL (DL: 0.1) in all the soil samples collected.

Calcium content in these soils ranges between 0.002–0.004 mg/kg thereby indicating that the soils are with low levels of available Calcium content.

3.9 ECOLOGY AND BIOLOGICAL ENVIRONMENT

3.9.1 Description of Thoothukudi District Environment

Traditionally known as “Pearl City” on account of the prevailing Pearl fish in the past in the area, Thoothukudi has a fascinating History.

It is situated in the extreme south-eastern corner of Tamil Nadu state and bounded on the north by the districts of Tirunelveli, Virudhunagar and Ramanathapuram, on the east and south-east by Gulf of Mannar and on the west and south-west by the district of Tirunelveli. Total area of this district is 4621 sq kms and the administrative headquarters is an urban agglomeration and also one of the Taluk headquarters within the district.

This district comprises 20 town panchayats two municipalities and one corporation. There are 468 revenue villages, grouped in 408 village panchayats.

The district has a hot tropical climate. High relative humidity prevails throughout the year between 60 and 75%. During months of April, May and June Thoothukudi district is hot. During winter that is in the months of December and January, the climate is pleasant. The maximum temperature is 35.8° C and the minimum is 22.8°C. When the North East Monsoon started the actual rainfall was higher up to 584.10 millimetres.

3.9.2 Agriculture activities in Thoothukudi District

Agriculture is the main occupation on which 70% of the people depend on it. The main food crop in this district is paddy. Out of the total area of 4,70,724 hectares, 1,90,780 hectares are brought under the cultivation of different crops which is nearly 41% of total area of the district. The important food crops in the district are paddy, Cholam, cumbu, ragi, varagu, samai and commercial crops like cotton, chilly, sugarcane and groundnut

Table 3.14 Details of Important cash crops/ Horticulture crops in Thoothukudi District

Sl. No	Common name	Scientific name	Family
1.	Paddy	*Oryza sativa*	Poaceae
2.	Kuthiraivali	*Echinochloa frumentacea*	Poaceae
3.	Horsegram	*Macrotyloma uniflorum*	Fabaceae
4.	Cholam	*Sorgham bicolor*	Poaceae
5.	Kambu	*Pennisetum glaucum*	Poaceae
6.	Ragi	*Eleusine coracana*	Poaceae
7.	Groundnut	*Arachis hypogaea*	Fabaceae

8.	Sugarcane	*Saccharum officinarum*	Poaceae
9.	Maize	*Zea mays*	Poaceae
10.	Green gram	*Vigna radiata*	Fabaceae
11.	Red gram	*Cajanus cajan*	Fabaceae
12.	Castor	*Ricinus communis*	Euphorbiaceae
13.	Black gram	*Vigna mungo*	Fabaceae
14.	Cotton	*Gossypium herbaceum*	Malvaceae
15.	Vargu	*Paspalums crobiculatum*	Poaceae
16.	Marigold plant	*Tagetes erecta*	Asteraceae
17.	Firecracker flower	*Crossandra infundibuliformis*	Acanthaceae

3.9.3 Forest resources

Total area under forest in the district is 11012 hectares**.** Reserved forests are 7,121 hectares, reserved lands 3,889 hectares. Vallanadu Blackbuck Sanctuary is located in Vallanadu village of Srivaikundam Taluk on Tirunelveli – Thoothukudi road at a distance of 18km from Tirunelveli. The Vallanadu Blackbuck sanctuary is located in an isolated hillock with scrub forest

3.9.4 Water resources

The river Tamirabarani flows through this district. The area under the river basin within the district is 78,698.8 hectares.

Pambayar and Manimuthar are the chief tributaries of Tamiraparani, which pass through the District. The Malattar and Uppodai flowing in Kovilpatti Taluk are drainage courses. Tamiraparani and Manimutharu are the catchment areas of river basins, which have their place of origin in the Pothigaimalai.

3.9.5 Study Area Ecology

A survey was conducted to study the flora around 10 km radius. Some of the information was gathered from the local habitants. All the collected data were classified to interpret the impact of pollution on the flora and fauna of that region. Survey of the mild plants as well as cultivated crop plants was made and all the available information was recorded. The primary data collected was compared with the Secondary data collected from Forest Department. There are no ecologically

sensitive areas such as Biosphere reserves, Wildlife Sanctuaries, national Parks and other protected areas in or around the project site in a radius of 10 km.

3.9.6 Methodology of Sampling

A methodology of sampling, flora and fauna studies were carried out during the winter season to assess the list of terrestrial plant and animal species that occur in the core area and the buffer area up to 10 km radius from the project site. No damage is created to flora and fauna during the sampling. None of the specimens were collected as voucher specimens and for the herbarium. It is basically done through field observations only. The study of flora is conducted as per the guidelines of the Ministry of Environment Forest and Climate Change (MoEFCC) and Botanical Survey of India (BSI).

The study involved in the collection of primary data by conducting a survey in the field, examination of flora and fauna records in previously published reports and records. Analysis of the information is the view of the possible alteration in the environment of the project site. For the survey of fauna, both direct and indirect observation methods were used

3.9.7 Sampling Method of Flora

The present study on the floral assessment for the proposed project activity is based on extensive field survey of the area. The plant species were identified with the help of plant taxonomy manual, literatures and Botanical Survey of India website (efloraindia.nic.in). In addition besides the collection of plant species, information was also collected with vernacular names of plant species made by local inhabitants.

- Status of floral species was assessed in the representative habitat types (Forest, Agriculture and Wetland habitats) existing in the study area.

- Quantitative data were collected using standard Quadrate methods using circular plots followed by Mueller-Dombois and Ellenberg (1967) and Kershaw (1973).

- Status of tree, shrub and annuals (grass and herb) were quantified using circular plots of different sizes, 15m, 8m radius and 1 x 1m two plots respectively. Others like climbers and creepers found within the 8m radius plots were also identified and enumerated

3.9.7.1. Flora in Core Zone

Taxonomically a total of 39 species distributed in 26 families have been recorded from the core mining lease area. Based on habitat classification of the enumerated plants the majority of species were tree 22 (56%) followed by shrubs 6(15%), herbs 9 (23%) and creeper 2 (5%). Details of flora with the scientific name were mentioned in Table No. 3.15 and Fig No: 3.15. No ecologically sensitive plant species has been reported from this area.

3.9.7.2. Flora in Buffer Zone

Taxonomically a total of 63 species distributed among 35 families have been recorded from the buffer area. Based on habitat classification of the enumerated plants the majority of species were tree 31 (49%) followed by shrubs 13(21%), herbs 15(24%) and rest 4 (6%) is a climber. Details of flora with the scientific name were mentioned in Table No. 3.15 and Fig No: 3.15.

Table 3.15 Floral Diversity in Core and Buffer area (Thiru S. Kandasamy Rough Stone and Gravel, Thoothukudi District)

Sl.No.	Common Name	Local Name	Family	Scientific Name	Core	Buffer
TREES						
1.	Coconut Tree	Tennai Maram	Arecaceae	*Coccus nucifera*	+	+
2.	Banana Tree	Vaazhai Maram	Musaceae	*Musa paradisica*	-	+
3.	Manila tamarind	Kodukkapuli Maram	Fabaceae	*Pithecellobium dulce*	+	+
4.	Palmyra palm Tree	Panai Maram	Arecaceae	Borassus flabellifer	+	+
5.	Bamboo Tree	Munkil Maram	Poaceae	*Bambusa vulgaris*	+	+
6.	Teak Tree	Tekku Maram	Lamiaceae	*Tectona grandis*	+	+
7.	South West Thorn	Seemai karuvellam	Fabaceae	*Prospis juliflora*	+	+
8.	Otaheite gooseberry Tree	Siru neli Maram	Phyllanthaceae	*Phyllanthus acidus*	+	+
9.	Drumstick Tree	Murungai Maram	Moringaceae	*Moringa oleifera*	+	+
10.	Guava Tree	Koiya Maram	Myrtaceae	*Psidium guajava*	+	+
11.	Neem Tree	Vempa Maram	Meliaceae	*Azadirachta india*	+	+
12.	Papaya Tree	Papali Maram	Caricaceae	Carica Papaya	+	+
13.	Indian date Tree	Elandhai Maram	Rhamnaceae	*Ziziphus mauritiana*	+	+
14.	Mango Tree	Maa Maram	Anacardiaceae	*Mangifera indica*	+	+
15.	Iron wood Tree	Savukku Maram	Casuarinaceae	*Casuarina equisetifolia*	+	+
16.	Lemon Tree	Ealumichai Maram	Rutaceae	*Citrus limon*	-	+
17.	Black plum Tree	Naval Maram	Myrtaceae	*Syzygium cumini*	+	+
18.	Sapodilla Tree	Sappota Maram	Sapotaceae	*Manilkara zapota*	-	+
19.	Lemon-Scented Gum	Thaila Maram	Myrtaceae	*Eucalyptus citriodora*	+	+
20.	Chebulicmyrobalan	Kadukkai Maram	Combretaceae	*Terminalia chebula*	-	+

21.	Pungamin Tree	Pungai Maram	Fabaceae	*Pongamia pinnata*	+	+
22.	Custard apple	Seethe pazham Maram	Annonaceae	*Annona squamosa*	+	+
23.	Thorn mimosa	Karuvelam Maram	Mimosaceae	*Acacia nilotica*	+	+
24.	Tamarind	Puliya Maram	Fabaceae	*Tamarindus indica*	+	+
25.	Sweet acacia Tree	Kastuurivel Maram	Fabaceae	*Vachellia farnesiana*	-	+
26.	Bodhi Tree	Arasa Maram	Moraceae	*Ficus Religiosa*	-	+
27.	Cannonbal tree	Nagalinga Maram	Lecythidaceae	*Couroupita guianensis*	-	+
28.	Scarlet Wistaria Tree	Aagathikerai Maram	Fabaceae	*Sesbania grandiflora*	-	+
29.	Banyan Tree	Ala Maram	Moraceae	*Ficus benghalensis*	-	+
30.	Cluster fig	Aathi Maram	Moraceae	*Ficus racemosa*	+	+
31.	Portia Tree	Poovarasa Maram	Malvaceae	*Thespesia populnea*	+	+
SHRUBS						
1.	Prickly pear	Sappathi kalli	Cactaceae	*Opuntia ficus indica*	+	+
2.	Madagascar Periwinkle	Nithiya kalyani	Apocynaceae	*Vinca rosea*	+	+
3.	Scarlet jungle flame	Ittili poo/ Sinduram	Rubiaceae	*Ixora coccinea*	-	+
4.	Henna plant	Maruthani chedi	Lythraceae	*Lawsonia inermis*	+	+
5.	Gwar patha	Katrazai	Liliaceae	*Aloe barbadensis miller*	+	+
6.	Peacock flower	Mayil kontai	Fabaceae	*Caesalpinia pulcherrima*	-	+
7.	Marigold	Samanthi cheedi	Asteraceae	*Tagetes erecta*	-	+
8.	Firecracker flower	Kanakambaram	Acanthaceae	*Crossandra infundibuliformis*	-	+
9.	Hibiscus	Sembarutti	Malvaceae	*Hibiscus rosanaceae*	-	+
10.	Crown flower	Erukku cheedi	Apocynaceae	*Calotropis gigantean*	+	+
11.	Jimson weed	Ummathai cheedi	Solanaceae	*Datura stramonium*	+	+
12.	Coat buttons	Kenathuppondu	Asteraceae	*Tridax porcumbens*	-	+

13.	Rose	Rosa	Rosaceae	*Rosa rubiginosa*	-	+
HERBS & GRASS						
1.	Castor bean	Aamanakku	Euphorbiaceae	*Ricinus communis*	+	+
2.	Bellyache Bush	Aathalai	Euphorbiaceae	*Jatropha glandulifera*	+	+
3.	Tanner's cassia	Avaram poo Maram	Fabaceae	*Senna auriculata*	+	+
4.	Indian Copper leaf	Kuppaimeni chedi	Euphorbiaceae	*Acalypha indica*	-	+
5.	Chinese chaste	Nocchi Chedi	Lamiaceae	*Vitex negundo*	+	+
6.	Bladder cherry	Sodakku thakkali chedi	Solanaceae	*Physalis minima*	-	+
7.	Black nightshade	Mana thakkali chedi	Solanaceae	*Solanum nigum*	-	+
8.	Holy basil	Thulasi chedi	Lamiaceae	*Ocimum tenuiflorum*	-	+
9.	Turkey berry	Sundakkai chedi	Solanaceae	*Solanum torvum*	-	+
10.	Balloon vine	Mudakattan chedi	Sapindaceae	*Cardiospermum halicacabum*	+	+
11.	Bitter cassava	Maravali kilanku chedi	Euphorbiaceae	*Manihot esculenta C.R*	+	+
12.	Palisade grass	Pala pul	Poaceae	*Brachiaria ramosa*	-	+
13.	Nut grasses	Korai pul	Cyperaceae	*Cyperus rotundus*	+	+
14.	Indian doab	Arugampul	Poaceae	*Cynodon dactylon*	+	+
15.	Carrot grass	Mookkuthi poo	Asteraceae	*Parthenium hysterophorus*	+	+
CREEPERS/CLIMBERS						
1.	Melothria scabra	Paluvakkai	Cucurbitaceae	*Melothria scabra*	+	+
2.	Bitter melon	Pavakkai	Cucurbitaceae	*Momordica charantia*	-	+
3.	Veldt grape	Perandai	Vitaceae	*Cissusqua dranqularis*	+	+
4.	Ivy gourd	Kovakkai	Cucurbitaceae	*Coccinia grandis*	-	+

Fig a. Ricinus communis

Fig b. Opuntia ficus indica

Fig c. Ziziphus mauritiana

Fig d. Psidium guajava

Fig e. Vinca rosea

Fig f. Carica papaya

Fig g. Cissusqua dranqularis

Fig h. Senna auriculata

Fig i. Bambusa vulgaris

Fig j. Musa paradisiaca

Fig k. Jatropha glandulifera

Fig l. Sesbania grandiflora

Fig No 3.15 Photos of Flora in Core and Buffer area

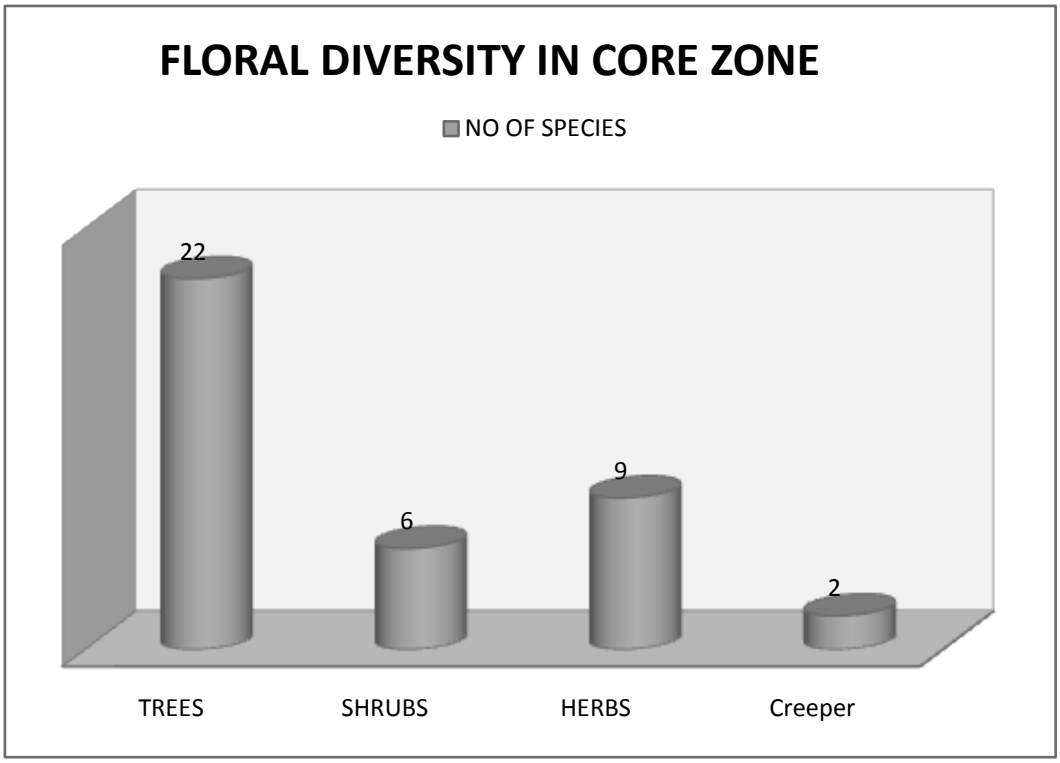


Fig No 3.16 Flora diversity in Core Zone

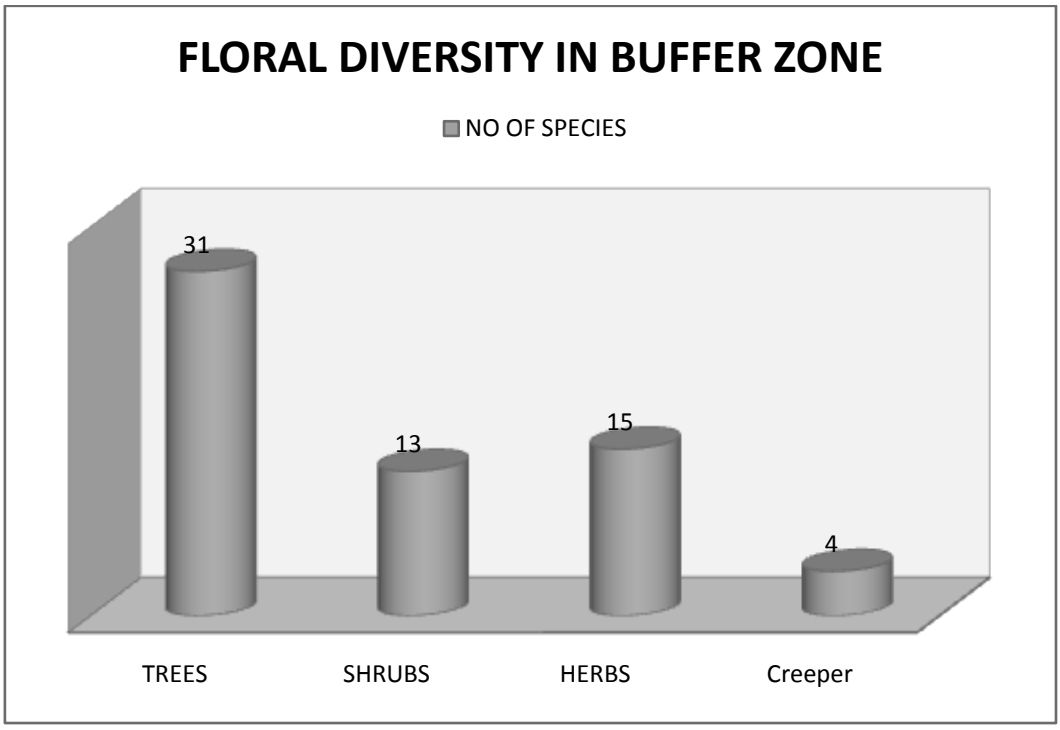


Fig No 3.17 Flora diversity in Buffer Zone

3.9.8. Fauna

The fauna survey has been carried out as per the methodology cited and listed out Mammals, birds, Reptiles, Amphibians, and Butterflies. All the listed species were compared with Red Data Book and Indian Wildlife Protection Act, 1972.

The study of fauna takes a substantial amount of time to understand the specific fauna characteristics of the area. The assessment of fauna has been done on the bases of primary data collected from the project sites. The presence was also confirmed from the local inhabitants depending on the animal sightings and the frequency of their visits in the project area. In addition, officials, local peoples were another source of information for studying the fauna of the area. Field activities are physical/active search, covering rocks, burrows, hollow inspection and location of nesting sites and habitat assessment etc. Taxonomical identification was done by the field guide book and wildlife envis database (wiienvis.nic.in/Database/Schedule Species Database) and Zoological Survey of India (ZSI).

Table 3.16 Methodology applied during survey of fauna

S. No	Taxa	Method of Sampling	References
1	Insects	Random walk, Opportunistic observations	Pollard (1977); Kunte (2000)
2	Reptiles	Visual encounter survey (Direct Search)	Daniel J.C (2002)
3	Amphibians	Visual encounter survey (Direct Search)	
4	Mammals	Tracks and Signs	Menon V (2014)
5	Avian	Random walk, Opportunistic observations	Ali S (1941); Grimmett R (2011); Collins 2015

3.9.8.1. Fauna in Core Zone

Varieties of species were observed in the core zone (0-2km radius) of the Quarry. Number of species decreases towards the mining area this might be due the lack of vegetation and forest cover in mining lease area. None of these species are threatened or endemic. Taxonomically a total of 25 species belonging to 25 families have been recorded from the core mining lease area. Based on habitat classification the majority of species were birds 10 (40%) followed by insects 9 (36%), reptiles 2 (8%) and mammals 4 (16%). Dominant species were mostly birds and insects no amphibians were observed during the extensive field visit. Details of fauna with the scientific name were mentioned in Table 3.17.

There are no critically endangered, endangered, vulnerable and endemic species were observed.

3.9.8.2. Fauna in Buffer Zone

Taxonomically a total of 39 species belonging to 39 families have been recorded from the buffer mining lease area. Based on habitat classification the majority of species were birds 16 (41%) followed by insects 14 (36%), reptiles 3 (8%) and mammals 6 (15%). There were no critically endangered, endangered, vulnerable and endemic species were observed. Details of fauna with the scientific name were mentioned in Table 3.17.

There were no critically endangered, endangered, vulnerable and endemic species were observed.

Table 3.17 Faunal in Core and Buffer area (Thiru S. Kandasamy Rough Stone and Gravel Thoothukudi District)

Sl. No	Common Name	Family Name	Scientific Name	Core Area	Buffer Area	Schedule list wildlife protection act 1972	IUCN Red list data
MAMMALS							
1.	Common mongoose	Herpestidae	*Herestes edwardsii*	-	+	NL	NL
2.	Palm squirrel	Sciuridae	*Funambulus pennantii*	+	+	NL	NL
3.	Bat	Pteropodidae	*Pteropus medius*	+	+	NL	NL
4.	Indian mole rat	Muridae	*Bandicota bengalensis*	-	+	NL	NL
5.	Indian rat	Muridae	*Mus rattus*	+	+	NL	NL
6.	Cat	Felidae	*Felis catus*	+	+	NL	NL
INSECTS							
1.	Blister beetle	Meloidae	*Mylabris phalerata*	+	+	Schedule IV	LC
2.	Peacock pansy	Nymphalidae	*Junonia almana*	+	+	NL	
3.	Mottled emigrant	Pieridae	*Catopsilia pyranthe*	+	+	Schedule IV	LC
4.	Red-veined darter	Libellulidae	*Sympetrum fonscolombii*	-	+	Schedule IV	LC
5.	Common grass yellow	Pieridae	*Eurema brigitta*	-	+	Schedule IV	LC
6.	Marbled white	Nymphalidae	*Melanargia galathea*	-	+	Schedule IV	LC
7.	Banded hairstreak	Lycaenidae	*Satyrium calanus*	-	+	Schedule IV	NE
8.	Blue basher	Libellulidae	*Pachydiplax longipennis*	+	+	NL	LC
9.	White butterfly	Pieridae	*Pieris rapae*	-	+	Schedule IV	LC
10.	Milkweed butterfly	Nymphalidae	*Danaus plexippus*	+	+	NL	LC
11.	Red-veined darter	Libellulidae	*Sympetrum fonscolombii*	+	+	NL	LC
12.	Common Tiger	Nymphalidae	*Dananus genutia*	+	+	NL	NE
13.	Yellow pansy	Nymphalidae	*Junonia hierta*	+	+	NL	NE

14.	Lime butterfly	Papilionidae	*Papilio demoleus*	+	+		
REPTILES							
1.	Green Lizard	Chamaeleonidae	*Chamaeleon zeylanicus*	+	+	NL	NL
2.	Garden Lizard	Agamidae	*Calotes verticolor*	-	+	NL	NL
3.	Wall Lizard	Gekkonidae	*Hemidactylus sps.*	+	+	NL	LC
BIRDS							
1.	Common myna	Sturnidae	*Acridotheres tristis*	+	+	NL	LC
2.	Red vented bulbul	Pycnonotidae	*Pycnonotus cafer*	-	+	NL	LC
3.	Paddy bird	Ardeidae	*Ardeola grayii*	+	+		
4.	Rock pigeon	Columbidae	*Columba livia*	-	+	NL	LC
5.	Purple heron	Ardeidae	*Ardea purpurea*	-	+		
6.	Thick billed warbler	Acrocephalidae	*Iduna aedon*	+	+	NL	LC
7.	Small mini vert	Campephagidae	*Pericrocotus cinnamomeus*	-	+	NL	LC
8.	Black kite	Accipitridae	*Milvus migrans*	+	+	NL	LC
9.	Common cuckoo	Cuculidae	*Cuculus canorus*	+	+	NL	LC
10.	Streak throated swallow	Hirundinidae	*Petrochelidon fluvicola*	-	+	NL	LC
11.	House Crow	Corvidae	*Corvus splendens*	+	+	NL	LC
12.	koel	Cuculidae	*Eudynamys scolopaceus*	+	+	NL	LC
13.	Common hen	Phasianidae	*Gallus Gallus domesticus*	+	+	NL	LC
14.	Indian robin	Muscicapidae	*Saxicoloide sfulicatus*	+	+	NL	LC
15.	Parrot	Psittacidae	*Psittacula eupatria*	-	+	NL	LC
16.	House sparrow	Passeridae	*Passer domestics*	+	+	NL	LC

((+) Symbol indicate presence of Species, (-) Symbol indicate absence of Species, *NL- Not listed, NE- Not evaluated, LC- Least concern)

Fig. a Mylabris phalerata

Fig. b Funambulus pennantii

Fig. c. Pachydiplax longipennis

Fig. d. Ardeola grayii

Fig.e. Junonia almana

Fig.f. Chamaeleon zeylanicus

Fig.g. Ardea purpurea

Fig.h. Junonia hierta

Fig No 3.18 Photos of Fauna in Core Area

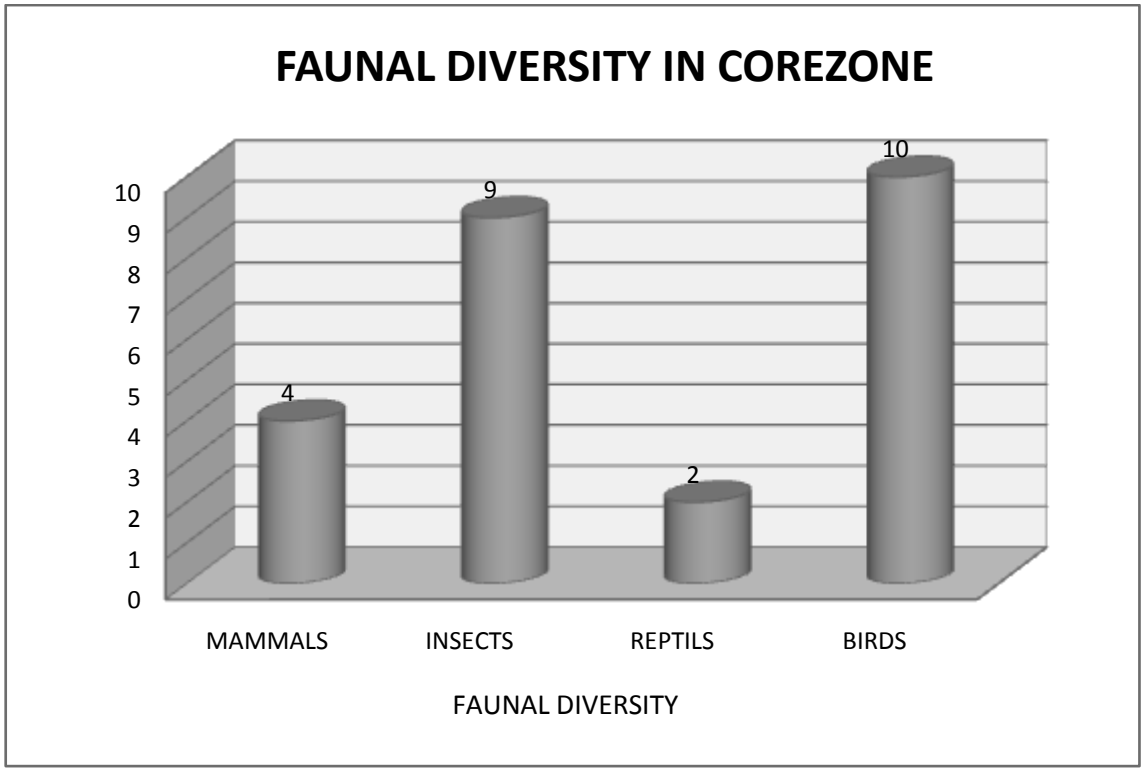


Fig No 3.19 Fauna diversity in Core Zone

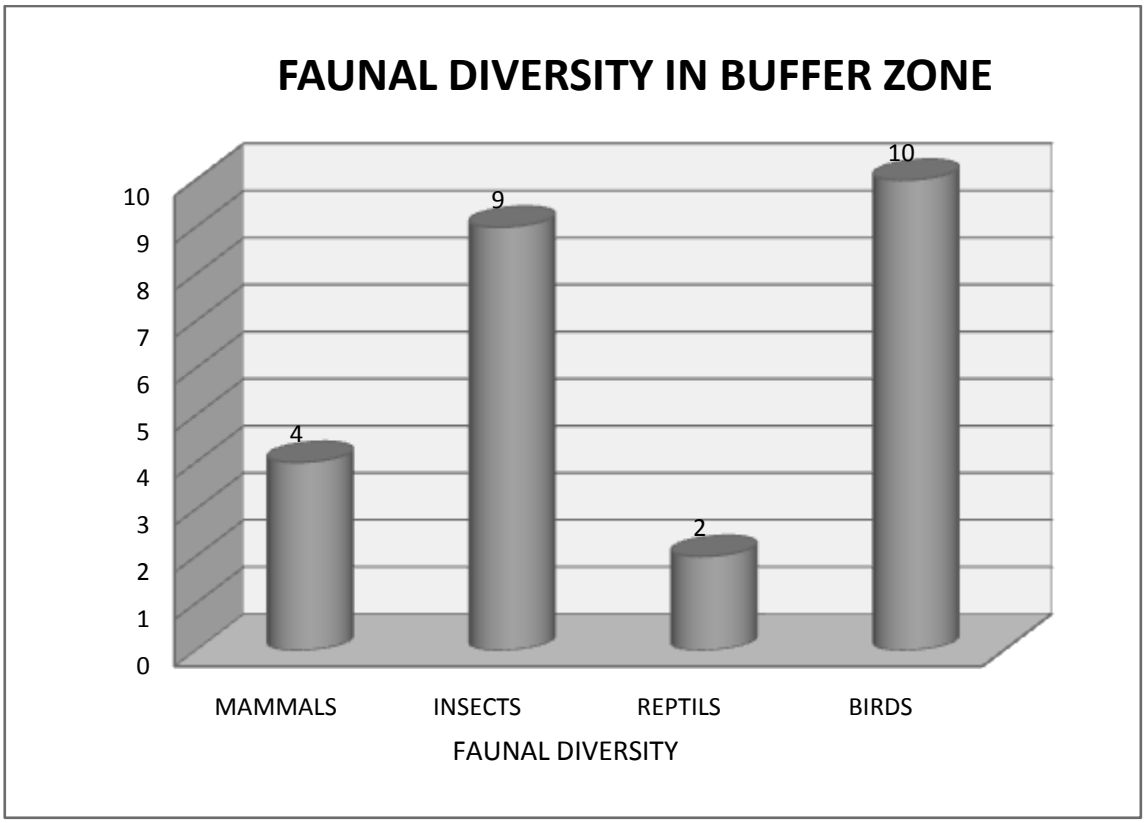


Fig No 3.20 Faunal diversity in Buffer Zone

3.10 SOCIO-ECONOMIC ENVIRONMENT

3.10.1 Introduction

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

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

3.10.2 Objectives of the Study

The report deals with the Socio-Economic Impact Assessment of the multi-color granite quarry promoted by proponent Thiru. S.Kandasamy, 272/2A, 2B, 2C and 2D respectively located in Chettikurichi Village, Kayathar Taluk, Thoothukkudi District, Tamil Nadu.

The objectives of the socio-economic study are as follows:

- To analyse the socio-economic status of the demographic variables such as age, gender, marital status, occupation and residence influence the opinion of the respondents living in the study area of the proposed mining project.
- To assess the impact of the projection Quality of life of the people in the study area.
- To recommend Community Development measures needs to be taken up in the study Area.

3.10.3 Scope of Work

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

3.10.4 Study Area – Chettikurichi village

Gram Panchayat name of the Chettikurichi village is Chettikurichi. Chettikurichi village is in Kayathar Taluk of Thoothukkudi district in Tamil Nadu, India. It is situated 13.72 km away from sub-district headquarter Kayathar (tahsildar office) and 50.83 km away from district headquarter Thoothukkudi. As per 2009 stats, Chettikurichi village is also a gram panchayat. Pincode of Chettikurichi village is 628552.

Table 3.18 Chettikurichi village Census 2011 Data

S. No	Description	Census 2011 Data
1	Village Name	Chettikurichi
2	Tehsil Name	Kayathar
3	District Name	Thoothukkudi
4	State Name	TamilNadu
5	Total Population	3420
6	Total Area	3.28.0Ha

3.10.5 Population Characteristics – Chettikurichi Village, Kayathar Taluk, Thoothukkudi District (2001-2011)

Chettikurichi village had a total household of 785 in 2001, which is increased to 947 in according to census 2011. Village had a total person of 3420 in 2011 census previous census 3072 persons in 2001. There were about 1675 men (48.98%) according to 2011 census and 1497 men (48.73%) in 2001 census marking increase of about 178 men over the previous census. During 2001 there were about 1575 women (51.27%), which is an increase to 1745 (51.02%) in 2011 census.

Chettikurichi village had a literate accounted for 1861 persons (60.58%) in 2001 and increased to 2089 persons (61.08%) in 2011. There were about 1096 males (35.68%) in 2001 and 1163 males (34.01%) in 2011. There were about 765 females (24.90 %) increased to 926 females (27.08%) in 2011.

Sex composition is the most important demographic characteristics that affect the incidence of birth and death. The average sex ratio in Kayathar Taluk, Chettikurichi village was 1052 during 2001 and decreased to 1042 the year of 2011. The lowest sex ratio may be either due to the migrants for educational purpose and employment opportunities and due to infant birth of female is low. The population characteristics of Chettikurichi Village (2001-2011) are shown in Table 3.19 and Fig no. 3.21.

Table 3.19 Chettikurichi Village Population Facts

S. no	Characteristics	2001	%	2011	%
1	Total Household	785	25.55	947	27.69
2	Rural population	3072		3420	
3	Male Population	1497	48.73	1675	48.98
4	Female Population	1575	51.27	1745	51.02
5	Rural Literacy	1861	60.58	2089	61.08
6	Male Literacy	1096	35.68	1163	34.01
7	Female Literacy	765	24.90	926	27.08
8	Sex Ratio		1052.1		1042

Source: https://www.census2011.co.in/data/ village/635204- Chettikurichi -tamil-nadu.html

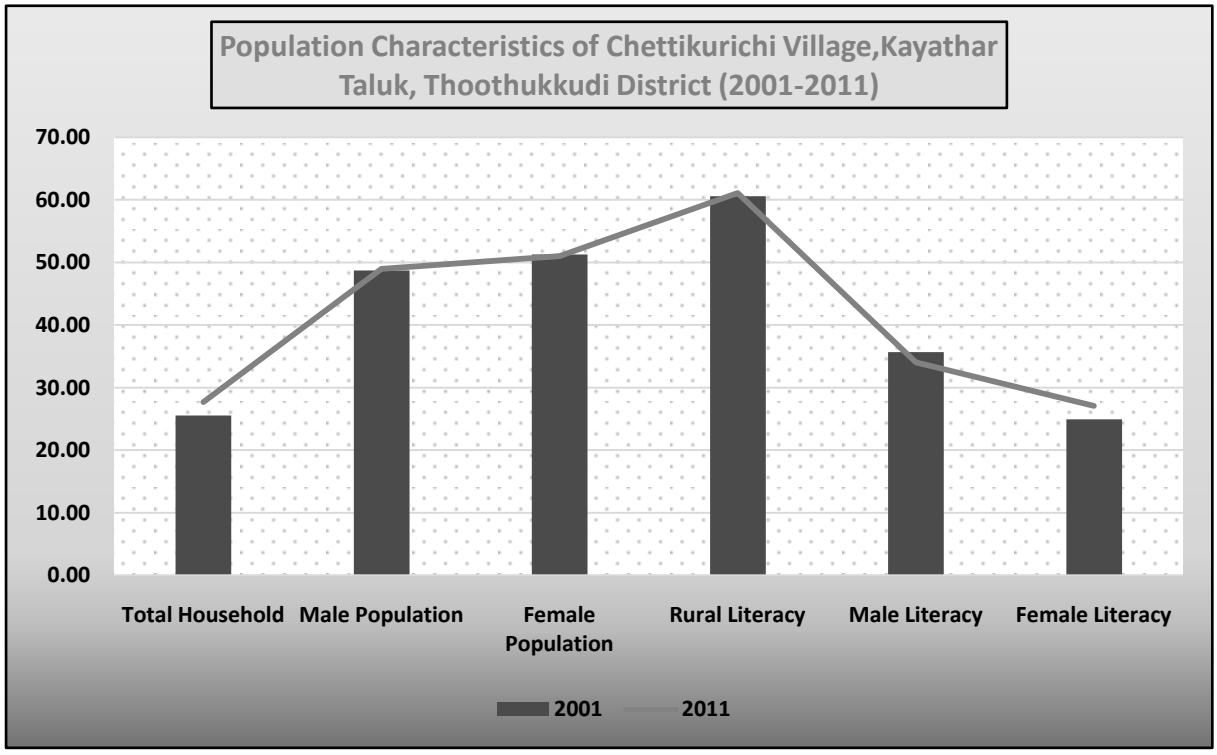


Fig No 3.21 Population Characteristics of Chettikurichi village Thoothukkudi District (2001-2011)

3.10.6 Occupational profile of Chettikurichi Village

Chettikurichi village had total main workers of 1444 (47.01%) persons during 2001 census which is an increase to 1948 (56.96%) persons during 2011. There were about 718 (23.37%) women in 2001 and 930(27.19%) women according to the census 2011 marking an increase of 212 women over the previous census.

Chettikurichi village had non workers population accounted of 1176 (38.28%) according to census 2011 which decreased from census 2001 had population 1374 (40.18%). It shows that most of the people are employed through industrial activities and quarry activities since 2001.

By starting this quarry, nearly 100 people will get job opportunity through direct and indirect employment. Thereby rate of non workers population will be decreased and workers population will be increased. The economic and living standard of the surrounding village people will be increased gradually.

Table 3.20 Chettikurichi Working Population-Census 2011

S. No	Census Parameters	2001	%	2011	%
1	Total Population	3072		3420	
2	Total Workers	1896	61.72	2046	59.82
3	Male Workers	898	29.23	1051	30.73
4	Female Workers	998	32.49	995	29.09
5	Total Main workers	1444	47.01	1948	56.96
6	Male Main workers	726	23.63	1018	29.77
7	Female Main Workers	718	23.37	930	27.19
8	Total Cultivators	300	9.77	215	6.29
9	Male Cultivators	166	5.40	121	30.54
10	Female Cultivators	134	4.36	94	2.75
11	Total Main Agricultural Labourers	590	19.21	1195	34.94
12	Male Agri.Labourers	301	9.80	522	15.26
13	Female Agri.Labourers	289	9.41	673	19.68
14	Total Main HHI	14	0.46	30	0.88
15	Male HHI	3	0.10	12	0.35
16	Female HHI	11	0.36	18	0.53
17	Total Main Other Tertiary workers	540	17.58	508	14.85
18	Male OT	256	8.33	363	10.61
19	Female OT	284	9.24	145	4.24
20	Total Nonworkers	1176	38.28	1374	40.18
21	Male Nonworkers	599	19.50	624	18.25
22	Female Non workers	577	18.78	750	21.93

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

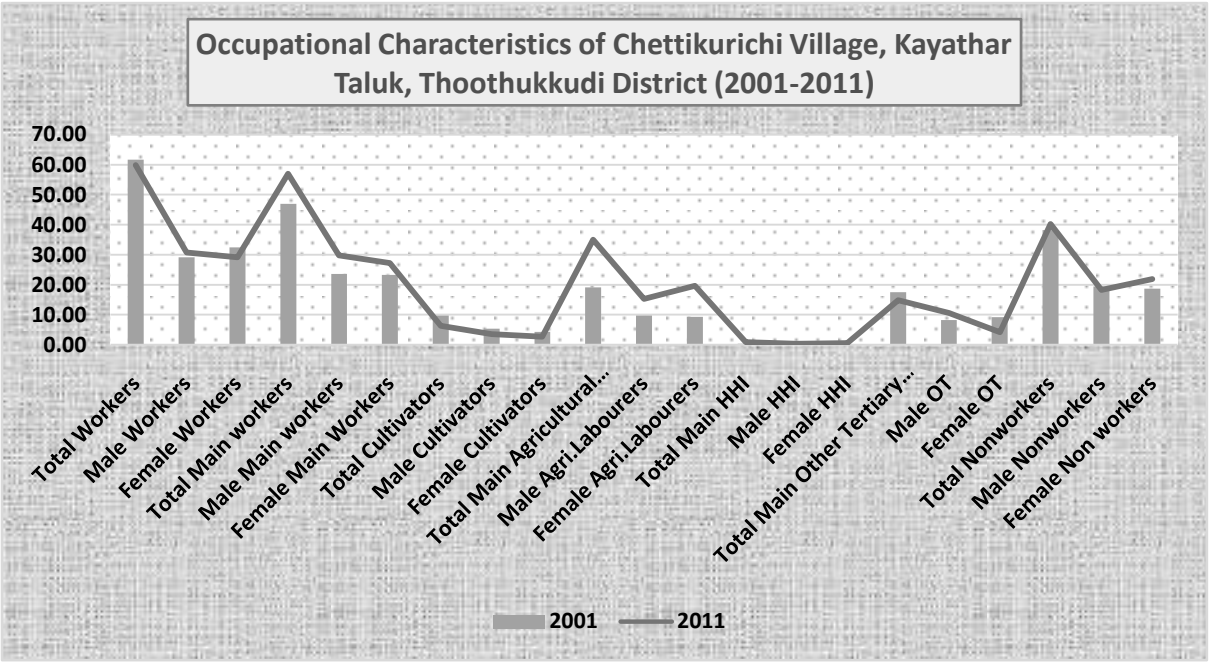


Fig No 3.22 Occupational Characteristics – Chettikurichi Village, Thoothukkudi District (2001-2011)

3.10.7 Socio economic studies in buffer area

It is mining project covering an extent of 3.28.0Ha and comes under B1 category. The impact of proposed project will be up to the distance of 10km surrounding the project site. The socio - economic benefits of proposed project is given below.

1. The proposed project will generate employment within 10km radius
2. As the workers and tippers from various villages move to and fro projects site, shops such as mechanic, welding, tea and hotels will be developed around the project site. It will generate indirect employment to the village people.
3. The surrounding village people will get benefits under CER and CSR Scheme. CER is 2.0% of project cost whereas CSR is 2.5% of the project profit.
4. When people get employment, it will upgrade the living standard of the people.
5. As the people getting employment in their native places, migration towards developed cities in search of employment may be prevented. Thereby, agricultural activities will not be affected.

The list of revenue villages and its details within 10km radius are given as follows

Table 3.21 List and Details of Revenue villages within 10km radius

S.No	Village	Population
1	Chettikurichi	3072
2	Chidambarampatti	1374
3	Kattalangulam	2364
4	Idaiseval	2807
5	K.Subramaniapuram	1759
6	Vadakku Ilandaikulam	2135
7	Sevalapperi	1191
	Total	**14702**

Source: www.census india.gov.in-Tamilnadu Census of India-2011

Table 3.22 Population Data of Study Area

Village Name	No. of House Holds	Total Population	Male	Female	Total Literate Population	Male Literate	Female Literate	Total Illiterate Population	Male Illiterate	Female Illiterate
Chettikurichi	947	3420	1675	1745	2089	1163	926	1331	512	819
Chidambarampatti	391	1421	693	728	827	461	366	594	232	362
Kattalangulam	748	2835	1403	1432	2353	1192	1161	482	211	271
Idaiseval	850	3024	1533	1491	2273	1257	1016	751	276	475
K.Subramaniapuram	521	1721	851	870	1189	673	516	532	178	354
Vadakku Ilandaikulam	660	2361	1144	1217	1414	791	623	947	353	594
Sevalapperi	403	1511	749	762	942	536	406	569	213	356

Table 3.23 Communication & Transport Facilities in the Study Area

S.No	Village Name	PO	SPO	PTO	T	PCF	BS	PBS	RS	SH	MDR	BTR	GR	FP
1.	Chettikurichi	1	0	0	0	0	1	1	0	0	1	1	1	1
2.	Chidambarampatti	1	0	0	0	0	1	1	0	0	1	1	1	1
3.	Kattalangulam	0	0	0	0	0	1	1	0	0	1	1	1	1
4.	Idaiseval	1	0	0	0	0	1	1	0	0	1	1	1	1
5.	K.Subramaniapuram	1	1	1	0	6	1	1	0	2	2	1	1	1
6.	Vadakku Ilandaikulam	1	0	0	0	1	1	1	0	1	1	1	1	1
7.	Sevalapperi	0	0	0	0	0	1	1	0	0	1	1	1	1

Abbreviations: PO - Post Office; RS - Railway Station; GR - Gravel Roads; SPO - Sub Post Office; PTO - Post & Telegraph office; PCF - Private Courier Facility; SH - State Highways; FP - Foot path; T- Telephone (Landline); BS -Public Bus Service; MDR - Major District Road; PBS - Private Bus Service; BTR - Black Topped (Pucca Road).

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

Table 3.24 Water & Drainage Facilities in the Study Area

S.No	Village Name	TP	CW	UCW	HP	TW/BH	S	R/C	T/P/L	CD	OD	CT
1.	Chettikurichi	1	1	1	1	1	2	2	1	1	1	2
2.	Chidambarampatti	1	2	1	1	1	2	2	2	1	1	2
3.	Kattalangulam	1	2	1	1	1	2	2	2	1	1	2
4.	Idaiseval	1	1	1	2	1	1	2	2	1	1	2
5.	K.Subramaniapuram	1	1	1	2	2	2	2	2	1	1	2
6.	Vadakku Ilandaikulam	1	1	1	1	1	1	2	1	1	1	2
7.	Sevalapperi	1	1	1	1	1	2	2	2	1	1	1

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

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

Table 3.25 Other Facilities in the Study Area

S.No	Village Name	ATM	CB	COB	ACS	SHG	PDS	AMS	NC	NC-AC	CC	SF	PL	NPS	APS	BDRO	PS
1.	Chettikurichi	2	1	1	2	2	1	2	2	1	2	2	1	1	2	1	1
2.	Chidambarampatti	2	2	2	2	2	1	2	2	1	2	1	1	1	1	1	1
3.	Kattalangulam	2	2	2	2	2	1	2	2	1	1	1	1	1	1	1	1
4.	Idaiseval	2	2	2	2	2	1	2	2	1	2	2	1	1	1	1	1
5.	K.Subramaniapuram	3	2	2	2	2	1	2	2	1	2	2	2	1	1	1	1
6.	Vadakku Ilandaikulam	2	1	1	2	2	1	2	2	1	2	2	2	1	1	1	1
7.	Sevalapperi	2	1	2	2	2	1	2	2	1	1	1	1	1	1	1	1

Abbreviations: ATM - Automatic Teller Machine; PDS - Public Distribution System (Shop); CB - Commercial Bank; COB - Co-operative Bank; AMS - Agricultural Market Society: ACS –Agricultural Credit Societies; NC- Nutritional Centre; SHG-Self Help Group; NC-AC-Nutritional Centre – Anganwadi Centre; BDRO-Birth & Death Registration Office; PS-Power Supply; CC- Community Centre (without TV); SF – Sports field; PL-Public library, NPS – News paper supply; APS – Assembly polling station.

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

Table 3.26 Educational Facilities in the Study Area

		PPS		PS		MS		SS		SSS		DC		EC		MC		MI		PT		VTS		SSD	
Sl.No	**Village Name**	**G**	**P**	**G**	**P**	**G**	**P**	**G**	**P**	**G**	**P**	**G**	**P**	**G**	**P**	**G**	**P**	**G**	**P**	**G**	**P**	**G**	**P**	**G**	**P**
1.	Chettikurichi	1	2	1	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
2.	Chidambarampatti	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
3.	Kattalangulam	1	2	1	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
4.	Idaiseval	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
5.	K.Subramaniapuram	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
6.	Vadakku Ilandaikulam	1	2	1	2	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
7.	Sevalapperi	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2

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

Table 3.27 Medical Facilities in the Study Area

Sl.No	Village Name	CHC	PHC	PHSC	MCW	TBC	HA	HAM	D	VH	MHC	FWC	NGM-I/O
1.	Chettikurichi	2	1	1	2	2	2	2	2	1	2	2	a
2.	Chidambarampatti	2	1	1	2	2	2	2	2	1	2	2	b
3.	Kattalangulam	2	2	1	2	2	2	2	2	2	2	2	b
4.	Idaiseval	2	2	1	2	2	2	2	2	1	2	2	b
5.	K.Subramaniapuram	2	2	1	2	2	2	2	2	1	2	2	b
6.	Vadakku Ilandaikulam	2	1	1	2	2	2	2	2	2	2	2	c
7.	Sevalapperi	2	1	1	2	2	2	2	2	1	2	2	b

Abbreviations: CHC-Community Health Centre; TBC- TB Clinic; VH- Veterinary Hospital; PHC-Primary Health Centre; HA-Allopathic Hospital; FWC-Family Welfare Centre; PHSC-Primary Health Sub Centre; HAM-Alternative Medicine Hospital; MHC-Mobile Health Clinic; MCW-Maternity and Child Welfare Centre; D-Dispensary; NGM-I/O-Non Government Medical Facilities In & Out Patient

Note–1-Available within the village; 2 –Not available; a- Facility available at<5kms; b- Facility available at>10kms

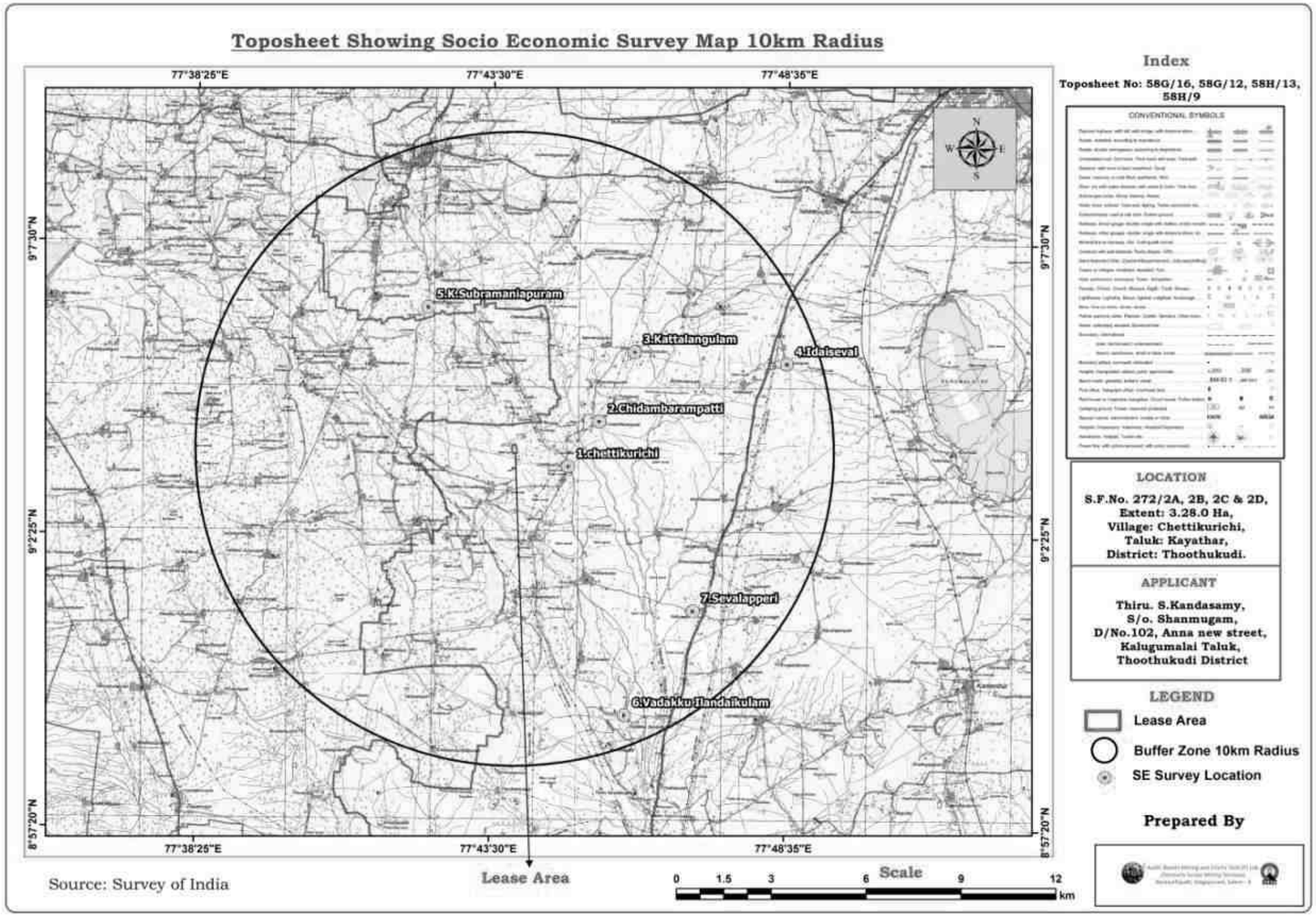


Fig No 3.23 Socioeconomic Survey Location

3.10.8 Primary survey conducted by FAE- SE

Primary survey was conducted at 7 villages which total population is **14702**. Chettikurichi town has approximately 1 percent of total population of the village area.

3.10.8.1 Primary survey methodology

The study was carried out with a participatory approach by involving the stakeholders, particularly the project beneficiaries and probable affected persons through a series of Chettikuruchi, Chidambarampatti, Kattalangulam, Idaiseval, K.Subramaniapuram, Vadakku Ilandaikulam and Sevalapperi villages in Thoothukudi district. The population groups that were consulted include beneficiary group of people in the project influence area, particularly the shopkeepers, farmers, Gram Panchayat members, village elders etc. Proportionate and purposive sampling methods were used for selecting respondents for household survey. Male and female respondents, both were selected for household survey. Structured questioners were used for survey.

3.10.8.2 Data structures

The data collected with the help of questionnaire survey for list of Chettikuruchi, Chidambarampatti, Kattalangulam, Idaiseval, K.Subramaniapuram, Vadakku Ilandaikulam and Sevalapperi villages of Kayathar Taluk were suitably converted into uni-variate, bi-variate and multivariate tables. The selection of these blocks were meaningfully done in order to get complete details of the surveyed population, their living environment, socio economic and socio-cultural and healthcare practices so as to conceptualize the findings with the help of interrelationships between Occupation and income status. the surveyed population were examined and interpreted with reference to socioeconomic living area, family structure and Educational, Sanitation etc.,

The Survey was conducted by SE expert Mrs. S.Santhi (FAE) along with her team.



Fig No 3.24 Primary Survey Photographs of village wise, Thoothukudi District

3.10.9 Summary and Conclusion

From the primary survey, it is found that the basic facilities such as water, road, PHSC, schools are available within the surveyed villages. The people stated that they did not get benefits under CER and CSR activities. Also they suggested that to operate the truck at minimum speed while crossing villages, schools, hospitals. The strongly asked to provide the employment opportunities only to the village people and registered their complaint on employment opportunities to other state people.

The proponent assured that he will improve facilities in government schools and hospitals under CER and CSR Schemes.

The socio-economic wellbeing of the area that demonetization yield better results to some extent but not up to the level of expectations made by general public and its people is represented by the infrastructure and the social assets available in the area. The study area constituted of various infrastructures related to education, health care, communication, transportation, drinking waters etc.

3.11 Land Environment

3.11.1 General:

In order to assess impacts of project activities on existing physical, biological and social environment, it is necessary to collect information of Land Environment. The main objective of this section is to provide the details of land use/land cover of the study area covering 10km radius around the proposed project so that temporal and permanent changes in the land use due to the operation of quarry can be assessed. Studies on Land use aspects of eco-system play an imperative role in identifying susceptible issues and to take appropriate action to uphold ecological equilibrium in the region.

3.11.2 Changes in LU/LC due to Proposed Project/ Rough Stone and Gravel Quarry:

The proposed rough stone and gravel quarry is located in S.F. No. 272/2A, 2B, 2C and 2D, (fresh area) Chettikurichi Village, Kayathar Taluk, Thoothukkudi District, Tamil Nadu. The operation of quarry involves formation of approach road connecting lease area to village road, excavation of pit, formation of benches, formation of haul road, dumping of rejects and construction of labour shed, toilet facilities. This will causes temporary and permanent changes in the land use in and around the project site. This will leads to impact on ecology and biodiversity as the fauna which depends on flora for habitation will be disturbed.

The quarry area of 2.42.91Ha undergoes permanent changes by excavation of pit. The proposed depth of mining is 34m below ground level. The proponent proposed to develop greenbelt at the rate of 30 trees per annum along the boundary of lease area over an extent of 0.56.19 Ha. The rejects will be temporarily dumped within the lease area in south side and will be backfilled into the excavated pit. 90% of the present land use within lease area will be permanently changed at the end of mining activities.

At the end of mining, the rain water stored in quarried out pit will help to recharge ground water, thereby the agricultural activities around the project site will be improved. There is possibility of changing of barren land into agricultural land due to proposed project.

To analyse the various changes in land use in future due to proposed project, the study on present land use in core and buffer zone is important.

3.11.3 LU/LC Map by ARC GIS

Land use/Land Cover map is prepared by adopting interpretation techniques of the image classification. Various activities has been included in the preparation of Land Use/Land Cover Maps such as Satellite Image/Data Acquisition, pre-processing, Rectification, Ground trotting etc. Satellite Images are processed and LU/LC maps are prepared by using Arc GIS 10.8.

Remote sensing data provides reliable accurate baseline information for land use mapping and it is a rapid method of acquiring up to date information of over a large geological area. Studies on land use aspects of eco-system play an imperative role in identifying susceptible issues and to take appropriate action to uphold ecological equilibrium in the region.

3.11.4 Methodology adopted for thematic data extraction from the satellite imageries:

ERDAS image processing software and ArcGIS Software were used for the project. Erdas 9.2 Image Processing Software was used for digital processing of the spatial data. Digital image processing techniques were applied for the mapping of the land use/land cover classes of the provided area from the satellite data. The methodology applied comes under following steps:

a. **Image Extraction**: Satellite imageries were obtained and a sub set for the Area of Interest was created through ERDAS image processing software. Processing functions primarily done to improve the appearance.

b. **Geo-Rectification**: Geometric correction includes correction for geometric distortions due to sensor, earth geometry variations and conversion of the data to real world coordinates (e.g. Latitude and Longitude) on the Earth's surface. The satellite imagery was geometrically rectified with reference to the geo-referenced toposheets and vector data.

c. **Image Enhancement:** Image enhancement is one of the important images. Imagery to assist in visual interpretation and analysis. Various options of image enhancement techniques were tried out to get the best image for visual interpretation. Histogram equalized stretch enhancement techniques was applied to the imagery of the study area for better interpretation of different features in the satellite imagery.

d. **Classification:** Satellites images are composed of array of grid, each grid have a numeric value that is known as digital number. Smallest unit of this grid is known as a pixel that captures reflectance of ground features represented in terms of

Digital number, which represent a specific land features. Using image classification technique, the satellite data is converted into thematic information map based on the user's knowledge about the ground area.

Hybrid technique has been used i.e. visual interpretation and digital image processing for identification of different land use and vegetation cover classes based on spectral signature of geographic feature. Spectral signature represents various land use classes. Image interpretation keys are developed based on image characteristics like colour, tone, size, shape, texture, pattern, shadow, association etc which enables interpretation of satellite images for ground feature. Training sites are then assigned based on their spectral signature and interpretation elements.

Land use/Land cover Map has been broadly classified into five classes namely, Built-up Area, Plantation, Agriculture, Water Bodies, Non-agriculture, Barren Land and mining areas have been categorized in others class. Using image classification algorithm land use map is then generated.

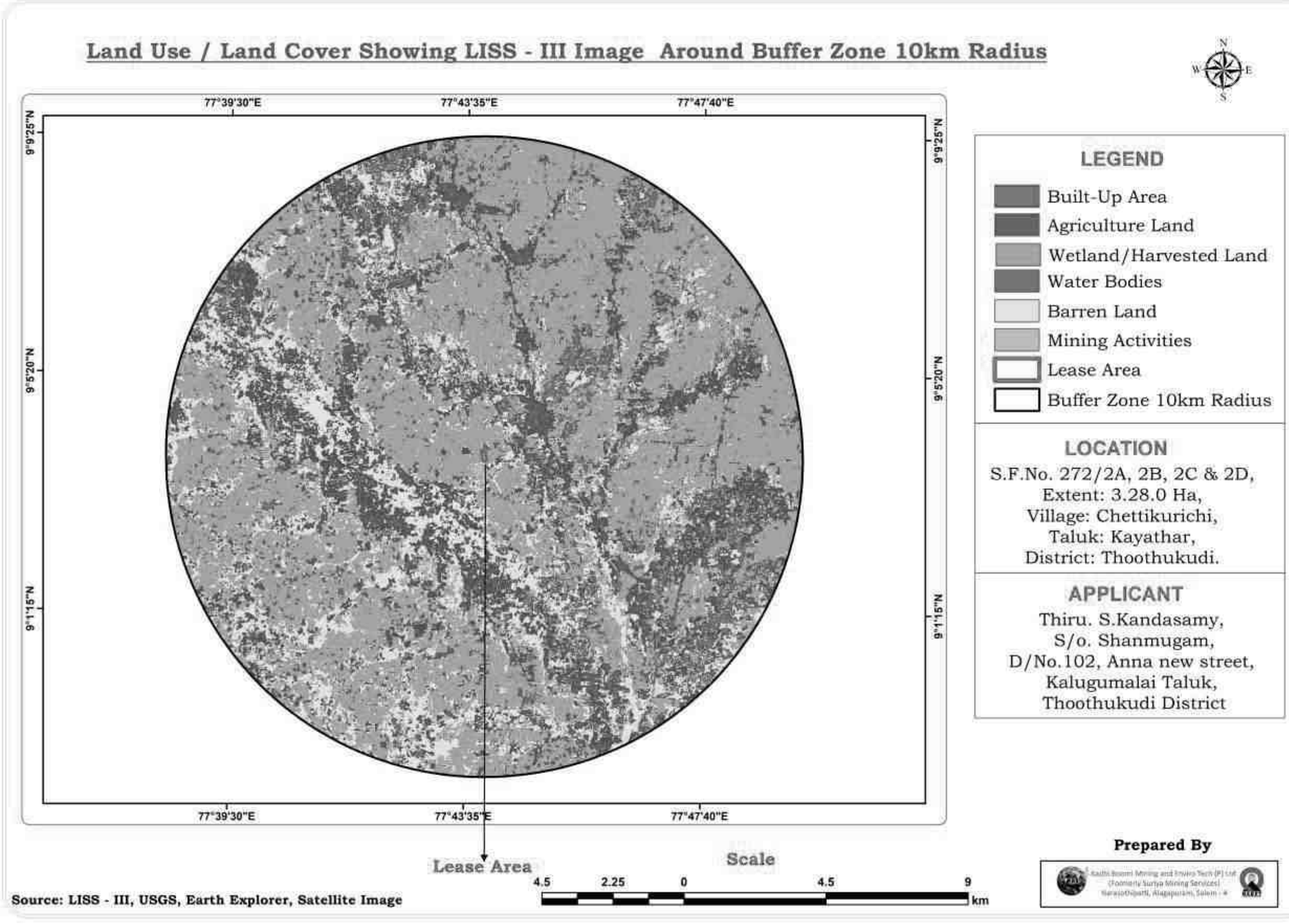


Fig No. 3.25 Land use / Land cover of project study area around 10km radius of proposed quarry

Table No: 3.28 Area of different land cover within 10km radius of proposed rough stone quarry

S.No	LU/LC Classes	Area(Ha)	(%)
1	Built-up	4196.01	13.11
2	Agriculture land	3779.54	11.73
3	Wet land/Harvested land	17011.44	52.80
4	Barren Land	6182.27	19.19
5	Water bodies	1021.90	3.17
6	Mining area	28.11	0.09
	Total	32219.27	100.00

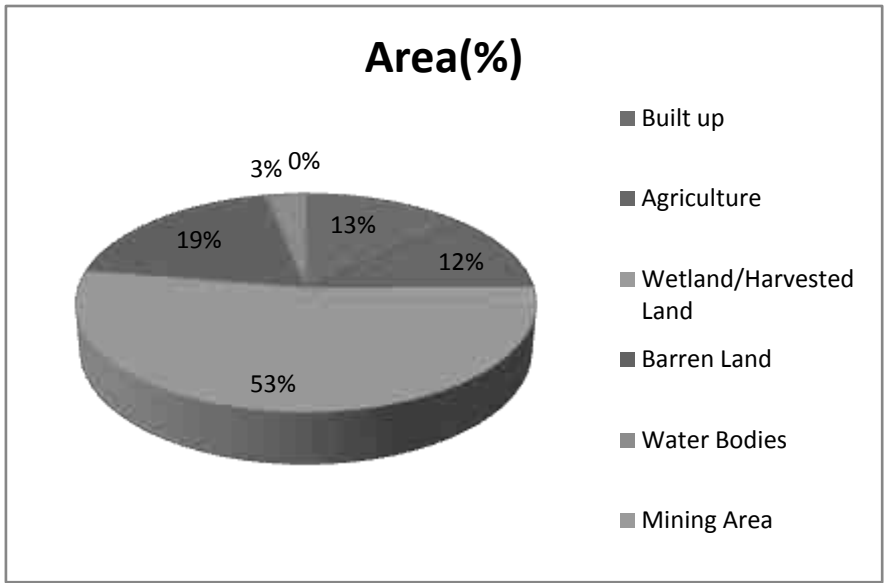


Fig No. 3.26 Land use/Land covers statistics of study area of 10km radius around proposed rough stone quarry

3.11.5 Topography

The topography of the project site is flat terrain without any undulations. Three existing quarries are located within the 500m radius of proposed project site. No reserve forest, wild life sanctuaries are located within 10km radius of the proposed quarry. Uppodai River is located at the distance 2.0km in east side and the Bay of Bengal is located at the distance of 53km in eastern side. Out of 32219.27 Ha, 17011.44 Ha are covered by Harvested land.

3.11.6 Drainage Pattern of study area around 10km radius of project site

Drainage pattern of the area is dendritic in nature. The drainage pattern is mostly south easterly in the study area. There are three fourth order streams and two fifth order stream located within 10km radius of proposed quarry. One river, namely Uppodai River is flowing on the east side of the site at the distance of 2.0km.

As the geology of the both study area is hard rock formation, the water table is identified at depth of 55-60m bgl.

3.11.7 Geology of Study area around 10km of project site

The geology of the study area is following:

1. Hornblende – Biotite Gneiss
2. Charnockite
3. Calcareous gritty sandstone/clay

1. Hornblende – Biotite Gneiss

Hornblende gneiss is a coarse grained metamorphic rock belonging to the gneiss family, its overall dark colouration is due to high levels of the mafic mineral hornblende, while quartz and feldspar are also present. More than 80% of the study area is deposited with Hornblende – Biotite Gneiss.

2. Charnockite

Charnockite is any orthopyroxene-bearing quartz-feldspar rock formed at high temperature and pressure, commonly found in granulite facies' metamorphic regions. The charnockite series includes rocks of many different types, some being felsic and rich in quartz and microcline, others mafic and full of pyroxene and olivine, while there are also intermediate varieties corresponding mineralogically to norites, quartz-norites and diorites. Within 10km Charnockite is deposited at less than 5%.

3. Calcareous gritty sandstone/clay

Calcareous sandstone is composed of more than 15 percent of carbonate minerals (e.g., calcite) as cementing materials. Next to Hornblende – Biotite Gneiss, Calcareous sandstone are deposited, however the percentage of deposition is less than 15.

3.11.8 Geomorphology of Study area around 25km of project site

Geomorphology is the study of the surface features which arise when the rocks and overlying deposits at the surface are acted on by forces, usually thought of as

water(rivers, floods, tsunamis and rain), winds(and the particles carried by them) and ice(mechanical fracturing by water in the act of freezing and glaciers). The geomorphology of the study area is given below.

1. Dome type Residual hills
2. Inselberg
3. Shallow weathered/shallow buried pediplain
4. Moderately weathered/moderately buried pediplain
5. Pediment/valley floor

The landforms of the study area are majorly Shallow weathered pediplain. These are the areas of nearly level terrain with low gradient. These are covered with shallow weathering material ranging from 0 to 5 m. The top soil is generally red soil. The groundwater prospect in such zone is described as poor to moderate.

Next to Shallow weathered pediplain, the land form of the study area is moderately weathered pediplain. Moderately weathered land form is formed due to coalescence of several pediments which forms good recharge zone due to thick weathering (10-20 m).

Pediment formation is seen in few places within 10km radius of study area. A pediment is a gently sloping erosion surface or plain of low relief formed by running water in arid or semiarid region at the base of a receding mountain front.

Inselberg is isolated hill that stands above well-developed plains. There are mountains (Inselberg) in Kazhugumalai town. Kazhugumazhai town is located 9.4km away from the project site.

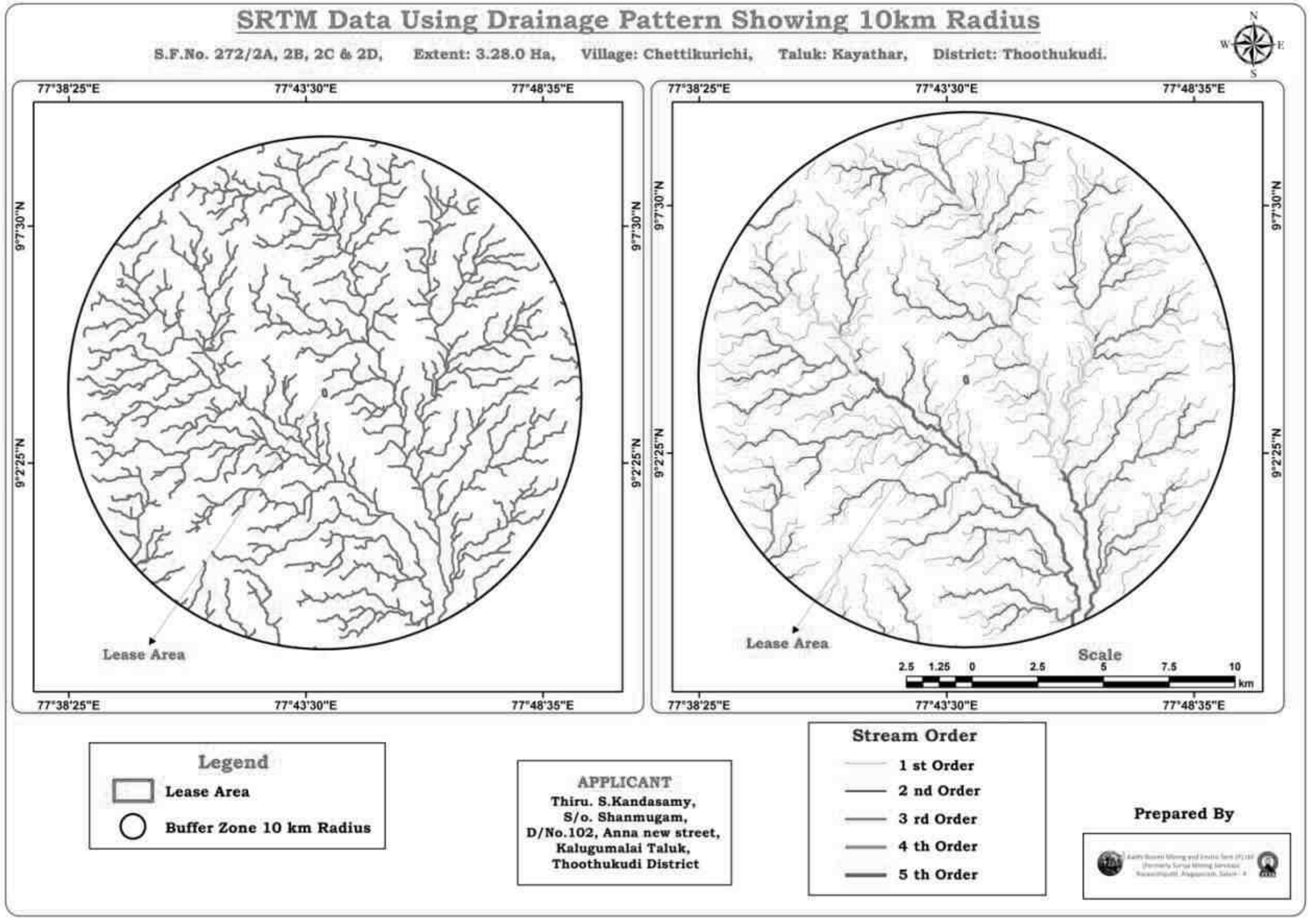


Fig No. 3.27 Image Representing the River/Streams (Drainage) of the study area within 10km radius from the project site

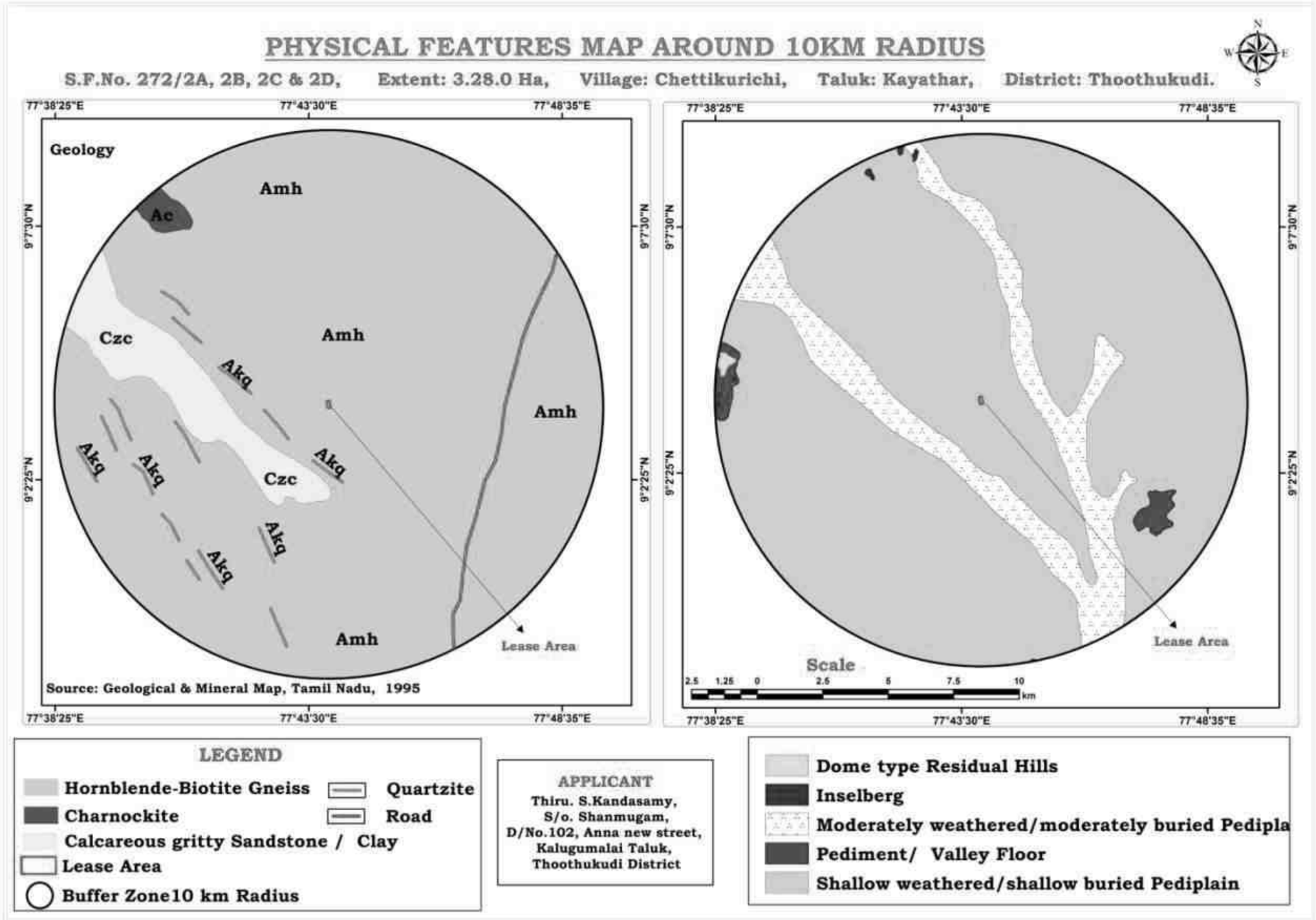


Fig No. 3.28 Image showing Geology and Geomorphology of the study area around 10km radius of project site

3.11.9 Contour around 10km radius of proposed rough stone and gravel quarry

Contour lines are the greatest distinguishing feature of a topographic map. Contour lines are lines drawn on a map connecting points of equal elevation, meaning if you physically followed a contour line, elevation would remain constant. Contour lines show elevation and the shape of the terrain in the study area. The contour map of 10km radius around proposed quarry was derived from a SRTM data of the study area.

The minimum and maximum elevation of the study area of 10km radius is +70m and +120m above MSL.

3.11.10 Slope around 10km radius of proposed quarry

The slope map was derived from a SRTM data of the study area. The slope of the study area was classified into five classes, such as less than 10 Percent/degree flat to almost flat no meaningful denudation process. The contour map is prepared in 1:50000 scale from SOI topo sheets. The slope map of 10km radius around project site has been prepared. In the slope map it is found that, the slope of 90% of the study area around 10km is varied between 1.35% and 6.15% which shows that the land is nearly flat or gentle slope.

3.11.11 Soil type in study area of 10km radius

Soil is an upper most layer of the earth and contains diverse rock particles and organic matter. As per United States Department of Agriculture (USDA) classification, there are four major soil types such as Vertisols, Entisols, Alfisols and Inceptisol.

The west side of the study area is covered with Entisols. Entisols are soils that show little or no evidence of pedogenic horizon development. Entisols are commonly formed in recently deposited materials, or in parent materials resistant to weathering (eg. sand). Entisol soils also occur in areas of very dry or cold climate, on steep slopes, or in sandy areas.

The south side of the study area is covered with Alfisols. Alfisols are moderately leached soils that have relatively high native fertility. These soils have mainly formed under forest and have a subsurface horizon in which clays have accumulated. Alfisols are primarily found in temperate humid and sub-humid regions. The type of soil in the lease area is Alfisols.

The soil type in north and east side of the study area is not classified as Vertisols, Entisols, Alfisols or Inceptisol. It is miscellaneous type of soil.

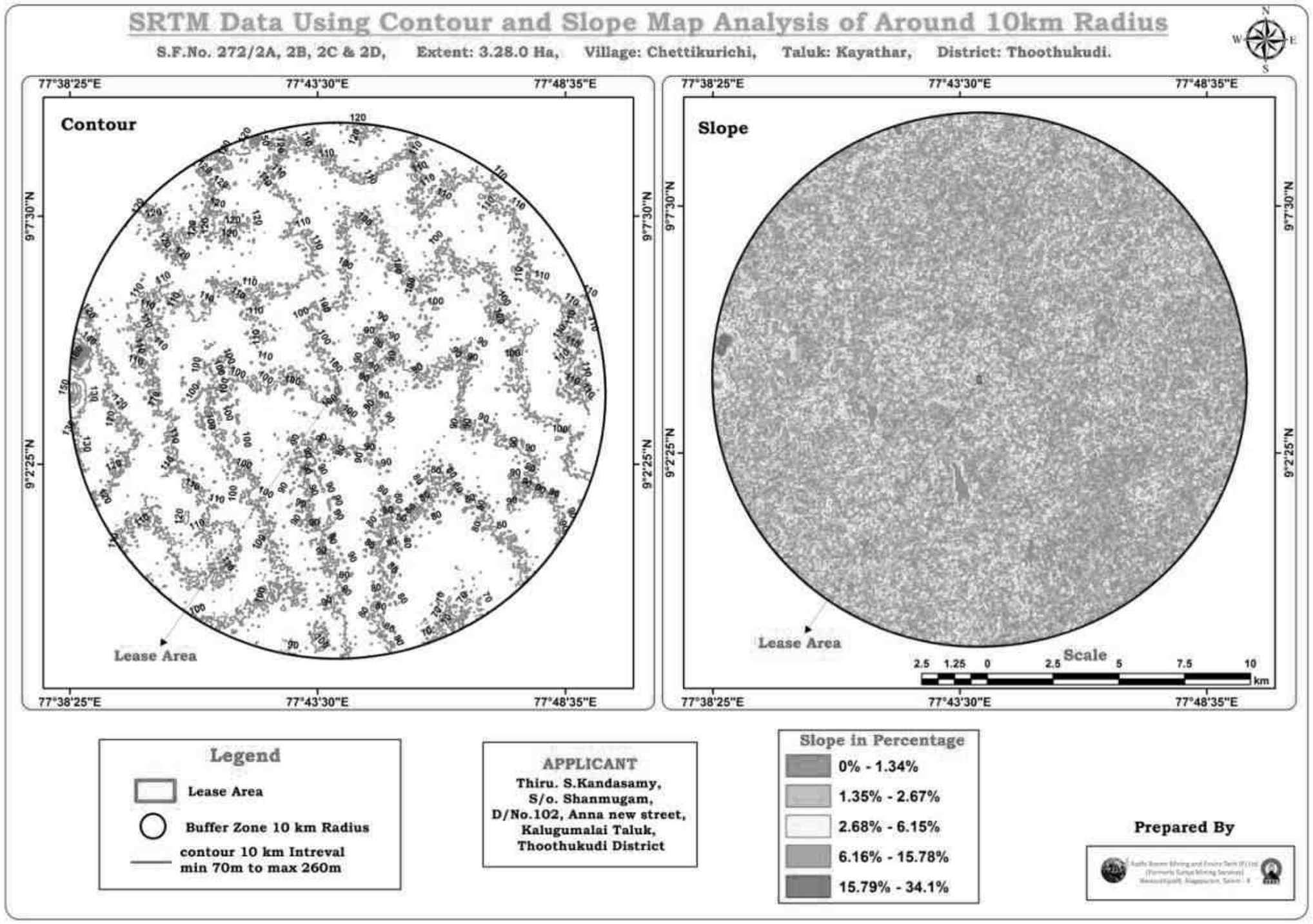


Fig No. 3.29 Image showing Contour and slope of study area around 10km radius of proposed quarry

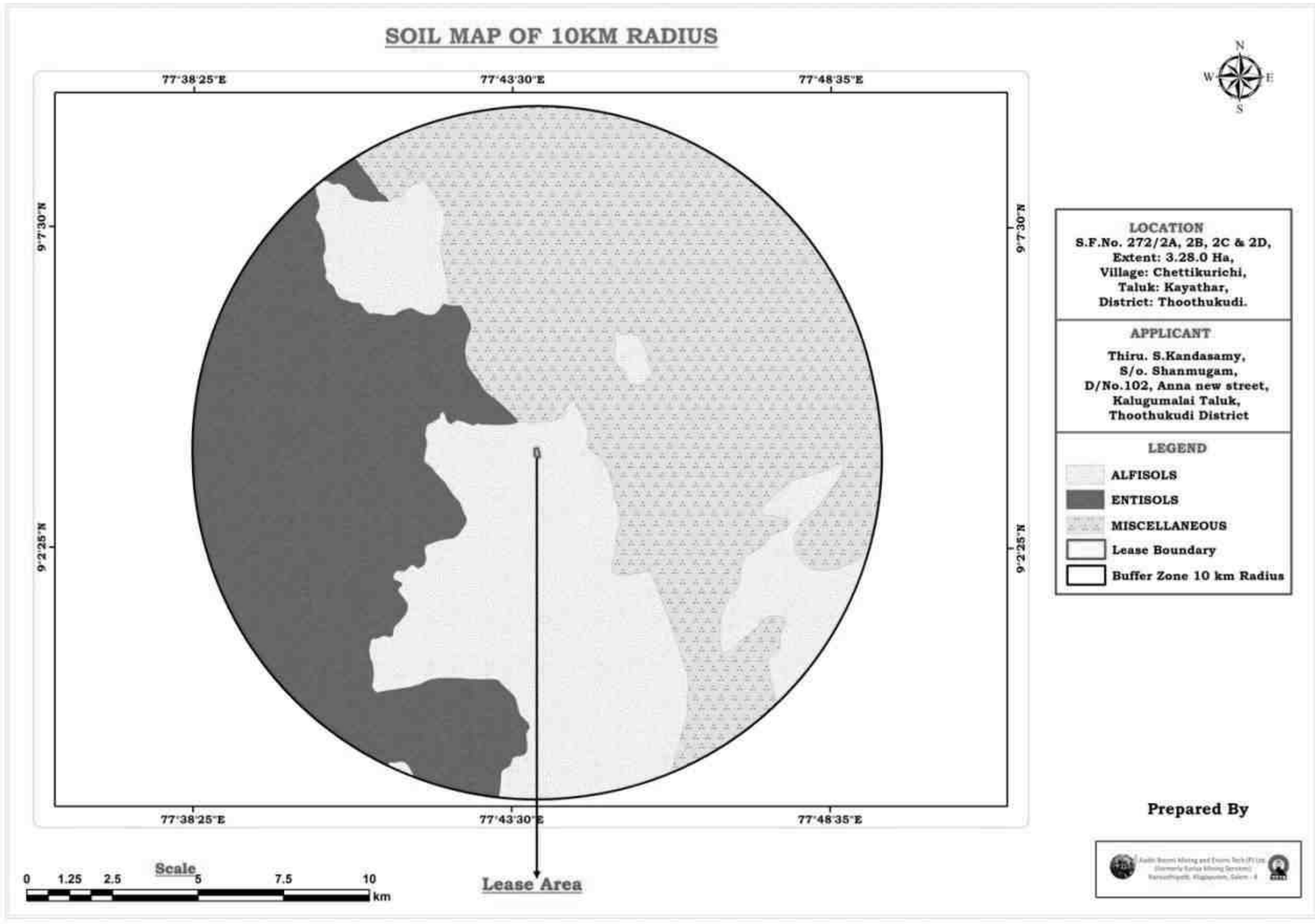


Fig No. 3.30 Image showing soil types of study area around 10km radius of proposed quarry

3.11.12 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.

3.11.13 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 is given below.

Table 3.29 Environmental Sensitiveness

Interstate Boundary	Tamil Nadu –Kerala Interstate boundary –52km (W)
Coastal Zone	Bay of Bengal – 53km – Southeast
Reserve Forest	1. Kurumalai R.F – 13km – E 2. Uthumalai R.F – 17km -SW The proposed projects site does not attract Forest Conservation Act, 1980.
Wildlife sanctuary	Nil within 10km radius.
Water bodies	1. A small lake – 740m – N 2. Nalanthula lake – 1.3km - NNE 3. Mel Nalanthula lake – 1.8km - N 4. North Konarkottai lake I – 988m – SW 5. North Konarkottai lake II – 1.5km – S 6. Uppodai River – 2.0km - E 7. Water body with weir across River Uppodai – 1.9km – ENE 8. A odai – 2.0km - SW 9. Olaikulam lake I – 2.7km – SSW 10. Olaikulam lake II– 2.9km – SSW 11. Vellappaneri lake – 3.8km – SW 12. Karisalkulam lake – 3.6km – NW 13. A odai – 4.7km – NE 14. Water body with weir across Odai – 4.7km - NE
Defense Installations	Nil within 10km radius
Critically Polluted area	Nil within 10km radius

CHAPTER – 4: ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Open cast mining is carried out by using excavators and tippers combination. Scientific mining with proper benches with width and slope will be adopted as per MMR, 1961. Jackhammers with compressors will be deployed for drilling. Manual labors will be engaged for jack hammer drilling, sorting of waste and excavator will be used for loading the rough stone and gravel into tippers. Primary Blasting will be carried out by Nonel blasting techniques with minimum vibration or detonating card with electric detonator initiation system. Sizing of materials shall be done by rock breakers or muffle blasting or pop shooting to the required size for better loading into trucks.

All these operations can disturb the environment in various ways, such as removal of mass, change of landscape, endangering of flora and fauna of the area, changes in surface drainage, and changes in air, water and soil quality. Therefore, it is essential to assess the impacts of mining on different environmental parameters before starting the mining operations, so that abatement measures could be planned in advance for eco-friendly mining in the area. The likely impacts on various environmental aspects and mitigation measures are discussed below.

4.1 Air Environment

The mining operation will be carried out by jack hammer drilling, blasting, excavation, loading and transportation. All these activities will generate dust into the air environment. The rate of dust generation into the atmosphere is based on the total quantity of production of rough stone and gravel per day.

4.1.1. Anticipated Impact

The long time exposure to the dust particles causes health problems to workers such as reduced lung function, the development of chronic bronchitis, and even causes premature death. Those dusts will travel in the predominant wind direction and will affect the health condition of people living around the quarry site. Not only the human beings it also affect the growth of plants, trees and crops in the surrounding area due to dust deposition on them. The frequent movement of tippers on the haul road and transportation of materials without tarpaulin causes high dust generation. To overcome the above issues, the emission rate of various activities has to be calculated to predict the incremental GLC due to mining activity through the AERMOD software and to adopt the effective air pollution control measures based on total GLC.

4.1.2 Emissions Details

Drilling, blasting, loading, unloading and transportation of rough stone & gravel and wind erosion of the exposed area and movement of light vehicles will be the main polluting source in the mining activities that releasing Particulate Matter (PM10) affecting ambient air of the area. In this mining project, blasting, loadings are considered as open pit source and unloading are considered as area source and transportation of the rough stone & gravel along the haul road is considered as line source. The emission rates from various source of mining activity are calculated based on mathematical formula of Chakraborty and Chaulya.

4.1.2.1 Drilling

Drilling is the process of making holes in rough stone to carry out smooth blasting. The drilling is most representative for point source. The rate of emission from the drilling process will be very high when compared to loading, unloading, transporting and blasting. The emission rate during the drilling process was calculated by using estimator equation of Chakraborty et al. (2002).

$$E=0.0325[(100-m)\ su\ \{(100-s)m\}^{-1}\ ]^{0.1}(df)^{0.3}$$

Table 4.1: Source Parameters (Drilling of hole)

S.No	Description	Symbol	Quantity
1	moisture content (%)	m	1%
2	silt content (%)	s	50%(approx)
3	wind speed (m s^{-1})	u	5.25
4	hole diameter (mm)	d	32
5	frequency (no of hole d^{-1})	f	505
6	Area of source (m^2)	a	32800
6	Uncontrolled emission rate (g s^{-1})	CE	0.9
7	Control efficiency (%)	c	90%
8	Controlled emission rate	CE	0.09

4.1.2.2. Loading of Rough stone

Chakraborty et al. (2002) was used to calculate emission of particulate matter released into the atmosphere during loading of Mineral.

$$E = [\{(100 - m)\ (m)^{-1}\}^{0.1}\ \{(s)\ (100 - S)^{-1}\}^{0.3}\ h^{0.2}\ \{(u)\ (0.2 + 1.05)^{-1}\}\{(xl)\ (15.4 + 0.87xl)^{-1}\}]$$

Table 4.2: Source Parameters (Loading of Rough stone)

S.No	Description	Symbol	Quantity
1	moisture content (%)	m	1%
2	silt content (%)	s	10(approx)
3	wind speed (m s^{-1})	u	5.25
4	drop height (m)	h	1m above the tipper body
5	size of loader (m^3)	l	1.20
6	frequency of loading(no.h^{-1})	x	23 times
7	Quarry area (m^2)	a	32800
8	Uncontrolled emission rate (g s^{-1})	CE	0.32
9	Control efficiency (%)	c	90%
10	Controlled emission rate	CE	0.032

Totally 3 tippers and 1 hydraulic excavator will be proposed for proposed Rough stone & Gravel quarry.
ROM – 317556m^3 for five years or 27m^3/hr

The loading capacity of excavator is 1.20 m^3.

x = frequency of loading (no. h^{-1}) = 27/1.20 = 23 times.

4.1.2.3 Loading of Overburden (Gravel and Top soil)

Chakraborty et al. (2002) was used to calculate emission of particulate matter released into the atmosphere during loading of Gravel and Top soil.

$$\mathbf{E = [0.018\{(100\text{-}m)\ (m)^{-1}\}^{1.4}\{s\ (100\text{-}s)^{-1}\}^{1.4}(uhxl)^{0.1}]}$$

Table 4.3: Source Parameters (Loading of overburden)

S.No	Description	Symbol	Quantity
1	moisture content (%)	m	2.03
2	silt content (%)	s	32
3	wind speed (m s^{-1})	u	5.25
4	drop height (m)	h	1m above the tipper body
5	size of loader (m^3)	l	1.20
6	frequency of loading(no.h^{-1})	x	42 times (maximum)
7	Quarry area (m^2)	a	32800
8	Uncontrolled emission rate (g s^{-1})	CE	2.44
9	Control efficiency (%)	c	90%
10	Controlled emission rate	CE	0.244

Overburden – 80448m^3 for 3 years or 2m^3/hr. In actual, an excavator can excavate 30-50m^3 of overburden per hour.

The loading capacity of excavator is 1.2 m^3.

x = frequency of loading (no. h^{-1}) = 50/1.2 = 42 times

4.1.2.4 Haul Road

Chaulya (2006) was used to calculate emission of particulate matter released into the atmosphere during transportation of Rough stone & Gravel by truck operated per hour on haul road.

$$E = [\{(100-m)\ (m)^{-1}\}^{0.35}\ \{(us)\ (100-s)^{-1}\}]^{0.7}\{0.5 + 0.1(f + 0.42v)\}\ 10^{-3}$$

Table 4.4: Source Parameters (During Vehicle Movement on Haul Road)

S.No	Description	Symbol	Quantity
1	Moisture content (%)	m	2.03
2	silt content (%)	s	32
3	wind speed (ms^{-1})	u	5.25
4	frequency of transporting (no. h^{-1})	f	24 times (maximum)
5	average vehicle speed(ms^{-1})	v	11.1
6	haul road area (m^2)	a	32800
7	Uncontrolled emission rate (g s^{-1})	CE	0.016
8	Control efficiency (%)	c	70%
9	Controlled emission rate	CE	0.0048

Frequency of transporting of rough stone (no.h-1) = 7 times/hr

Frequency of unloading for top soil (no.h-1) = 5times/hr

Frequency of transporting (no. h-1), f =24 times (up and down)

4.1.2.5 Blasting

In another scenario when controlled blasting is carried out at the mine site and all the other activities are brought to halt. Significant amount of PM_{10} is released during blasting at mining site for very short-term.

$$E = E_f \times Q$$

Table 4.5: Source Parameters (During Blasting)

S.No	Description	Symbol	Quantity
1	Uncontrolled Particulate matter emissions rate in pounds per year	UE	127.0
2	Emission factor in unit of pounds of particulate per ton shifted by blasting	E_f	TSP E_f = 0.0001 pounds/ton $PM_{10}E_f$= 0.0008 pounds/ton

			$PM_{2.5}E_f$ = 0.0008 pounds/ton
3	Amount of material of all types shifted by blasting during the year in tons	Q	158778
4	Control efficiency (%)	c	30
5	Controlled Particulate matter emissions rate in pounds per year	CE	88.9

(Reference: Mojave Desert Air Quality Management District, 1403 Park Avenue, Victoria, CA 92392 -2310).

Loading and unloading of Rough Stone & Gravel, overburden, movement of trucks on haul roads were considered as combined action. So the emission during loading, unloading and transportation were taken combined and US EPA based AERMOD software was used with input of 1-h meteorological data of the study period for prediction of incremental GLC and for identifying dispersion pattern of pollutant. Blasting was considered as separate action and AERMOD model was used separately for two scenarios.

4.1.2.6 Summary of calculated Emission Rates

Table 4.6: Emissions Rates of PM_{10}

Source type	Controlled Emission Rate ($g/s/m^2$)
Drilling	2.7×10^{-6}
Rough stone loading	9.7×10^{-7}
Overburden Loading	7.4×10^{-7}
Haul Road	1.5×10^{-7}
Blasting	1.4×10^{-7}

Table 4.7: Emissions Rates of SO_2

Source type	Average Emission rate for HDDV as per EPA	Emission rate (Proposed Project)
Excavators	0.012 g/mile	6.4×10^{-8} g/s/m^2
Total Emission Rate		6.4×10^{-8} g/s/m^2

Average emission rate of SOx as per EPA, 2010 is 0.012g/mile or 0.00746 g/km or 0.00746g/200ml of diesel consumption or 0.0373g/litre.

Excavators

Diesel consumption by excavator per hour = 10 litre

SOx emission rate = 10 litre/hour x 0.373g/lit
= 3.73g/hr or 0.00104g/s
= 6.4×10^{-8} g/s/m^2

Table 4.8: Emissions Rates of NO_2

Source type	Average Emission rate for HDDV as per EPA	Emission rate (Proposed Project)
Excavators	0.725 g/mile	3.8 x 10-7 g/s/m2
Total Emission Rate		3.8 x 10-7 g/s/m2

Average emission rate of NOx as per EPA, 2010 is 0.725g/mile or 0.450g/km or 0.450g/200ml of diesel consumption or 2.25g/ litre.

Excavators

Diesel consumption by excavator per hour = 10 litre

SOx emission rate = 10 litre/hour x 2.25g/lit

= 22.5g/hr or 0.00625g/s

= 3.8 x 10^{-7} g/s/m^2

4.1.3 Frame work of Computation & Model details

By using the above-mentioned inputs, ground level concentrations due to the mining activities have been estimated to know the incremental rise 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 modeling is an important tool for prediction of dispersion of pollutants with GLC and it is used to find the air pollution control activities which controls the emission rates of different activities.

4.1.3.1 Model Input data

The air pollution modeling carried out represents the normal operating scenarios. As the proposed activity is mining the major source of pollution is particulate matter and gaseous emission. The following data has required as input data for dispersion pattern.

1) Location of the Project
2) Baseline data of PM_{10}, SO_X and NO_2
3) Meteorological Data for three months (One non monsoon Season)
4) Emission rates of PM_{10}, SO_x and NO_2
5) Elevation of the site
6) Location of nearest habitation, sensitive places if any

4.1.3.2 Model Results

The Air Quality Impact Prediction has been done by using AERMOD of USEPA". The main sources of air pollution with regard to the proposed project for the purpose of estimation of increase in PM_{10}, SO_X and NO_2 are identified due to –

1. Scenario 1 – PM_{10}

(i) Loading/unloading of Rough stone & Gravel and overburden

(ii) Transportation of Rough stone & Gravel, overburden by trucks on the Haul roads from mining benches.

2. Scenario 2 - PM_{10}

(i) Due to blasting

3. Scenario 3 – SO_x and NO_2

i. From Operation of Excavator and movement of transporting vehicle

Scenario1:

Table 4.9: Total predicted GLC of PM_{10} in core and buffer zone due to combined action of loading, unloading and Transportation of Rough stone & Gravel by trucks on the haul road of the mining lease area.

Location	Location Code	Background value in µg/m³	Incremental GLC in µg/m³	Total Predicted GLC in µg/m³
Mine site	AQ1 - Centre	49	18.08	67.08
Receptor 01	AQ2 – 1.3km - SE	49	0.08	49.08
Receptor 02	AQ3 – 1.3km - SW	49	1.59	50.59
Receptor 03	AQ4 – 2.0km - N	49	0.0	49.0
National Ambient Air Quality Standards (NAAQS)				**100**

Scenario 2:

Table 4.10: Total predicted GLC of PM_{10} in core and buffer zone due to blasting activity in the mining lease area.

Location	Location Code	Background value in µg/m³	Incremental GLC in µg/m³	Total Predicted GLC in µg/m³
Mine site	AQ1 - Centre	49	7.23	56.23
Receptor 01	AQ2 – 1.3km - SE	49	0.03	49.03
Receptor 02	AQ3 – 1.3km - SW	49	0.64	49.64
Receptor 03	AQ4 – 2.0km - N	49	0.0	49.0
National Ambient Air Quality Standards (NAAQS)				**100**

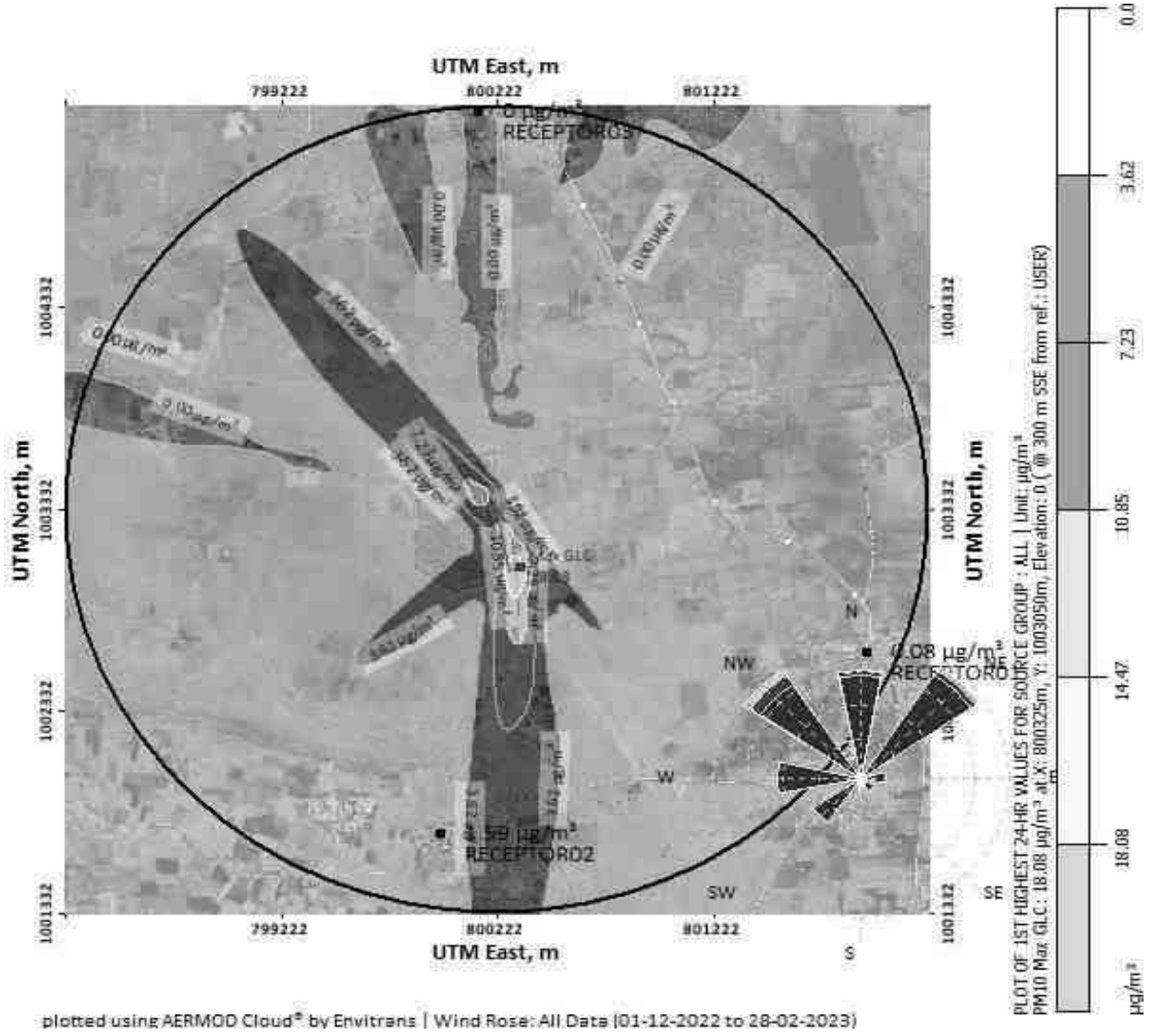


Fig 4.1: Image showing Isopleths of PM10 occurred during i) loading and unloading and ii) transportation of Rough stone and Gravel over the haul road

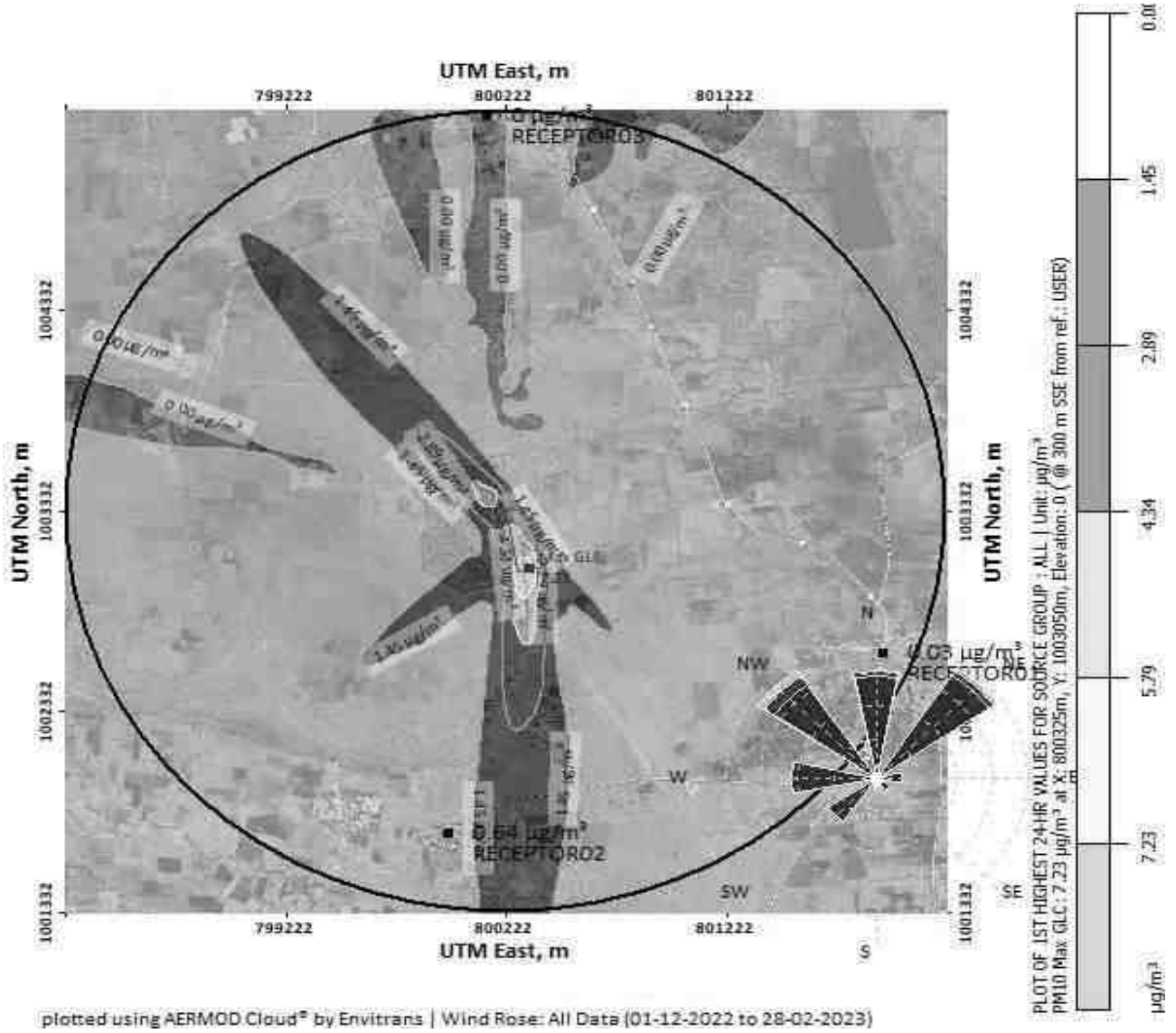


Fig 4.2: Image showing Isopleths of PM10 occurred during blasting in the mining area

Scenario 3:

Table 4.11: Impact of SOx due to Operation of Excavator and Movement of Vehicle in the mining lease area

Location	Location Code	Background value in µg/m^3	Incremental GLC in µg/m^3	Total Predicted GLC in µg/m^3
Mine site	AQ1 - Centre	15	BDL	15
National Ambient Air Quality Standards (NAAQS)				**80**

Table 4.12: Impact of NOx due to Operation of Excavator and Movement of Vehicle in the mining lease area

Location	Location Code	Background value in µg/m^3	Incremental GLC in µg/m^3	Total Predicted GLC in µg/m^3
Mine site	AQ1 - Centre	22	BDL	22
National Ambient Air Quality Standards (NAAQS)				**80**

AERMOD was used for prediction of impact of PM_{10} during conditions i) Loading/unloading and transportation of rough stone and weathered rock by trucks on Haul ii) During blasting of minerals. Total predicted 24-h maximum GLC of PM_{10} at project site for scenario 1 i.e loading-unloading and transportation and scenario 2 i.e. Blasting was 67.08µg/m^3 and 56.23µg/m^3 occurred at the project site after superposition of base-line value 49µg/m^3 over the incremental value of 18.08µg/m^3 and 7.23µg/m^3 due to combined impact of loading and unloading and transportation over the haul road and due to blasting. Meteorological data under worst case scenario providing 24-h maximum average GLC was discussed above.

The predicted incremental GLC of SO_x and NO_x for scenario 3 i.e. due to the operation of excavator and movement of vehicle in the project site were found to be BDL µg/m^3.

4.1.4. Air Quality Index

An air quality index is defined as an overall scheme that transforms the weighed values of individual air pollution related parameters (for example, pollutant concentrations) into a single number or set of numbers (Ott, 1978). Air quality standards are the basic foundation that provides a legal framework for air pollution control. The basis of development of standards is to provide a rational for protecting public health from adverse effects of air pollutants, to eliminate or reduce exposure to hazardous air pollutants, and to guide national/ local authorities for pollution control decisions.

The objective of an AQI is to quickly disseminate air quality information (almost in real-time) that entails the system to account for pollutants which have short-term impacts. To present status of the air quality and its effects on human health, the following description categories have been adopted for IND-AQI.

AQI breakpoints for eight pollutant parameters considered for AQI and these are summarized below in Table with color scheme to represent the AQI bands.

Table 4.13: AQI and its associated Health Impacts

AQI	Associated Health Impacts
Good	Minimal Impact
Satisfactory	May cause minor breathing discomfort to sensitive people
Moderate	May cause breathing discomfort to the people with lung disease such as asthma and discomfort to people with heart disease, children and older adults
Poor	May cause breathing discomfort to the people on prolonged exposure and discomfort to people with heart disease with short exposure
Very Poor	May cause respiratory illness to the people on prolonged exposure. Effect may be more pronounced in people with lung and heart diseases
Severe	May cause respiratory effects even on healthy people and seious health impacts on people with lung/heart diseases. The health impacts may be experienced even during light physical activity

Table 4.14: Proposed Breakpoints for AQI Scale 0-500
(Units: µg/m^3 unless mentioned otherwise)

AQI Category (Range)	PM_{10} 24-hr	$PM_{2.5}$ 24-hr	NO_2 24-hr	O_3 8-hr	CO 8-hr (mg/m^3)	SO_2 24-hr	NH_3 24-hr	Pb 24-hr
Good (0-50)	0-50	0-30	0-40	0-50	0-1.0	0-40	0-200	0-0.5
Satisfactory (51-100)	51-100	31-60	41-80	51-100	1.1-2.0	41-80	201-400	0.5 –1.0
Moderately polluted (101-200)	101-250	61-90	81-180	101-168	2.1- 10	81-380	401-800	1.1-2.0
Poor (201-300)	251-350	91-120	181-280	169-208	10-17	381-800	801-1200	2.1-3.0
Very poor (301-400)	351-430	121-250	281-400	209-748*	17-34	801-1600	1200-1800	3.1-3.5
Severe (401-500)	430 +	250+	400+	748+*	34+	1600+	1800+	3.5+

**One hourly monitoring (for mathematical calculation only)*

4.1.4.1. Interpretation of Air quality using IND-AQI:

Table 4.15: Computation of AQI with Baseline data

Air pollutants	Total Predicted GLC due to proposed quarry µg/m^3	AQI	Associated Health Impacts
PM_{10}	68.07	Satisfactory (51-100)	May cause minor breathing discomfort to sensitive people
SOx	10.95	Good (0-50)	Minimal Impact
NO_2	17.31	Good (0-50)	Minimal Impact

The above table shows the AQI quality due to total predicted GLC of quarry in core area. PM_{10} is between 51-100 of AQI which is satisfactory and may cause minor breathing discomfort to sensitive people. SO_2 and NO_2 are between 0-40 of AQI which is good and may cause Minimal Impact. When all the quarries in the cluster area are working together the incremental GLC will be high and it may cross the prescribed limits by NAAQS. To overcome such situation, cluster committee should be formed and adopt the environmental management plan effectively as per EIA report.

4.1.5. Mitigation Measures

The pollutants from nearby ongoing mining activities, residential and commercial activities are the primary sources of air pollution. However, in the study area adequate control measures will be implemented in future at the time of mining operation. Mitigate measures suggested for air pollution controls are based on the

baseline ambient air quality of the area. From the point of view of maintenance of an acceptable ambient air quality in the region, it is desirable that air quality is monitored on a regular basis to check compliance of standards as prescribed by regulatory authorities. However, to further minimize the pollutant concentration especially PM_{10}, the following control measure should be adopted by the project proponent.

- Regular water sprinkling on haul roads, blasted heaps, service roads and overburden dumps at regular intervals will help in reducing considerable dust pollution
- 2.0 KLD will be used for dust suppression.
- Use of Sharp drill bits for drilling holes and charging the holes by using optimum charge and using time delay detonator.
- Conventional low explosives are being used.
- The scale of blasting is however very less considering the rate of production.
- Covering of material when transport through trucks/dumper
- The drilling and blasting are being carried out as per the proposals laid down in the approved plan.
- Proposed to follow up muffle blasting so as to prevent fly rock fragments
- Avoiding blasting during high windy periods and temperature inversion periods
- Delay blasting under unfavorable wind and atmospheric conditions
- Use of appropriate explosives for blasting and avoiding overcharging of blast holes
- The vehicles and machinery will be kept in well maintained condition so that emissions will minimize
- Provision of green belt all along the periphery of the lease area for control of dust
- Information on wind direction and meteorology will be considered while planning, so that pollutants, which cannot be fully suppressed by engineering technique, will be prevented from reaching the residential areas
- Cabins for shovel and dumpers and dust masks to workmen will be provided
- The dust respirators should be provided to all workers working in dusty environment
- Regular health check–up of workers and nearby villagers in the impacted area should be carried out and also regular occupational health assessment of employees should be carried out as per the Factories Act
- Ambient Air Quality Monitoring will be conducted on regular basis to assess the quality of ambient air.

As discussed above under each activity, there will be increase in terms of dust load and gaseous emissions. However, it can be stated that these incremental contributions will remain within the prescribed limits/norms. Further, the mitigation measures will further bring down these concentrations making the mining activities more eco-friendly.

4.2 Carbon emission and carbon sinks due to proposed mining activity

4.2.1 Carbon emissions

There are both natural and human sources of carbon dioxide emissions. Natural sources include decomposition, ocean release and respiration. Human sources come from industrial activities such as cement production, deforestation as well as the burning of fossil fuels like coal, oil and natural gas.

4.2.1.1 Carbon emission due to natural activity in project site and carbon sinks

a) Carbon from decomposition

As the proposed project site is dry barren land with few shrubs which implies there is no much cutting of trees. So the process of decomposition will not take place which emits carbon dioxide into the atmosphere.

b) Carbon from respiration

The carbon dioxide we exhale does not contribute to global warming for the simple reason. Since all the carbon dioxide we exhale captured by plants during photosynthesis, we are not disturbing the carbon dioxide content of the atmosphere by breathing.

4.2.1.2 Carbon emission due to human activity in project site and carbon sinks

a) Carbon from Vehicles

The proposed method of mining is semi mechanized which involves activity of excavator and tippers. The burning of fossil fuels used for the tippers and excavators releases carbon monoxide, carbon dioxide and nitrogen oxide into the atmosphere. When those gases are emitted into the atmosphere it affects the amount of greenhouse gases, which are linked to climate change and global warming. In the proposed project, one or two excavators will be operated for nearly 10 hours in a day and will cause gaseous pollution in the atmosphere. Plants not only absorb carbon dioxide but also absorb other gases and remove impurities from it.

Table 4.16: Emission of carbon monoxide from vehicle

Source type	Average Emission rate of CO for HDDV as per EPA	Emission rate of CO
Excavators	2.311 g/mile	0.718kg/day
Total Emission Rate		0.718kg/day

Average emission rate – 2.311 g/mile or 1.436 g/km or 1.436 g/200ml of diesel

For one liter of diesel consumption by HDDV, ER – 7.18g

Excavators

Diesel requirement per day – 100 liters

Emission rate by excavators per day – 100 x 7.18 – 718g/ day or 0.718kg/day

Remediation

The project proponent proposed to plant 500 numbers of one year taller tree sapling along the safety zone of mining lease area to overcome the emission of carbon gases and other gases by vehicles in the quarry. Moreover, they will plant trees along the village road and government schools under CER and CSR schemes. BS –VI model of tippers are proposed to use in the quarry for the controlled emission of gases.

4.3 Soil Carbon stock

Soil carbon sequestration is a process in which CO_2 is removed from the atmosphere and stored in the soil carbon pool. This process is primarily mediated by plants through photosynthesis, with carbon stored in the form of SOC. The leaves of growing trees absorb atmospheric carbon dioxide, releasing oxygen and locking up the carbon until the tree eventually dies and decays and burnt. Carbon is mainly transferred into the soil through the release of organic compounds into the soil by plant roots or through the decay of plant material when they die. Some of the carbon from falling leaves enters the woodland soil and is stored there for the long term, making the entire woodland ecosystem an important carbon store. During decomposition of trees or plants, the microbes release carbon partly to soil and partly to atmosphere. The dense carbon stocks below and above the soil are mostly seen in dense forest where more process of photosynthesis takes place. The agricultural activity in field can degrade and deplete the SOC levels during the process of tillage in paddy, sugarcane turmeric crop field.

The land use analyst shows that there is Kurumalai R.F and Thoppasamymalai R.F located at the distance of 13km and 17km respectively. As it is mining project which is carried out within lease area it will not affect any soil carbon stock in the reserved forest.

4.4 Noise Environment

A preliminary reconnaissance was undertaken to identify the major noise generating sources in the area. Nine locations (5 in Core Zone & 4 in Buffer Zone) were identified based on the activities in the study area, traffic and sensitive areas like hospitals and schools. The noise monitoring locations are shown in following Table No. 3.4 in Chapter 3.

4.4.1 Anticipated Impacts due to Noise Pollution

Noise pollution poses a major health risk to the mine workers. When noise in the form of waves impinges the eardrum, it begins to vibrate, stimulating other delicate tissues and organs in the ear. If the magnitude of noise exceeds the tolerance limits, it is manifested in the form of discomfort leading to annoyance and in extreme cases to loss of hearing. Noise level due to mining activity will be less at nearest habitation due to distance involved and other topographical features between quarry site and nearest village. However the continuous operation of excavator and movement of tippers will disturb the elderly people and studying students in the nearest habitations.

Effects of Noise Pollution on Humans

1. Hearing impairment
2. Interference with spoken communication
3. Decrease in efficiency
4. Lack of concentration
5. Fatigue
6. Disturbance in mental health
7. Temporary or Permanent Deafness

Diseases caused by Noise Pollution

1. High BP
2. Heart Attack
3. Deafness
4. Stress
5. Anxiety

Detrimental effects of noise pollution are not only related to sound pressure level and frequency, but also on the total duration of exposure and the age of the person. Expected Noise level and Noise Exposure Levels & Its Effects are given in Table No. 4.19.

Table No: 4.17 Permissible Noise Exposures by Occupational Safety & Health Administration (OSHA)

Maximum allowable duration	Sound pressure level, dB (A)
8	90
6	92
4	95
3	97
2	100
1.5	102
1	105
0.5	110
0.25	115

No exposure in excess of 115 dB (A) is permitted.

Table 4.18: Expected Noise Level in Mining Project

Equipment's	Expected Noise Levels dB(A)
Mining	
Drilling	90-100
Shovel	75-80
Tipper	75-80
Dozers	85-90
Crusher	85-95

Table 4.19: Noise Exposure Levels & Its Effects

Noise Levels dB(A)	Exposure Time	Effects
85	Continuous	Safe
85-90	Continuous	Annoyance and Irritation
90-100	Short term	Temporary shift in hearing threshold, generally with complete recovery
Above 100	Continuous	Permanent loss of hearing
100-110	Several years	Permanent deafness
110-120	Few months	Permanent deafness
120	Short term	Extreme discomfort
140	Short term	Discomfort with actual pain
150 and above	Single exposure	Mechanical damage to the ear

Source: Hand Book of EIA, Rao & Wooten

4.4.2 Anticipated noise levels due to mining operations using Mathematical Equations

$L_2 = L_1 - 20 \log_{10} (R_2/R_1)$ Where L_1dB (A) = Noise level at a distance R_1 (m)
L_2dB (A) = Noise level at a distance R_2 (m) &
$L = 10 \log_{10} (10^{L_1/10} + 10^{L_2/10} + \text{----------} + 10^{Ln/10})$
Where L_1, L_2 and Ln are noise level dB (A)

Table 4.20: Predicted Noise levels in Core Zone and buffer zone

Location Code	Distance km	Source Noise Level, dB(A)	L(Day) dB(A)	L(Night) dB(A)	Noise level at Receptor from Mining sources, dB(A)	Resultant noise level, dB(A) day time	Resultant noise level, dB(A) Night time
Core Zone	--	100	44.1	38.3	100	100	38.3
Lease boundary Pillar (North)	0.075	100	42.9	36.2	70	70	36.2
Lease boundary Pillar (West)	0.075	100	47.2	32.4	70	70	32.4
Lease boundary Pillar (East)	0.075	100	44.5	38.1	70	70	38.1
Lease boundary Pillar (South)	0.075	100	39.9	39.5	70	70	39.5
Chettikurichi (SE)	1.36	100	45.1	39.7	44.8	47.9	39.7
Cithamparampatti (NE)	2.6	100	43.4	37.8	39.2	44.8	37.8
Nalanthula (N)	2.0	100	42.3	36.4	41.5	44.9	36.4
Ramiyapatti (W)	3.7	100	42.6	35.6	36.1	43.5	35.6
Vadakku Konarkottai (S)	1.3	100	39.5	31.8	45.2	46.2	31.8

Green colour- Baseline Value,

Red Colour – Noise level due to mining,

Blue colour- Baseline + Noise level due to mining

Although the noise level due to the operation of various mining machineries is 100dB(A), the noise level at different receptors is lower due to the distance involved and other topographical features adding to the noise attenuation. The calculated values at the receptors and resultant noise level are based on the mathematical formula as mentioned above.

The anticipated noise level in buffer villages due to mining activity is calculated by considering operation of one quarry only. **When all the quarries in the cluster work together in same time, the resultant noise level may increase up to 5 decibel.**

To overcome the noise pollution due to operation of quarries in the cluster area the following mitigation measure should be followed.

4.4.3 Mitigation measures for Control of Noise

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

- Use of personal protective devices i.e., earmuffs and earplugs by workers, who are working in high noise generating areas.
- Limiting time exposure of workers to excessive noise.
- Proper and regular maintenance of vehicles, machinery and other equipments.
- The noise generated by the machinery will be reduced by proper lubrication of the machinery and other equipments.
- Speed of trucks entering or leaving the mine will be limited to moderate speed to prevent undue noise from empty vehicles.
- Carrying out blasting only during day time and not on cloudy days.
- Noise levels will be controlled by using optimum explosive charge, proper delay detonators and proper stemming to prevent blow out of holes.
- Providing proper noise proof enclosure for the workers separated from the noise source and noise prone equipment
- Provision of Quiet areas, where employees can get relief from workplace noise.
- The development of green belts around the periphery of the mine to attenuate noise.
- Regular medical check–up and proper training to personnel to create awareness about adverse noise level effects.

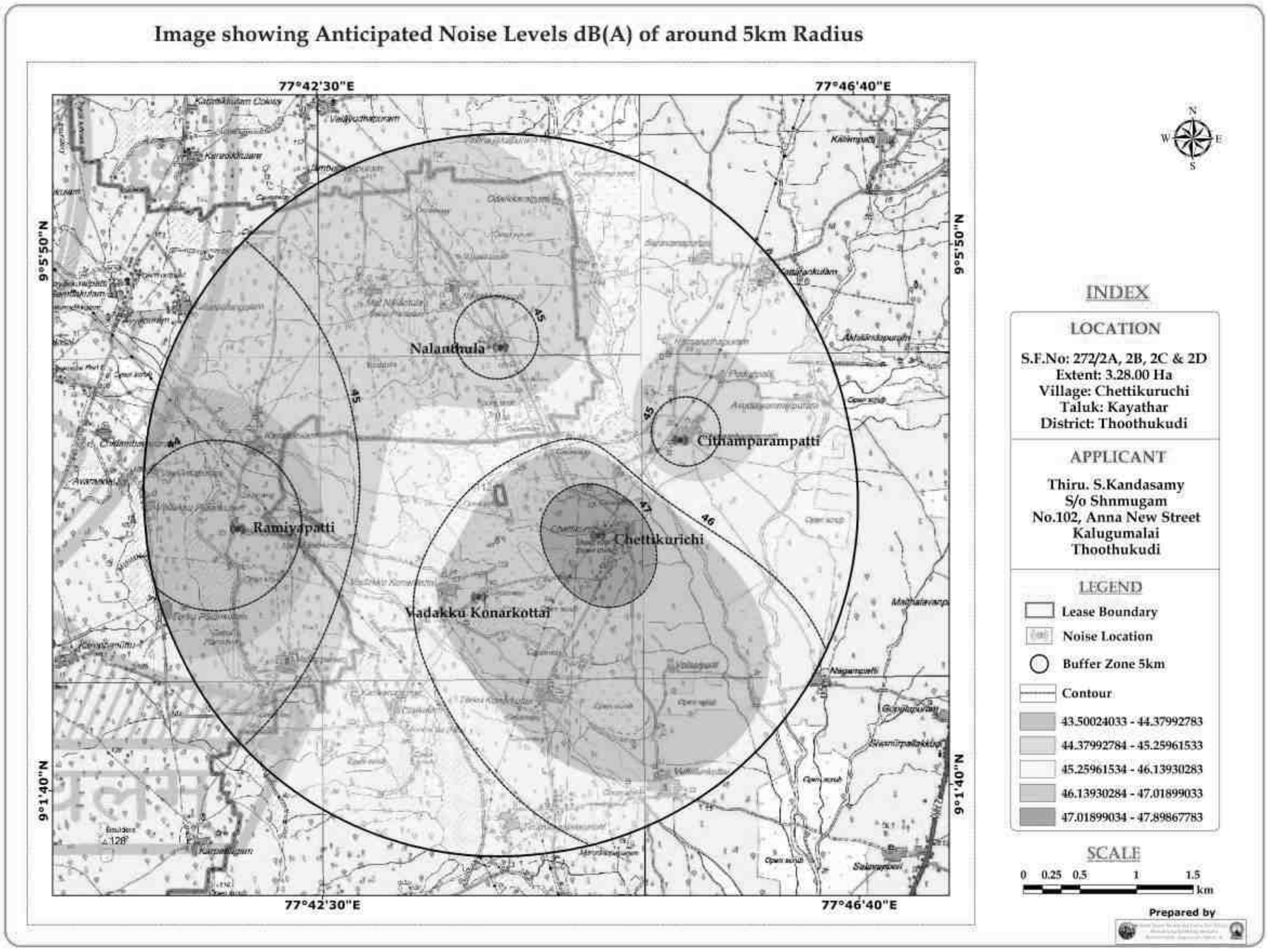


Fig 4.3: Noise dispersion in Buffer zone due to proposed mining activity

4.5 Ground Vibrations

Ground vibration due to mining activities in the area are anticipated due to operation of mining machines like excavators, wheel loaders, drilling and blasting, transportation vehicles, etc. However, the major source of ground vibration from this mine is blasting. Another impact due to blasting activities is fly rocks. These may fall on the houses or agriculture fields nearby the mining lease area and may cause injury to persons or damage to the structures. Nearest habitation from the mine lease area is Chettikurichi which is located 1.3km away from mining lease area. The study area does not involve any mining activity so anticipated impact has been assessed using the empirical equation. The empirical equation used for assessment of peak particle velocity (PPV) is:

$$V= 417.8 \{D/ (Q^{0.5})\}^{-1.265}$$

Where

V= Peak particle velocity in mm/s
D= Distance between location of blast and gauge point in m
Q=Quantity of explosive per blasting in kg.

The standards for safe limit of PPV are established by Directorate General of Mines Safety for safe level criteria through Circular No. 7 dated 29/8/1997. Permissible standards of Ground vibration due to blasting as per guidelines of Director General of Mines Safety (DGMS), Dhanbad are given in Table 4.22.

Table 4.21: Estimated Peak Particle velocities for different Explosive Charges

Nearest Habitation	Quantity of Explosive/Blast, Kg	PPV, mm/s
1300m -SE	75	0.73
1300m -SE	150	1.14
1300m -SE	300	1.8
1300m -SE	600	2.7
1300m -SE	1200	4.3
1300m –SE	1550	5.0

Note: The empirical formula does not take into account the delay factor in blasting due to use of Delay Detonators.

ROM for five years = 317556m^3
ROM for a year = 317556/5 = 63511 m^3
= 63511 x 2.5 = 158778 MT.
Per day ROM = 530 MT
Explosives requirement = 530/7 =75 kg/day

Table 4.22: Permissible Peak Particle Velocities (mm/s)

S. No	Type of Structure	Dominant excitation Frequency		
		< 8 Hz	8 – 25 Hz	> 25 Hz
A)	**Buildings/structures not belonging to the owner**			
1	Domestic houses/structures (Kuchcha brick and cement)	5	10	15
2	Industrial Buildings (RCC and framed structures)	10	20	25
3	Objects of historical importance and sensitive structure	2	5	10
B)	**Buildings belonging to the owner with limited life span**			
1	Domestic houses/structures (Kuchcha brick and cement)	10	15	25
2	Industrial buildings (RCC & framed structures)	15	25	50

Source: DGMS Circular No. 7 dated 29/08/1997

From the above results (Table 4.21), it can be seen that the charge per blast of 75kg is well below the Peak Particle Velocity of 5mm/s. However, as per statutory requirement additional control measures needs to be adopted to avoid the impacts due to ground vibrations and fly rocks due to blasting.

4.5.1 Mitigation measures for Control of Vibration

Blasting is the major source of vibration and fly rocks. The following mitigation measures are proposed for control of vibration and fly rocks.

- Specific charge pattern has to be designed by proper trial vibration studies with varying charge ratios.
- Milli second detonators shall be used preferably 25–50ms per delay to control vibrations.
- Inclined holes shall minimize back brake and intensive shocks.
- In case of development work if any, cushion blasting and Deck loading system shall be adopted to minimize throw of fragments and ground vibration.
- Air blast due to usage of Detonating Cord with 10gm/m shall be reduced to 5gms/m to minimize air reverberation.
- If the vibration still exceeds the limit a long Trench to a depth of 6m may cut in the direction of wave's movement to break longitudinal waves which travel close to surface, preferably near mine buffer zone.
- No deep hole blasting shall be practiced.
- Heavy machineries with high ground pressure shall not be used in the mines.
- Proper warning signals should be used.

- ❖ In spite of all measures periodical testing of vibration and noise using approved seismograph by DGMS has to be followed as a part of Environmental monitoring.

Though all mitigation measures are pointed out, as such no adverse effects on human life, wild life and other biotic system.

4.6 Water Environment

Mining operations can affect groundwater quality in several ways. The most obvious occurs in mining below the water table, either in underground workings or open pits. This provides a direct conduit to aquifers. Groundwater quality is also affected when waters (natural or process waters or wastewater) infiltrate through surface materials (including overlying waste or other material) into ground water.

Whereas Impacts on surface water include the build–up of sediments or other toxic products, short and long–term reductions in pH levels (particularly for lakes and reservoirs), destruction or degradation of aquatic habitat, and contamination of drinking water supplies and other human health issues. The water balance for the project is presented in Fig 4.4.

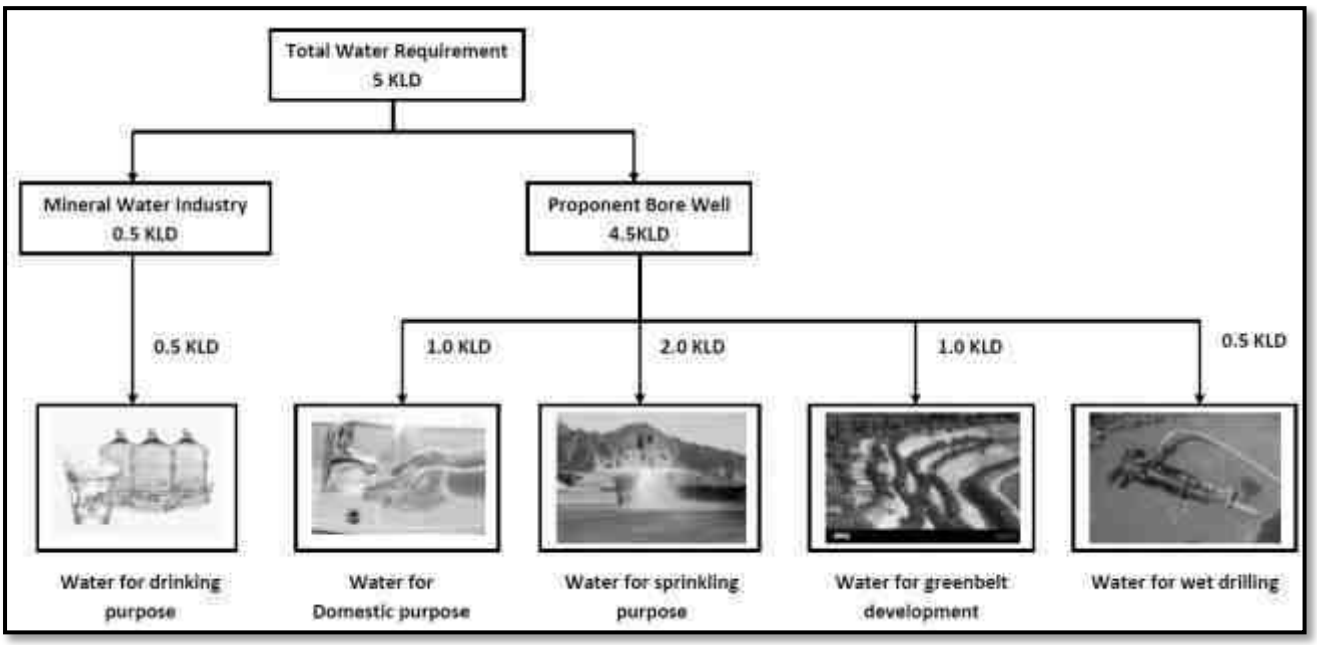


Fig. 4.4 Water Balance Chart

Drinking & Utilities = 1.5 KLD
Wastewater = (1.5 KLD * 75%) = 1.125 KLD
Water required For Dust Suppression, Green Belt, wet drilling = 3.5 KLD

Total Water Requirement = 5.0 KLD

There are no probable sources of liquid effluents in this project. The 1.125 KLD of domestic effluent/ wastewater generated from office will be discharged into soak pit via septic tank.

4.6.1. Anticipated Impact on Surface Water body due to proposed project

The water bodies located within 5km radius of the project site is given below.

1. A small lake – 740m – N
2. Nalanthula lake – 1.3km - NNE
3. Mel Nalanthula lake – 1.8km - N
4. North Konarkottai lake I – 988m – SW
5. North Konarkottai lake II – 1.5km – S
6. Uppodai River – 2.0km - E
7. Waterbody with weir across River Uppodai – 1.9km – ENE
8. A odai – 2.0km - SW
9. Olaikulam lake I – 2.7km – SSW
10. Olaikulam lake II– 2.9km – SSW
11. Vellappaneri lake – 3.8km – SW
12. Karisalkulam lake – 3.6km – NW
13. A odai – 4.7km – NE
14. Waterbody with weir across Odai – 4.7km – NE

The impact of mining activity on surface water body will be maximum upto 1km only. It is found that one small lake and North Konarkottai lake I is located within 1km radius of the project site.

Based on the drainage map given in the Fig.No.4.8 it is found that the 1st order stream may connect the south side of lease area to the nearest Uppodai River located in east side. From the proposed mining project, 5% of rejects will be generated which is planned to dump within the mining lease area (south side). During monsoon seasons, the probability of silitation in that 1st order stream due to dumping of rejects within the lease area is high and this 1st order stream will carry silt and causes siltation in the 4th order stream (Uppodai River). So the following mitigation shall be followed to overcome the pollution of surface water bodies due to mining activity.

4.6.1.1 Mitigation Measures:

i. The garland drainage will be provided around the dump (Top Soil and rejects) to prevent the escape of runoff from the dump.
ii. The repair works of the machineries are strictly prohibited within the lease area to prevent the spillage of grease, oil etc.

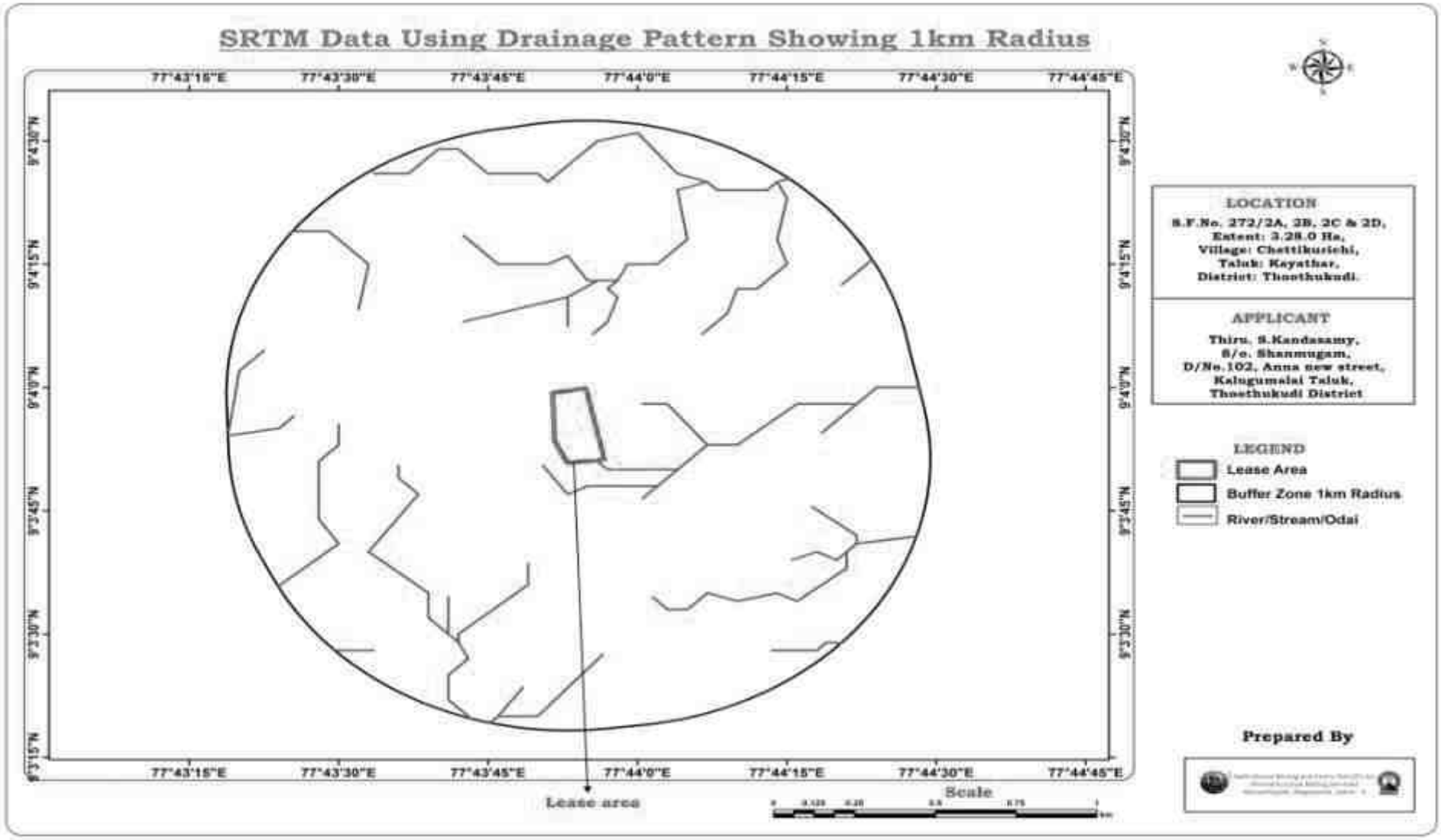


Fig. 4.5 Drainage pattern and water bodies within the 1km radius around the project site

4.6.2 Anticipated Impact on Ground water due to proposed project

The water table in this region is about 55-60m bgl. The proposed depth of mining is 34m bgl for five years. Thus, the mining activity will not intersect ground water table. No chemical having toxic elements will be used for carrying out mining activity. Also Rough stone does not contain any kind of toxic element which can contaminate the water. So the rain water or water used for drilling purposes which infiltrates into the ground in the lease area does not affect the quality of ground water. The schematic representation of depth of mining and water table is given in Figure 4.6.

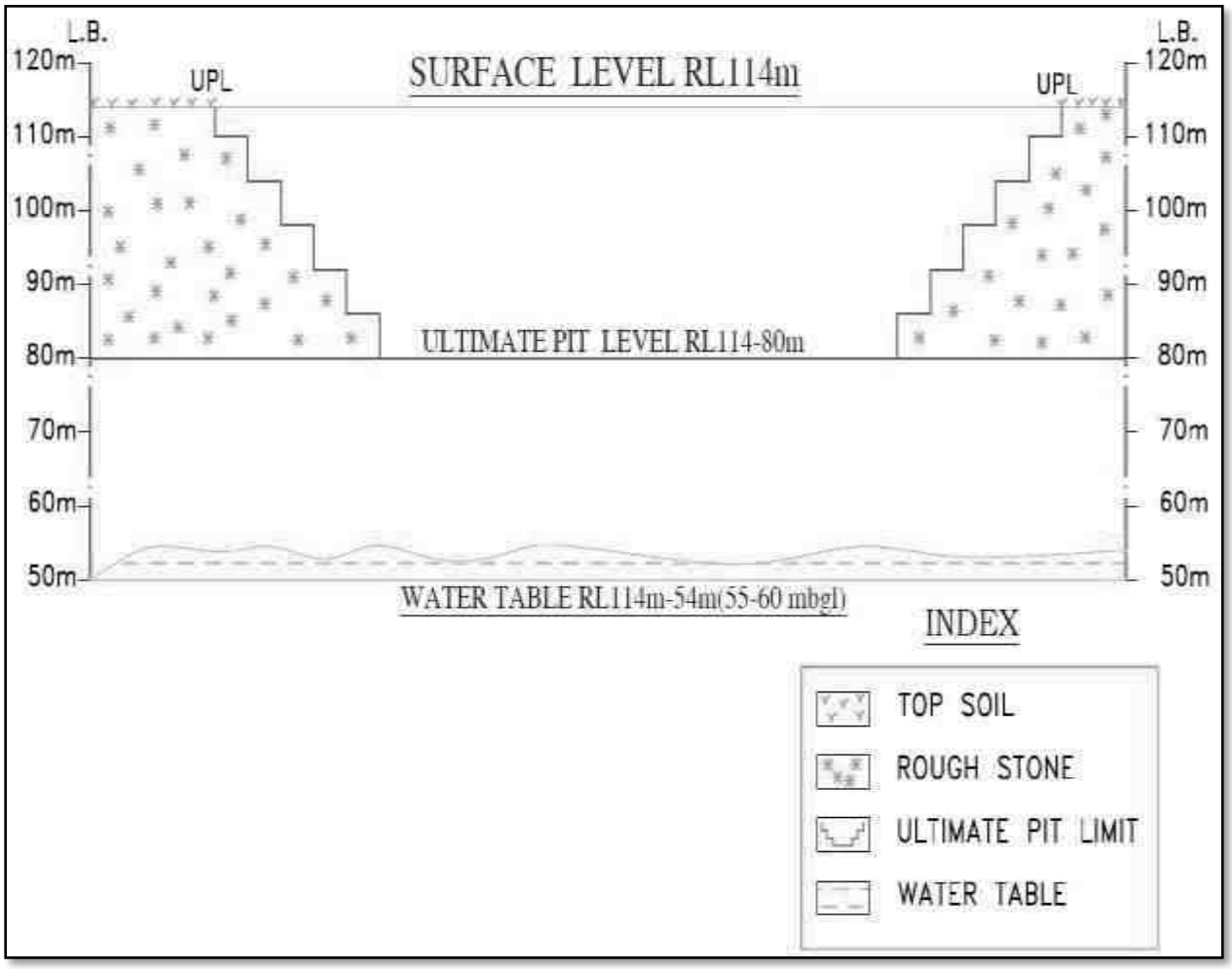


Fig.4.6 Schematic representation of depth of mining and water level

4.6.3 Management of rain water in the pit during Monsoon Season

During monsoon season, the rain water gets stored in the quarried out pit. For the working purpose, rain water will be pumped and allowed to store in the surface setting tank constructed near to the lease area to remove suspended solids if any. After the sedimentation process, the water from the settling tank will be used for dust suppression, and green belt development within the lease area.

4.6.4 Water Quality Index

Water Quality Index value has been calculated for the observed values and compared with drinking water specification as per IS 10500:2012 and results were discussed. The WQI has been calculated by using the standards of drinking water quality recommended by the World Health Organization (WHO), Bureau of Indian Standards (BIS) and Indian Council for Medical Research (ICMR). The weighted arithmetic index method (Brown et. al.,) has been used for the calculation of WQI of the water body.

Water Quality Index = Σ qn Wn / Σ Wn

Further quality rating or sub-index (qn) was calculated using the following expression.

qn = 100*[Vn – Vio] / [Sn – Vio] Where,

qn = Quality rating for the nth water quality parameter.

Vn = Estimated value of the nth parameter at a given sampling station.

Sn = Standard permissible value of the nth parameter.

Vio = Ideal value of nth parameter in a pure water.

Ideal value in most cases Vio = 0 except in certain parameters like PH and dissolved oxygen. Vio for PH = 7 and Vio for DO = 14.6

Wn = Unit weight for the nth parameter.

The overall Water Quality Index (W.Q.I.) was calculated by aggregating the quality rating with the unit weight linearly.

Table 4.23: Water Quality Index (W.Q.I.) and Status of water quality (Chatterji and Raziuddin 2002)

Water Quality Index Level	Water Quality Status
0 – 25	Excellent water quality
26 - 50	Good water quality
51 - 75	Poor water quality
76 - 100	Very Poor water quality
>100	Unfit for Drinking

Table 4.24: Analyses of water quality using Water Quality Index

Parameters	As Per IS 10500:2012	Unit Weight (Wn)	Core Zone	Chettikurichi	Cithamparampatti	Nalanthula	Ramiyampatti	Vadakku Konarkottai
Water Quality Index Level			**62.4**	**44.1**	**72.9**	**56.8**	**49.1**	**58.6**
Water Quality Status			**Poor water quality**	**Good water quality**	**Poor water quality**	**Poor water quality**	**Good water quality**	**Poor water quality**
pH value at 25°C	6.5 – 8.5	0.079	7.36	7.48	7.83	7.53	7.15	7.89
Turbidity , NTU	Max 1 NTU	0.0853	BDL(DL:0.1)	BDL(DL:0.1)	BDL(DL:0.1)	BDL(DL:0.1)	BDL(DL:0.1)	BDL(DL:0.1)
Total Dissolved Solids, mg/L	Max 500 mg/L	0.135	**1032**	**734**	**1064**	**864**	**820**	**700**
Total Hardness as $CaCO_3$, mg/L	Max 200 mg/L	0.059	**330**	200	**390**	**290**	**385**	**423**
Chlorides as Cl, mg/L	Max 250 mg/L	0.132	**360**	240	**430**	**330**	222	**376**
Sulfates as SO_4, mg/L	Max 200, mg/L	0.097	74	54	90	62	19	16
Total Iron as Fe, mg/L	Max 0.3 mg/L	0.088	0.04	0.03	0.04	0.06	0.08	0.07

Note: Water Quality is calculated only for Physical and Chemical Parameters

TDS from all the water samples exceeds the acceptable limits of 500mg/l and TH in the water sample of Chettikurichi village only was found within the acceptable limit of 200mg/l. The chloride also exceeds the acceptable limits of 250mg/l in all the samples except from Chettikurichi and Ramiyampatti Village. Based on the Water Quality Index calculated, water quality from Chettikurichi and Ramiyampatti Village is found good and water quality from all other locations are found poor. For excellent water quality, the ground water from all the location required to be treated by reverse osmosis to reduce dissolved solids and total hardness to the required rate. As the water quality of Chettikurichi village is good, the reject during the R.O treatment of water will be very less. Boiling of water will remove the microorganisms effectively from all waters in the above said villages and core zone making the water aseptically fit for drinking purposes.

Total Coliform: The most basic test for bacterial contamination of a water supply is the test for **total coliform bacteria**. Total coliform counts give a general indication of the sanitary condition of a water supply. It includes bacteria that are found in the soil, in water that has been influenced by surface water, and in human or animal waste.

Effects: Drinking water that is contaminated with **coliform** bacteria does not always cause illness. If disease-causing bacteria are present, the most common symptoms are gastrointestinal upset and general flu-like symptoms such as fever, abdominal cramps, and diarrhea.

Solution: To kill the microorganisms (Total Coliform) boiling the water is very easy and effective step.

Escherichia coli (E.coli): It is the major species in the fecal coliform group. E. coli is considered to be the species of coliform bacteria that is the best indicator of fecal pollution and the possible presence of pathogens.

Effects: It Causes intestinal infection include diarrhea, abdominal pain, and fever. More severe cases can lead to bloody diarrhea, dehydration, or even kidney failure.

Solution: E.coli contaminated water can be treated by using chlorine, ultra-violet light, or ozone, all of which act to kill or inactivate E. coli. Chlorine is a cheap and effective disinfectant. It is available in local market.

4.6.5 Impact on Hydrogeology

i. RESISTIVITY SURVEY ANALYSIS

Electrical Resistivity survey by Schlumberger configuration was conducted to interpret various geological formation and possibility of water spring touch at various depths by Inverse slope method.

Table 4.25: Resistivity Survey result

Layer	Depth (m)	Nature of formation	Resistivity Value
h1	0–6m	Top Soil & Weathered Rock	Low value ('Ω)
h2	7-55m	Massive formation	Medium value ('Ω)
h3	55m	Fracture Zone	Medium value ('Ω)
h4	>55	Massive formation	High value('Ω)

From the results of Resistivity Survey, it is understood that the study area is composed of Rough stone & Gravel deposit, with little geological disturbances by folding. It is blue with grey in color. Mild Seepage of Ground water is reported at 55m bgl.

4.6.6 Rainwater Harvesting Potential in Core Zone at the end of project

1) Total Pit Area = 24291m^2
2) Annual rainfall of the area = 0.655m
3) Total rainwater available to store in pit area = 15910 m^3
4) Total volume of Quarried Pit = 825894 m^3

4.7 Soil Environment

4.7.1 Impact on Soil Environment

For the five year plan period, the generation of top soil and gravel is estimated as 80,448m^3 upto the depth of 4m from the surface. From this quantity, the generated top soil will be dumped along 7.5m inner boundary of the lease area and generated gravel generated will be sold to the local needy customers. The top soil will be used to develop greenbelt within the lease area. Part of top soil will be spread over the non active dumps along the slope and edges to plant tree saplings to form vegetal cover over the dumps. No chemical or toxic elements will be used during mining activity. So the health of soil in and around the quarry will not be affected.

4.7.2 Mitigation measures for Soil Conservation

- Garland drains will be provided around the dumps to arrest any soil carried away by the rain water. This will protect the adjacent agricultural land and surface water body from the deposition of soil.
- Toe drains with low height retaining wall will be provided all along the toe of dumps to prevent the soil along the slopes being carried away by the rain water
- Top soil should not be mixed with other waste or reject materials. It should be conserved by judicious utilization in the mine premises.

4.8 Waste Dump Management

4.8.1 Anticipated Impact

The proposed rate of production of Rough stone for five years is about 3,10,678m^3 at the rate of 95% recovery up to permissible depth. The 5% reject of 15878m^3 will be dumped within the mining lease area (south side) as per approved mining plan. All rejects dumped will be backfilled at the end of mine life. During monsoon seasons, the runoff from the dump will carry silts and small stones and it affect the land use around the project site which means it may affect the carrying capacity of stream, water holding capacity of lakes and affect nearest agricultural lands.

4.8.2 Mitigation measures

The mineral rejects and waste shall be dumped systematically with proper repose angle and stabilization as given below,

- Gradation of dump shall be done automatically as coarser materials go to the bottom and finer at the top and therefore drain of rain water flow freely to the bottom without endangering the stability of dump,
- More over the dump height shall be less than 6m with natural repose angle and hence dump will be more stable.
- Garland drainage around dump will prevent under wash of dump by hydrostatic pressure to be developed by surface water and control wash outs and collapse.
- The runoff from the slopes of dump will be collected by garland drainage around the dump and it will be taken up to settling tank to settle down the suspended solids. After that the water will be used for greenbelt development and dust suppression purposes.

4.9 Municipal solid waste management

The human waste shall be treated by temporarily built septic tank and soak pit within the mine lease area. The municipal solid waste generated by workers will be properly segregated into biodegradable and non-biodegradable and disposed through garbage collector.

4.10 Ecology and Biodiversity

4.10.1 Impact on Ecology and Biodiversity

The details and list of flora, fauna, reserved forest and cropping pattern within the 10km radius of study area is given in chapter 3. The impact on ecology and biodiversity due to the proposed mining activity has to be studied in detail to prepare the management plan to safeguard the flora, fauna, forest products and aquatic living organism etc.

A detailed anticipated impact of Ecology and Biodiversity due to mining activity is described in Table 4.26 & 4.27.

Table 4.26: Ecological Impact Assessments and Its Mitigations -Part 1

Sl. No	Issues	Assessment	Mitigations
1	Proximity to national park/ wildlife sanctuary / reserve forest / mangroves / coastline/estuary/sea	No forests are situated within 10km radius. The proposed project does not attract Forest Conservation Act, 1980. There is no wild life sanctuaries found around 10km radius. Quarry area is 154km (SE) away from the Bay of Bengal. Hence the area does not attract Wildlife Protection Act, 1972 and C.R.Z. Notification, 1991.	-.
2	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. The fauna in the buffer zone may be affected by noise generated due to mining activity.	The noise due to the mining activity will be controlled developing green belt all along the lease boundary, regular maintenance of tippers, excavators, transporting the empty tipper within the speed the 20 km/hr.

3	Located near an area populated by rare or endangered species	No endangered, critically endangered, vulnerable species sighted in core mining lease area and also in buffer zone.	Nil
4	Proposed project restricts access to waterholes for wildlife	No waterholes are in core zone. No Wild life sanctuary within 10km radius.	Nil
5	Proposed mining project impact surface water quality that also provide water to wildlife	'NO' scheduled or threatened wildlife animal sighted regularly in core area.	Nil
6	Proposed mining project increase siltation that would affect nearby Biodiversity area.	Yes, the runoff from the dump which carries the solid materials may get silt in the adjacent agricultural land and affect the cropping pattern. Also it may get silt in the adjacent water body and reduce its water holding capacity	Garland drainage will be excavated around the dump and quarry area to collect the runoff during monsoon season. The water collected in the garland drainage will be diverted to settling tank or mine pits to settle down the silts and other suspended solids. This will prevent the siltation in the adjacent area. The drainage will be desilted after every precipitation.
7	Risk of fall/slip or cause death to wild animals due to project activities	'NO'. No Wild life sanctuary within 10km radius.	Nil
8	The project release effluents into a water body that also supplies water to a wildlife	As the proposed project is mining activity there will be no possibilities of release of effluents. Also no Wild life sanctuary within 10km radius.	Nil
9	Mining project effect the forest based livelihood/ any specific forest production which local livelihood depended	There is no Reserve forest or Protected forest located within 10km radius. Hence the proposed mining activity will not affect the nearest forest.	-
10	Project likely to affect migration routes	No migration route observed during monitoring period.	Nil
11	Project likely to affect flora of	No flora having medicinal value	The flora such as neem

	an area, which have medicinal value	found within the lease area	having medicinal value found in the study area of buffer zone. Those floras will not be affected by the proposed mining activity at it will be carried out only within the lease area.
12	Forestland is to be diverted, has carbon high sequestration	'NO'. There is no forest land within the lease area.	Nil
13	The project likely to affect wetlands, fish breeding grounds, marine ecology	**'**NO'. No wetland, fish breeding grounds, marine ecology present in core mining area.	Nil

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

Table 4.27: Ecological Impact Assessments – Part 2

Ecological Criteria	Identified Impacts	Ecological significance of Impact	Magnitude	Duration /Timing/ Frequency	Reversibility	Mitigation	Cumulative Impact
Zone of Influence	**Project site Habitat due to Site Clearance.**	The proposed mining lease is located in Chettikurichi Village. Since it is a fresh area, some shrubs will be cleared before the commencement of the project. The fauna which depends on the shrubs for habitat will be disturbed. No clearance of vegetation in the buffer zone	**Low Impact**	-	**Irreversible in quarry area**	During the clearance, it will find the alternate habitat in the buffer zone. During the operation of quarry, the proponent will develop the green belt along the lease boundary. This afforestation will provide the habitant for the migrated fauna.	**No Cumulative Impact**
Zone of Influence	**Ecological Impact Surrounding habitat due to fugitive emission**	The fugitive emission due to the mining activities such as drilling, blasting, loading and transportation on the haul road will be deposited on the flora and crop field in the buffer zone which affects growth and its productivity.	**Temporary Impact**	During the mining plan period	**Reversible**	Before loading the rough stone & gravel will be moisturized to minimize the emission. The sprinkling of water over the haul road will be done. Then completely wet drilling will be adopted. The transportation vehicles will be maintained and serviced Properly.	**No Cumulative Impact**
Accessibility	**Ecological Impact due to road construction**	No Road construction is required to assess the project site. The existing approach road connects the project site to the existing village road.	**No Impact**		-	-	**No Impact**

Zone of Influence	**Ecological Impact on Surrounding/ Eco sensitive habitat due to waste water generated from the project activity.**	Since the proposed project is an mining activity no waste water generation is expected. Human waste and municipal solid waste will be generated due to the workers.	**No Impact**	-	-	Human waste will be properly treated by septic tank and soak pit in the lease area and dispose periodically. The municipal solid waste generated by workers will be properly segregated into biodegradable and non-biodegradable and disposed through garbage collector.	**No Impact**
Zone of Influence	**Ecological Impact on Surrounding / Eco sensitive habitat due to Noise generated from the project activity.**	During drilling or blasting, transportation of rough stone & gravel, noise will be generated and it may slightly affect the movement of fauna around the lease area.	**Temporary impact**	Only during drilling, blasting operation and transportation period. (5 years)	No	Avenue trees will be planted along the lease area to minimize the noise level. Milli second detonators shall be used preferably 25–50ms per delay to control vibrations. Regular maintenance of vehicles and driving the empty tipper within 20km/hr speed also control the noise generations.	**No Impact**

Zone of Influence	**Ecological Impact On Surrounding/ Eco sensitive habitat due to Transportation**	There is no eco sensitive habitat found around the lease area. The fugitive emission from drilling, blasting, vehicle movement will form layer in leaves thus reducing the gaseous exchange process. This ultimately affects the growth of plants. The animals like dog, cattle may get accident due to truck movement.	**Temporary impact**	During Operation Phase	No	The truck driver will be advised to drive the vehicle within 20km/hr inside the lease area and 40km/hr outside the lease area. Before loading the rough stone & gravel, it will be moisturized to minimize the emission. The sprinkling of water over the haul road will be done. Then completely wet drilling will be adopted.	**No Impact**
Zone of Influence	**Ecological Impact on Natural ecosystem, the soil micro flora and fauna and soil seed banks.**	There are no forests and wild life sanctuary located within 10km radius of the project site. No major water bodies are located within 500m radius. It is found that plantation of trees are adjacent to the project site in west side. In that area soil micro flora and fauna may be found. The mining activity may affect the adjacent micro flora and fauna.	**Temporary Impact**	Nil	--	The mining activity should be carried strictly within the lease area. No rejects should be dumped outside the lease area. The adjacent tree plantation should not be disturbed and proper EMP must be adopted to protect surround ecosystem.	**No Impact**
Zone of Influence	**Fish habitats and the Food web/food chain in the water body and Reservoir**	There is no major water bodies located within 500m radius of the project site.	**No Impact**	Nil	--	The garland drainage will be around the quarry pit and dump. The maintenance of vehicle will be strictly prohibited in the lease area	**No Impact**

Table 4.28: Afforestation Plan of the Proposed Rough Stone & Gravel Quarry for the next five years

Year	Place	Types of Trees	Number	Rate of Survival
I	Lease Boundary & Dump	Neem, Teak & other regional trees	30	80%
II	Lease Boundary & Dump	Neem, Teak & other regional trees	30	80%
III	Lease Boundary & Dump	Neem, Teak & other regional trees	30	80%
IV	Lease Boundary & Dump	Neem, Teak & other regional trees	30	80%
V	Lease Boundary & Dump	Neem, Teak & other regional trees	30	80%

Nearly 5619 Sq.m area is proposed to use under afforestation by planting 30 nos of neem, teak and other sapling etc., every year in the spacing interval of (5m x 5m) with an anticipated survival rate of 80%.

4.11 Socio Economic

4.11.1 Anticipated Impact

Employment generation (Direct and Indirect) due to the project has generated direct and indirect employment for more than 50 persons. Preference will be given to the local population for employment in all categories including semi-skilled and unskilled. The villages and their inhabitants in the buffer zone will not be disturbed from their settlements due to the mining operations.

It is obvious to assume that the activities of the mining operations will improve the socio-economic levels in the study area. The anticipated impact of this project on various aspects is described in the following sections

- Impact on human settlement: Overall, due to employment generation and economic progress, there will be positive changes in the socio-economic condition of the people residing in the vicinity of the project site. The local population will have preference to get an employment. No resettlement has occurred due to mining activity. Built up land will be increased marginally.

- Impact on Population Growth: Population rate grows annually and demand of primary needs and employment will increase due to population growth. It will provide some direct and indirect employment to the people in and around the villages.

- Impact on Vegetation: Agricultural activity is found poor around the project site. It may be due to poor availability of ground water and surface water resources. At the end of mining, the water stored in the quarried out pit will be utilized for improving agricultural activity around the project site.

Therefore due to mining, per capita income of local people will be improved. The local people have been provided with either direct employments or indirect employment such as business, contract works and development work like roads, etc. and other welfare amenities such as Sanitary facilities, Solar Lighting to Govt school, Health Care to the villages in buffer zone, Maintenance of village road or Providing funds to local body or Prime minister's fund on Socio economic Development and relief measures. The job/ business opportunities will improve the economic condition of the persons. They are in a position to utilize this money for purchase of tractors, trucks, etc. which may be put into use for business purposes. Many **positive impacts** can be resulted from a long-term mine unit. In this context, provision of job opportunities, business, transport and communication, laborer etc are the major ones. Thus, this unit is highly favorable to poor and landless people.

4.11.2 Mitigation Measures

- Good maintenance practices will be adopted for plant 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.
- Drilling, blasting etc at specified location will be followed with proper schedule.
- Appropriate air pollution control measure will be taken so as 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 has been provided which meet 'BIS' (Bureau of Indian Standards).

Thus, no significant impact on health and safety will be occurred due to this project.

4.12 Land Environment

4.12.1 Anticipated Impact on Land Use / Land Cover

Rough stone & gravel quarry project will result in disturbance of the land use pattern of the mine lease area. The impact on the topography in the form of changed landscape is unavoidable during mining activities like excavation, overburden dumping, soil extraction etc. Land requirement for the project has been assessed considering functional needs. So reclamation of mined out land will be given due importance as a step for sound land resource management. There is no release of toxic elements into the ground. No adverse impact is anticipated on land use of buffer zone associated due to the mining activity, as all the activities will be confined within the project site. The mining operations will impact the land usage and land aesthetics of mine lease area.

The land use analyses show that the tree plantation is found on the west side of the lease area and existing rough stone quarries are found on north and south side. Minor agricultural activity is carried out within 500m radius in northeast and southeast side. The dumping of rejects and dust deposition in the adjacent lands may affect the land use around the site.

At the end of the project, the quarried pit will be act as water storage pond. The stored water will be used for developing agricultural activity around the mining lease area. It will improve the livelihood of village people. The evaporation rate of the water in the pit is given detail in the report.

4.12.2 Mitigation measures

- The restoration of the degraded land would cover backfilling and terracing with the overburden / wastes and surfacing the same with top soil.
- Provision of Garland drainage around the dumps
- Fast growing trees and other native shrubs would be planted to stabilize the reclaimed land
- Appropriate measures will be taken for Green belt development.
- The rain water will be stored in the pit which will recharge the ground water as a part of rain water harvesting scheme for irrigating the nearby agricultural lands.
- The adjacent land should not be disturbed by dumping of rejects or any other activities.
- Sprinkling of water over the haul road and other exposed surface based on weather condition in the project site must be carried out.

4.13 Occupational Health Risks

4.13.1 Anticipated Impact

Occupational health and safety hazards occur during the operational phase of mining.

Excessive dust, Noise and vibration are the chief health hazards. Exposure to fine particulates is associated with work in most of the dust generating stages of mining. Workers with long term exposure to fine particulate dust are at risk of pneumoconiosis, emphysema, bronchitis, silicosis and fibrosis.

Precautions would be adopted to prevent dust generation at site and dispersing in the environment. Workers are likely to get exposed to excessive noise levels during mining activities. Occupational Safety hazards related to blasting activities may result in accidental explosions, if not properly mitigated.

Physical injuries during project operation are related to near slips and falls: contact with falling/ moving objects and lifting/ over-exertion. Other injuries may be due to contact with or capture in, moving machinery like dump trucks, loaders etc.

4.13.2 Anticipated occupational and safety hazards

- Health Impact due to Physical activity, Extremes of age, poor physical condition, fatigue, Cardiovascular disease, Skin disorders
- Noise
- Burns and shocks due to electricity
- Respiratory hazards due to Dust exposure
- Physical hazards
- Explosives
- Fire

4.13.3 Anticipated health impacts on people in nearby villages

The mining activity not only causes health hazards to quarry workers but also affect the health of nearby village people. The fugitive emission during heavy wind period travel along the predominant wind direction and people in village located along predominant wind direction gets affected. The chances of changing water quality in villages due to mining activities lead to causes various diseases in the nearby village people.

4.13.4 Mitigation measures

For the safety of workers at site, the following mitigation measures are proposed

- Excavators, dumpers, drills other automated equipments will be enclosed
- Use of personal breathing protection will be made compulsory
- Spraying with water on all working faces & haul roads, by water–sprinkler
- Regular health monitoring of workers once in 6months for silicosis
- Random health check up village people around the lease area for identify diseases if any due to mining activity
- No employee will be exposed to a noise level greater than 75 dB(A) for a duration of more than 8 hours per day without hearing protection
- Ear muffs provided will be capable of reducing sound levels at the ear to at least 75 dB(A).
- During mining operations, all the statutory provisions of the Indian Electricity Rules 1956, and Indian Standards for installation and maintenance of electrical equipment etc. will be observed.
- Care will be taken to evacuate the mining area completely at the time of blasting operations.
- A blasting SIREN will be used at the time of blasting for audio signal
- Before Blasting and after blasting, red and green flags will be displayed as visual signals.
- Warning notice boards indicating the time of blasting and NOT TO TRESSPASS are displayed prominently.
- First-aid facilities as per provisions under Rule (44) of Mines Rules 1955
- Initial and Periodical medical examination shall be conducted for the employees under Rule 29B & 45 (A).
- Insurance will be taken in the name of the laborers working in the mines.

4.14 Agricultural Environment

4.14.1 General

The general impacts on agricultural lands will be dust pollution, as volume of dust is discharged into the air during the process of quarrying. Dust gets deposited on the leaves of plants, flowers and soil. This affects the photosynthetic and fruiting ability of the crops.

Silt from the excavation, screening process and reject during monsoon season gets washed and chokes the agricultural fields, rendering them useless for the growth of

crops. Due to blasting, fly rocks may fall on agricultural fields making it difficult for the farmer to cultivate.

There is a need for dust control on haul road movements. Vehicles emit fugitive gases during transportation of materials. Those gases enter the plants through the stomata pores; it destructs chlorophyll and affects photosynthesis leading to stunted growth or death of crops.

The pumping of water from the ground for the mining activity will reduce the availability of water for the agricultural purposes.

4.14.2 Anticipated Impacts of Proposed project on Agriculture, Horticulture and livestock

The land use analyst sighted that the agricultural activities are carried out only few places within 1km radius. The major agricultural activities are carried out in Chettikurichi village and in Vadakku konarkottai where the surface water resources are available. During site visit, it is seen that the nearest village people are farming animals like goat, cow, and sheep for their livelihood.

The above mentioned impact may be observed on the nearest agricultural farm during the quarrying activity. So the following mitigation measures will be suggested to protect the nearest farm. The requirement of water for the proposed project will be obtained from proponent's own bore well. This may causes the depletion of ground water resources and affect the agricultural activity in that area. The bore well is located nearest to the project side in north side.

4.14.3 Mitigation Measures

- Spraying of water on the haul roads will be done to suppress the dust in the source itself. Interval of sprinkling depends on the environmental factors such as temperature, rainfall and humidity of the proposed site.
- The trees having tolerance to different air pollutants will be planted along the boundary to prevent the escape of dust to the surroundings.
- Garland drainage will be provided around the lease area to prevent the leach of silt into the farm.
- Regular check and proper maintenance of Vehicles will be carried out to minimize the emission of pollutants.

- Adequate Blast shield or blast mats will be provided wherever necessary for fly rock protection during blasting, thus to prevent the accident on the nearest farms.
- During monsoon season the dust deposited on the surface of plant body is washed out naturally.
- Making two bore holes which have direct conduit with the water table in the lease area will help ground water recharge during monsoon seasons. It helps the agricultural activity in the buffer area of project site.

Fig No 4.7 Agricultural activity within 1km radius of project site

CHAPTER – 5: ANALYSIS OF ALTERNATIVES (TECHNOLOGY AND SITE)

Consideration of alternatives to a project proposal is a requirement of the 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 environment friendly and cost effective options. Analysis of alternatives should be similar to the content of the approved mining plan.

The selection of the site is based on the following considerations which are feasible in terms of location, deposit characteristics, availability of reserves, percentage recovery, road facilities, labor availability, requirement of health and safety and environmental concerns, production scheduling, scope of mechanization/automation, land reclamation, and operating and capital cost estimates.

Mineral deposits are site specific, and therefore, selection of a quarry site has limited alternatives. The geologic formations found in the district are a well-developed litho package of meta-sedimentary sequence inter banded with Charnockite Group of rocks. The "Charnockite" or Hypersthene granite rock commercially called as Rough stone or Blue metal contains Hypersthene, Quartz and feldspar identified by grayish white in colour, pearly luster on cleavage faces. This rock is suitable for construction purposes because of its high strength, colour, high density, low porosity etc. The proportion of quartz shall be more than Ortho feldspar and thereby chemical resistance resist weathering and uniformly grained materials of sand and grits are useful for making aggregates. In the project site, the rock types exposed are of quartzite, calc-granulites, garnet-biotite-Sillimanite gneiss, garnet quartzo-feldspathic gneiss and garnet-biotite-cordierite gneiss belonging to Khondalite Group of rock. This project is mineral and site specific, hence no alternative site or technology is considered for this project.

CHAPTER – 6: ENVIRONMENTAL MONITORING PROGRAMME

Environmental Monitoring program is mandatory to check the impact of the mining activity in the core and buffer zone. Hence regular monitoring of various environmental parameters helps in maintaining sound operating practices of the mining in line with mining and environmental regulations. Environmental Monitoring program will be conducted for various environmental components as per conditions stipulated in Environmental Clearance Letter issued by SEIAA & Consent to Operate issued by TNPCB.

6.1 Measurement methodologies

The following instruments will be used for environment monitoring for various environmental parameters.

Table No: 6.1 Instruments used for Monitoring

S. No	Instruments	Purpose of Monitoring
1	Respirable Dust Sampler	Air Pollution
2	Fine Particulate Sampler	Air Pollution
3	Sound level meter	Noise level
4	Digital Seismograph	Vibration monitoring
5	Water level indicator	Water level
6	Geophysical Instruments (DDR3)	Water table
7	Camera, Binocular & Lens	Flora, Fauna
8	GPS & DGPS	For fixing the coordinates of sampling location
9.	Electronic Total station	Reduced level & topography monitoring

In addition to the above, Primary data on land use, socio economics will be collected by visiting the field and secondary data will be collected from Government Department and other sources.

6.2 Monitoring Schedule and Frequency

The sampling and analysis of the environmental attributes will be as per the guidelines of Central Pollution Control Board (CPCB). Monitoring program will be followed till the mining operation ceases as per the schedule below.

Table 6.2: Monitoring Schedule

S. No.	Environment Attributes	Location	Monitoring		Remarks
			Duration	Frequency	
1	Meteorology and Air Quality	Continuous monitoring weather station in core zone/ nearest IMD station	24 hours	Monthly Once	Wind speed, direction, Temperature, Relative humidity and Rainfall.
2	Air Pollution Monitoring – $PM_{2.5}$, PM_{10}, SO_2 and NO_x	5 locations (One station in the core zone and at least one in nearby residential, area, one in the upwind, one station on the downwind direction and one in cross wind direction)	8 hours	Once in six months	Fine Dust Sampler and Respirable Dust Sampler
3	Water Pollution Monitoring	Collection of ground water samples in core and buffer zone	–	Once in six months	Phyiso–chemical, microbiological characteristics
4	Hydrogeology	Water level in open wells in buffer zone around 1km at specific wells	-	Once in six months	Water level monitoring devices may be used.
5	Noise	Mine Boundary, high noise generating areas within the lease and at the nearest residential area	24 hours	Monthly Once	Sound level meter
6	Vibration	At the nearest habitation (in case of reporting)	–	During blasting operation	Digital Seismograph
7	Soil	Core Zone and Buffer zone (Grab samples)	–	Once in six months	Physical and Chemical characteristics

6.3 Data Analysis

Data analysis will be done by MoEFCC/NABL approved laboratory as per CPCB guidelines & compliance reports shall be submitted to concerned authority (specified in Environment Clearance Letter issued by SEIAA, Tamil Nadu and Consent issued by TNPCB, Thoothukudi) on regular basis.

6.4 Emergency procedures

The mines manager monitors the emergencies that may occur in opencast mining operations and prepares an emergency plan to deal with emergency situations during the operation of the mine. Preparation of a preventive maintenance schedule program based on recommendations given and maintenance schedules for all equipments and instruments as per recommendations of the manufacturers user manuals.

6.5 Detailed Budget

Detailed budgetary provisions for monitoring program are detailed in the following Table No 6.3.

Table No 6.3 Environment monitoring budget

S. No	Environmental Monitoring Program	No. of samples per year	Cost per sample	Cost
1	Ambient Air Quality monitoring	4	Rs.4000	Rs 16,000
2	Water quality	4	Rs 3000	Rs 12,000
3	Soil quality	4	Rs 3000	Rs 12,000
4	Noise monitoring	10	Rs 1000	Rs 10,000
5	Hydro geology	10	Rs 2000	Rs 20,000
	Total			**Rs 70,000**

CHAPTER – 7: ADDITIONAL STUDIES

7.1. Public Consultation

The Draft EIA report has been prepared for conducting public hearing meeting.

7.2 Risk assessment and Disaster Management Plan

Risk Assessment is all about prevention of accidents and to take necessary steps to prevent it from happening. The mining operation is carried out under the management control and direction of a qualified mines manager. The DGMS have been issuing a number of standing orders, model standing orders and circulars to be followed by the mine management in case of disaster, if any.

To overcome such risks, help/aid would be sought from emergency services providers like Police station, fire station, Hospital, Ambulance services in the vicinity of the mine site. Their telephone numbers and communication facilities are to be provided and displayed on the board at the mine office as well as mine site. Responsibility of coordinating rescue activities is entrusted to quarry-in- charge at the quarry site in addition to quarry-in-charge is also looking after statutory obligatory under Mines Act,1952. Name and Address of Contact Person coordinating in case of Eventuality is stated below:

Name and Address of the Proponent	**Thiru. S.Kandasamy** S/o Shanmugam No.102, Anna new street, Kalugumalai Taluk, Thoothukudi District, Tamil Nadu.

However, the following natural/industrial hazards may occur during normal operations.

i. Operational Phase,
ii. Inundation of mine pit due to flood/excessive rains,
iii. Accident due to transport & other equipments, Safety and Environmental aspects.

Table 7.1 Risk Assessment and Disaster Management Plan

S. No	Hazards	Mitigation measures
1	Surface Fire	➢ Fire Extinguishers ➢ Sand Buckets
2	Explosives/Blasting	➢ The applicant is directly purchasing explosives from an authorized dealer and they are blasting with help of certified blaster. Agreement is made with License holder in Form-22 for store, use and sale of explosives. ➢ Shot holes blasting using compressor and Jack Hammers combination are adopted to release the mineral.
3	Flooding of Rain water	➢ Escape Routes will be provided to prevent inundation of storm water ➢ Garland drains will be provided at the toe of dump
4	Radioactive hazard	➢ Not Anticipated
5	Failure of Mine Benches and Pit Slope	➢ Ultimate or over all pit slope shall be 45° and each bench height shall be 6m height equal to the boom height of excavator and vertical. ➢ During working normally 3-6m will be maintained as per the plan.
6	Failure of Waste Dumps	➢ Stabilization of dump with top soil and tree plantation shall make the dump more stable. ➢ Garland drainage around dump shall prevent under wash of dump by hydrostatic pressure to be developed by surface water and control wash outs and collapse.
7	Dust	➢ Periodical wetting of land by spraying solutions. ➢ Regular water sprinkling on haulage roads ➢ Provision of Dust mask to workers ➢ Green Belt shall be carried out within the mine premises by planting trees, to improve the aesthetics of the area and also to reduce the pollution outside the activity area
8	Noise	➢ Rotation of workers to minimize exposure time of noise ➢ The equipments and machineries shall be maintained properly

		➢ Provision of earmuffs to workers
9	Transportation	➢ Convex mirrors should be kept at all corners ➢ All vehicles should be fitted with reverse horn with one spotter at every tipping point ➢ Loading according to the vehicle capacity ➢ Regular checking of brakes to avoid failures ➢ Periodical maintenance of vehicles
10	General measures	➢ No entry for any unauthorized persons ➢ S1 type fencing as per DGMS circulars ➢ Quarrying as per Approved Plans only ➢ Provision of Personal Protective Equipments ➢ In case of any closure of mine the compensation under Industrial Dispute Act will be paid as per law

7.2.1 Care and Maintenance during temporary discontinuance

Watch and ward are provided permanently in the Mine premises to monitor the Mine openings to prevent inadvertent entry. Top soil bund is made partly and Stone fencing is proposed all around lease boundary to safe guard the mine and the adjacent livings. Temporary discontinuance will be minimal as there is good demand for this material in construction work.

7.2.2 Economic repercussions of closure of mine and manpower retrenchments

7.2.2.1 Number of local residents employed in the mine, status of continuation of family occupation and scope of joining occupation back

There are 21 person employed in the quarry. Most of labors are Agriculturist. In case of closure of mine, they may continue their own work.

7.2.2.2 Compensation given or to be given to the employees connecting with sustenance of himself and their family members

In case of any closure of mine the compensation under Industrial Dispute Act will be paid as per law. All workers shall get retrenchment benefits as per labour laws under enforcement.

7.2.2.3 Satellite occupations connected to the mining industry – number of persons engaged therein – continuance of such business after mine closes

The quarrying activity shall lead to development of several ancillary units and business, which are explained below:

i. Other than mine employment, workshops, spare parts, hotels, tea shop and related several self-employment opportunities.
ii. Several shops and service providers shall grow in the public adjacent to mines.
iii. Schools and city development shall also be possible owing to the fact of economic growth in the village.

7.2.2.4 Continued engagement of employees in the rehabilitate status of mining lease area and any other remnant activities.

In the event of closure of mine, the mine worker shall get alternate work or business like agriculture etc. No serious repercussions envisaged in the event of cessation of mining activity, as they will be provided employment in other mines belong to the company.

7.2.2.5 Envisaged repercussions on the expectation of the society around due to closure of mine

Persons on roll at the time of closure will get benefit as per State Govt. guidelines as applicable at the time of retrenchment

7.2.3 Time Scheduling for abandonment

The following works are scheduled before abandoning the mine,

i. Parapet wall of 2m height will be constructed around the pit,
ii. Planting and monitoring of Afforestation program.

There is no proposal for closure of mine for the next 10 years. The parapet and plantations will be done during operation of mine. In case of any abandonment the following time is required,

Activities	Days for schedule
Time schedule for fencing	6 months
Time schedule for reclamation of mined out area	1 year

7.3 Social Impact Assessment, R&R Action Plans

The Rough Stone and Gravel quarry project of Thiru S.Kandasamy S/o. Thiru. Shanmugam does not involve any kind of displacement of the population since the mining will be concentrated only in the mining area only. Not much disturbance in respect of fauna, flora and human settlement of the villages. The impact of mining activity on the population will be insignificant. Hence, Rehabilitation of settlements is not anticipated under this project as it will not be required. Thus R&R Action Plans not proposed.

The project proponent will help in uplifting the poor section of the society as part of CSR activity by undertaking social welfare programs. The Project proponent contributes 2.5% of profit towards CSR activities. This project will have a positive impact on the socio economic as it will provide considerable employment to the families in the nearby villages. Improved health care facilities are expected to come–up in the area for catering to the health needs of the miners. The impact of mining on the civic amenities will be substantial after the commencement of mining activities. The local people who are currently depending on forest and agriculture will have new avenue from the mine.

7.4 Detail study of Rainwater harvesting after the completion of project.

I.	Total Pit Area	= 24291m^2
II.	Annual rainfall of the area	= 0.655 m
III.	Total rainwater available to store in pit area	= 15911m^3
IV.	Total volume of quarried pit	= 825894 m^3

Since the rainwater directly getting stored in the quarried pit, the runoff will not take place. The Quarried Pit will be act as **Artificial Ground Water Recharge Pond.** After the rainwater getting stored in quarried pit, the water slowly infiltrates into the ground and reaches the ground water table. This will greatly increase the ground water table around the lease area.

By electrical resistivity survey it is found that there is massive rock formation at 34m bgl. So the infiltration rate of rain water is very less. If the rain water stored in pit for long period the evaporation loss will take place.

Meyer's Formula (1915) is used to find the loss of water in pit due to natural evaporation process.

Meyer's Formula (1915)

$$E_L = K_M (e_w - e_a) (1 + u9/16)$$

Where

- E_L = Evaporation Rate (mm/day)
- e_w = the saturation vapor pressure at the water temperature in mm of mercury
- e_a= the actual vapor pressure in the air in mm of mercury
- u_9 = monthly mean wind velocity in km/h at about 9 m above ground
- K_M = coefficient accounting for various other factors with a value of 0.36 for large deep and 0.50 for small shallow waters.

Here,

e_w = 39.91 mm of Hg (considered average temperature in Thoothukudi district during May month of 2022)

e_a= 0.67 x 39.91 = 26.7 mm of Hg.

u_1 = 16.3 km/hr

$u_9= u_1 (9)^{1/7}$ = 22.31 km/hr

Substitute the above parameters in Meyer's equation,

E_L=0.36 (39.91 – 26.7) (1+ 22.31/16)

E_L = 11.4 mm/day

Evaporated Volume per day = 24291 x 0.0114 = 277m^3/day or 277 KLD

The total quantity of rain water to be stored in quarried pit is 15911m^3/year. The evaporation rate of water per day is 277m^3 based on the maximum temperature in Thoothukudi District. It takes nearly 3 months for the complete evaporation of water. Before that the stored water will be used to irrigate the crop around the quarry area.

Other benefits are that the water will be used for the domestic purposes after the water properly treated by Sedimentation-Filtration processes. A higher quantity of about 20 liters **per capita per** day should be assured to take care of basic hygiene needs and basic food hygiene.

Thereby the Proposed quarry benefits the daily needs of water to so many families around the quarry area for every year. This is very important **positive impact** of the proposed Rough stone and gravel quarry of Thiru. S.Kandasamy.

7.5 Plastic/Microplastic waste Management Plan

This is proposed Rough stone and gravel quarry. So the project does not need any plastic related material for quarry operations. The plastic materials will be used by the employee and labours in the form of carry bags, water bottles, etc. To avoid such situations the employees and labours will be strictly instructed to avoid the plastic materials in the lease area. Moreover they will be advised to use cloth bags, jute bags and bring the food by Steel tiffin box.

Water will be provided by the project proponent for both drinking and domestic purposes. So the dustbins will not be needed in the quarry. To manage the unavoidable situations, Dustbins will be placed in the quarry for both decompose and non-decompose waste separately of Municipal solid waste. The collected waste will be disposed periodically as instructed by TNPCB. The board with the instruction "**Avoid plastics"** is placed in the two sides of quarry and awareness program will be conducted to the labours monthly once.

Microplastics are small pieces of plastics less than 5mm. As usage of plastics is totally devoid in the quarry premise, the chance of Microplastic pollution is negligible inside the lease area.

CHAPTER – 8: PROJECT BENEFITS

Mining activity will help in improving the socio–economic benefits in areas like employment, communication and infrastructure development etc.

8.1 Physical Infrastructure

The proposed Rough Stone and Gravel project located in Chettikurichi Village, Kayathar Taluk, Thoothukkudi District has well established roads, communications and other facilities. The impact on the civic amenities will be substantial after increasing the mining capacity.

The following physical infrastructure facilities will further improve due to mine.

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

Under plantation program, it is suggested to develop green belt further all along the boundary of mining lease area. The species to be grown in the areas will be dust tolerant and fast growing species so that a permanent green belt is created. Apart from the green belts and aesthetic plantation for eliminating fugitive emission and noise control, all other massive plantation efforts will be executed with the assistance of experts and cooperation of the local community.

8.2. Social Infrastructure

The mining activity will create rural employment. It has been observed that local people mainly depend upon agricultural, where the income is irregular and low. The mining activity in the region will have positive impact on the social economic condition of the area by way of providing employment to the local in–habitants; wages paid to them will increase the per capita income, housing, education, medical and transportation facilities, economic status, health and agriculture by improving the life style of the people. 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. Part of the royalty is given to local bodies by the State Govt. for the welfare and development of the village. District Mineral Fund @30% of the Royalty shall be

given to the Dept. of Geology and Mining, Thoothukudi District. The State Government will also benefit directly from the mine, through increased revenue from royalties, excise duty and etc…

8.3 Employment Potential

The proponent employed about 21 persons for carrying out the mining operations of which 2 are skilled, 2 semi-skilled, 13 unskilled worker personnel. In addition there will be indirect employment to many more people in the form of contractual jobs like construction of infrastructural facilities, transportation of Rough stone to destinations, sanitation, supply of goods and services to the mine and other community services, etc… The local population will have preference to get an employment. The economic status of the local people will be enhanced due to mining project.

8.4 Other tangible benefits

8.4.1 Corporate Social Responsibility

Corporate Social Responsibility (CSR) refers to voluntary actions undertaken by the project proponent either to improve the living conditions (economic, social, environmental) of local communities or to reduce the negative impacts of mining activity. By definition, voluntary actions are those that go beyond legal obligations, contracts, and license agreements.

CSR programs usually invest in infrastructure (potable water, electricity, schools, roads, hospitals, hospital equipment, drainage repairs, etc.), building social capital (providing high-school and university education, providing information on HIV prevention, workshops on gender issues, information on family planning, improving hygiene, etc.), and building human capital (training local people to be employed by the mining enterprise or to provide outsourced services, promote and provide skills on micro business, aquaculture, crop cultivation, animal rearing, textile production, etc.)

8.4.2 CSR activities

The following activities which may be included by companies in their Corporate Social Responsibility Policies are notified as CSR activities under Schedule VII ((See section 135) of the Companies Act 2013:

i. Eradicating extreme hunger and poverty;
ii. Promotion of education;

iii. Promoting gender equality and empowering women;
iv. Reducing child mortality and improving maternal health;
v. Combating human immunodeficiency virus, acquired immune deficiency Syndrome, malaria and other diseases;
vi. Ensuring environmental sustainability;
vii. Employment enhancing vocational skills;
viii. Social business projects;
ix. Contribution to the Prime Minister's National Relief Fund or any other fund set up by the Central Government or the State Governments for socio-economic development and relief and funds for the welfare of the Scheduled Castes, the Scheduled Tribes, other backward classes, minorities and women; and
x. Such other matters as may be prescribed.

The Board of every company referred to in sub-section (*1*), shall ensure that the company spends, in every financial year, at least 2% of the average net profits of the company made during the three immediately preceding financial years, in pursuance of its Corporate Social Responsibility Policy. Provided that the company shall give preference to local area and areas around it, where it operates for spending the amount earmarked for Corporate Social Responsibility activities. Provided further that if the company fails to spend such amount, the Board shall report under clause (*o*) of sub-section (*3*) of section 134, specify the reasons for not spending the amount.

Explanation: For the purposes of this section "average net profit" shall be calculated in accordance with the provisions of section 198.

8.4.2.1 CSR Cost Estimation

CSR activities will be taken up in the nearby villages 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.

i)	Sale value	=	Rs 160 per MT
ii)	Production cost	=	Rs 130 per MT
iii)	Profit	=	Rs 30 per MT
iv)	Production	=	150840 MT/year
v)	Hence, Total Profit	=	150840 x 30/MT
		=	Rs. 45,25,200/-
vi)	CSR @ 2.5 % Profit	=	Rs. 45,25,200 x 2.5%
		=	Rs 1,13,130/Year

(As per the Companies Act, 2013 and CSR Rules, 2014)
Total CSR amount = Rs 5,65,650 for plan period

Under this programme, the project proponents will take-up following activities for social and economical development of villages through local panchayat.

- Employment to eligible persons during operational phase of the mine
- Conducting Medical Camps
- Infrastructure Development like repair of roads, renovation of ponds, rainwater harvesting schemes, etc…
- Financial grant to the existing educational institutions for development of physical infrastructures
- Training for Self Employment
- Plantation in villages and all along roads.
- Providing solar lamps to nearby schools and villages by going eco-friendly.

8. 4.3 Corporate Environment Responsibility (CER)

CER Activity	Project Cost (Rs. In Lakhs)	Cost allocation for CER Activity (Rs. In Lakhs)
For Government High School, Chettikurichi Village 1. Developing sanitary facilities and library Facilities. 2. Tree plantation within the school and its maintenance 3. Placing environmental awareness sign Boards	81	5.0
Total Cost Allocation	**81**	**5.0**

CHAPTER – 9: ENVIRONMENTAL COST BENEFIT ANALYSIS

9.0 PROJECT COST

After making exhaustive study, it is considered that the mining project may be implemented.

Project cost for the proposed Rough stone and Gravel Quarry namely "Rough Stone and Gravel Quarry of Thiru. S. kandasamy" over an area of 3.28.0 Ha falling in Village Chettikurichi, District Thoothukkudi is Rs. 81,00,000/- and EMP Cost is Rs. 6,75,000/-

- This project provides direct employment to 21 people and indirect employment to nearly 40 people. In a family 5 persons, totally 305 persons will get benefit because of the project.

- Surrounding people will get benefit as they get aggregate (Rough Stone) for construction purposes with less transportation cost.

- The Management will ensure good production and in turn there will be good revenue to the Government of Tamil Nadu and Government of India through taxes. The industry is an asset to the nation.

- At the end of the project the pit will act as rain water harvesting tank which is useful for agricultural purpose. Thereby it will increase the survival of people around the quarry.

CHAPTER - 10: ENVIRONMENTAL MANAGEMENT PLAN

10.1 Introduction

The **Environment Management Plan (EMP)** is required to ensure sustainable development in the study area. The impacts due to proposed mining activity on various environments and related mitigation measures were elaborated in Chapter 4 and also given in Table No 10.1 in this Chapter. To implement the mitigation measures and environmental monitoring and to compliance the condition stipulated by SEIAA/SEAC and TNPCB through Environmental Clearance and CTO, the Environmental Management Cell should be formed by project proponent.

10.2 Environmental Policy of the Thiru S.Kandasamy, Rough Stone and Gravel quarry.

- The proposed quarry will be operated by adopting effective environmental management plan for the sustainable environment.
- Utilizing optimum natural resources considering future generations.
- Rehabilitation of mined out pit by developing greenbelt around the pit and along the benches and making the pit fit for rain water storage.
- Our EMC aware that the environment is not only for human being; it is also for all living things such as plants, animals, micro flora and fauna, aquatic organisms etc.
- To combat global warming, plantation of 500 saplings will be done in consultation with Forest Department.
- Create and maintain the safe workplaces for the workers to prevent occupational accidents.

10.3 Environment Management Cell

It is important to have a permanent organizational set up for implementation of environmental management plan. Conscious of this, the project proponent creates Environmental Management Cell.

Environmental Management Cell (EMC) will be headed by Mines Manager supported by adequate number of personnel and third party (Environment Consultant) having sufficient educational and professional qualification and experience to discharge responsibilities related to environmental management including statutory compliance, pollution prevention, environmental monitoring, preventive maintenance of pollution control equipment and green belt development as well as maintenance.

Environment Management Cell (EMC) will also look into any infringement/ deviation/ violation of the environmental or forest norms/ conditions.

The part of project proponent in the EMC is supporting financially to implement the EMP. The Mines Manager will be responsible for the implementation of mitigation measures during operation phases of the proposed quarry.

10.3.1 Duties of Environment Management Cell

- Monitoring Ambient air quality
- Noise monitoring
- Monitoring of ground vibration
- Green belt development
- Soil sampling and testing
- Water sampling and testing
- Management of municipal solid waste
- Monitor and mitigate infringement/ deviation/ violation of the environmental or forest norms/ conditions
- Submission of EC and CTO compliance to MOEF&CC, Regional office, Chennai and TNPCB

The organization set-up of the Environmental Management Cell (EMC) is presented in Figure 10.1.

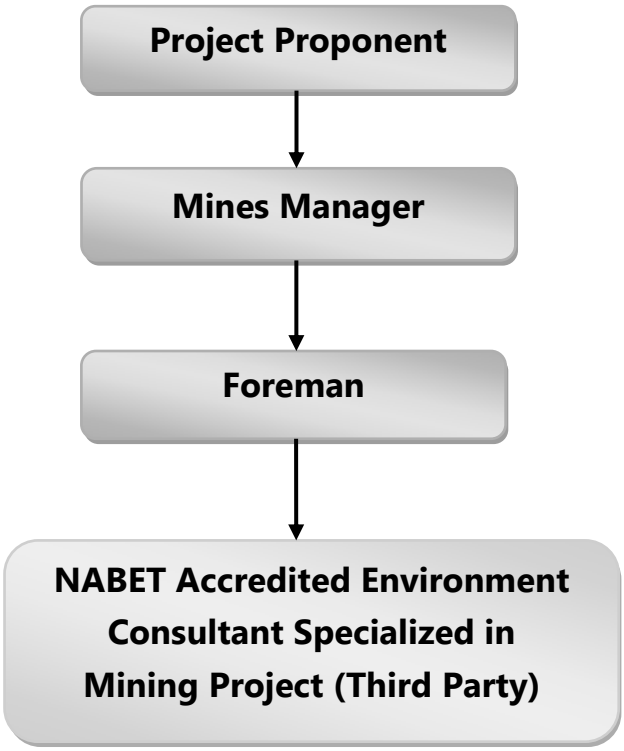


Fig No 10.1. Chart of Environment Management Cell

10.3.2 Reporting System

Proper reporting of implementation of mitigation measures plays important role in effective environmental management. The reporting is always from descending order, the lowest to higher level officer. The Environment Consultant of the EMC will monitor ambient air quality, noise level and collect sampling of water, soil with the help of NABL accredited laboratory and Mining Foreman. Also they will conduct ground vibration test and inspect quarry to identify whether greenbelt is done or not. After getting the test results, the consultant will prepare EC compliance report and submits all the reports to Foreman. Foreman will verify the reports submitted by consultant and audit all the condition in the Environmental clearance given by MOEF&CC shall be complied or not. If any condition given in the EC is not complied, the Foreman will make the necessary arrangement such as heath check up labors, Solar lights along the street, conducting mock drills, etc to comply all the NCs of Environmental Clearance. He will also work out the cost of implementation and convey the detailed report to Mines Manager. The Mines Manager will arrange the meeting with the Project Proponent by calling all members in EMC. In that meeting all the NC of EC condition will be discussed and the steps will be taken to comply the EC condition not to violate the environment norms and to maintain sustainable environment.

The environmental management plan to be implemented is given in below Table 10.1

Table 10.1 Environmental Management Plan

S.No	Parameters	Mining Activity	Mitigation measures
1	Air Environment	Drilling	○ Dust extractor or wet drilling to be followed to control dust at source of emission ○ Use of Sharp drill bits for drilling holes and charging the holes by using optimum charge and using time delay detonator
		Blasting	○ Regular water sprinkling on blasted heaps at regular intervals will help in reducing considerable dust pollution
		Loading	○ Water sprinkling be done before loading by making it moist
		Transportation	○ Water sprinklers along the sides of haul road shall be fixed to control fly of dust while transporting minerals and waste ○ Overloading will be prevented ○ Trucks/Dumpers covered by tarpaulin covers
		DG Sets	○ DG sets will be used only during power failure ○ Adequate stack height for DG sets will be provided as per CPCB norms
		General measures	○ Avenue trees along roads around ML boundary shall be planted as per the norms of MoEF to control fly of dust. ○ Labours engaged in such dust prone areas should be provided with safety devices like ear muff, mask, goggles as per the MMR, 1961 amendments and circulars of DGMS. ○ Regular health check–up of workers and nearby villagers in the impacted area should be carried out and also regular occupational health assessment of employees should be carried out as per the

			Factories Act o Ambient Air Quality Monitoring will be conducted on regular basis to assess the quality of ambient air.
2	Water Environment	Surface water	o Wastewater discharge from mine if any will be treated in settling tanks before using for dust suppression and tree plantation purposes.
		Ground water	o The mining activity will not intersect the ground water table o De silting will be carried out before and immediately after the monsoon season
		Storm water	o Pit will be used for Storage of rainwater o Rain water will be collected in sump in the mining pit 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 onwards and such sites where dust likely to be generated and for developing green belt. o The proponent will collect and judicially utilize the rainwater as part of rain water harvesting
		General measures	o Regular monitoring and analyzing the quality of water
3	Noise Environment	Drilling	o Limiting time exposure of workers to excessive noise
		Blasting	o Carrying out blasting only during day time and not on cloudy days o Noise levels will be controlled by using optimum explosive charge, proper delay detonators and proper stemming to prevent blow out of holes. o Providing proper noise proof enclosure for the workers separated from the noise source and noise prone equipment

		Transportation	○ Proper and regular maintenance of vehicles, machinery and other equipments. ○ The noise generated by the machinery will be reduced by proper lubrication of the machinery and other equipments. ○ Speed of trucks entering or leaving the mine will be limited to moderate speed to prevent undue noise from empty vehicles. ○ Adequate silencers will be provided in all the diesel engines of vehicles. ○ Minimum use of horns and speed limit of 10 km/hr in the village area. ○ It will be ensured that all transportation vehicles carry a valid PUC Certificates
		General measures	○ Use of personal protective devices i.e., earmuffs and earplugs by workers, who are working in high noise generating areas ○ Provision of Quiet areas, where employees can get relief from workplace noise. ○ The development of green belts around the periphery of the mine to attenuate noise. ○ Regular medical check–up and proper training to personnel to create awareness about adverse noise level effects.
4	Vibration	Blasting	○ No deep hole blasting envisaged. ○ Small dia shot holes are used for breaking boulders. ○ Specific charge pattern has to be designed by proper trial vibration studies with varying charge ratios. ○ If the vibration still exceeds the limit a long Trench to a depth of 6m may cut in the direction of wave's movement to break longitudinal

			waves which travel close to surface, preferably near mine buffer zone o In spite of all measures periodical testing of vibration and noise using approved seismograph by DGMS has to be followed as a part of Environmental monitoring
5	Soil Environment	Topsoil	o Humus top soil shall be preserved for reuse in afforestation and agriculture o Top soil should not be mixed with other waste or reject materials. It should be conserved by judicious utilization in the mine premises o Garland drains will be provided around the mine and dumps to arrest any soil from the mine area being carried away by the rain water. This will also avoid the soil erosion and siltation in the mining pits and maintaining the stability of the benches
6	Waste Dump	Stabilization of Dumps	o The rejects\ waste dump shall be properly terraced in to 1.5m benches with proper repose angle and then the top soil shall be spread over the dumps and slope to make them humus for some time, after the soil suitable for water retention trees will be planted at the top, slope and toe of the stabilized dumps to form vegetation. o Garland drainage around dump shall prevent under wash of dump by hydrostatic pressure to be developed by surface water and control wash outs and collapse o Dump should be terraced for every 5m height and stabilized
7	Plantation	Mine lease boundary and waste dump	o Provision of green belt all along the periphery of the lease area for control of dust and to attenuate noise o Stabilization of Dump with plantation

			○ It is strongly recommended that the loss of plant in each year will be counted and again planted in subsequent plantation. ○ The plant should be planted taken from nursery, where the survival rate is high.
8	Land Environment		○ The restoration of the degraded land would cover backfilling and terracing with the overburden / wastes and surfacing the same with top soil. ○ Provision of Garland drainage around the dumps ○ Fast growing trees and other native shrubs would be planted to stabilize the reclaimed land ○ Appropriate measures will be taken for Green belt development. ○ The rain water will be stored in the pit which will recharge the ground water as a part of rain water harvesting scheme for irrigating the nearby agricultural lands.
9	Socio Economic		○ Good maintenance practices will be adopted for 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. ○ Drilling, blasting etc at specified location will be followed with proper schedule. ○ Appropriate air pollution control measure will be taken so as to minimize the environmental impact within the core zone. ○ An emergency preparedness plan will be prepared in advance, to deal with fire fighting, evacuation and local communication.

		○ For the safety of workers, personal protective appliances like hand gloves, helmets, safety shoes, goggles, aprons, nose masks and ear protecting devices has been provided which meet 'BIS' (Bureau of Indian Standards). ○ As a part of CSR activities, community welfare activities will be undertaken by the proponent which leads to socio economic development
10	Occupational Health	○ First-aid facilities as per provisions under Rule (44) of Mines Rules 1955 ○ Initial and Periodical medical examination shall be conducted for the employees under Rule 29B & 45 (A). ○ Insurance will be taken in the name of the labourers working in the mines ○ Workers involved in mining work shall be provided protective equipments such as Thick Gloves, Goggles, ear plugs, safety boot wears, etc…

10.4 Budget allocated for implementing Environmental Management Plan

Table 10.2 EMP Budget for Plan period

S. No	Description	Budget
1.	Personal protective equipment	Rs 75,000
2.	Environmental Monitoring	Rs 1,50,000
3.	Occupation Health	Rs 1,00,000
4.	Green Belt & Dust suppression	Rs 3,50,000
	Total	**Rs. 6.75 lakhs**

Table 10.3 Budget Allocation for Mine Closure Plan as per ToR

S. No	Description	Budget
1.	Garland Drainage around Mines	Rs 1,50,000
2.	Earth Bund with Fencing around mines	Rs 1,50,000
3.	Making Pit for pond after the activity of mines	Rs 50,000
	Total	**Rs 4.0 lakhs**

CHAPTER – 11: SUMMARY AND CONCLUSIONS

11.0 INTRODUCTION

The Applicant, **Thiru. S.Kandasamy** S/o. Shanmugam, residing at No. 120, Anna New Street, Kalugumalai Taluk, Thoothukudi District, Tamil Nadu has applied for grant of permission for quarrying Rough Stone & Gravel over an Extent of 3.28.0 Ha located in S.F. No. 272/2A, 2B, 2C and 2D, Chettikurichi Village, Kayathar Taluk, Thoothukkudi District, Tamil Nadu for the period of five years.

The Assistant Director, Department of Geology and Mining, Thoothukudi has directed the applicant **Thiru. S.Kandasamy** S/o. Shanmugam, vide his precise area communication letter Roc No. G.M.1/861/2022 dated 14.07.2023 to get approved mining plan and obtain Environmental clearance from the State Environment Impact Assessment Authority (SEIAA) as per the EIA Notification, 2006 and its amendments for grant of lease to Rough Stone & Gravel quarry over an Extent of 3.28.0 Ha located in S.F. No. 272/2A, 2B, 2C and 2D, Chettikurichi Village, Kayathar Taluk, Thoothukkudi District, Tamil Nadu for the period of five years.

The mining plan is prepared as per the Assistant Director's precise area communication letter, Roc No. G.M.1/861/2022 dated 14.07.2023 under Rule 41& 42 of Tamil Nadu Minor Minerals Concession Rules, 1959 for quarrying Rough Stone & Gravel and it is approved by Assistant Director, Department of Geology and Mining, Dindugul vide letter Roc No. G.M.1/861/2022 dated 01.09.2023. The project cost is about Rs. 81.0 lakhs and EMP cost is Rs. 6.75 lakhs.

The proposed area comes under cluster classification, based on the letter issued by Assistant Director, Thoothukudi vide Roc.No. G.M.1/861/2022 dated 01.09.2023. So this project has to obtain Terms of Reference for conducting EIA studies. There are three existing quarries namely Shree Selvi Chambers with an extent of 4.63.50Ha, Tmt. Kasthuri with an extent of 2.32.20Ha & Thiru. S.K.P Murugan with an extent of 2.61.00Ha and one newly proposed quarry namely Thiru.S.Kandasmy with an extent of 3.28Ha located within the 500m radius from the lease boundary of the proposed project. The total cluster area is 9.56.7 Ha.

As per MoEF&CC OM: F.No.L-11011/175/2018-IA-II(M), dated 12.12.2018, the EIA/EMP report has to be prepared for the cluster area based on ToR recommended by SEIAA. Therefore, the applicant applied for ToR through PARIVESH Portal vide online proposal no. SIA/TN/MIN/447362/2023 Dated 07.10.2023. The ToR proposal was appraised in the 443rd SEAC meeting held on 08.02.2024. After detailed discussions, the Authority accepts the recommendation of SEAC and granted Terms

of Reference (ToR) along with Public Hearing vide TOR Identification No. TO23B0108TN5752566N. The Draft EIA report has been prepared based on the Terms of Reference issued by SEIAA. The points raised in the public hearing and the commitments of the project proponent will be given detail in the Final EIA Report which will be submitted to SEAC/SEIAA, TN for obtaining environmental clearance.

11.1 SCOPE OF THE PROJECT

The scope of the project is to operate rough stone and gravel quarry after conducting public hearing through TNPCB, Thoothukudi and obtaining environmental clearance from SEIAA/SEAC, Tamil Nadu. The proposed quarry will be operated by adopting environmental management plan prepared by EIA consultant and with compliance of conditions given by SEIAA/SEAC and TNPCB.

11.2 PROJECT DESCRIPTION

Table No 11.1 Project Details

Project Details				
Proponent	**Thiru. S.Kandasamy** S/o. Shanmugam			
Total Mine Lease Area	3.28.0 Ha (Patta Land)			
Survey No.	272/2A, 2B, 2C and 2D			
Site Location	Chettikurichi Village, Kayathar Taluk, Thoothukkudi District, Tamil Nadu			
Geographical Co-ordinates	Latitude: 9°3'50.79"N to 9°3'59.90"N Longitude: 77°43'51.47"E to 77°43'56.63" E			
Toposheet No.	58 G/12			
Elevation	Elevation of the area is 114m above MSL			
Accessibility				
Nearest Habitation	Temporary shed of crusher unit - 260m - SW			
Nearest Village	Chettikurichi – 1.3km - SE			
PMHC	Kazhugumalai Government Primary Hospital – 9.0 km - NNW			
Nearest Settlement	**Name of Village**	**Direction**	**Distance from Mines**	**Population**
	Chettikurichi	SE	1.6 km	3420
	Cithamparampatti	NE	2.8 km	1421
	Kattarankulam	NE	4.6 km	1850
	Vellalankottai	SE	4.5 km	1819
Nearest Town	Kalugumalai – 9.4km – NW			

	Kayathar – 14km - SE Kovilpatti – 18km – NE
Nearest Roadway	NH 44 – 7.1km – E (Kashmir to Kanyakumari) SH 76– 8.6km - N (Nallatinputhur to Puliyangudi) MDR 160m – 860m – E (Kayathar to Kalugumalai) Village road – 1.6km – E (Chettikurichi to Gopalapuram) Approach road is available near to this project site.
Nearest Railway station	Kumarapuram Railway Station – 11.7km – NE Kadambur Railway Station – 16km – SE
Nearest Airport	Thoothukudi Airport–50km – SE
Environmental Sensitiveness	
Interstate Boundary	There is no interstate boundary within 15km radius. Tamil Nadu – Kerala Interstate boundary is located 52 km away from mining lease area in west side.
Coastal Zone	Bay of Bengal – 53 km - SE.
Reserve Forest	The project is not a forest land, it is patta land. There is no Reserve forest and Protected forest found within 10km radius. Kurumalai R.F – 13km – E Uthumalai R.F – 17km -SW The proposed project site does not attract Forest Conservation Act, 1980.
National Park/Wildlife sanctuary	Nil within 10km radius. Gangaikondan Spotted Deer Sanctuary – 26km – S. It is notified Sanctuary by MOEF&CC vide S.O.2773 (E) dated 31/07/2019. The Proposed project site does not attract the Wildlife (Protection) Act, 1972.
Water bodies	1. A small lake – 740m – N 2. Nalanthula lake – 1.3km - NNW 3. Mel Nalanthula lake – 1.8km - NNW 4. North Konarkottai lake I – 988m – SW 5. North Konarkottai lake II – 1.5km – S 6. Uppodai River – 2.0km - E 7. Waterbody with weir across River Uppodai – 1.9km – ENE 8. A odai – 2.0km - SW 9. Olaikulam lake I – 2.7km – SSW 10. Olaikulam lake II– 2.9km – SSW

	11. Vellappaneri lake – 3.8km – SW 12. Karisalkulam lake – 3.6km – NW 13. A odai – 4.7km – NE 14. Water body with weir across Odai – 4.7km - NE
Defense Installations	Nil within 10km radius
Critically Polluted area	Nil within 10km radius
Quarries around 500m radius (AD Letter furnished)	Three existing quarries and one present proposed quarry are located within the 500m radius from the lease boundary of the proposed project site. Total Cluster area : 9.56.7 Ha AD Cluster Letter: Roc No.G.M.1/861/2022, dated 01.09.2023
Seismic zone	Zone-II, Low damage risk zone as per BMTPC, Vulnerability atlas Seismic zone of India IS: 1893-2002
Mining Details	
Particulars	**Details**
Method of Mining	Open cast Mechanized method of mining
Geological resources	9,78,900m^3
Mineable reserves	5,10,300m^3 of Rough Stone & 1,08,616m^3 of Top soil and Gravel
Production (95%)	Rough stone – 3,01,678m^3 for five years or 60,336m^3 per annum(Avg) Top soil & Gravel – 80,448m^3 for three years or 26,816m^3 per annum
Reject (5%)	15878 m^3
Top soil	Top soil & Gravel – 80,448m^3
Ore: Waste ratio	1: 0.05
Depth of Mining	34m bgl (Ultimate Depth) 0-4m - Top soil & Gravel 4-34m – Rough stone
Water Table	55-60m bgl
Road design	1: 10 inside the pit and ramp 1:16 for transport
Overall Pit Slope	45°
Period of Lease	5 Years from the date of execution
Existing pit dimension	Nil The proposed rough stone and gravel lease is fresh area

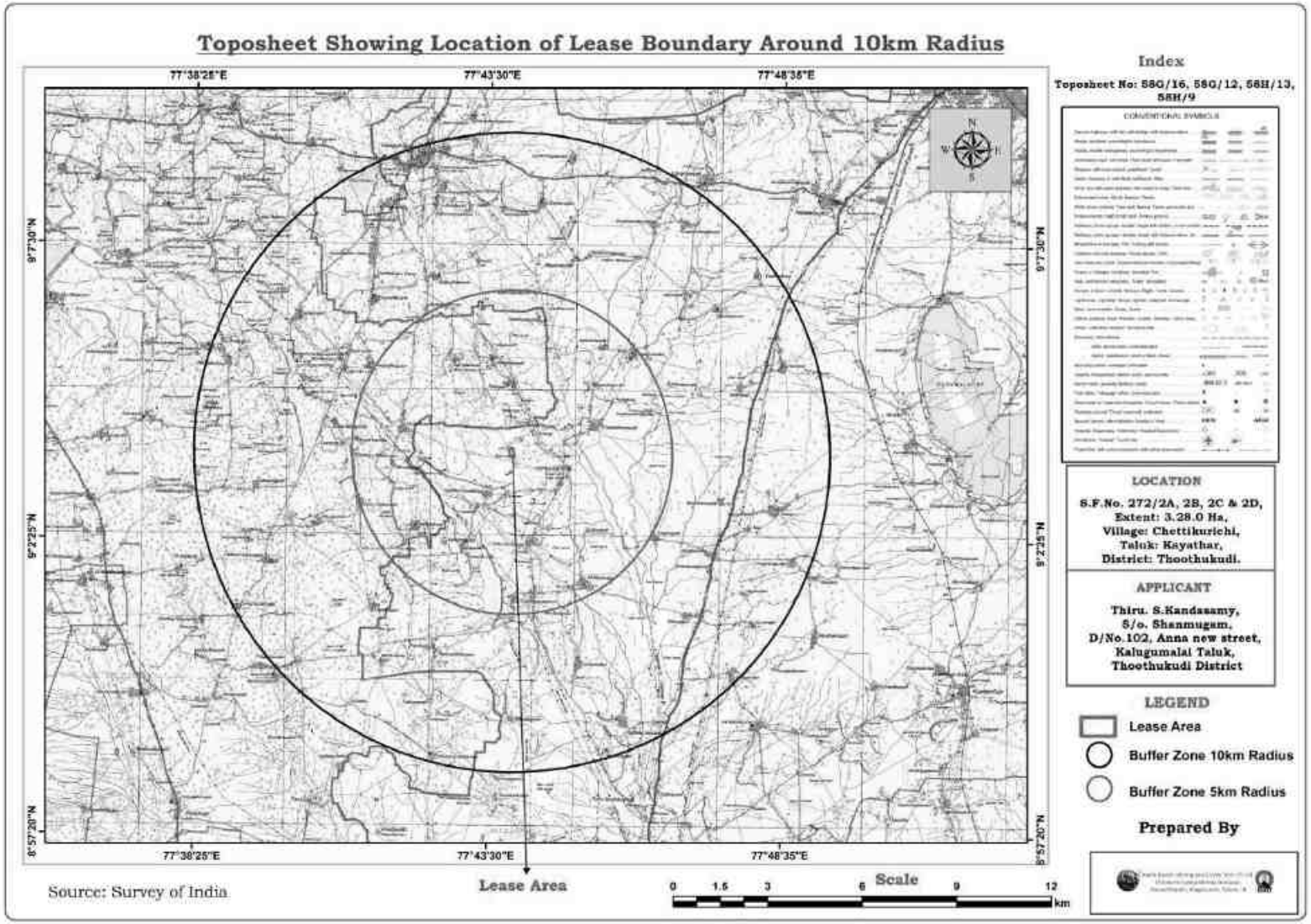


Fig No 11.1 Toposheet showing location of proposed rough stone quarry with 10km radius study area

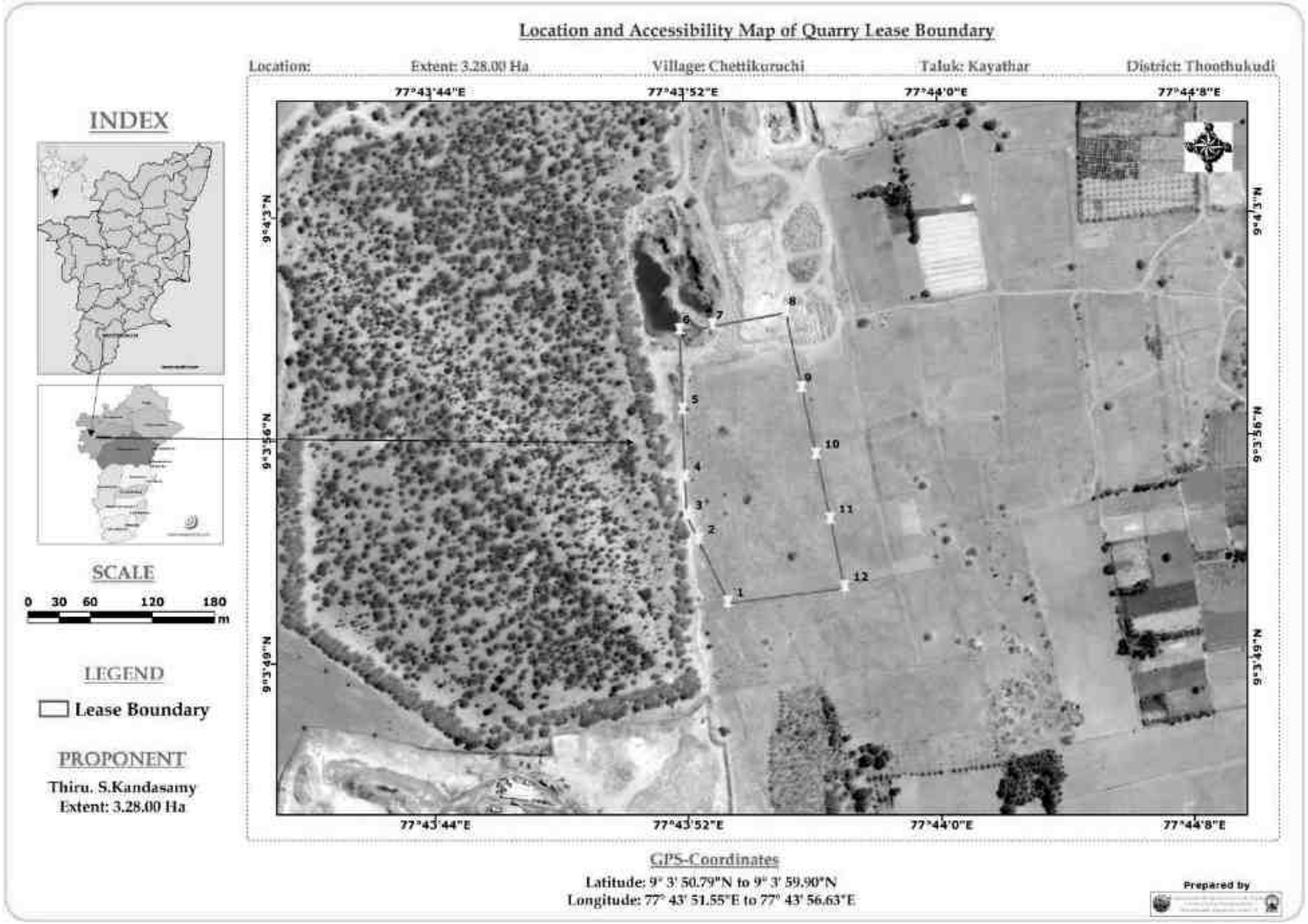


Fig No 11.2 Google earth image showing location and route for proposed rough stone and gravel quarry

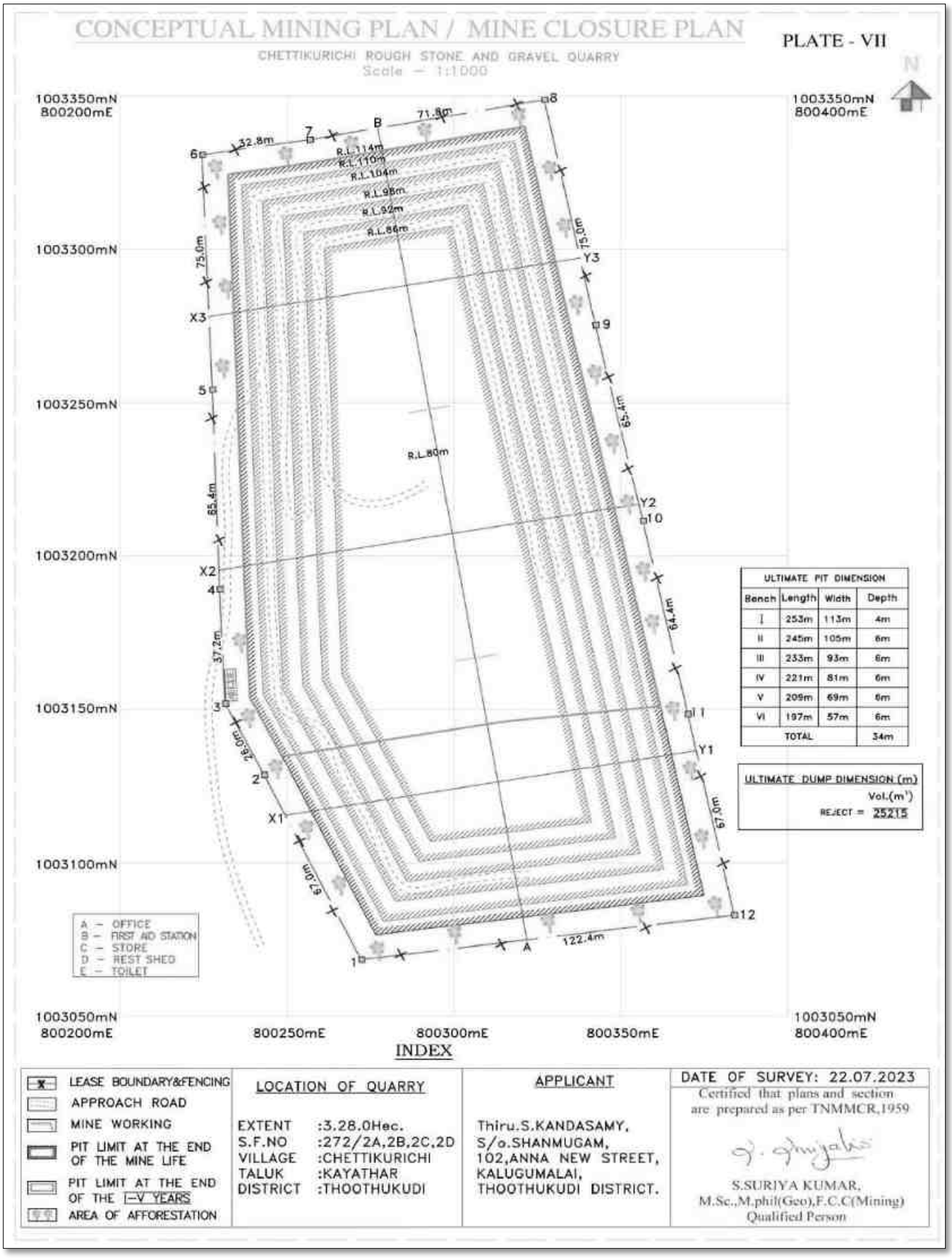


Fig No 11.3 Conceptual mining plan

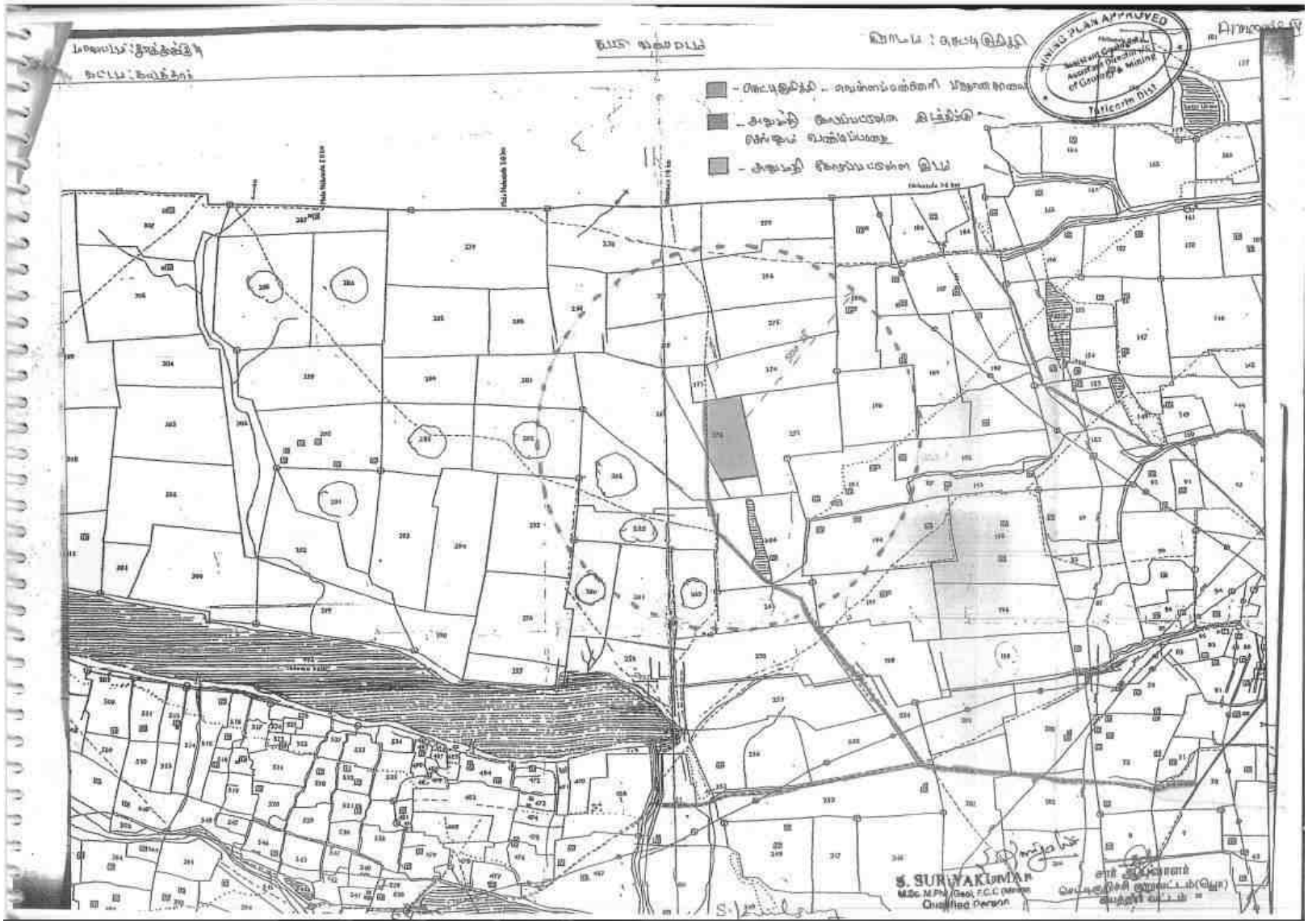


Fig No 11.4 Combined sketch

11.3 Description of the environment

11.3.1 Base line environmental study

Collection of base line data is an integral part of the preparation of environmental impact assessment reports. The baseline monitoring study has been carried out during December 1st 2022 – February 28th, 2023 to assess the existing environmental scenario in the area. For the purpose of EIA studies, mine lease area was considered as the core zone and area outside the mine lease boundary up to 10km radius from the lease boundary was considered as buffer zone.

Table No 11.2 Baseline Data

Particulars	Details	Standards
Meteorology (December 1st 2022 – February 28th, 2023)		
Rainfall (Avg.)	211.47 mm (study period)	--
Temperature (Avg.)	26°C	--
Wind speed (Avg.)	5.2 m/s	--
Wind Direction	Predominantly from N, NW, NE	
Ambient Air Quality (NAAQS)		
PM_{10}	39-54 µg/m^3	100 µg/m^3
$PM_{2.5}$	15-36 µg/m^3	60 µg/m^3
SO_2	9-19 µg/m^3	80 µg/m^3
NO_x	11-30 µg /m^3	80 µg/m^3
Noise Level (CPCB Standards)		
Day time (6:00 am - 10:00 pm)	Core zone – 39.9 – 47.2 dB (A) Buffer zone – 39.5 – 45.1 dB (A)	**Industrial Area** Day Time - 75 dB (A) **Residential Area** Day Time – 55 dB (A)
Night time (10:00pm - 06:00 am)	Core zone – 32.4– 39.5 dB (A) Buffer zone – 31.8 – 39.7 dB(A)	**Industrial Area** Night Time – 70 dB(A) **Residential Area** Night Time – 45 dB (A)
Water Quality IS 10500:2012 (Desirable limits)		
pH	7.15 – 7.89	6.5 to 8.5
TDS	700 - 1064 mg/l	500 mg/l
Electrical conductivity at 25˚C	1198 - 1720 micromhos/cm	-
Total Hardness as $CaCO_3$	200 - 423 mg/l	200 mg/l

Total suspended solids	1 - 2	IS:3025:P.16:1984:R.2012
Chlorides Cl	222 – 430 mg/l	250
Total iron Fe	0.03-0.08 mg/l	0.3mg/l
Sulfates SO_4	16-90 mg/l	200 mg/l
Soil Quality		
pH	7.12 – 8.2	Neutral to slightly alkaline
Bulk density	1.02-1.22 g/cc	Favorable physical condition for plant growth
Hydro Geology		
Depth of Mining	34m bgl	
Water Table	55-60m bgl	

11.4 ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

11.4.1 Air Environment

The air borne particulate matter is the main air pollutant by opencast mining. The mining operation will be carried out by adopting mechanized methods which involves Jack Hammer drilling and blasting, excavation, loading and transportation.

AERMOD - Model was used for prediction of impact of PM_{10} during conditions i) Loading/unloading and transportation of rough stone and weathered rock by trucks on Haul roads ii) During blasting of minerals. Total predicted 24-h maximum GLC of PM_{10} at project site for scenario 1 i.e loading-unloading and transportation and scenario 2 i.e blasting was 67.08µg/m^3 and 56.23 µg/m^3 respectively occurred at the project site after superposition of base-line value 49 µg/m^3 over the incremental 18.08 µg/$m^3$and 7.23 µg/m^3 respectively due to combined impact of loading and unloading and transportation over the haul road and due to blasting.

The predicted incremental GLC of SO_x and NO_x for scenario 3 i.e. due to the operation of excavator and movement of vehicle in the project site were found to be BDL µg/m^3. The total GLC during mining activity was found within the prescribed limit of NAAQS. The mitigation measures for controlling air pollution due to proposed quarry are given in Table No 11.3.

11.4.2 Noise Environment

Noise pollution poses a major health risk to the mine workers. The sources of noise in the open cast proposed rough stone and gravel quarry are such as Drilling, Blasting, and during movement of vehicles.

The noise generated by the mining activity is dissipated within the core zone. This is because of distance involved and other topographical features adding to the noise attenuation. From the results, it can be seen that the ambient noise levels (day time and night time) at all the locations remain within permissible limits prescribed by CPCB and 90dB (A) norms of DGMS. At present there is no mining activity carried out. However, the expected noise levels are not likely to have any effect. Precaution will be made to keep down the noise exposure level of 85 dB (A) to the operating personnel for 8 hrs duration. The charge per blast of 75kg is below the Peak Particle Velocity of 5mm/s for the habitation located at the distance of 1300m. So ground vibrations due to blasting activities will not cause any impact to the nearest habitations.

The mitigation measures for controlling noise pollution due to proposed mining activity are given in Table No 11.3.

11.4.3 Water Environment

11.4.3.1 Ground Water

Mining operations can affect groundwater quality in several ways. The most obvious occurs in the mining below the water table, either in underground workings or open pits. This provides a direct conduit to aquifers. Groundwater quality is also affected when waters (natural or process waters or wastewater) infiltrate through surface materials (including overlying waste or other material) into ground water.

The impact due to proposed mining activity on the water quality is expected to be insignificant because of no use of chemicals or hazardous substances during mining process. The mining activity will not intersect ground water table as the depth of mining is 34m bgl whereas the depth of ground water table is identified as 55-60m bgl.

The ground water samples were collected at 5 locations to identify the present water quality status. TDS from all the water samples exceeds the acceptable limits of 500mg/l and TH in the water sample of Chettikurichi village only was found within the acceptable limit of 200mg/l. The chloride also exceeds the acceptable limits of 250mg/l in all the samples except from Chettikurichi and Ramiyampatti Village. Based on the Water Quality Index calculated, water quality from Chettikurichi and Ramiyampatti Village is found good and water quality from all other locations are found poor. For excellent water quality, the ground water from all the location required to be treated by reverse osmosis to reduce dissolved solids and total

hardness to the required rate. As the water quality of Chettikurichi village is good, the reject during the R.O treatment of water will be very less.

11.4.3.2 Surface Water

Since major water bodies are located beyond 1km radius of the project site, the possibility of affecting water quality in those water bodies due to proposed mining activity is less.

11.4.4 Soil Environment

For the five year plan period, the generation of top soil and gravel is estimated as 80,448m^3 upto the depth of 4m from the surface. From this quantity, the generated top soil will be dumped along 7.5m inner boundary of the lease area and generated gravel generated will be sold to the local needy customers. The top soil will be used to develop greenbelt within the lease area.

The management of top soil is given in Table No 11.3

11.4.5 Waste Dump

The proposed rate of production of Rough stone for five years is about 3,10,678m^3 at the rate of 95% recovery up to permissible depth. The 5% reject of 15878m^3 will be dumped within the mining lease area (south side) as per approved mining plan. All rejects dumped will be backfilled at the end of mine life.

The management of reject/waste dump is mentioned in Table No 11.3.

11.4.6 Biological Environment

There is no Reserve Forest or any Protected Forest located within 10km radius of the project site and there are no notified endangered species in the area, which may be affected due to the mining activities; therefore the biological environment will not have significant impact due to mining activity. The impact on the biological environment due to amount of dust generation is minimized by well-developed green belt in and around mining lease area.

11.4.7 Land Environment

Rough stone & gravel quarry project will result in disturbance of the land use pattern of the mine lease area. The land degradation is unavoidable during mining activities like excavation, overburden dumping, soil extraction etc. So reclamation of mined out land and proper formation of benches will be given due importance.

The land use analyses show that the tree plantation is found on the west side of the lease area and existing rough stone quarries are found on north and south side. Minor agricultural activity is carried out within 500m radius in northeast and southeast side. The dumping of rejects and dust deposition in the adjacent lands may affect the land use around the site.

At the end of the project, the quarried pit will be act as water storage pond. The stored water will be used for developing agricultural activity around the mining lease area. It will improve the livelihood of village people.

The mitigation measure for land degradation is mentioned in Table No 11.3.

11.4.8 Socio Economic Environment

The mining activity will definitely increase the employment opportunity (directly as well as indirectly) in the project area. Some of these impacts would be beneficial. The expectation of the people of the area is concerned towards employment, education, and health facilities.

Direct Employment – 21 persons
Indirect Employment - 40 persons

Table 11.3 Environmental Management Plan

S.No	Parameters	Mining Activity	Mitigation measures
1	Air Environment	Drilling	○ Dust extractor or wet drilling to be followed to control dust at source of emission ○ Use of Sharp drill bits for drilling holes and charging the holes by using optimum charge and using time delay detonator
		Blasting	○ Regular water sprinkling on blasted heaps at regular intervals will help in reducing considerable dust pollution
		Loading	○ Water sprinkling be done before loading by making it moist
		Transportation	○ Water sprinklers along the sides of haul road shall be fixed to control fly of dust while transporting minerals and waste ○ Overloading will be prevented ○ Trucks/Dumpers covered by tarpaulin covers
		DG Sets	○ DG sets will be used only during power failure ○ Adequate stack height for DG sets will be provided as per CPCB norms
		General measures	○ Avenue trees along roads around ML boundary shall be planted as per the norms of MoEF to control fly of dust. ○ Labours engaged in such dust prone areas should be provided with safety devices like ear muff, mask, goggles as per the MMR, 1961 amendments and circulars of DGMS. ○ Regular health check–up of workers and nearby villagers in the impacted area should be carried out and also regular

			occupational health assessment of employees should be carried out as per the Factories Act o Ambient Air Quality Monitoring will be conducted on regular basis to assess the quality of ambient air.
2	Water Environment	Surface water	o Wastewater discharge from mine will be treated in settling tanks before using for dust suppression and tree plantation purposes.
		Ground water	o The mining activity will not intersect the ground water table o Desilting will be carried out before and immediately after the monsoon season
		Storm water	o Pit will be used for Storage of rainwater o Rain water will be collected in sump in the mining pit 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 onwards and such sites where dust likely to be generated and for developing green belt. o The proponent will collect and judicially utilize the rainwater as part of rain water harvesting
		General measures	o Regular monitoring and analyzing the quality of water
3	Noise Environment	Drilling	o Limiting time exposure of workers to excessive noise
		Blasting	o Carrying out blasting only during day time and not on cloudy days o Noise levels will be controlled by using optimum explosive charge, proper delay detonators and proper stemming to

			prevent blow out of holes. o Providing proper noise proof enclosure for the workers separated from the noise source and noise prone equipment
		Transportation	o Proper and regular maintenance of vehicles, machinery and other equipments. o The noise generated by the machinery will be reduced by proper lubrication of the machinery and other equipments. o Speed of trucks entering or leaving the mine will be limited to moderate speed to prevent undue noise from empty vehicles. o Adequate silencers will be provided in all the diesel engines of vehicles. o Minimum use of horns and speed limit of 10 km/hr in the village area. o It will be ensured that all transportation vehicles carry a valid PUC Certificates
		General measures	o Use of personal protective devices i.e., earmuffs and earplugs by workers, who are working in high noise generating areas o Provision of Quiet areas, where employees can get relief from workplace noise. o The development of green belts around the periphery of the mine to attenuate noise. o Regular medical check–up and proper training to personnel to create awareness about adverse noise level effects.
4	Vibration	Blasting	o Specific charge pattern has to be designed by proper trial

			vibration studies with varying charge ratios. o Milli second detonators shall be used preferably 25–50ms per delay to control vibrations o If the vibration still exceeds the limit a long Trench to a depth of 6m may cut in the direction of wave's movement to break longitudinal waves which travel close to surface, preferably near mine buffer zone o In spite of all measures periodical testing of vibration and noise using approved seismograph by DGMS has to be followed as a part of Environmental monitoring
5	Soil Environment	Topsoil	o Humus top soil shall be preserved for reuse in afforestation and agriculture o Top soil should not be mixed with other waste or reject materials. It should be conserved by judicious utilization in the mine premises o Garland drains will be provided around the mine and dumps to arrest any soil from the mine area being carried away by the rain water. This will also avoid the soil erosion and siltation in the mining pits and maintaining the stability of the benches
6	Waste Dump	Stabilization of Dumps	o The rejects\ waste dump shall be properly terraced in to 1.5m benches with proper repose angle and then the top soil shall be spread over the dumps and slope to make them humus for some time, after the soil suitable for water retention trees will be planted at the top, slope and toe of the stabilized dumps to

			form vegetation o Garland drainage around dump shall prevent under wash of dump by hydrostatic pressure to be developed by surface water and control wash outs and collapse
7	Plantation	Mine lease boundary and waste dump	o Provision of green belt all along the periphery of the lease area for control of dust and to attenuate noise o Stabilization of Dump with plantation o It is strongly recommended that the loss of plant in each year will be counted and again planted in subsequent plantation. o The plant should be planted taken from nursery, where the survival rate is high.
8	Land Environment		o The restoration of the degraded land would cover backfilling and terracing with the overburden / wastes and surfacing the same with top soil. o Provision of Garland drainage around the dumps o Fast growing trees and other native shrubs would be planted to stabilize the reclaimed land o Appropriate measures will be taken for Green belt development. o The rain water will be stored in the pit which will recharge the ground water as a part of rain water harvesting scheme for irrigating the nearby agricultural lands.
9	Socio Economic		o Good maintenance practices will be adopted for machinery and equipment, which will help to avert potential noise problems. o Green belt will be developed in and around the project site as

			per Central Pollution Control Board (CPCB) guidelines. o Drilling, blasting etc at specified location will be followed with proper schedule. o Appropriate air pollution control measure will be taken so as to minimize the environmental impact within the core zone. o An emergency preparedness plan will be prepared in advance, to deal with firefighting, evacuation and local communication. o For the safety of workers, personal protective appliances like hand gloves, helmets, safety shoes, goggles, aprons, nose masks and ear protecting devices has been provided which meet 'BIS' (Bureau of Indian Standards). o As a part of CSR activities community welfare measures will be taken by Proponent through local Panchayat
10	Occupational Health		o First-aid facilities as per provisions under Rule (44) of Mines Rules 1955 o Initial and Periodical medical examination shall be conducted for the employees under Rule 29B & 45 (A). o Insurance will be taken in the name of the labourers working in the mines o Workers involved in mining work shall be provided protective equipments such as Thick Gloves, Goggles, ear plugs, safety boot wears, etc…

11.5 Analysis of Alternatives

The mining site is dependent on the geology and mineral deposition of the area. Hence, this project is mineral and site specific and no alternative site considered for this project.

11.6 Environmental Monitoring Program

Environmental Monitoring program will be conducted for various environmental components as per conditions stipulated in Environmental Clearance Letter issued by SEIAA & Consent to Operate issued by TNPCB.

Table No: 11.4 Post Project Environmental Monitoring Program

S. No.	Environment Attributes	Location	Monitoring		Remarks
			Duration	Frequency	
1	Meteorology and Air Quality	Continuous monitoring weather station in core zone/ nearest IMD station	24 hours	Monthly Once	Wind speed, direction, Temperature, Relative humidity and Rainfall.
2	Air Pollution Monitoring – $PM_{2.5}$, PM_{10}, SO_2 and NO_x	5 locations (One station in the core zone and at least one in nearby residential, area, one in the upwind, two station on the downwind direction and one in cross wind direction).	8 hours	Once in six months	Fine Dust Sampler and Respirable Dust Sampler
3	Water Pollution Monitoring	Mine effluents, Set of grab samples during pre and post monsoon for ground and surface water in the vicinity.	–	Once in six months	Phyiso–chemical, microbiological characteristics
4	Hydrogeology	Water level in open wells in buffer zone around 1km at specific wells	-	Once in six months	Water level monitoring devices may be used.

5	Noise	Mine Boundary, high noise generating areas within the lease and at the nearest residential area	24 hours	Monthly Once	Sound level meter
6	Vibration	At the nearest habitation (in case of reporting)	–	During blasting operation	Digital Seismograph
7	Soil	Core Zone and Buffer zone (Grab samples)	–	Once in six months	Physical and Chemical characteristics

11.7 Project Benefits

The proponent is very much conscious of their obligations to society at large. Under plantation program, it is suggested to develop green belt further all along the boundary of mining lease area. Apart from the green belts and aesthetic plantation for eliminating fugitive emission and noise control, all other massive plantation efforts will be executed with the assistance of experts and cooperation of the local community.

The mining activity will create rural employment. In addition there will be indirect employment to many more people in the form of contractual jobs like construction of infrastructural facilities, transportation to destinations, sanitation, supply of goods and services to the mine and other community services, etc…The local population will have preference to get an employment. Part of the royalty is given to local bodies by the State Govt. for the welfare and development of the village. The proponent help in socio economic development of the village by providing education facilities to children's, procuring sports equipments, welfare amenities like drinking water to school, road facilities to villages and employment opportunities to nearby villagers. CSR budget is allocated as 2.5% of the profit.

11.8 Environment Management Cell

It is important to have a permanent organizational set up for implementation of environmental management plan. Conscious of this, the project proponent creates Environmental Management Cell.

Environmental Management Cell (EMC) will be headed by Mines Manager supported by adequate number of personnel and third party (Environment Consultant) having sufficient educational and professional qualification and experience to discharge responsibilities related to environmental management including statutory compliance, pollution prevention, environmental monitoring, preventive maintenance of pollution control equipment and green belt development as well as maintenance.

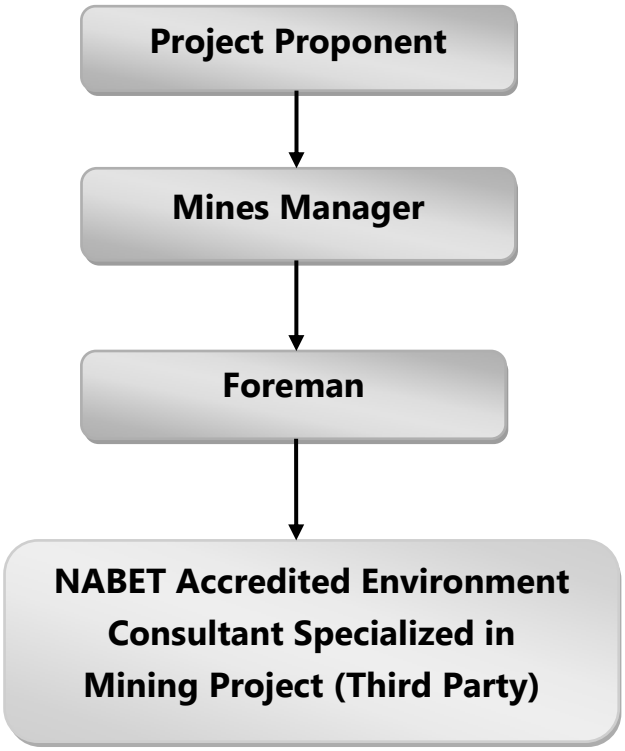


Fig No 11.5 Chart of Environment Management Cell

11.9 Environmental Policy of the Thiru S.Kandasamy, Rough Stone and Gravel quarry.

- The proposed quarry will be operated by adopting effective environmental management plan for the sustainable environment.
- Utilizing optimum natural resources considering future generations.
- Rehabilitation of mined out pit by developing greenbelt around the pit and along the benches and making the pit fit for rain water storage.
- Our EMC aware that the environment is not only for human being; it is also for all living things such as plants, animals, micro flora and fauna, aquatic organisms etc.
- To combat global warming, plantation of 500 saplings will be done in consultation with Forest Department.
- Create and maintain the safe workplaces for the workers to prevent occupational accidents.

11.10 Conclusion

As discussed, it is safe to say that the project is not likely to cause significant impact on the ecology and environment of the area, as adequate preventive measures will be adopted to contain the pollutants within permissible limits. The total operation shall be carried out with ease & minimum risk of the workers. The proposed Environmental Management Plan will keep the area in a safe environment with negligible impact on the environment. Plantation will substantiate the impact due to the mining activity. Mining activity will help in improving the socio–economic benefits in areas like employment, communication and infrastructure development etc.

CHAPTER - 12: DISCLOSURE OF CONSULTANTS ENGAGED

AADHI BOOMI MINING AND ENVIRO TECH (P) LTD, a QCI/NABET accredited EIA Consultant Organization having it's Registered Office at Salem and Branch at Porur, Chennai were promoted by a team of professional Geologists\ Mining\ Environment\ Civil\ Mechanical\ Chemical Engineers\Scientists. The company has vast experience in various disciplines including Exploration and mining of minerals and was incorporated in 2002 in the name of Suriya Mining Services providing expert advice and solutions for clients' requirement in the field of Mineral prospecting, Exploration, Mining, Geo-technical, Techno economic Feasibility reports\evaluation, Mineral Engineering, Environment Impact Assessment (EIA), Environment Management Plan (EMP), Environment Monitoring and related liaison jobs like Environment Clearance, Wild life and Forest clearance from DEIAA/SEIAA/NBWL/CRZ, MoEF& CC etc of all accredited sectors.

12.1 SCOPE

- EIA & EMP for all accredited sectors and Monitoring as per SPCB/CPCB/MoEF & CC
- Environment/ Wild life/ CRZ/ Forest Clearance
- Social Impact Analysis (SIA) and Eco-Biodiversity studies for Mine Closure Plan
- Remote Sensing & GIS including Satellite data processing, ASTER, DEM etc for application in Forest, Agriculture, Disaster, Mineral Exploration, Environment Modelling, Town planning etc.
- Geological Surveying, Mapping, Exploration and Project Management
- Geophysical, Geochemical & Geotechnical studies to locate concealed deposit\ formation including structural studies.
- Noise and Vibration studies as per DGMS\MoEF & CC to design controlled blasting where inhabitations are located within 300m.
- Mine Design and costing, selection of Machineries and Project Evaluation.
- Statutory Mine Plans & Sections, Mining Plan and other mandatory projects.
- Design and development of Mineral Beneficiation Plant including mineral separation studies.

12.2 INFRASTRUCTURE

- Our Human resources are well expertise in all functional areas as per Ver. 3 of NABET\QCI. Our Hi Tech ISO certified Office and Lab are accredited by NABL and MoEFCC.

- And have latest field Investigation devices like Respirable and Fine Dust Samplers, Digital Seismograph, DDR3 Resistivity Meter, Echo sounder, DGPS, Total Station, Water level monitoring meters, GPS 62S, Sound Level Meter etc.

12.3 DISCLOSURE OF CONSULTANT FOR EIA STUDY

THIRU. S.KANDASAMY, appointed **AADHI BOOMI MINING AND ENVIRO TECH PRIVATE LTD**, having its office at 3/216, K.S.V Nagar, Narasothipatti, Alagapuram, Salem – 636 004, Tamil Nadu, for preparation of EIA/EMP report for obtaining Environment Clearance from SEIAA/SEAC, Tamil Nadu.

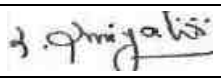
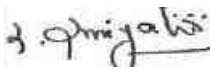
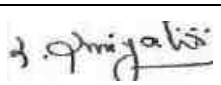
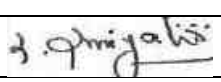
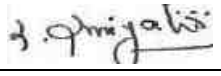
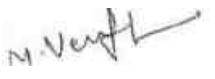
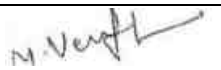
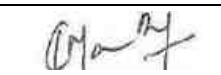
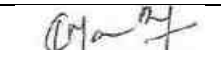
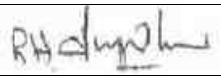
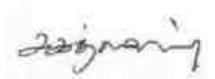
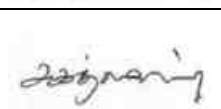
AADHI BOOMI MINING AND ENVIRO TECH PRIVATE LTD has MoU with **EKDANT ENVIRO SERVICES (P) LTD** laboratory at Chennai and has own Laboratory named **ABM ENVIRONMENTAL AND ANALYTICAL LABORATORY, accredited by NABL** for sampling and testing of air, water, noise and soil samples. Ekdant Enviro Services are recognized by the Ministry of Environment and Forests, Government of India under the relevant provision of Environment (Protection) Act 1986 and Accredited by NABL and NABET, Quality Council of India, New Delhi.

S. No.	Study	Consultants/LAB
1	Generation of Base Line Data	Aadhi Boomi Mining & Enviro Tech P Ltd, Salem Ekdant Enviro Services (P) Ltd, Chennai
2	Remote Sensing and Land use/Land cover Studies	Aadhi Boomi Mining & Enviro Tech P Ltd, Salem
3	Preparation of EIA and EMP Report	Aadhi Boomi Mining & Enviro Tech P Ltd, Salem

12.4 DECLARATION OF EXPERTS INVOLVED IN THE EIA REPORT PREPARATION

Names of the EIA coordinator, Functional Area Experts and other Team Members engaged and nature of consultancy rendered is provided in NABET Annexure –VII of EIA report. The multidisciplinary team comprises of Environmental Engineers, Geologists and Geographers who involved in preparation of Environmental Impact Assessment Report and Environment Management Plan for various functions like Air quality, Water quality, Noise levels, Soil Conservation, Hydro geology, Ecology and bio-diversity, Land use and Socio–Economics.

Table 12.1: Declaration of Experts

S.No	Name of the Expert	Category	Functional Areas	Signature
1.	Mr.S.Suriyakumar	A	EIA Co-ordinator	
		A	Solid and Hazardous Waste SHW*- HW* only	
		A	Risk Assessment and Hazard Management (RH)	
		A	Land Use (LU)	
		A	Soil Conservation (SC)	
2.	Mrs. S. Santhi	B	Land Use (LU)	
		B	Socio Economics (SE)	
3.	Dr. Nithia Priya P.M	B	Air Pollution, Monitoring, Prevention and Control (AP)	
		B	Water Pollution Monitoring, Prevention and Control (WP)	
4.	Mr. M. Venkatesh Prabhu	B	Meteorology, Air Quality Modelling & Prediction (AQ)	
		B	Noise and Vibration (NV)	
5.	Mr. K. Manuraj	B	Geology (GEO)	
			Hydrogeology (HG)	
6.	V. Sudha	B	Ecology and Biodiversity	
Team Member Involved in Report Preparation				
7.	Mrs. S. Sri Vidhya	Team Member	Water Pollution Monitoring, Prevention and Control (WP) under FAE - Dr. Nithia Priya P.M	
			Meteorology, Air Quality Modelling & Prediction (AQ) under FAE - Mr. M. Venkatesh Prabhu	
8.	Mr. S. Sagath Srikrishnan	Team Member	Solid hazardous Waste (SHW) under FAE Mr. Suriyakumar. S	
			Water Pollution Monitoring, Prevention and Control (WP) under FAE - Dr. Nithia Priya P.M	

9.	Mrs. A. Nagadevi	Team Member	Water Pollution Monitoring, Prevention and Control (WP) under FAE - Dr. Nithia Priya P.M	
			Ecology and Biodiversity (EB) under FAE – V. Sudha	
10.	Mr. A. Jagadeesh Kumar	Team Member	Noise and vibration under FAE - Mr. M. Venkatesh Prabhu	
			Meteorology, Air Quality Modelling & Prediction (AQ) under FAE - Mr. M. Venkatesh Prabhu	

Annexure I - Terms of Reference

File No: 10475
Government of India
Ministry of Environment, Forest and Climate Change
(Issued by the State Environment Impact Assessment Authority(SEIAA), TAMIL NADU)
***

Dated **06/04/2024**

To,

SHANMUGAM KANDASAMY
SHANMUGAM KANDASAMY
102,Annapudhutheru Colony, Kalukumalai,Thoothukkudi, TamilNadu,Pin-628552, Kalukumalai, TUTICORIN, TAMIL NADU, Annapudhutheru Colony, 628552
shanmugamkandasamyrst23@gmail.com

Subject: Grant of Terms of Reference under the provision of the EIA Notification 2006-regarding.

Sir/Madam,

This is in reference to your application for Grant of Terms of Reference under the provision of the EIA Notification 2006-regarding in respect of project Kandasamy Chettikurichi village Roughstone Quarry submitted to Ministry vide proposal number SIA/TN/MIN/447362/2023 dated 24/02/2024.

Reference:

1. Online proposal No. SIA/TN/MIN/447362/2023, dated:07.10.2023.
2. Your application submitted for Terms of Reference dated:13.10.2023.
3. Reply by the project proponent dated:29.12.2023

2. The particulars of the proposal are as below :

(i) TOR Identification No.	TO23B0108TN5752566N
(ii) File No.	10475
(iii) Clearance Type	TOR
(iv) Category	B1
(v) Project/Activity Included Schedule No.	1(a) Mining of minerals
(vii) Name of Project	Kandasamy Chettikurichi village Roughstone Quarry
(viii) Name of Company/Organization	SHANMUGAM KANDASAMY
(ix) Location of Project (District, State)	TUTICORIN, TAMIL NADU
(x) Issuing Authority	SEIAA
(xii) Applicability of General Conditions	no
(xiii) Applicability of Specific Conditions	no

3. In view of the particulars given in the Para 1 above, the project proposal interalia including Form-1(Part A and B) were submitted to the Ministry for an appraisal by the State Environment Impact Assessment Authority(SEIAA) Appraisal Committee (SEIAA) in the Ministry under the provision of EIA notification 2006 and its subsequent amendments.

4. The above-mentioned proposal has been considered by State Environment Impact Assessment Authority(SEIAA) Appraisal Committee of SEIAA in the meeting held on 26/03/2024. The minutes of the meeting and all the Application and documents submitted [(viz. Form-1 Part A, Part B, Part C EIA, EMP)] are available on PARIVESH portal which can be accessed by scanning the QR Code above.

5. The State Expert Appraisal Committee (SEAC), based on the information & clarifications provided by the project proponent and after detailed deliberations recommended the proposal for grant of Terms of Reference under the provision of EIA Notification, 2006 and as amended thereof subject to the stipulation of specific and general conditions as detailed in Annexure (2).

6. The SEIAA has examined the proposal in accordance with the Environment Impact Assessment (EIA) Notification, 2006 & further amendments thereto and after accepting the recommendations of the State Environment Impact Assessment Authority(SEIAA) Appraisal Committee hereby decided to grant Terms of Reference for instant proposal of M/s. SHANMUGAM KANDASAMY under the provisions of EIA Notification, 2006 and as amended thereof.

7. The Ministry/SEIAA-TN reserves the right to stipulate additional conditions, if found necessary.

8. The Terms of Reference to the aforementioned project is under provisions of EIA Notification, 2006. It does not tantamount to approvals/consent/permissions etc. required to be obtained under any other Act/Rule/regulation. The Project Proponent is under obligation to obtain approvals /clearances under any other Acts/ Regulations or Statutes, as applicable, to the project.

9. This issues with the approval of the Competent Authority.

10. The TORs with public hearing prescribed shall be valid for a period of three years from the date of issue, for submission of the EIA/EMP report as per OMNo.J-11013/41/2006-IA-II(I) (part) dated 29th August, 2017.

Copy To

1. The Additional Chief Secretary to Government, Environment & Forests Department, Govt. of Tamil Nadu, Fort St. George, Chennai - 9
2. The Chairman, Central Pollution Control Board, Parivesh Bhavan,CBD Cum-Office Complex, East Arjun Nagar, New Delhi 110032.
3. The Member Secretary, Tamil Nadu Pollution Control Board,76, Mount Salai, Guindy, Chennai-600 032.
4. The APCCF (C), Regional Office, MoEF & CC (SZ), 34, HEPC Building, 1st & 2nd Floor, Cathedral Garden Road, Nungambakkam, Chennai -34.
5. Monitoring Cell, IA Division, Ministry of Environment, Forests & CC, Paryavaran Bhavan, CGO Complex, New Delhi 110003
6. The District Collector, Thoothukkudi District.
7. Stock File.

Annexure 1

Specific Terms of Reference for (Mining Of Minerals)

1. Seac Standard Conditions

S. No	Terms of Reference
1.1	1. In the case of existing/operating mines, a letter obtained from the concerned AD (Mines) shall be submitted and it shall include the following:

S. No	Terms of Reference
	(i) Original pit dimension (ii) Quantity achieved Vs EC Approved Quantity (iii) Balance Quantity as per Mineable Reserve calculated. (iv) Mined out Depth as on date Vs EC Permitted depth (v) Details of illegal/illicit mining (vi) Violation in the quarry during the past working. (vii) Quantity of material mined out outside the mine lease area (viii) Condition of Safety zone/benches (ix) Revised/Modified Mining Plan showing the benches of not exceeding 6 m height and ultimate depth of not exceeding 50m. 2. Details of habitations around the proposed mining area and latest VAO certificate regarding the location of habitations within 300m radius from the periphery of the site. 3. The PP shall submit a detailed hydrological report indicating the impact of proposed quarrying operations on the waterbodies like lake, water tanks, etc are located within 1 km of the proposed quarry. 4. The Proponent shall carry out Bio diversity study through reputed Institution and the same shall be included in EIA Report. 5. The DFO letter stating that the proximity distance of Reserve Forests, Protected Areas, Sanctuaries, Tiger reserve etc., up to a radius of 25 km from the proposed site. 6. In the case of proposed lease in an existing (or old) quarry where the benches are not formed (or) partially formed as per the approved Mining Plan, the Project Proponent (PP) shall the PP shall carry out the scientific studies to assess the slope stability of the working benches to be constructed and existing quarry wall, by involving any one of the reputed Research and Academic Institutions - CSIR-Central Institute of Mining & Fuel Research / Dhanbad, NIRM/Bangalore, Division of Geotechnical Engineering-IIT-Madras, NIT-Dept of Mining Engg, Surathkal, and Anna University Chennai-CEG Campus. The PP shall submit a copy of the aforesaid report indicating the stability status of the quarry wall and possible mitigation measures during the time of appraisal for obtaining the EC. 7. However, in case of the fresh/virgin quarries, the Proponent shall submit a conceptual 'Slope Stability Plan' for the proposed quarry during the appraisal while obtaining the EC, when the depth of the working is extended beyond 30 m below ground level. 8. The PP shall furnish the affidavit stating that the blasting operation in the proposed quarry is carried out by the statutory competent person as per the MMR 1961 such as blaster, mining mate, mine foreman, II/I Class mines manager appointed by the proponent. 9. The PP shall present a conceptual design for carrying out only controlled blasting operation involving line drilling and muffle blasting in the proposed quarry such that the blast-induced ground vibrations are controlled as well as no fly rock travel beyond 30 m from the blast site. 10. The EIA Coordinators shall obtain and furnish the details of quarry/quarries operated by the proponent in the past, either in the same location or elsewhere in the State with video and photographic evidences. 11. 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, 12. What was the period of the operation and stoppage of the earlier mines with last work permit issued by the AD/DD mines? 13. Quantity of minerals mined out. ● Highest production achieved in any one year ● Detail of approved depth of mining. ● Actual depth of the mining achieved earlier. ● Name of the person already mined in that leases area. ● If EC and CTO already obtained, the copy of the same shall be submitted. ● Whether the mining was carried out as per the approved mine plan (or EC if issued) with

S. No	Terms of Reference
	stipulated benches. 14. 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). 15. The PP shall carry out Drone video survey covering the cluster, green belt, fencing, etc., 16. 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. 17. 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. 18. The Project Proponent shall provide the Organization chart indicating the appointment of various statutory officials and other competent persons to be appointed as per the provisions of the Mines Act'1952 and the MMR, 1961 for carrying out the quarrying operations scientifically and systematically in order to ensure safety and to protect the environment. 19. The Project Proponent shall conduct the hydro-geological study considering the contour map of the water table detailing the number of groundwater pumping & open wells, and surface water bodies such as rivers, tanks, canals, ponds, etc. within 1 km (radius) along with the collected water level data for both monsoon and non-monsoon seasons from the PWD / TWAD so as to assess the impacts on the wells due to mining activity. Based on actual monitored data, it may clearly be shown whether working will intersect groundwater. Necessary data and documentation in this regard may be provided. 20. 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. 21. The Proponent shall carry out the Cumulative impact study due to mining operations carried out in the quarry specifically with reference to the specific environment in terms of soil health, biodiversity, air pollution, water pollution, climate change and flood control & health impacts. Accordingly, the Environment Management plan should be prepared keeping the concerned quarry and the surrounding habitations in the mind. 22. Rain water harvesting management with recharging details along with water balance (both monsoon & non-monsoon) be submitted. 23. 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. 24. 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. 25. 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. 26. Description of water conservation measures proposed to be adopted in the Project should be given. Details of rainwater harvesting proposed in the Project, if any, should be provided. 27. Impact on local transport infrastructure due to the Project should be indicated. 28. 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

S. No	Terms of Reference
	activity. 29. A detailed mine closure plan for the proposed project shall be included in EIA/EMP report which should be site-specific. 30. 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. 31. The purpose of Green belt around the project is to capture the fugitive emissions, carbon sequestration and to attenuate the noise generated, in addition to improving the aesthetics. A wide range of indigenous plant species should be planted as given in the appendix-I in consultation with the DFO, State Agriculture University. The plant species with dense/moderate canopy of native origin should be chosen. Species of small/medium/tall trees alternating with shrubs should be planted in a mixed manner. 32. Taller/one year old Saplings raised in appropriate size of bags, preferably ecofriendly 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 33. A Disaster management Plan shall be prepared and included in the EIA/EMP Report for the complete life of the proposed quarry (or) till the end of the lease period. 34. A Risk Assessment and management Plan shall be prepared and included in the EIA/EMP Report for the complete life of the proposed quarry (or) till the end of the lease period. 35. Occupational Health impacts of the Project should be anticipated and the proposed preventive measures spelt out in detail. Details of pre-placement medical examination and periodical medical examination schedules should be incorporated in the EMP. The project specific occupational health mitigation measures with required facilities proposed in the mining area may be detailed. 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. 37. 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. 38. Details of litigation pending against the project, if any, with direction /order passed by any Court of Law against the Project should be given. 39. 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. 40. If any quarrying operations were carried out in the proposed quarrying site for which now the EC is sought, the Project Proponent shall furnish the detailed compliance to EC conditions given in the previous EC with the site photographs which shall duly be certified by MoEF&CC, Regional Office, Chennai (or) the concerned DEE/TNPCB. 41. The PP shall prepare the EMP for the entire life of mine and also furnish the sworn affidavit stating to abide the EMP for the entire life of mine. 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.

2. Seac Mining Conditions - Site Specific

S. No	Terms of Reference
2.1	1. The PP shall furnish ownership details of all survey numbers in EIA report.

S. No	Terms of Reference
	2. The PP shall submit the 'Action Plan' on the issues raised during the Public Hearing with budgetary provisions for the same. 3. The PP shall submit the controlled blasting measures for reducing the impacts due to the blasting operation in the proposed quarries within 1 km of the proposed quarry. 4. The PP shall submit a 'Conceptual Mining Plan' indicating the accessible ramp from the surface to the pit bottom keeping the benches intact for the dimension as stipulated in the Approved Mining Plan. 5. The PP shall submit the nature of buildings/structures, occupants and their profession, etc located within 500 m radius of the proposed quarry.

3. Seiaa Standared Conditions

S. No	Terms of Reference
3.1	Cluster Management Committee 1. Cluster Management Committee shall be framed which must include all the proponents in the cluster as members including the existing as well as proposed quarry. 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., 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. 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. 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. 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. 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. 8. The committee shall furnish the Emergency Management plan within the cluster. 9. The committee shall deliberate on the health of the workers/staff involved in the mining as well as the health of the public. 10. The committee shall furnish an action plan to achieve sustainable development goals with reference to water, sanitation & safety. 11. The committee shall furnish the fire safety and evacuation plan in the case of fire accidents. Impact study of mining 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 & soil biological, physical land chemical features . b) Climate change leading to Droughts, Floods etc. c) Pollution leading to release of Greenhouse gases (GHG), rise in Temperature, & Livelihood of the local people. d) Possibilities of water contamination and impact on aquatic ecosystem health. e) Agriculture, Forestry & Traditional practices. f) Hydrothermal/Geothermal effect due to destruction in the Environment. g) Bio-geochemical processes and its foot prints including environmental stress. h) Sediment geochemistry in the surface streams.

S. No	Terms of Reference
	Agriculture & Agro-Biodiversity 13. Impact on surrounding agricultural fields around the proposed mining Area. 14. Impact on soil flora & vegetation around the project site. 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. 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. 17. Action should specifically suggest for sustainable management of the area and restoration of ecosystem for flow of goods and services. 18. The project proponent shall study and furnish the impact of project on plantations in adjoining patta lands, Horticulture, Agriculture and livestock. Forests 19. The project proponent shall detailed study on impact of mining on Reserve forests free ranging wildlife. 20. The Environmental Impact Assessment should study impact on forest, vegetation, endemic, vulnerable and endangered indigenous flora and fauna. 21. The Environmental Impact Assessment should study impact on standing trees and the existing trees should be numbered and action suggested for protection. 22. The Environmental Impact Assessment should study impact on protected areas, Reserve Forests, National Parks, Corridors and Wildlife pathways, near project site. Water Environment 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 may be provided, covering the entire mine lease period. 24. Erosion Control measures. 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. 26. The project proponent shall study impact on fish habitats and the food WEB/ food chain in the water body and Reservoir. 27. The project proponent shall study and furnish the details on potential fragmentation impact on natural environment, by the activities. 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. 29. The Terms of Reference should specifically study impact on soil health, soil erosion, the soil physical, chemical components and microbial components. 30. The Environmental Impact Assessment should study on wetlands, water bodies, rivers streams, lakes and farmer sites. Energy 31. The measures taken to control Noise, Air, Water, Dust Control and steps adopted to efficiently utilise the Energy shall be furnished. Climate Change 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. 33. The Environmental Impact Assessment should study impact on climate change, temperature rise, pollution and above soil & below soil carbon stock. Mine Closure Plan

S. No	Terms of Reference
	34. Detailed Mine Closure Plan covering the entire mine lease period as per precise area communication order issued. EMP 35. Detailed Environment Management Plan along with adaptation, mitigation & remedial strategies covering the entire mine lease period as per precise area communication order issued. 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. Risk Assessment 37. To furnish risk assessment and management plan including anticipated vulnerabilities during operational and post operational phases of Mining. Disaster Management Plan 38. To furnish disaster management plan and disaster mitigation measures in regard to all aspects to avoid/reduce vulnerability to hazards & to cope with disaster/untoward accidents in & around the proposed mine lease area due to the proposed method of mining activity & its related activities covering the entire mine lease period as per precise area communication order issued. Others 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. 40. As per the MoEF& CC office memorandum F.No.22-65/2017-IA.III dated: 30.09.2020 and 20.10.2020 the proponent shall address the concerns raised during the public consultation and all the activities proposed shall be part of the Environment Management Plan. 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.

4. Seiaa Specific Condtions

S. No	Terms of Reference
4.1	The Authority noted that the subject was appraised in the 443rd SEAC meeting held on 08.02.2024. After detailed discussions, the Authority accepts the recommendation of SEAC and decided to grant **Terms of Reference (ToR) along with Public Hearing** under cluster for undertaking the combined Environment Impact Assessment Study and preparation of separate Environment Management Plan subject to the conditions as recommended by SEAC & normal conditions and conditions

Standard Terms of Reference for (Mining of minerals)

1.

S. No	Terms of Reference
1.1	An EIA-EMP Report shall be prepared for peak capacity (…..MTPA)operation in an ML/project area of.....ha based on the generic structure specified in Appendix III of the EIA Notification, 2006.
1.2	An EIA-EMP Report would be prepared for peak capacity operation to cover the impacts and environment management plan for the project specific activities on the environment of the region,

S. No	Terms of Reference
	and the environmental quality encompassing air, water, land, biotic community, etc. through collection of data and information, generation of data on impacts including prediction modeling for..... MTPA of mineral production based on approved project/Mining Plan for.....MTPA. Baseline data collection can be for any season (three months) except monsoon.
1.3	Propoer KML file with pin drop and coordinate of mine at 500-1000 m interval be provided
1.4	A Study area map of the core zone (project area) and 10 km area of the buffer zone (1: 50,000 scale) clearly delineating the major topographical features such as the land use, surface drainage pattern including rivers/streams/nullahs/canals, locations of human habitations, major constructions including railways, roads, pipelines, major industries, mines and other polluting sources. In case of ecologically sensitive areas such as Biosphere Reserves/National Parks/WL Sanctuaries/ Elephant Reserves, forests (Reserved/Protected), migratory corridors of fauna, and areas where endangered fauna and plants of medicinal and economic importance found in the 15 km study area should be given. The above details to be furnished in tabular form also
1.5	Map showing the core zone delineating the agricultural land (irrigated and un-irrigated, uncultivable land as defined in the revenue records, forest areas (as per records), along with other physical features such as water bodies, etc should be furnished.
1.6	A contour map showing the area drainage of the core zone and 25 km of the study area (where the water courses of the core zone ultimately join the major rivers/streams outside the lease/project area) should also be clearly indicated in the separate map.
1.7	Catchment area with its drainage map of 25 km area within and outside the mine shall be provided with names, details of rivers/ riverlet system and its respective order. The map should clearly indicate drainage pattern of the catchment area with basin of major rivers. Diversion of drains/ river need eloboration in form of lengthe, quantity and quality of water to be diverted
1.8	(Details of mineral reserves, geological status of the study area and the seams to be worked, ultimate working depth and progressive stage-wise working scheme until the end of mine life should be provided on the basis of the approved rated capacity and calendar plans of production from the approved Mining Plan. Geological maps and sections should be included. The Progressive mine development and Conceptual Final Mine Closure Plan should also be shown in figures. Details of mine plan and mine closure plan approval of Competent Authority should be furnished for green field and expansion projects.
1.9	Details of mining methods, technology, equipment to be used, etc., rationale for selection of specified technology and equipment proposed to be used vis-à-vis the potential impacts should be provided.
1.10	Impact of mining on hydrology, modification of natural drainage, diversion and channeling of the existing rivers/water courses flowing though the ML and adjoining the lease/project and the impact on the existing users and impacts of mining operations thereon.
1.11	A detailed Site plan of the mine showing the proposed break-up of the land for mining operations such as the quarry area, OB dumps, green belt, safety zone, buildings, infrastructure, Stockyard, township/colony (within and adjacent to the ML), undisturbed area -if any, and landscape features such as existing roads, drains/natural water bodies to be left undisturbed along with any natural drainage adjoining the lease /project areas, and modification of thereof in terms of construction of

S. No	Terms of Reference
	embankments/bunds, proposed diversion/re-channelling of the water courses, etc., approach roads, major haul roads, etc should be indicated.
1.12	Original land use (agricultural land/forestland/grazing land/wasteland/water bodies) of the area should be provided as per the tables given below. Impacts of project, if any on the land use, in particular, agricultural land/forestland/grazing land/water bodies falling within the lease/project and acquired for mining operations should be analyzed. Extent of area under surface rights and under mining rights should be specified. Area under Surface Rights S.N ML/Project Land use Area under Surface Rights(ha) Area Under Mining Rights(ha) Area under Both (ha) 1 Agricultural land 2 Forest Land 3 Grazing Land 4 Settlements 5 Others (specify) S.N. Details Area (ha) 1 Buildings 2 Infrastructure 3 Roads 4 Others (specify) Total
1.13	Study on the existing flora and fauna in the study area (10km) should be carried out by an institution of relevant discipline. The list of flora and fauna duly authenticated separately for the core and study area and a statement clearly specifying whether the study area forms a part of the migratory corridor of any endangered fauna should be given. If the study area has endangered flora and fauna, or if the area is occasionally visited or used as a habitat by Schedule-I species, or if the project falls within 15 km of an ecologically sensitive area, or used as a migratory corridor then a Comprehensive Conservation Plan along with the appropriate budgetary provision should be prepared and submitted with EIA-EMP Report; and comments/observation from the CWLW of the State Govt. should also be obtained and furnished.
1.14	One-season (other than monsoon) primary baseline data on environmental quality - air (PM10, PM2.5, SOx, NOx and heavy metals such as Hg, Pb, Cr, As, etc), noise, water (surface and groundwater), soil - along with one-season met data coinciding with the same season for AAQ collection period should be provided. The detail of NABL/ MoEF&CC certification of the respective laborartory and NABET accreditation of the consultant to be provided.
1.15	Map (1: 50, 000 scale) of the study area (core and buffer zone) showing the location of various sampling stations superimposed with location of habitats, other industries/mines, polluting sources, should be provided. The number and location of the sampling stations in both core and buffer zones should be selected on the basis of size of lease/project area, the proposed impacts in the downwind (air)/downstream (surface water)/groundwater regime (based on flow). One station should be in the upwind/upstream/non-impact/non-polluting area as a control station. The monitoring should be as per CPCB guidelines and parameters for water testing for both ground water and surface water as per ISI standards and CPCB classification wherever applicable. Observed values should be provided

S. No	Terms of Reference
	along with the specified standards.
1.16	For proper baseline air quality assessment, Wind rose pattern in the area should be reviewed and accordingly location of AAMSQ shall be planned by the collection of air quality data by adequate monitoring stations in the downwind areas. Monitoring location for collecting baseline data should cover overall the 10 km buffer zone i.e. dispersed in 10 km buffer area. In case of expansion, the displayed data of CAAQMS and its comparison with the monitoring data to be provided
1.17	A detailed traffic study along with presence of habitation in 100 mts distance from both side of road, the impact on the air quality with its proper measures and plan of action with timeline for widening of road. The project will increase the no. of vehicle along the road which will indirectly contribute to carbon emission so what will be the compensatory action plan should be clearly spell out in EIA/ EMP report.
1.18	The socio-economic study to conducted with actual survey report and a comparative assessment to be provided from the census data should be provided in EIA/ EMP report also occupational status & economic status of the study area and what economically project will contribute should be clearly mention. The study should also include the status of infrastructural facilities and amenities present in the study area and a comparative assessment with census data to be provided and to link it with the initialization and quantification of need based survey for CSR activities to be followed.
1.19	The Ecology and biodiversity study should also indicate the likely impact of change in forest area for surface infrastructural development or mining activity in relation to the climate change of that area and what will be the compensatory measure to be adopted by PP to minimize the impact of forest diversion.
1.20	Baseline data on the health of the population in the impact zone and measures for occupational health and safety of the personnel and manpower for the mine should be submitted.
1.21	Impact of proposed project/activity on hydrological regime of the area shall be assessed and report be submitted. Hydrological studies as per GEC 2015 guidelines to be prepared and submitted
1.22	Impact of mining and water abstraction from the mine on the hydrogeology and groundwater regime within the core zone and 10 km buffer zone including long-term monitoring measures should be provided. Details of rainwater harvesting and measures for recharge of groundwater should be reflected in case there is a declining trend of groundwater availability and/or if the area falls within dark/grey zone.
1.23	Study on land subsidence including modeling for prediction, mitigation/prevention of subsidence, continuous monitoring measures, and safety issues should be carried out.
1.24	Detailed water balance should be provided. The break up of water requirement as per different activities in the mining operations, including use of water for sand stowing should be given separately. Source of water for use in mine, sanction of the Competent Authority in the State Govt. and impacts vis-à-vis the competing users should be provided.
1.25	PP shall submit design details of all Air Pollution control equipment (APCEs) to be implemented as part of Environment Management Plan vis-à-vis reduction in concentration of emission for each APCEs

S. No	Terms of Reference
1.26	PP shall propose to use LNG/CNG based mining machineries and trucks for mining operation and transportation of mineral. The measures adopted to conserve energy or use of renewable sources shall be explored
1.27	PP to evaluate the green house emission gases from the mine operation/ washery plant and corresponding carbon absorption plan.
1.28	Site specific Impact assessment with its mitigation measures, Risk Assessment and Disaster Preparedness and Management Plan should be provided.
1.29	Impact of choice of mining method, technology, selected use of machinery and impact on air quality, mineral transportation, handling & storage/stockyard, etc, Impact of blasting, noise and vibrations should be provided.
1.30	Impacts of mineral transportation within the mining area and outside the lease/project along with flow-chart indicating the specific areas generating fugitive emissions should be provided. Impacts of transportation, handling, transfer of mineral and waste on air quality, generation of effluents from workshop etc, management plan for maintenance of HEMM and other machinery/equipment should be given. Details of various facilities such as rest areas and canteen for workers and effluents/pollution load emanating from these activities should also be provided.
1.31	Details of various facilities to be provided to the workers in terms of parking, rest areas and canteen, and effluents/pollution load resulting from these activities should also be given.
1.32	The number and efficiency of mobile/static water jet, Fog cannon sprinkling system along the main mineral transportation road inside the mine, approach roads to the mine/stockyard/siding, and also the frequency of their use in impacting air quality should be provided.
1.33	Conceptual Final Mine Closure Plan and post mining land use and restoration of land/habitat to the pre- mining status should be provided. A Plan for the ecological restoration of the mined out area and post mining land use should be prepared with detailed cost provisions. Impact and management of wastes and issues of re-handling (wherever applicable) and backfilling and progressive mine closure and reclamation should be furnished.
1.34	Adequate greenbelt nearby areas, mineral stock yard and transportaion area of mineral shall be provided with details of species selected and survival rate Greenbelt development should be undertaken particularly around the transport route.
1.35	Cost of EMP (capital and recurring) should be included in the project cost and for progressive and final mine closure plan.
1.36	Details of R&R. Detailed project specific R&R Plan with data on the existing socio- economic status of the population (including tribals, SC/ST, BPL families) found in the study area and broad plan for resettlement of the displaced population, site for the resettlement colony, alternate livelihood concerns/employment for the displaced people, civic and housing amenities being offered, etc and costs along with the schedule of the implementation of the R&R Plan should be given.
1.37	CSR Plan along with details of villages and specific budgetary provisions (capital and recurring) for specific activities over the life of the project should be given.

S. No	Terms of Reference
1.38	Corporate Environment Responsibility:
1.39	a) The Company must have a well laid down Environment Policy approved by the Board of Directors.
1.40	b) The Environment Policy must prescribe for standard operating process/procedures to bring into focus any infringements/deviation/violation of the environmental or forest norms/conditions.
1.41	c) The hierarchical system or Administrative Order of the company to deal with environmental issues and for ensuring compliance with the environmental clearance conditions must be furnished.
1.42	d) To have proper checks and balances, the company should have a well laid down system of reporting of non-compliances/violations of environmental norms to the Board of Directors of the company and/or shareholders or stakeholders at large.
1.43	e) Environment Managament Cell and its responsibilities to be clearly spleel out in EIA/ EMP report
1.44	f) In built mechanism of self-monitoring of compliance of environmental regulations should be indicated.
1.45	Status of any litigations/ court cases filed/pending on the project should be provided.
1.46	PP shall submit clarification from DFO that mine does not falls under corridors of any National Park and Wildlife Sanctuary with certified map showing distance of nearest sanctuary.
1.47	Copy of clearances/approvals such as Forestry clearances, Mining Plan Approval, mine closer plan approval. NOC from Flood and Irrigation Dept. (if req.), etc. wherever applicable.
1.48	Details on the Forest Clearance should be given as per the format given: Total ML Area (ha) / Total Forest land (ha) If more than one provide details of each FC / Date of FC / Extent of Forest Land / Balance area for which FC is yet to be obtained / Status of appl For diversion of forest land
1.49	In case of expansion of the proposal, the status of the work done as per mining plan and approved mine closure plan shall be detailed in EIA/ EMP report
1.50	Details on Public Hearing should cover the information relating to notices issued in the newspaper, proceedings/minutes of Public Hearing, the points raised by the general public and commitments made by the proponent and the time bound action proposed with budgets in suitable time frame. These details should be presented in a tabular form. If the Public Hearing is in the regional language, an authenticated English Translation of the same should be provided.
1.51	PP shall carry out survey through drone highlighting the ground reality for atleast 10 minutes

S. No	Terms of Reference
1.52	Detailed Chronology of the project starting from the first lease deed alloted/Block allotment/ Land acquired to its No. of renewals, CTO /CTE with details of no. renewals, previous EC(s) granted details and its compliance details, NOC details from various Govt bodies like Forest NOC(s), CGWA permissions, Power permissions, etc as per the requisites respectively to be furnished in tabular form.
1.53	The first page of the EIA/ EMP report must mention the peak capacity production, area, detail of PP, Consultant (NABET acrreditation) and Laboratory (NABL / MoEF & CC certification)
1.54	The compliances of ToR must be properly cited with respective chapter section and page no in tabular form and also mention sequence of the respective ToR complied within the EIA-EMP report in all the chapter,s section.

Annexure II - Precise area communication letter

புவியியல் மற்றும் சுரங்கத்துறை

ந.க.எண்.ஜி.எம்.1/861/2022

மாவட்ட ஆட்சியர் அலுவலகம்
தூத்துக்குடி

நாள் : 14.07.2023

குறிப்பாணை

பொருள் : கனிமமும் சுரங்கமும் - தூத்துக்குடி மாவட்டம் - கயத்தார் வட்டம் - செட்டிகுறிச்சி கிராமம் - புல எண்கள். 272/2A, 272/2B, 272/2C மற்றும் 272/2D ஆகியவற்றில் மொத்த விஸ்தீரணம் 3.28.00 ஹெக்டேர் நிலத்தில் குண்டுக்கல் மற்றும் சரள் எடுக்க அனுமதி வேண்டி திரு.S.கந்தசாமி த/பெ.சண்முகம் என்பவர் விண்ணப்பித்தது - குவாரி பணி செய்ய தகுதி வாய்ந்த நிலப்பரப்பாக தெரிவித்தல் - சுரங்கத்திட்டம் மற்றும் மாநில அளவிலான சுற்றுச்சூழல் பாதுகாப்பு தாக்க மதிப்பீட்டு ஆணையத்தின் இசைவினைப் பெற்று சமர்ப்பிக்க கோருவது - தொடர்பாக.

பார்வை :

1. திரு.S.கந்தசாமி த/பெ.சண்முகம் என்பவரது விண்ணப்பம் நாள். 09.09.2022.
2. இவ்வலுவலக கடிதம் ந.க.எண்.ஜி.எம்.1/861/2022 நாள்: 14.09.2022.
3. கோவில்பட்டி வருவாய் கோட்டாட்சியர் அறிக்கை ந.க.அ2/772/2023 நாள்: 08.02.2023.
4. உதவி புவியியலாளர் / உதவி இயக்குநர் (பொ), புவியியல் மற்றும் சுரங்கத்துறை, தூத்துக்குடி புலத்தணிக்கை அறிக்கை நாள்: 18.05.2023.

*****

தூத்துக்குடி மாவட்டம், கயத்தார் வட்டம், செட்டிகுறிச்சி கிராமம் புல எண்கள். 272/2A, 272/2B, 272/2C மற்றும் 272/2D ஆகியவற்றில் மொத்த விஸ்தீரணம் 3.28.00 ஹெக்டேர் நிலத்தில் ஐந்து (5) வருடங்களுக்கு குண்டுக்கல் மற்றும் சரள் எடுக்க உரிமம் வழங்கக் கோரி பார்வை 1-ல் கண்டவாறு திரு.S.கந்தசாமி த/பெ.சண்முகம் என்பவரது விண்ணப்பம் வரப்பெற்றுள்ளது.

மேற்படி நிலத்தில் ஐந்து (5) வருட காலத்திற்கு குண்டுக்கல் மற்றும் சரள் குவாரி செய்ய உரிமம் வழங்க கோவில்பட்டி, வருவாய் கோட்டாட்சியர் மற்றும் உதவி புவியியலாளர் / உதவி இயக்குநர் (பொ) (கனிமம்) ஆகியோர் கீழ்க்காணும் நிபந்தனைகளுக்குட்பட்டு பரிந்துரை செய்துள்ளனர்.

நிபந்தனைகள்

1. 1959 தமிழ்நாடு சிறு கனிம சலுகை விதிகள், அட்டவணை- II ல் கண்டுள்ள படி குவாரி செய்யப்படும் கனிமங்களுக்குரிய சீனியரேஜ் தொகை அவ்வப்போது செலுத்தி கனிமம் கொண்டு செல்லப்பட வேண்டும்.
2. தமிழ்நாடு சிறு கனிம விதிகளில் படி அருகே உள்ள பட்டா நிலங்களுக்கு 7.5 மீட்டர் பாதுகாப்பு இடைவெளி விட்டு குவாரி பணி மேற்கொள்ள வேண்டும்.

44

அருகே உள்ள பட்டாதாரர்களுக்கு எவ்வித இடையூறும் ஏற்படாத வண்ணம் குவாரி பணி மேற்கொள்ள வேண்டும்.

4. [illegible] உள்ள அரசு புறம்போக்கு நிலங்கள், தீர்வை ஏற்பட்ட புன்செய் தரிசு நிலங்களை [illegible] ஆக்கிரமிப்பும் செய்யாமல் குவாரி பணி மேற்கொள்ள வேண்டும்.

5. அருகேயுள்ள கிராம மக்களின் இருப்பிற்கும், இயக்கத்திற்கும், விவசாய பணிகளுக்கும் எவ்வித இடையூறும் ஏற்படாத வண்ணம் குவாரி பணி மேற்கொள்ள வேண்டும்.
6. குவாரி கழிவுகளை குத்தகை உரிமம் வழங்கப்படும் பகுதிக்கு உள்ளேயே இருப்பு வைக்க வேண்டும்.
7. வெடி மருந்தினை விதிகளின் படி பாதிப்பு ஏற்படாவண்ணம் பயன்படுத்த வேண்டும்.
8. சுரங்கத்திட்டம் மற்றும் சுற்றுச்சூழல் தடையில்லாச் சான்று குத்தகை உரிமம் வழங்குவதற்கு முன் சமர்ப்பிக்கவேண்டும்.

மேற்கூறிய அலுவலர்களின் பரிந்துரையினை ஏற்றும் நிபந்தனைகளுக்குட்பட்டும், தூத்துக்குடி மாவட்டம், கயத்தார் வட்டம், செட்டிகுறிச்சி கிராமம் புல எண்கள். 272/2A, 272/2B, 272/2C மற்றும் 272/2D ஆகியவற்றில் மொத்த விஸ்தீரணம் 3.28.00 ஹெக்டேர் நிலத்திற்கு குவாரி உரிமம் வழங்கலாம். மேற்படி பிரஸ்தாப நிலமானது 1959-ம் வருடத்திய தமிழ்நாடு சிறுகனிம சலுகை விதிகள் விதிஎண்: 19 மற்றும் 20-ன் படி ஐந்து (5) வருட காலத்திற்கு குண்டுக்கல் மற்றும் சரள் குவாரி பணி செய்ய தகுதி வாய்ந்த நிலப்பரப்பாக கருதப்படுகிறது.

மேலும் தமிழ்நாடு சிறுகனிம சலுகை விதிகள் 1959 விதி எண்: 41-ன் படி குவாரி பணி மேற்கொள்வது தொடர்பாக மேற்படி பரப்பளவான 3.28.00 ஹெக்டேர் நிலத்திற்கு சுரங்கத் திட்டத்தினை (Mining Plan) சமர்ப்பித்து விதி எண்: 42-ன் படி மாநில அளவிலான சுற்றுச்சூழல் தாக்க மதிப்பீட்டு ஆணையத்தின் (State Level Environmental Impact Assessment Authority Clearance) சுற்றுச்சூழல் தடையில்லாச் சான்று (Environmental Clearance) பெற்று சமர்ப்பிக்குமாறும் மனுதாரர் கேட்டுக் கொள்ளப்படுகிறார்.

14/7/23

உதவி புவியியலாளர்/
உதவி இயக்குநர் (பொ),
புவியியல் மற்றும் சுரங்கத்துறை,
தூத்துக்குடி.

14/07/22

பெறுநர்

திரு.S.கந்தசாமி,
த/பெ.சண்முகம்,
1102, அண்ணா புதுத்தெரு,
கழுகுமலை,
தூத்துக்குடி.

S. SURIYAKUMAR
M.Sc. M.Phil (Geo), F.C.C (Mining)
Qualified Person

Annexure III - Details of land purchase

MINING PLAN APPROVED
Assistant Geologist / Assistant Director of Geology & Mining

Annexure-II

भारतीय गैर न्यायिक INDIA NON JUDICIAL

भारत

रु.5000 Rs.5000

पाँच हजार रुपये FIVE THOUSAND RUPEES

सत्यमेव जयते

INDIA

தமிழ்நாடு तमिलनाडु TAMILNADU

F 430034
ரூபாய் 5000/-

தமிழ்நாடு
எண் : 18045
நாள் : 9.1.13

உரிமம் எண் : 341/79

ரூ.97,200/-க்கு கிரையம்

2013 -ம் வருடம் ஜனவரி மாதம் 9.- ம் தேதி, தமிழ் 1188-ம் வருடம் மார்கழி மாதம் 25 - ம் தேதி,

தூத்துக்குடி மாவட்டம், கோவில்பட்டி தாலுகா, கழுகுமலை கஸ்பா, அண்ணா புதுத்தெருவில் கதவு எண் - 102 உள்ள இல்லத்தில் வசித்து வரும் உயர்திரு. சண்முக ரெட்டியார் அவர்கள் குமாரர் திரு. S.கந்தசாமி (ஓட்டுனர் உரிமம் எண் - TN69z20100002262) அவர்களுக்கு,

R. சந்திரசேகரன்

[எழுதிக்கொடுப்பவர்]

S. Kandasamy

[எழுதிவாங்குபவர்]

S. SURIYAKUMAR
M.Sc. M.Phil (Geo), F.C.C (Mining)
Qualified Person

PLAN APPROVED
Assistant Geologist / Assistant Director of Geology & Mining
Tuticorin

118

SCANNED

2019 ஆம் ஆண்டின்
11 புத்தகம்
1 தாள்கள்
1 வது தொகுதி

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No/Year 118/2019
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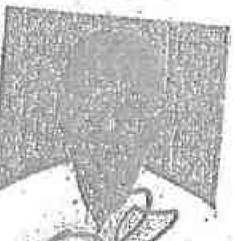
2

2019 ஆம் ஆண்டு திங்கள்
9 ஆம் நாள் பகல் 3-4 மணிக்கு
இட்டியில் சார் பதிவாளர்
அலுவலகத்தில் தாக்கல் செய்த
... 1800 ...
இடது கை பெருவிரல்



- S. Kamalesun

சார் பதிவாளர்

"கூடுதல் விவரங்கள் ஆவண வாசகங்களில் உள்ளபடி"

எழுதிக் கொடுத்ததாக ஒப்புக்கொண்டவர்
இடது கை பெருவிரல்

- R. கதிரேசன்

"கூடுதல் விவரங்கள் ஆவண வாசகங்களில் உள்ளபடி"

எழுதி வாங்கியதாக
ஒப்புக் கொண்டவர்
இடது பெருவிரல்

S. Kamalesun
S. Kamalesun

भारतीय गैर न्यायिक INDIA NON JUDICIAL

एक हजार रुपये ONE THOUSAND RUPEES

रु1000 Rs.1000

सत्यमेव जयते

தமிழ்நாடு तमिलनाडु TAMILNADU

Z 396627
ரூபாய் 1000/-

தமிழ்நாடு
எண் : 18940
நாள் : 9.1.13
S.காந்தசாமி
சுமெட்டால்

வி. அந்தோணிசாமி
S. R. O. ஸ்டாம்ப் வெண்டர்
கயத்தார்
உரிமம் எண் : 341/79

(2)

தூத்துக்குடி மாவட்டம், கோவில்பட்டி தாலுகா, செட்டிகுறிச்சி கிராமத்தில் வடக்குத்தெருவில் முன்பு கதவு எண் - 22A, தற்போது கதவு எண் - 181A உள்ள இல்லத்தில் வசித்து வரும் உயர்திரு. ராமசாமி ஆசாரி அவர்கள் குமாரர் திரு. R.கதிரேசன் (குடும்ப அட்டை எண் - 28/G/0403491) ஆகிய நான் எழுதிக்கொடுத்த கிரையப்பத்திரம் என்னவென்றால்,

R. கதிரேசன்
[எழுதிக்கொடுப்பவர்]

S. Kuulsay
[எழுதிவாங்குபவர்]

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No./Year 118/2013
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S. Kuulsay

MINING PLAN APPROVED
Assistant Geologist I/c
Assistant Director I/C
of Geology & Mining
Tuticorin Dist

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No./Year 118/2013
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2

இன்னாரென்று நிரூபித்தவர்கள்

2013 ஆம் ஆண்டு மார்ச் மாதம் 4 ம் நாள்

சார் பதிவாளர்

புத்தகம் 1 2013 ம் ஆண்டின் 118 எண்ணாகப் பதிவு செய்யப்பட்டது

2013
118
2

4.3.2013 நாள்

சார்பதிவாளர்

சார்பதிவாளர்

S. Kumar

भारतीय गैर न्यायिक

भारत INDIA

रु. 500 FIVE HUNDRED RUPEES

पाँच सौ रुपये Rs. 500

सत्यमेव जयते

INDIA NON JUDICIAL

தமிழ்நாடு तमिलनाडु TAMILNADU Z 712692

ரூபாய் 500,-

தமிழ்நாடு
எண் : 18747
நாள் : 9.1.13

வி. அந்தோணிசாமி,
S. B. O. ஸ்டாம்ப் வெண்டர்
காயத்தார்
உரிமம் எண் : 341/79

(3)

இதன் தபசில் கண்ட சொத்து எனக்கு பாத்தியப்பட்டு என் பெயரில் - 1308 நம்பர் தனிப்பட்டா ஏற்பட்டு என் பெயரில் வரிவிதிப்பும், தீர்வையும் ஏற்பட்டு நாளது தேதி வரை நானே தீர்வை செலுத்தி எந்தவித வில்லங்கம் இல்லாமல் தனித்து சர்வசுதந்திர பாத்தியமாய் அனுபவித்து வரும் இதன் தபசில் கண்ட சொத்தை நாளது தேதியில் நான் தங்களுக்கு ரூ.97,200/- க்கு கிரையம் செய்து கொடுத்து கிரயத்தொகை ரூபாய். தொன்னூற்று ஏழாயிரத்து இருநூறையும் நான் தங்களிடம் ரொக்கமாக பெற்றுக்கொண்டபடியால் இன்று முதல் இதன் தபசில் கண்ட சொத்தை தாங்கள் சர்வ சுதந்திர கிரைய பாத்தியமாகவும் சந்ததி பரம்பரையாகவும் எல்லாவித உரிமைகளுடனும் அடைந்து அனுபவித்துக் கொள்வீர்களாகவும்.

R. ஆதிசேஷன்

[எழுதிக்கொடுப்பவர்]

S. Kulasing

[எழுதிவாங்குபவர்]

DOCUMENT No 118/2013
Page 3 Total 13

S. Kulasing

भारतीय गैर न्यायिक

एक सौ रुपये Rs. 100

Rs. 100 ONE HUNDRED RUPEES

भारत INDIA

INDIA NON JUDICIAL

MINING PLAN APPROVED
Assistant Geologist / Assistant Director i/c of Geology & Mining
Tuticorin Dist.

தமிழ்நாடு तमिलनाडु TAMILNADU

AH 251089

ரூபாய் 100/-

தமிழ்நாடு
எண் : 18048
நாள் : 9-1-13

ஆர். அந்தோணிசாமி
R.O. ஸ்டாம்ப் வெண்டர்
கயத்தார்
உரிமம் எண் : 341/79

(4)

தபசில் கண்ட சொத்தில் என்னைப் பொறுத்து ஒத்தி, அடமானம், கட்டுக்குத்தகை, முன் அடமானம், கிரைய ஒப்பந்தம், பொது அதிகார ஆவணம், தானம் மற்றும் உயில் போன்ற எந்தவித வில்லங்கமும் இல்லை என்று உறுதி கூறுகிறேன். அப்படி ஏதேனும் வில்லங்கம் விவகாரம் ஏற்பட்டால் அதற்கு நானும் என் வாரீசுகளும் எனக்கு பாத்தியப்பட்ட இதர சொத்துகளிலிருந்தும் ஈடு செய்து கொடுப்பேன் என்று உறுதி கூறுகிறேன்.

R. கருப்பசாமி

[எழுதிக்கொடுப்பவர்]

S. kumaresan

[எழுதிவாங்குபவர்]

149
118/2013
4-2-13

S. kumaresan

தமிழ்நாடு தமிழ்நாடு TAMILNADU

AH 251090

ரூபாய் 100.-

தமிழ்நாடு
எண் : 18049
நாள் : 9.1.13

வி. அந்தோணிசாமி
S. R. O. ஸ்டாம்ப் வெண்டர்
கடலூர்
உரிமம் எண் : 341/79

(5)

தபசில் ...கண்ட சொத்தை நாளது தேதி முதல் தங்களுடைய அனுபவத்திற்கு ஒப்படைத்துவிட்டேன். தபசில் கண்ட சொத்து தங்கள் பெயரில் பட்டா மாறும் பொருட்டு இத்துடன் புள்ளி மனுவும் கொடுத்து இருக்கிறேன்.

R. தனசேகரன்
[எழுதிக்கொடுப்பவர்]

S. kumaresan
[எழுதிவாங்குபவர்]

Paid Rs. 100/-

S. kumaresan

தமிழ்நாடு தமிலநாடு TAMILNADU

AH 251091

தமிழ்நாடு
எண் : 18052
நாள் : 9.1.13

ரூபாய் 100/-

வி. அந்தோணிசாமி
S. R. O ஸ்டாம்ப் வெண்டர்
கயத்தார்
உரிமம் எண் : 341/79

(6)

சொத்துவிபரம்

பாளையங்கோட்டை பதிவு மாவட்டம், கயத்தர் சார்பதிவக சரகம், செட்டிகுறிச்சி கிராமத்தில், அயன் புஞ்சை சர்வே 272/2A நம்பர் ஹெக்டர் 0.81.0 நிலம் முழுவதும் சொத்துவிபரம் சரி.

R. கணேசன்

[எழுதிக்கொடுப்பவர்]

S. Kumaresan

[எழுதிவாங்குபவர்]

L74

Page 6 18/2013

S. Kumaresan

தமிழ்நாடு தமிலனாடு TAMIL NADU

28AA 498783

தமிழ்நாடு
எண் : 18051
நாள் : 9.1.13

(7)

ரூபாய் 10

வி. அந்தோணிசாமி,
S. R.C. ஸ்டாம்ப் வெண்டர்
கயத்தார்
உரிமம் எண் : 341/79

ஐஸ் சொத்து ஐஸ் கிராம பஞ்சாயத்து எல்லைக்குள்பட்டு கயத்தார் யூனியனில் இணைக்கப்பட்டுள்ளது.

R. தங்கசேகர் — S. Kumaresan

[எழுதிக்கொடுப்பவர்] [எழுதிவாங்குபவர்]

சாட்சிகள்:-

1) [illegible]

2) [illegible]

ஆவணம் தயாரித்தவர்:- மா.ஆண்டி த/பெ.மாரியப்பன் செட்டியார், மாநில அரசு எழுத்தர்- L.NO ; A213 PLM 1993 கயத்தார்.

S. Kumaresan

APPROVED MINING PLAN Assistant Director i/c Geology & Mining Tuticorin Dist

அ-பதிவேடு விவரங்கள்

மாவட்டம் : தூத்துக்குடி

வட்டம் : கயத்தார்

கிராமம் : செட்டிகுறிச்சி

1. புல எண்	272	9. மண் வயனமும் ரகமும்	8 - 4
2. உட்பிரிவு எண்	2A	10. மண் தரம்	6
3. பழைய புல உட்பிரிவு எண்		11. தீர்வை (ரு - பை)	0.91
4. பகுதி	-	12. பரப்பு (ஹெக்டேர் - ஏர்)	0 - 81.00
5. அரசு / ரயத்துவாரி	ரயத்துவாரி	13. மொத்த தீர்வை (ரு - பை)	0.73
6. நிலத்தின் வகை	புஞ்சை	14. பட்டா எண்	2796
7. பாசன ஆதாரம்	-	15. குறிப்பு	-
8. இரு போகமா	-	16. பெயர்	1.கந்தசாமி

குறிப்பு 1:

1. மேற்கண்ட தகவல் / சான்றிதழ் நகல் விவரங்கள் மின் பதிவேட்டிலிருந்து பெறப்பட்டவை. இவற்றை தாங்கள் http://eservices.tn.gov.in என்ற இணைய தளத்தில் 30254 என்ற குறிப்பு எண்ணை உள்ளீடு செய்து உறுதி செய்துகொள்ளவும்.

S. Kandasamy

தமிழ்நாடு தமிழ்நாடு TAMILNADU

F 430035

ரூபாய் 5000/-

எண் : 18038

நாள் : 9.1.13

S. கந்தசாமி

கமிஷன்

வி. அந்தோணிசாமி,
S. R. O ஸ்டாம்ப் வெண்டர்,
கயத்தார்
உரிமம் எண் : 341/79

ரூ.97,200/-க்கு கிரையம்

2013 - ம் வருடம் ஜனவரி மாதம் 9 - ம் தேதி, தமிழ் 1188-ம் வருடம் மார்கழி மாதம் 25 - ம் தேதி,

தூத்துக்குடி மாவட்டம், கோவில்பட்டி தாலுகா, கழுகுமலை கஸ்பா, அண்ணா புதுத்தெருவில் கதவு எண் - 102 உள்ள இல்லத்தில் வசித்து வரும் உயர்திரு. சண்முக ரெட்டியார் அவர்கள் குமாரர் திரு. S.கந்தசாமி (ஓட்டுனர் உரிமம் எண் - TN69z20100002262) அவர்களுக்கு,

M. Balakrishnan
[எழுதிக்கொடுப்பவர்]

S. kandasamy
[எழுதிவாங்குபவர்]

174

1 112/2013

S. Kandasamy

272/13

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Tuticorin Dist

117
203

SCANNED

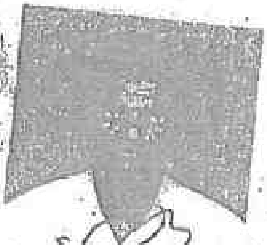
DOCUMENT No. 1197 Year 2013 Page 12 Total 13

2013

2013 ஆம் ஆண்டு ... மாதம் ... ந் தேதி
... மணிக்கும் ... மணிக்கும்
இடையில் சார் பதிவாளர்
அலுவலகத்தில் தாக்கல் செய்து
கட்டணம் ரூ. 1000 வசூலித்தவர்

சார்பதிவாளர்

இடது கை பெருவிரல்

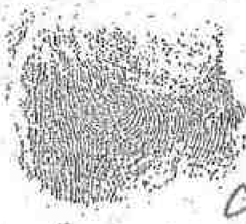


S. Kulasekaran

சார் பதிவாளர்
கயத்தார்

"கூடுதல் விவரங்கள் ஆவண
வாசகங்களில் உள்ளபடி"

...திக் கொடுத்ததாக ஒப்புக்கொண்டவர்
...து கை பெருவிரல்

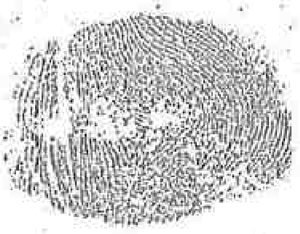


M. Balakrishnan

சார் பதிவாளர்
கயத்தார்

"கூடுதல் விவரங்கள் ஆவண
வாசகங்களில் உள்ளபடி"

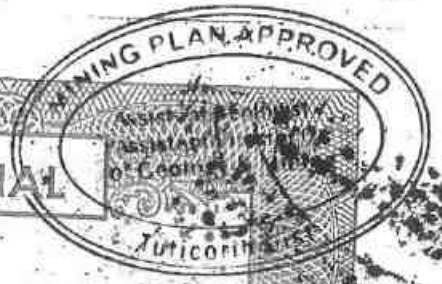
எழுதி வாங்கியதாக
ஒப்புக் கொண்டவர்
இடது பெருவிரல்



S. Kulasekaran

"கூடுதல் விவரங்கள் ஆவண
வாசகங்களில் உள்ளபடி"

S. Kulasekaran



தமிழ்நாடு तमिलनाडु TAMILNADU

Z 396628

தமிழ்நாடு
எண் : 18039,
நாள் 9.1.13

ரூபாய் 1000/-

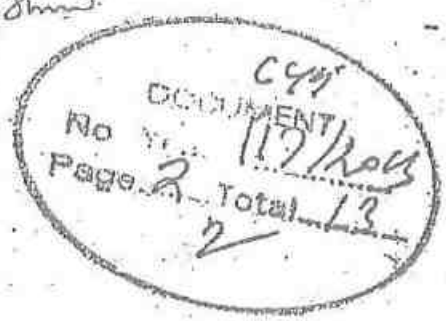
வி. அந்தோணிசாமி,
R.O. ஸ்டாம்ப் வெண்டர்
கயத்தார்
உரிமம் எண் : 341/79

(2)

தூத்துக்குடி மாவட்டம், கோவில்பட்டி தாலுகா, செட்டிகுறிச்சி கிராமத்தில் கதவு எண் - 2/181 உள்ள இல்லத்தில் வசித்து வரும் உயர்திரு. ராமசாமி ஆசாரி அவர்கள் குமாரர் திரு. R.பாலகிருஷ்ணன் (குடும்ப அட்டை எண் : 28/G/00270 08) ஆகிய நான் எழுதிக்கொடுத்த கிரையப்பத்திரம் என்னவெனில்,

Mr. Balakrishnan
[எழுதிக்கொடுப்பவர்]

S. Kumar
[எழுதிவாங்குபவர்]



S. Kumar

MINING PLAN APPROVED
Tuticorin Dist

DOCUMENT
No/Year 112/2013
Page 3 Total 13

இன்னாரென்று நிரூபித்தவர்கள்

2013 ஆம் ஆண்டு ... மாதம்
9 ஆம் நாள்
சார் பதிவாளர்

புத்தகம் ... எண்ணாகப் பதிவு செய்யப்பட்டது
9/1/2013
நாள்
சார்பதிவாளர்
1 புத். 2013 ஆண்டின்
வது தாள்கள்
சார்பதிவாளர்

S. Kumaraswamy

भारतीय-गैर-न्यायि

भारत INDIA

MINING PLANS SECTION
Assistant Geologist
Assistant Director
of Geology & Mining
Tuticorin Dist.

रु. 500 FIVE HUNDRED RUPEES

पाँच सौ रुपये Rs. 500

सत्यमेव जयते

INDIA NON JUDICIAL

தமிழ்நாடு तमिलनाडु TAMILNADU

Z 712693

தமிழ்நாடு
எண் : 18040
நாள் : 9.1.13

ரூபாய் 500, -

எஸ். அந்தோணிசாமி.
S. R. O. ஸ்டாம்ப் வெண்டர்
கயத்தார்
உரிமம் எண் : 341/79

(3)

இதன் தபசில் கண்ட சொத்து எனக்கு பாத்தியப்பட்டு என் பெயரில் - 1309 - நம்பர் தீனிப்பட்டா ஏற்பட்டு என் பெயரில் வரிவிதிப்பும், தீர்வையும் ஏற்பட்டு நாளது தேதி வரை நானே தீர்வை செலுத்தி எந்தவித வில்லங்கம் இல்லாமல் தனித்து சர்வசுதந்திர பாத்தியமாய் அனுபவித்து வரும் இதன் தபசில் கண்ட சொத்தை நாளது தேதியில் நான் தங்களுக்கு ரு.97,200/- க்கு கிரையம் செய்து கொடுத்து கிரையத்தொகை ரூபாய். தொன்னூற்று ஏழாயிரத்து இருநூறையும் நான் தங்களிடம் ரொக்கமாக பெற்றுக்கொண்டபடியால் இன்று முதல் இதன் தபசில் கண்ட சொத்தை தாங்கள் சர்வ சுதந்திர கிரைய பாத்தியமாகவும் சந்ததி பரம்பரையாகவும் எல்லாவித உரிமைகளுடனும் அடைந்து அனுபவித்துக் கொள்வீர்களாகவும்.

Mr. Balakrishnan

[எழுதிக்கொடுப்பவர்]

S. Kumaresan

[எழுதிவாங்குபவர்]

S. Kumaresan

தமிழ்நாடு TAMILNADU

AH 251092

ரூபாய் 100/-

(4)

தபசில் கண்ட சொத்தில் என்னைப் பொறுத்து ஒத்தி, அடமானம், கட்டுக்குத்தகை, முன் அடமானம், கிரைய ஒப்பந்தம், பொது அதிகார ஆவணம், தானம் மற்றும் உயில் போன்ற எந்தவித வில்லங்கமும் இல்லை என்று உறுதி கூறுகிறேன். அப்படி ஏதேனும் வில்லங்கம் விவகாரம் ஏற்பட்டால் அதற்கு நானும் என் வாரீசுகளும் எனக்கு பாத்தியப்பட்ட இதர சொத்துகளிலிருந்தும் ஈடு செய்து கொடுப்பேன் என்று உறுதி கூறுகிறேன்.

[எழுதிக்கொடுப்பவர்]

[எழுதிவாங்குபவர்]

भारतीय गैर न्यायिक
एक सौ रुपये
Rs. 100
ரூ. 100
ONE HUNDRED RUPEES
भारत INDIA
INDIA NON JUDICIAL

தமிழ்நாடு तमिलनाडु TAMILNADU

தமிழ்நாடு
எண் : 18042
நாள் : 9-1-13

AH 251093
ரூபாய் 100,-

அ. அந்தோணிசாமி,
S.R.O. ஸ்டாம்ப் வெண்டர்
கயத்தார்
உரிமம் எண் : 341/79

(5)

தபசில் கண்ட சொத்தை நாளது தேதி முதல் தங்களுடைய அனுபவத்திற்கு ஒப்படைத்துவிட்டேன். தபசில் கண்ட சொத்து தங்கள் பெயரில் பட்டா மாறும் பொருட்டு இத்துடன் புள்ளி மனுவும் கொடுத்து இருக்கிறேன்.

M. Balakrishnan
[எழுதிக்கொடுப்பவர்]

S. Kumaresan
[எழுதிவாங்குபவர்]

449
117 Reg
5
2-13

S. Kumaresan

भारतीय गैर न्यायिक

रुपये Rs. 100

ONE HUNDRED RUPEES

Rs. 100

भारत INDIA

INDIA NON JUDICIAL

தமிழ்நாடு तमिलनाडु TAMILNADU

AH 251094

ரூபாய் 100/-

தமிழ்நாடு
எண் : 18043
நாள் : 9.1.13
S அந்தோணி
கனெடீஸ்

திரு. அந்தோணிசாமி,
S. R. O. ஸ்டாம்ப் வெண்டர்
கயத்தார்
உரிமம் எண் : 341/79

(6)

<u>சொத்துவிபரம்</u>

பாளையங்கோட்டை பதிவு மாவட்டம், கயத்தார் சார்பதிவக சரகம், செட்டிகுறிச்சி கிராமத்தில், அயன் புஞ்சை சர்வே 272/2B நம்பர் ஹெக்டேர் 0.81.0 நிலம் முழுவதும் சொத்துவிபரம் சரி.

MINING PLAN APPROVED
Assistant Geologist / Assistant Director i/c Geology & Mining Tuticorin Dist.

M.R. Balakrishnan
[எழுதிக்கொடுப்பவர்]

DOCUMENT
No/Year 112/2014
Page 6 Total 11

S. Kumar
[எழுதிவாங்குபவர்]

S Kumar

भारतीय गैर न्यायिक

भारत

दस रुपये

रु.10

TEN RUPEES

Rs.10

सत्यमेव जयते

INDIA

INDIA NON JUDICIAL

MINING PLAN APPROVED
Assistant Geologist / Assistant Director I/C of Geology & Mining
Tuticorin Dist

தமிழ்நாடு तमिलनाडु TAMIL NADU

28AA 498751
ரூபாய் 10 /-

தமிழ்நாடு
எண் : 18044
நாள் : 9.1.13
[illegible]
(7)

DOCUMENT No. 117/2013
Page 9 Total 13

ஸ்ரீ. அந்தோணிசாமி,
S. R. Q. ஸ்டாம்ப் வெண்டர்
கயத்தார்.
உரிமம் எண் : 341/70

ஷை சொத்து ஷை கிராம பஞ்சாயத்து எல்லைக்குள்பட்டு கயத்தார் யூனியனில் இணைக்கப்பட்டுள்ளது.

M. Balakrishnan
[எழுதிக்கொடுப்பவர்]

S. Kumaresan
[எழுதிவாங்குபவர்]

சாட்சிகள்:-

1) [illegible]

2) [illegible]

ஆவணம் தயாரித்தவர்:- மா.ஆண்டி த/பெ.மாரியப்பன் செட்டியார், மாநில ஆவண எழுத்தர்- L.NO ; A213 PLM 1993 கயத்தார்.

S. Kumaresan

அ-பதிவேடு விவரங்கள்

மாவட்டம் : தூத்துக்குடி

வட்டம் : [illegible]

கிராமம் : [illegible]பட்டிகுறிச்சி

1. புல எண்	272	9. மண் வயனமும் ரகமும்	8 - 4
2. உட்பிரிவு எண்	2B	10. மண் தரம்	6
3. பழைய புல உட்பிரிவு எண்		11. தீர்வை (ரு - ஹெ)	0.91
4. பகுதி	-	12. பரப்பு (ஹெக்டேர் - ஏர்)	0 - 81.00
5. அரசு / ரயத்துவாரி	ரயத்துவாரி	13. மொத்த தீர்வை (ரு - பை)	0.73
6. நிலத்தின் வகை	புஞ்சை	14. பட்டா எண்	2796
7. பாசன ஆதாரம்	-	15. குறிப்பு	-
8. இரு போகமா	-	16. பெயர்	1.கந்தசாமி

குறிப்பு 1:

1. மேற்கண்ட தகவல் / சான்றிதழ் நகல் விவரங்கள் மின் பதிவேட்டிலிருந்து பெறப்பட்டவை. இவற்றை தாங்கள் **http://eservices.tn.gov.in** என்ற இணைய தளத்தில் **30254** என்ற குறிப்பு எண்ணை உள்ளீடு செய்து உறுதி செய்துகொள்ளவும்.

S. Kandasamy

भारतीय गैर न्यायिक INDIA NON JUDICIAL

भारत

रु.5000 Rs.5000

पाँच हजार रुपये FIVE THOUSAND RUPEES

सत्यमेव जयते

INDIA

தமிழ்நாடு तमिलनाडु TAMILNADU

F 430070

ரூபாய் 5000/-

MINING PLAN APPROVED
Asst. Director of Geology / Asst. Director of Geology & Mining, Thoothukudi Dist.

தமிழ்நாடு
எண் : 18079
நாள் : 9-1-2013

ரூ.1,02,000/-க்கு கிரையம்

2013 ம் வருடம் ஜனவரி மாதம் 9 - ம் தேதி, தமிழ் 1188-ம் வருடம் மார்கழி மாதம் 25 - ம் தேதி,

தூத்துக்குடி மாவட்டம், கோவில்பட்டி தாலுகா, கழுகுமலை கஸ்பா, அண்ணா புதுத்தெருவில் கதவு எண் - 102 உள்ள இல்லத்தில் வசித்து வரும் உயர்திரு. சண்முக ரெட்டியார் அவர்கள் குமாரர் திரு. S.கந்தசாமி (ஓட்டுனர் உரிமம் எண் : TN69z20100002262) அவர்களுக்கு,

R. Padmanaban
[எழுதிக்கொடுப்பவர்]

S. Kandasamy
[எழுதிவாங்குபவர்]

272/2c

119

2013

SCANNED

MINING PLAN APPROVED
Assistant Geologist / Assistant Director I/C of Geology & Mining
Tirupathi Dist

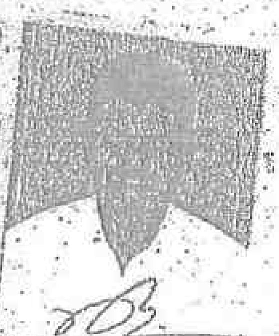
DOCUMENT No / Year 119 / 2013
Page 11 Total 14

2013 ஆண்டு ... திங்கள் ... நாள் பகல் 4 மணிக்கு ... இடையில் கயத்தார் சார் பதிவாளர் அலுவலகத்தில் தாக்கல் செய்த கட்டணம் ரூ. 1024 செலுத்தியவர்

ஆவணம் 60 ... தாள்கள் வரை தாள்கள்

சார் பதிவாளர்

இடது கை பெருவிரல்



சார் பதிவாளர்
கயத்தார்

"அடுதல் விவரங்கள் ஆவண வாசகங்களில் உள்ளபடி"

— S. Kulasekaran

எழுதிக் கொடுத்ததாக ஒப்புக்கொண்டவர்
இடது கை பெருவிரல்

— R. Padmanabhan

எழுதி வாங்கியவராக ஒப்புக் கொண்டவர்
இடது பெருவிரல்

சார் பதிவாளர்
கயத்தார்

"அடுதல் விவரங்கள் ஆவண வாசகங்களில் உள்ளபடி"

— S. Kulasekaran

"அடுதல் விவரங்கள் ஆவண வாசகங்களில் உ..."

S. Kulasekaran

भारतीय गैर न्यायिक INDIA NON JUDICIAL

भारत

एक हजार रुपये ONE THOUSAND RUPEES

₹1000 Rs.1000

தமிழ்நாடு तमिलनाडु TAMILNADU

Z 396595

ரூபாய் 1000/-

தமிழ்நாடு
எண் - 18030
நாள் 14-1-2013

வி. அந்தோணிசாமி,
S. R. O. ஸ்டாம்ப் வெண்டர்
கயத்தார்
உரிமம் எண் : 341/78

(2)

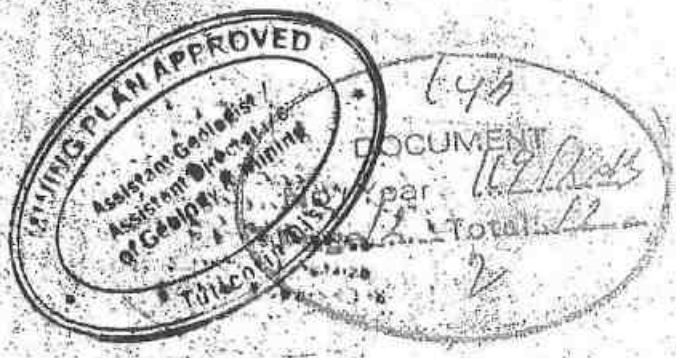
மதுரை மாவட்டம், மதுரை - 12, வில்லாபுரம், மாரியப்ப பிள்ளை தெருவில் கதவு எண் - 14-35/NA உள்ள இல்லத்தில் வசித்து வரும் உயர்திரு. (லேட்) ராமசாமி ஆசாரி அவர்கள் குமாரர் திரு. R.பத்மநாபன் (குடும்ப அட்டை எண் - 28/G/0403492) ஆகிய நான் எழுதிக்கொடுத்த கிரையப்பத்திரம் என்னவென்றால்,

R.Padmanaphan
[எழுதிக்கொடுப்பவர்]

K. Kuladsamy
[எழுதிவாங்குபவர்]

DOCUMENT
No/Year 119/2009
Page 2 Total 5

S. Kuladsamy


MINING PLAN APPROVED
Assistant Geologist /
Assistant Director /
of Geology & Mining
DOCUMENT
par
Total

भारतीय गैर न्यायिक INDIA NON JUDICIAL

भारत

एक हजार रुपये ONE THOUSAND RUPEES

रु1000 Rs.1000

सत्यमेव जयते

MINING PLAN APPROVED
Assistant Geologist / Assistant Director / of Geology & Mining
Tuticorin Dist

தமிழ்நாடு तमिलनाडु TAMILNADU

Z 396596
ரூபாய் 1000/-

தமிழ்நாடு
எண் : 18081,
நாள் : 9-1-2013

ஆ. அந்தோணிசாமி,
S. R. O / ஸ்டாம்ப் வெண்டர்
கயத்தார்
உரிமம் எண் : 341/79

(3)

இதின் தபசில் கண்ட சொத்து எனக்கு பாத்தியப்பட்டு என் பெயரில் - 1310 - நம்பர் தனிப்பட்டா ஏற்பட்டு என் பெயரில். வரிவிதிப்பும், தீர்வையும் ஏற்பட்டு நாளது தேதி வரை நானே தீர்வை செலுத்தி எந்தவித வில்லங்கம் இல்லாமல் தனித்து சர்வசுதந்திர பாத்தியமாய் அனுபவித்து வரும் இதன் தபசில் கண்ட சொத்தை நாளது தேதியில் நான் தங்களுக்கு ரூ.1,02,000/- க்கு கிரையம் செய்து கொடுத்து கிரையத்தொகை ரூபாய். ஒரு லட்சத்து இரண்டாயிரத்தையும் நான் தங்களிடம் ரொக்கமாக பெற்றுக்கொண்டபடியால் இன்று முதல் இதன் தபசில் கண்ட சொத்தை தாங்கள் சர்வ சுதந்திர கிரைய பாத்தியமாகவும் சந்ததி பரம்பரையாகவும் எல்லாவித உரிமைகளுடனும் அடைந்து அனுபவித்துக் கொள்வீர்களாகவும்.

R. Padmanaphan
[எழுதிக்கொடுப்பவர்]

S. Kulasamy
[எழுதிவாங்குபவர்]

DOCUMENT No / Year 119/2013
Page 3 Total 12

S. Kulasamy

भारतीय गैर न्यायिक

भारत

FIFTY RUPEES

रु.50 Rs.50

INDIA

INDIA NON JUDICIAL

தமிழ்நாடு तमिलनाडु TAMILNADU

AB 821179

ரூபாய் 50/-

தமிழ்நாடு
எண் : 18082
நாள் : 9-1-2013

வி. அந்தோணிசாமி
S. R. O. ஸ்டாம்ப் வெண்டர்
கயத்தார்
உரிமம் எண் : 341/79

(4)

தபசில் கண்ட சொத்தில் என்னைப் பொறுத்து ஒத்தி, அடமானம், கட்டுக்குத்தகை, முன் அடமானம், கிரைய ஒப்பந்தம், பொது அதிகார ஆவணம், தானம் மற்றும் உயில் போன்ற எந்தவித வில்லங்கமும் இல்லை என்று உறுதி கூறுகிறேன். அப்படி ஏதேனும் வில்லங்கம் விவகாரம் ஏற்பட்டால் அதற்கு நானும் என் வாரிசுகளும் எனக்கு பாத்தியப்பட்ட இதர சொத்துகளிலிருந்தும் ஈடு செய்து கொடுப்பேன் என்று உறுதி கூறுகிறேன். தபசில் கண்ட சொத்தை நாளது தேதி முதல் தங்களுடைய அனுபவத்திற்கு ஒப்படைத்துவிட்டேன். தபசில் கண்ட சொத்து தங்கள் பெயரில் பட்டா மாறும் பொருட்டு இத்துடன் புள்ளி மனுவும் கொடுத்து இருக்கிறேன்.

R. Padmanapha

[எழுதிக்கொடுப்பவர்]

S. Kulasekaran

[எழுதிவாங்குபவர்]

S. Kulasekaran

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MINING PLAN APPROVED
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தமிழ்நாடு
எண் : 58083
நாள் : 9-1-2013

வி. அந்தோணிசாமி, S. R. O. ஸ்டாம்ப் வெண்டர், கயத்தார், உரிமம் எண் : 341/79

(5)

சொத்துவிபரம்

பாளையங்கோட்டை பதிவு மாவட்டம், கயத்தார் சார்பதிவக சரகம், செட்டிகுறிச்சி கிராமத்தில், அயன் புஞ்சை சர்வே 272/2C நம்பர் ஹெக்டர் 0.85.0 நிலம் முழுவதும் சொத்துவிபரம் சரி.

R. Padmanaphun
[எழுதிக்கொடுப்பவர்]

S. Kumlesury
[எழுதிவாங்குபவர்]

149
119/2013
Page 5 of 12

S. Kumlesury

தமிழ்நாடு தமிழ்நாடு TAMILNADU

AB 821181

ரூபாய் 50/-

தமிழ்நாடு
என் : 18084
நாள் : 9-1-2013
கீழ்நத்தம்,
கயத்தாறு.

வி. அந்தோணிசாமி,
S.R.O. ஸ்டாம்ப் வெண்டர்
கயத்தார்
உரிமம் எண் : 341/79

(6)

ஷை சொத்து ஷை கிராம பஞ்சாயத்து எல்கைக்குள்பட்டு கயத்தார் யூனியனில் இணைக்கப்பட்டுள்ளது.

R. Padmanaban — S. Kumaresan

[எழுதிக்கொடுப்பவர்] [எழுதிவாங்குபவர்]

சாட்சிகள்:-

1) [illegible]

2) M. [illegible]

ஆவணம் தயாரித்தவர்:- மா.ஆண்டி த/பெ.மாரியப்பன் செட்டியார், மாநில

ஆவண எழுத்தர்- L.NO ; A213 PLM 1993 கயத்தார்.

S. Kumaresan

அ-பதிவேடு விவரங்கள்

MINING PLAN APPROVED
Assistant Geologist / Assistant Director i/c of Geology & Mining

மாவட்டம் : தூத்துக்குடி

வட்டம் : சயத்தர்

கிராமம் : செட்டிகுறிச்சி

1. புல எண்	272	9. மண் வயனமும் சகமும்	8 - 4
2. உட்பிரிவு எண்	2C	10. மண் தரம்	6
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7. பாசன ஆதாரம்	-	15. குறிப்பு	-
8. இரு போகமா	-	16. பெயர்	1.கந்தசாமி

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1. மேற்கண்ட தகவல் / சான்றிதழ் நகல் விவரங்கள் மின் பதிவேட்டிலிருந்து பெறப்பட்டவை. இவற்றை தாங்கள் http://eservices.tn.gov.in என்ற இணைய தளத்தில் 30254 என்ற குறிப்பு எண்ணை உள்ளீடு செய்து உறுதி செய்துகொள்ளவும்.

S. Kumar

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எண் : 18059
நாள் : 9.1.13
S. கந்தசாமி
கழுகுமலை

வி. அந்தோணிசாமி,
S.R.O. ஸ்டாம்ப் வெண்டர்
கயத்தாறு
உரிமம் எண் : 3/11/79

ரூ.97,200/-க்கு கிரையம்

2013 - ம் வருடம் ஜனவரி மாதம் 9 - ம் தேதி, தமிழ் 1188ம் வருடம் மார்கழி மாதம் 25 - ம் தேதி,

தூத்துக்குடி மாவட்டம், கோவில்பட்டி தாலுகா, கழுகுமலை கஸ்பா; அண்ணா புதுத்தெருவில் கதவு எண் - 102 உள்ள இல்லத்தில் வசித்து வரும் உயர்திரு. சண்முக ரெட்டியார் அவர்கள் குமாரர் திரு. S.கந்தசாமி (ஓட்டுனர் உரிமம் எண் - TN69z20100002262) அவர்களுக்கு,

R. கார்த்திகேயன்
R. Revathi
[எழுதிக்கொடுப்பவர்]

S. Kandasamy
[எழுதிவாங்குபவர்]

No. 116/2014
Total 4
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S. Kandasamy 27/2/20

116
2013

MINING PLAN APPROVED
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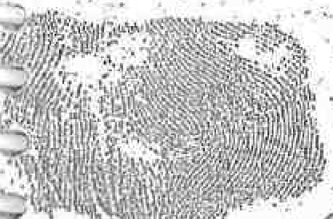
Tuticorin

DOCUMENT
No / Year 116/2013
Page 12 Total

2013
116 ஆ.
12 தாள்கள்

2013 ஆம் ஆண்டு ... திங்கள்
9 ம் நாள் பகல் 3.4 மணிக்கு
இவ்வலுவலகத்தில் தாக்கல் செய்து
கட்டணம் ரூ. ... வசூலிக்கப்பட்டது

இடது கை பெருவிரல்



S. Kumar ...

சார் பதிவாளர்
கயத்தார்.

"கூடுதல் விவரங்கள் ஆவண வாசகங்களில் உள்ளபடி"

எழுதிக் கொடுத்ததாக ஒப்புக்கொண்டவர்
இடது கை பெருவிரல்

காமாட்சி அம்மாள்.

சார் பதிவாளர்
கயத்தார்.

"கூடுதல் விவரங்கள் ஆவண வாசகங்களில் உள்ளபடி"

S. Kumar ...

MINING PLAN APPROVED
Assistant Geologist / Assistant Director i/c of Geology & Mining
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எண் : 18060
நாள் : 9.1.13
S. கந்தசாமி
கயத்தாறு

வி. அந்தோணிசாமி,
S. R.-O. ஸ்டாம்ப் வெண்டர்
கயத்தார்
உரிமம் எண் : 341/70

DOCUMENT No 116/2013 Page 2

(2)

தூத்துக்குடி மாவட்டம், கோவில்பட்டி தாலுகா, செட்டிகுறிச்சி கிராமத்தில் வடக்குத்தெருவில் முன்பு கதவு எண் - 22, தற்போது கதவு எண் - 181 உள்ள இல்லத்தில் வசித்து வரும் உயர்திரு. (லேட்) ராதாகிருஷ்ணன் அவர்கள் மனைவி காமாட்சியம்மாள் (குடும்ப அட்டை எண் - 28/G/0403376) (1), மை முகவரியில் வசித்து வரும் மை 1 நபரின் குமாரத்தி ரேவதி (குடும்ப அட்டை எண் - 28/G/0403376) (2) ஆகிய நாங்கள் இரண்டு பேர்களும் சேர்ந்து எழுதிக்கொடுத்த கிரையப்பத்திரம் என்னவென்றால்,

R. காமாட்சியம்மாள்
R. Revathi
[எழுதிக்கொடுப்பவர்கள்]

S. Kandasamy
[எழுதிவாங்குபவர்]

DOCUMENT No/Year ______ Page ______ Total ______

S. Kandasamy

MINING PLAN APPROVED
Assistant Geologist / Assistant Director i/c of Geology & Mining
Tuticorin Dist

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Z 712691
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எண் : 18081
நாள் : 9.1.13

வி. அந்தோணிசாமி,
S.R.O. ஸ்டாம்ப் வெண்டர்
கயத்தார்
உரிமம் எண் : 341/79

116/2014

இதன் தபசில் கண்ட சொத்து எங்களில் 1 நபரின் கணவரும், எங்களில் 2 நபரின் தகப்பனாருமான ராதாகிருஷ்ணன் அவர்களுக்கு பாத்தியப்பட்டு ஷையார் பெயரில் 1311 – நம்பர் தனிப்பட்டா ஏற்பட்டு அனுபவித்து வந்தும், ஷை ராதாகிருஷ்ணன் அவர்கள் 20-04-1998 தேதியில் காலம் சென்றபின் ஷையாரின் வாரிசு முறையில் எங்களுக்கு பாத்தியப்பட்டு நாளது தேதிவரை நாங்களே தீர்வை செலுத்தி பொதுவாகவும் ஜாயிண்டாகவும் சுவதந்திர பாத்தியமாய் அனுபவித்து வரும் இதன் தபசில் கண்ட சொத்தை நாளது தேதியில் நாங்கள் தங்களுக்கு ரூ.97,200/-க்கு கிரையம் பேசி கிரையத்தொகை ரூபாய். தொன்னூற்று ஏழாயிரத்து இருநூறையும் நாளது தேதியில் நாங்கள் தங்களிடம் ரொக்கமாக பெற்றுக்கொண்டபடியால் இன்று முதல் இதன் தபசில் கண்ட சொத்தை தாங்கள் சர்வ சுதந்திர கிரைய பாத்தியமாகவும் சந்ததி பரம்பரையாகவும் எல்லாவித உரிமைகளுடனும் அடைந்து அனுபவித்துக் கொள்வீர்களாகவும்.

R. Reath
[எழுதிக்கொடுப்பவர்கள்]

S. Kulesuz
[எழுதிவாங்குபவர்]

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AH 251086

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(4)

தபசில் கண்ட சொத்தில் எவ்வித வில்லங்கமும் இல்லை என்று உறுதி கூறுகிறோம். அப்படி ஏதேனும் வில்லங்கம் விவகாரம் ஏற்பட்டால் அதற்கு நாங்களும், எங்களின் வாரிசுகளும் எங்களுக்கு பாத்தியப்பட்ட இதர சொத்துக்களிலிருந்தும் ஈடு செய்து கொடுப்போம் என்று உறுதி கூறுகிறோம்.

R. Revathi

[எழுதிக்கொடுப்பவர்கள்]

[எழுதிவாங்குபவர்]

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AH 251087

ரூபாய் 100, -

தமிழ்நாடு
எண் : 18063
நாள் : 9.1.13

(5)

தபசில் கண்ட சொத்தை நாளது தேதி முதல் தங்களுடைய அனுபவத்திற்கு ஒப்படைத்துவிட்டோம். தபசில் கண்ட சொத்து தங்கள் பெயரில் பட்டா மாறும் பொருட்டு இத்துடன் புள்ளிமனுவும் கொடுத்து இருக்கிறோம்.

[எழுதிக்கொடுப்பவர்கள்]

[எழுதிவாங்குபவர்]

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दस रुपये

रु.10

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28AA 498752

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எண்: 18065

நாள்: 9.1.13

பி. அந்தோணிசாமி.
R.O. ஸ்டாம்ப் வெண்டர்
கயத்தார்
உரிமம் எண்: 341/79

ஷை சொத்து ஷை கிராம பஞ்சாயத்துக்குள்பட்டு கயத்தார் யூனியனில் இணைக்கப்பட்டுள்ளது.

R. காமாட்சி

R. Revath

[எழுதிக்கொடுப்பவர்கள்]

S. Kuralsamy

[எழுதிவாங்குபவர்]

சாட்சிகள்:-

1) தெய்வமுத்து

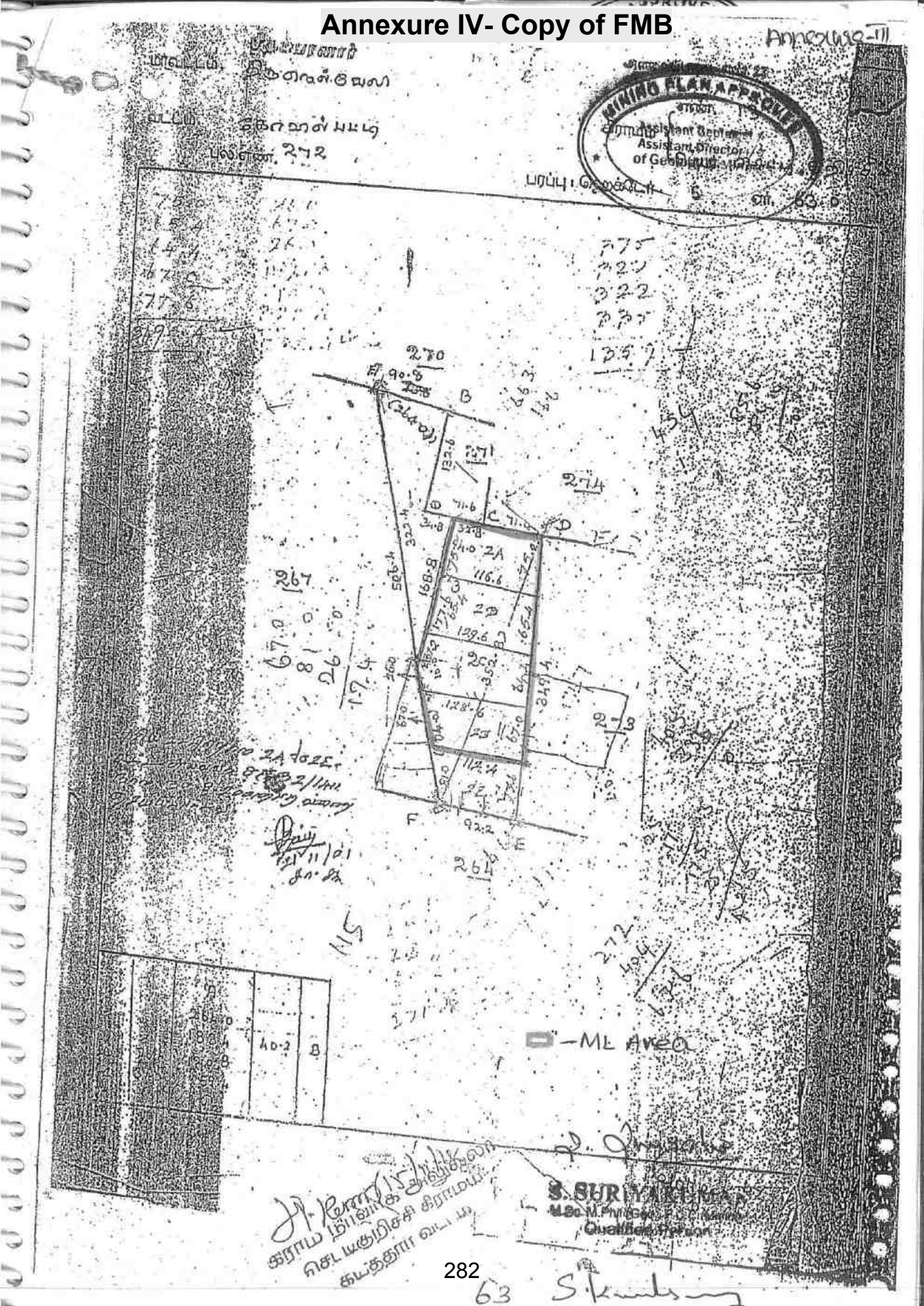
2) ர. பலவேசமுருகன்

ஆவணம் தயாரித்தவர்;-
ஆவண எழுத்தர், L.NO; A213 PLM1993

பெ.மாரியப்பன் செட்டியார், மாநில

S. Kuralsamy

Annexure IV- Copy of FMB



Annexure V- Copy of combined sketch

MINING PLAN APPROVED
Assistant Geologist
Assistant Director i/c
of Geology & Mining
Tuticorin Dist

S. SURIYAKUMAR
M.Sc. M.Phil (Geol), F.C.C (Mining)
Qualified Person

Annexure-V

Annexure VI - Copy of patta

MINING PLAN APPROVED
Assistant Geologist / Assistant Director i/c of Geology & Mining

தமிழக அரசு

வருவாய்த் துறை

நில உரிமை விபரங்கள் : இ. எண் 10(1) பிரிவு

மாவட்டம் : தூத்துக்குடி

வட்டம் : கயத்தார்

வருவாய் கிராமம் : செட்டிகுறிச்சி

பட்டா எண் : 2796

உரிமையாளர்கள் பெயர்

1. சண்முக ரெட்டியார் மகன் கந்தசாமி

புல எண்	உட்பிரிவு	புன்செய்		நன்செய்		மற்றவை		குறிப்புரைகள்
		பரப்பு	தீர்வை	பரப்பு	நீர்வை	பரப்பு	தீர்வை	
		ஹெக் - ஏர்	ரூ - பை	ஹெக் - ஏர்	ரூ - பை	ஹெக் - ஏர்	ரூ - பை	
272	2A	0 - 81.00	0.73	--	--	--	--	R2014-1408---- 01-05-2003
272	2B	0 - 81.00	0.73	--	--	--	--	R2014-1408---- 01-05-2003
272	2C	0 - 85.00	0.77	--	--	--	--	R2014-1408---- 01-05-2003
272	2D	0 - 81.00	0.73	--	--	--	--	R2014-1408---- 01-05-2003
		3 - 28.00	2.96					

குறிப்பு2 :

1. மேற்கண்ட தகவல் / சான்றிதழ் நில விவரங்கள் மின் பதிவேட்டிலிருந்து பெற்ப்பட்டவை. இவற்றை தாங்கள் https://eservices.tn.gov.in என்ற இணைய தளத்தில் 28/09/012/02796/30254 என்ற குறிப்பு எண்ணை உள்ளீடு செய்து உறுதி செய்துகொள்ளவும்.
2. இத் தகவல்கள் 25-08-2022 அன்று 01:12:13 PM நேரத்தில் அச்சடிக்கப்பட்டது.
3. கைப்பேசி கேமராவின்2D barcode படிப்பான் மூலம் படித்து 3G/GPRS வழி இணையதளத்தில் சரிபார்க்கவும்

S. SURIYAKUMAR
M.Sc-M.Phil (Geo), F.C.C (Mining)
Qualified Person

65

Annexure VII - Copy of QP Experience certificate

Annexure - VI

सेल रिफ्रैक्ट्री कम्पनी लिमिटेड, सेलम
SAIL REFRACTORY COMPANY LTD., SALEM
(A Govt. of India Enterprises)
(A Subsidiary of Steel Authority of India Limited)

MINING PLAN APPROVED
Assistant Geologist / Assistant Director i/c of Geology & Mining

SRCL/P&A/2017/0380 /1935 DATE: 18.09.2018

EMPLOYMENT CERTIFICATE

Employee Details :

Name	: S.SURIYAKUMAR
Employee No	: 100045
Grade	: E-2
Designation	: Asst. Manager (Geology)
Department	: Mines

This is to certify that Sri. S.SURIYAKUMAR F.S.No.100045 was in the employment of this organisation from 20.03.1981 to 31.07.1992 and he has resigned & released with effect from 31.07.1992 AN.

At the time of his resignation on 31.07.1992, he was employed as Assistant Manager in the capacity of II class Mines Manager.

18/09/18
S.SRIDHARAN
Asst. General Manager (Prsl & Admn)

Post Box No. 565 Salem - 636 005. Phone : +91427-2341403/4/5/6 Fax : +91427-2341407
पोस्ट बैग नो. : 565, सेलम - 636 005. फोन +91427-2341403/4/5/6 फैक्स +91427-2341407
E-mail : srclsalem@gmail.com CIN No. : U14200TZ2011GOI017357

S. Kumar

002646

MINING PLAN APPROVED
Assistant Geologist / Assistant Director i/c of Geology & Mining
Tuticorin Dist

University of Madras

FACULTY OF SCIENCE

The Senate of the University of Madras hereby makes known that S. Suriyakumar has been admitted to the Degree of Master of Science, he having been duly certified to be qualified to receive the same and awarded an Overall Grade O at the Examination held in the month of May 1979 in Branch VII A - Special Geology

Given under the seal of the University, at Madras this 28th day of September 1979

Registrar

M. Sc. Engg., C. Engg., F.I.E.E. (Lond.), F.I. Mun. E. (Lond.), F.I.E. (Ind.),
Vice-Chancellor

S. Kumar

455

MINING PLAN APPROVED
Assistant Geologist /
Assistant Director i/c
of Geology & Mining
Tuticorin Dist

University of Madras

FACULTY OF SCIENCE

The Senate of the University of Madras hereby makes known that S. Suriyakumar has been admitted to the Degree of Master of Philosophy in Geology, he having been certified by duly appointed Examiners to be qualified to receive the same and having been by them placed in the First Class at the Examination held in September 1986

Given under the seal of the University.

Senate House
September 21, 1988

P Kendaya
Registrar

F.N.A., F.N.A.Sc.,
Vice-Chancellor

68

S. Kumaresan

Government of India
Ministry of Labour
DIRECTORATE-GENERAL OF MINES SAFETY
****

MINING PLAN APPROVED
REGISTERED
Assistant Geologist/
Assistant Director
of Geology & Mining
Tuticorin Dist

No.Exam/MNGR-I/Field/Metal/R/ 113/91 /Dated,Dhanbad,the 27/5/ 19

To

Shri S. Suriya Kumar,
Assistant Manager,
Mangnesite Mines, Burn Standard Co,Ltd.,
SALEM-636005, TAMIL NADU.

MEMORANDUM

Ref:-His application dated 18-7-90

By virtue of Govt. Notification No.S.O.712(E) dated 13.12.1974 Shri S. Suriyakumar son of Shri A. Semban has become eligible to work in a capacity requiring the possession of First Class Manager's certificate, restricted to mines having opencast workings only, under the Metalliferous Mines Regulations, 1961 with effect from 19th March, 1991 till the above notification remain in force.

Encl:-

Secretary,
Board of Mining Examinations &
Director of Mines Safety(Exam)

Annexure VIII - Copy of approved mining plan letter

From

Dr. S. Suhatharahima, M.Sc., PhD.,
Assistant Geologist/
Assistant Director (i/c),
Dept. of Geology and Mining,
Thoothukudi.

To

Thiru. S. Kandasamy,
S/o. Shanmugam,
D.No. 102, Anna New Street,
Kalugumalai,
Thoothukudi District.

Roc. No.G.M.1/861/2022 dated: 01.09.2023

Sir,

Sub: Mines and Minerals - Minor Mineral – Rough Stone and Gravel – Thoothukudi District – Kayathar Taluk – Chettikurichi Village – Patta land over an extent of 3.28.00 Hects bearing S.F.Nos. 272/2A, 272/2B, 272/2C & 272/2D – Quarry lease application preferred by Thiru. S. Kandasamy – Precise area communicated – Draft Mining plan submitted – Approval accorded - Regarding.

Ref:
1. Quarry lease application of Thiru. S. Kandasamy dated : 09.09.2022.
2. This Office letter Rc.No. G.M.1/861/2022, dated : 14.07.2023.
3. Letter received from Thiru. S. Kandasamy along with draft mining plan.

*****

Thiru. S. Kandasamy, S/o. Shanmugam, D.No. 102, Anna New Street, Kalugumalai, Thoothukudi District has preferred an application dated: 09.09.2022 for the grant of quarry lease to quarry Rough Stone and Gravel in S.F.Nos. 272/2A, 272/2B, 272/2C & 272/2D of over an extent of 3.28.00 Hects of Chettikurichi Village, Kayathar Taluk under Rule 19 of Tamil Nadu Minor Mineral Concession Rules, 1959.

2) Based on report and recommendation of the Revenue Divisional Officer, Kovilpatti precise area was communicated by the Assistant Geologist / Assistant Director (i/c) (Mines) to the applicant with a direction to submit mining plan as stipulated in rule 41 of Tamil Nadu Minor Mineral Concession Rules, 1959.

3) In the reference third cited, the applicant has submitted three copies of draft Mining plan prepared by the qualified person for approval. The draft Mining plan has been examined and verified with reference to the provisions laid down in

Rule 36 and 41 of Tamil Nadu Minor Mineral Concession Rules and the guidelines issued by the Commissioner of Geology and Mining vide letter Rc. No. 3868/LC/2012 dated. 19.11.2012 & 07.11.2014.

4) **The scrutiny remarks on the draft Mining Plan are furnished below.**

a. The Rough Stone and Gravel quarry has been proposed to be operated for a period of five years.

b. The Geological resources of Rough Stone and gravel are estimated at 9,29,956 cubic meter, while the minable reserves are estimated at 1,08,616 cubic meter of gravel and Topsoil and 4,84,785 cubic meter of Rough stone upto a total depth of 34 m (4m Top Soil and gravel, 30m Rough Stone).

c. Machineries like tractor mounted compressor attached with jack hammers, excavators are proposed for quarrying operation.

d. No Archaeological / historical monuments with in a radial distance of 10 KM are reported.

e. As per the Rule 111 of Metalliferous Mining Regulations 1961, the boundary barrier Zone of 7.5 meters is ear-marked as neutral zone.

f. The plates including Mining lease plan (1:1,000), Surface cum Geological plan (1:1,000), Geological Section (1:1,000) Year wise Development & Production plan (1:1,000), Year wise Development & Production Sections (1:1,000) Conceptual / Progressive mine closure plan (1:1000), Environmental plan (1:5000) & Mine layout plan and land use pattern (1:1,000) were verified with reference to the field evidences.

g. The stipulations made in rule 36 of the Tamil Nadu Minor Mineral Concession Rules, 1959 are adhered in the draft Mining plan.

h. The draft Mining plan is submitted within the prescribed time limit of 90 days from the date of receipt of the precise area communication letter.

In view of the above, as per the powers laid down in rule 41 of the Tamil Nadu Minor Mineral Concession Rules, 1959, the draft mining plan submitted by the applicant Thiru. S. Kandasamy, in respect of proposed Rough Stone and Gravel quarry (Minor Mineral) for quarrying and transportation in S.F.Nos. 272/2A,

272/2B, 272/2C & 272/2D of over an extent of 3.28.00 Hects of Chettikurichi Village, Kayathar Taluk is hereby approved subject to the following conditions and stipulations made in the governing Act and Rules.

i) The Mining plan is approved without prejudice to any other Law applicable to the quarry lease from time to time.

ii) The approval of the Mining plan does not in any way imply the approval of the Government in terms of any other provisions of the Tamil Nadu Minor Mineral Concession Rules, 1959.

iii) The Mining plan is approved without prejudice to any of the orders or directions from any legal forums.

iv) Quarrying shall be carried out scrupulously as per the Approved Mining plan.

Encl: 2 copies of Approved Mining Plan

19/6/23

Assistant Geologist/
Assistant Director (I/c),
Geology and Mining,
Thoothukudi.

Annexure IX - Copy of 500m radius cluster letter

From

Dr. S. Suhatharahima, M.Sc., PhD.,
Assistant Geologist/
Assistant Director (i/c),
Dept. of Geology and Mining,
Thoothukudi.

To

Thiru. S. Kandasamy,
S/o. Shanmugam,
D.No. 102, Anna New Street,
Kalugumalai,
Thoothukudi District.

Roc.No.G.M.1/861/2022 Dated: 01.09.2023

Sub: Mines and Minerals - Minor Mineral – Rough Stone and Gravel – Thoothukudi District – Kayathar Taluk – Chettikurichi Village – Patta land over an extent of 3.28.00 Hects bearing S.F.Nos. 272/2A, 272/2B, 272/2C & 272/2D – Quarry lease application preferred by Thiru. S. Kandasamy – Mining Plan approved – Details of quarries situated within 500mts radial distance furnished - Regarding.

Ref:
1. Quarry lease application of Thiru. S. Kandasamy dated : 09.09.2022.
2. This Office letter Rc.No. G.M.1/861/2022, dated : 14.07.2023.
3. Letter received from Thiru. S. Kandasamy along with draft mining plan.

******

Thiru. S. Kandasamy, S/o. Shanmugam, D.No. 102, Anna New Street, Kalugumalai, Thoothukudi District has preferred an application dated: 09.09.2022 for the grant of quarry lease to quarry Rough Stone and Gravel in S.F.Nos. 272/2A, 272/2B, 272/2C & 272/2D of over an extent of 3.28.00 Hects of Chettikurichi Village, Kayathar Taluk under Rule 19 of Tamil Nadu Minor Mineral Concession Rules, 1959.

The Assistant Geologist / Assistant Director (i/c) (Mines), Thoothukudi has granted precise area communication for quarrying Rough Stone and Gravel in S.F.Nos. 272/2A, 272/2B, 272/2C & 272/2D of over an extent of 3.28.00 Hects of Chettikurichi Village, Kayathar Taluk for a period of five years vide reference 2nd cited.

In the reference 3rd cited, the applicant has requested the details of existing, abandoned and proposed quarries situated within 500mts from the applied area and the details are furnished below.

Existing quarries

S.No	Name and address of the lessee	Quarry location	Extent in Hect.	File No & Lease period
1.	Shree Selvi Chambers, Panjapattiprivu, Sukkampatti Via, Theppakulathupatti, Dindigul	S.F.Nos. 263/1, 263/2, 263/3, 263/5, 263/6 & 263/7 Chettikurichi village, Kayathar Taluk	4.63.50	Rc.No. 237/G&M/2018 Dt: 06.06.2019 19.06.2019 to 18.06.2024
2.	Tmt.Kasthuri, W/o.Kandasamy, 102, Anna New Street, Kalugumalai, Thoothukudi District	S.F.No. 275/1 Chettikurichi village, Kayathar Taluk	2.32.20	R.C.No.G.M.2/634/2018 Dt: 28.01.2022 28.01.2022 to 27.01.2027
3.	Thiru. S.K.P.Murugan S/o Thiru. Kandhasamy, Door. No. 134J, Thomas Richard Line, Bungalow street, Kadalaiyur Main Road, Kovilpatti	S.F.No. 277(P) Chettikurichi village, Kayathar Taluk	2.61.00	Rc.No.G.M.1/310/ 2022 Dt: 03.07.2023 03.07.2023 to 02.07.2028

Abandoned quarries

S.No	Name and address of the lessee	Quarry location	Extent in Hect.	File No & Lease period
-Nil-				

Proposed quarries

S.No	Name and address of the lessee	Quarry location	Extent in Hectare
1.	Thiru. S. Kandasamy, S/o. Shanmugam, D.No. 102, Anna New Street, Kalugumalai, Thoothukudi District.	S.F.Nos. 272/2A, 272/2B, 272/2C & 272/2D Chettikurichi Village, Kayathar Taluk	3.28.00
		Total	3.28.00

19.1.23.

Assistant Geologist/
Assistant Director (i/c),
Geology and Mining,
Thoothukudi.

Annexure X - Copy of VAO letter

சான்று

தூத்துக்குடி மாவட்டம் கயத்தாறு வட்டம் செட்டிகுறிச்சி கிராம நிர்வாக அலுவலர் அளிக்கும் சான்று

தூத்துக்குடி மாவட்டம் கழுகுமலை 102 அண்ணா புதுத்தெரு என்ற முகவரியில் வசிக்கும் திரு சண்முகம் என்பவர் மகன் திரு S. கந்தசாமி என்பவர் தூத்துக்குடி மாவட்டம் கயத்தாறு வட்டம் செட்டிகுறிச்சி கிராமத்தில் உள்ள் சர்வே எண் 272/2 A, 272/2B, 272/2C, 272/2D, உள்ள 3.28.0 ஹெக்டேர் பரப்பு பட்டா நிலத்தில் குண்டுக்கல் மற்றும் சரள் எடுக்க அரசாங்கத்திடமிருந்து குத்தகை அனுமதி கோரியுள்ளார். எனவே குவாரி குத்தகை உரிமம் எடுத்துள்ள நிலத்தை சுற்றி சுமார் 300 மீட்டருக்கு அருகில் அங்கீகரிக்கப்பட்ட வீட்டு மனைகள், மற்றும் புரதானச்சின்னங்கள் ஏதும் இல்லை எனவும், இதனால் பொதுமக்களுக்கு எவ்வித இடைஞ்சல்களோ அல்லது பாதிப்புகளோ ஏற்படாது என தெரிவித்துக் கொள்கிறன். மேலும் அனுமதி கோரிய புலத்திற்கு வண்டிகள் சென்று வர புலத்திற்கு தெற்கு மேற்காக பாதை அமைந்துள்ளது

S. Kandasamy

Annexure XI - Copy of site photo attested by VAO

S. Kandasamy S/o. Shanmugam, Rough stone and Gravel Quarry over an extent of 3.28.0 Hectares, S.F.No: 272/2A, 2B, 2C & 2D, Chettikurichi Village, KayatharTaluk, Thoothukkudi District, Tamil Nadu

General View of the Proposed Area

S. Kandasamy

கிராம நிர்வாக அலுவலர்
செட்டிகுறிச்சி கிராமம்
கயத்தார் வட்டம்

भारतीय गैर न्यायिक

एक सौ रुपये Rs. 100

रु. 100 ONE HUNDRED RUPEES

सत्यमेव जयते

भारत INDIA

INDIA NON JUDICIAL

தமிழ்நாடு तमिलनाडु TAMILNADU DB 174483

S. கந்தசாமி
கழுகுமலை
100
23-09-2023

பா. ராம... (stamp vendor)
முத்திரைத்தாள் விற்பனையாளர்
உரிமம் எண் - 1/2015
கழுகுமலை.

AFFIDAVIT TO SEIAA, TAMIL NADU

I,S. Kandasamy S/o.Shanmugamresiding at No.102, Anna new street,Kalugumalai,Thoothukkudi district, Tamil Nadustate do hereby solemnly declare and sincerely affirm that,

I have applied for getting environmental clearance to SEIAA Tamil Nadu for quarry lease for gravel quarry inS.F.No: 272/2A, 2B, 2C & 2Dover an extent of 3.28.0Ha located in, Chettikurichi Village, KayatharTaluk, Thoothukkudi District, Tamil Nadu.

1. I swear to state that within 10kms radius of the mines which I have applied for environmental clearance, none of the followings are situated as per the General Conditions of EIA Notification, 2006.

S. Kandasamy

Before me

D. VIJAYABASKARAN, M.A.,B.L.,
ADVOCATE & NOTARY PUBLIC
14A-5A, Sri Ram Nagar, 5th Street,
Manthithoppu Road,
KOVILPATTI - 628 501,
Thoothukudi District.
Cell No : 94431 35989

NOTARY
D. VIJAYABASKARAN,
THOOTHUKUDI DISTRICT
G.O. (MS) No. 52
Dt.25.02.2019
GOVT. OF TAMILNADU

- Protected areas notified under the Wildlife (Protection) Act, 1972
- Critically polluted area as identified by CPCB constituted under Water (Prevention and Control of Pollution) Act, 1974
- Eco Sensitive areas identified by the Forest Dept/State Govt
- Interstate boundaries and International boundaries

2. I will complete the following Corporate Environment Responsibility (CER) activities before commencement of the quarrying activities in addition to CSR and EMP.

CER Activity	Project Cost (Rs. In Lakh)	CER Cost 2% of Project Cost (Rs in Lakh)
Developing Sanitary and Library Facilities, Tree plantation and environmental awareness sign boards to Government High school, Chettikurichi Village.	81.0	5.0
Total Cost Allocation	**81.0**	**5.0**

3. There are Quarries located within 500m radius from the periphery of our quarry.

Proposed Quarries

Sl. No	Name of the owner	Village & S.F. No	Extent (in Ha.)	Lease status
1.	Thiru. S. Kandasamy, S/o Shanmugam, D.No. 102, Anna New Street, Kalugumalai,. Thoothukudi District	S.F.No: 272/2A, 272/ 2B, 272/ 2C &272/ 2DChettikurichi Village, KayatharTaluk	3.28.00	-

Before me

29/2/19

D. VIJAYABASKARAN, M.A.,B.L.
ADVOCATE & NOTARY PUBLIC
14A-5A, Sri Ram Nagar, 5th Street,
Manthithoppu Road,
KOVILPATTI - 628 501,
Thoothukudi District.
Cell No : 94431 35989

NOTARY
D. VIJAYABASKARAN,
THOOTHUKUDI DISTRICT
G.O. (MS) No. 52
Dt.25.02.2019
GOVT OF TAMILNADU

S. Kandasamy

Total Extent	**3.28.00**	-

Existing Quarries

Sl. No	Name of the owner	Village & S.F. No	Extent (in Ha.)	Lease status
1.	Shree Selvi Chambers, Panjapattiprivu, Sukkamapatti Via, Theppakulathupatti, Dindigul	S.F.Nos. 263/1, 263/2, 263/3, 263/5, 263/6 &263/7 Chettikurichi Village, KayatharTaluk	4.63.50	Rc.No. 237/G&M/2018 Dt: 06.06.2019 19.06.2019 to 18.06.2024
2.	Tmt. Kasthuri, W/o Kandasamy,D.No. 102, Anna New Street, Kalugumalai, Thoothukudi District	S.F.No. 275/1 Chettikurichi Village, KayatharTaluk	2.32.20	Rc.No. G.M.2/634/2018 Dt: 28.01.2022 28.01.2022 to 27.01.2027
3.	Thiru. S.K.P.Murugan S/o ThiruKandasamy, Door.No 134J, Thomas Richard Line, Bungalow Street, Kadalaiyur Main Road, Kovilpatti	S.F.No. 277(P) Chettikurichi Village, KayatharTaluk	2.61.00	Rc.No. G.M.1/310/2022 Dt: 03.07.2023 03.07.2023 to 02.07.2028
Total Extent			**12.84.7**	

Abandoned or Expired Quarries

Sl. No	Name of the owner	Village & S.F. No	Extent (in Ha.)	Lease status
-Nil-				

4. There will not be any hindrance or disturbance to the people living on enroute / nearby my quarry site while transporting the mined out materials and due to quarrying activities.

5. There are no habitations / villages located within 300 meters radius from the periphery of my quarry.

Before me

D. VIJAYABASKARAN, M.A., B.L.
ADVOCATE & NOTARY PUBLIC
14A-5A, Sri Ram Nagar, 5th Street,
Manthithoppu Road,
KOVILPATTI - 628 501,
Thoothukudi District.
Cell No : 94431 35989

NOTARY
D. VIJAYABASKARAN,
THOOTHUKUDI DISTRICT
G.O. (MS) No. 52
Dt.25.02.2019
TAMILNADU

S. Kumar

6. I swear that afforestation will be carried out during the course of quarrying operation and maintained.

7. The required insurance will be taken in the name of the labourers working in my proposed quarry.

8. The existing road from the main road to the quarry is in good condition and the same will be maintained and utilized for transportation of rough stone.

9. I will not engaging any child labour at my mines and I aware that engaging child labour is punishable under the Law.

10. All types of safety/protective equipments will be provided to all the laborers working in my quarry.

11.No permanent structures, temples etc are located within 500m from the periphery of my quarry.

12. The quarrying activity has not yet commenced and it will be carried out only after obtaining environmental clearance.

Deponent

S. Kandasamy

(S. Kandasamy)

Solemnly and sincerely affirmed and
Signed before the Notary Public on
the day of 29th Sep ----2023

Before me

29/09/23

D. VIJAYABASKARAN, M.A.,B.L.,
ADVOCATE & NOTARY PUBLIC
14A-5A, Sri Ram Nagar, 5th Street,
Manthithoppu Road,
KOVILPATTI - 628 501,
Thoothukudi District.
Cell No : 94431 35989

NOTARY
D. VIJAYABASKARAN,
THOOTHUKUDI DISTRICT
G.O. (MS)-No. 52
Dt.25.02.2019
TAMILNADU

Annexure XIII - Lab Reports

ABM ENVIRONMENTAL AND ANALYTICAL LABORATORY
(Unit of Aadhi Boomi Mining and Enviro Tech Pvt Ltd)
NIPBASS PLAZA
4/77-L, Indrani Nagar, Santhai Road,
Narasothipatti, Salem-636004, TN.
Ph: (0427)2444297, 2440446
Mob: 9842729655, 9443290855
Email: suriyakumarsemban@gmail.com, abmlabnabl@gmail.com
NABL TC-9497

TEST REPORT

Sample Ref No: ABM-TRF-231		Report No. : ABM-TR-817(a)
Issued To:	Thiru.Kandasamy-RST, Chettikurichi Village, Kayathar(TK),Thoothukudi (DT).	Report Date : 20.02.2023 Page : 1 of 1
Sample Name : Bore Water Sample Description : Colourless Liquid Sample Drawn By/ Date : By hand/16.02.2023 Sample method : ABMEAL/QSP/21 Sample Plan : ABMEAL/QSP/22 Sample Mark : Core Zone Site Address : Village : Chetttikurichi District : Thoothukudi State : Tamil Nadu.		Received On : 16.02.2023 Commenced On : 16.02.2023 Completed On : 18.02.2023 Sample latitude : 9° 4'9.30"N Sample Longitude : 77°43'56.41"E

S.No	Parameters	Units	Methods	Results
1.	pH	-	IS 3025:P.11:1983:R.2019	7.36
2	Electrical Conductivity (EC)	µs/cm	IS 3025:P.14:1984:R.2019	1666
3	Turbidity	NTU	IS 3025:P.10:1984:R.2017	BDL(DL:0.1)
4	Temperature	^{0}C	IS 3025:P.09:1984:R.2017	25.2
5	Total Suspended Solids (TSS)	mg/l	IS 3025:P.17:1984:R.2017	1
6	Total Dissolved Solids (TDS)	mg/l	IS 3025:P.16:1984:R.2012	1032
7	Total Hardness as $CaCO_3$	mg/l	IS 3025:P.21:2009:R.2019	330
8	Calcium as Ca	mg/l	IS 3025:P.40:1991:R.2019	210
9	Magnesium as Mg	mg/l	IS 3025:P.46:1994:R.2019	120
10	Chloride as Cl	mg/l	IS 3025:P.32:1988:R.2019	360
11	Total Alkalinity as $CaCO_3$	mg/l	IS 3025:P.23:1986:R.2019	240
12	Carbonate	mg/l	IS 3025:P.51:1986:R.2017	BDL(DL:1.0)
13	Bicarbonate	mg/l	IS 3025:P.51:1986:R.2017	240
14	Sulfate	mg/l	IS 3025:P.24:1986:R.2019	74
15	Iron	mg/l	IS 3025:P.53:1984:R.2017	0.04

Prepared by (V.KALAIVANI)

Verified by (V.KALAIVANI)

Authorize Signatory (S.SURYAKUMAR)

------ End of the Report ------

Note: 1. Test Results Shown in this test report only to the items tested
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ABM ENVIRONMENTAL AND ANALYTICAL LABORATORY
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Narasothipatti, Salem-636004, TN.
Ph: (0427)2444297, 2440446
Mob: 9842729655, 9443290855
Email: suriyakumarsemban@gmail.com, abmlabnabl@gmail.com
NABL TC-9497

TEST REPORT

Sample Ref No: ABM-TRF-231		Report No. : ABM-TR-818(a)
Issued To:	Thiru.Kandasamy-RST, Chetttikurichi Village, Kayathar(TK),Thoothukudi (DT).	Report Date : 20.02.2023 Page : 1 of 1
Sample Name : Bore Water Sample Description : Colourless Liquid Sample Drawn By/ Date : By hand/16.02.2023 Sample method : ABMEAL/QSP/21 Sample Plan : ABMEAL/QSP/22 Sample Mark : Buffer Zone-I Site Address : Village : Chetttikurichi District : Thoothukudi State : Tamil Nadu.		Received On : 16.02.2023 Commenced On : 16.02.2023 Completed On : 18.02.2023 Sample latitude : 9° 3'36.03"N Sample Longitude : 77°44'43.05"E

S.No	Parameters	Units	Methods	Results
1.	pH	-	IS 3025:P.11:1983:R.2019	7.48
2	Electrical Conductivity (EC)	µs/cm	IS 3025:P.14:1984:R.2019	1221
3	Turbidity	NTU	IS 3025:P.10:1984:R.2017	**BDL(DL:0.1)**
4	Temperature	°C	IS 3025:P.09:1984:R.2017	25.4
5	Total Suspended Solids (TSS)	mg/l	IS 3025:P.17:1984:R.2017	1
6	Total Dissolved Solids (TDS)	mg/l	IS 3025:P.16:1984:R.2012	734
7	Total Hardness as $CaCO_3$	mg/l	IS 3025:P.21:2009:R.2019	200
8	Calcium as Ca	mg/l	IS 3025:P.40:1991:R.2019	110
9	Magnesium as Mg	mg/l	IS 3025:P.46:1994:R.2019	90
10	Chloride as Cl^-	mg/l	IS 3025:P.32:1988:R.2019	240
11	Total Alkalinity as $CaCO_3$	mg/l	IS 3025:P.23:1986:R.2019	120
12	Carbonate	mg/l	IS 3025:P.51:1986:R.2017	**BDL(DL:1.0)**
13	Bicarbonate	mg/l	IS 3025:P.51:1986:R.2017	120
14	Sulfate	mg/l	IS 3025:P.24:1986:R.2019	54
15	Iron	mg/l	IS 3025:P.53:1984:R.2017	0.03

Prepared by
(V.KALAIVANI)

Verified by
(V.KALAIVANI)

Authorize Signatory
(S.SURYAKUMAR)

------- End of the Report ------

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Email: surivakumarsemban@gmail.com, abmlabnabl@gmail.com
NABL TC-9497

TEST REPORT

Sample Ref No: ABM-TRF-231		Report No. : ABM-TR-819(a)
Issued To:	Thiru.Kandasamy-RST, Chetttikurichi Village, Kayathar(TK),Thoothukudi (DT).	Report Date : 20.02.2023 Page : 1 of 1
Sample Name : Bore Water Sample Description : Colourless Liquid Sample Drawn By/ Date : By hand/16.02.2023 Sample method : ABMEAL/QSP/21 Sample Plan : ABMEAL/QSP/22 Sample Mark : Buffer Zone-II Site Address : Village : Cithamparampatti District : Thoothukudi State : Tamil Nadu.		Received On : 16.02.2023 Commenced On : 16.02.2023 Completed On : 18.02.2023 Sample latitude : 9° 4'20.75"N Sample Longitude : 77°45'19.66"E

S.No	Parameters	Units	Methods	Results
1.	pH	-	IS 3025:P.11:1983:R.2019	7.83
2	Electrical Conductivity (EC)	µs/cm	IS 3025:P.14:1984:R.2019	1720
3	Turbidity	NTU	IS 3025:P.10:1984:R.2017	**BDL(DL:0.1)**
4	Temperature	°C	IS 3025:P.09:1984:R.2017	25
5	Total Suspended Solids (TSS)	mg/l	IS 3025:P.17:1984:R.2017	2
6	Total Dissolved Solids (TDS)	mg/l	IS 3025:P.16:1984:R.2012	1064
7	Total Hardness as $CaCO_3$	mg/l	IS 3025:P.21:2009:R.2019	390
8	Calcium as Ca	mg/l	IS 3025:P.40:1991:R.2019	240
9	Magnesium as Mg	mg/l	IS 3025:P.46:1994:R.2019	150
10	Chloride as Cl^-	mg/l	IS 3025:P.32:1988:R.2019	430
11	Total Alkalinity as $CaCO_3$	mg/l	IS 3025:P.23:1986:R.2019	290
12	Carbonate	mg/l	IS 3025:P.51:1986:R.2017	**BDL(DL:1.0)**
13	Bicarbonate	mg/l	IS 3025:P.51:1986:R.2017	290
14	Sulfate	mg/l	IS 3025:P.24:1986:R.2019	90
15	Iron	mg/l	IS 3025:P.53:1984:R.2017	0.04

Prepared by
(V.KALAIVANI)

Verified by
(V.KALAIVANI)

Authorize Signatory
(S.SURYAKUMAR)

-------- *End of the Report* --------

Note: 1. Test Results Shown in this test report only to the items tested
2. This test report shall not be reproduce anywhere except in full and in same format without the approval of the laboratory
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The date of issue of test report (exceptional for microbiology and wastewater for which retaining time 7 days

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Email: surivakumarsemban@gmail.com, abmlabnabl@gmail.com
NABL TC-9407

TEST REPORT

Sample Ref No: ABM-TRF-231		Report No. : ABM-TR-820(a)
Issued To:	Thiru.Kandasamy-RST, Chetttikurichi Village, Kayathar(TK),Thoothukudi (DT).	Report Date : 20.02.2023 Page : 1 of 1
Sample Name : Bore Water Sample Description : Colourless Liquid Sample Drawn By/ Date : By hand/16.02.2023 Sample method : ABMEAL/QSP/21 Sample Plan : ABMEAL/QSP/22 Sample Mark : Buffer Zone-III Site Address : Village : Nalanthula District : Thoothukudi State : Tamil Nadu.		Received On : 16.02.2023 Commenced On : 16.02.2023 Completed On : 18.02.2023 Sample latitude : 9° 5'5.71"N Sample Longitude : 77°43'48.95"E

S.No	Parameters	Units	Methods	Results
1.	pH	-	IS 3025:P.11:1983:R.2019	7.53
2	Electrical Conductivity (EC)	µs/cm	IS 3025:P.14:1984:R.2019	1445
3	Turbidity	NTU	IS 3025:P.10:1984:R.2017	BDL(DL:0.1)
4	Temperature	^{0}C	IS 3025:P.09:1984:R.2017	25
5	Total Suspended Solids (TSS)	mg/l	IS 3025:P.17:1984:R.2017	1
6	Total Dissolved Solids (TDS)	mg/l	IS 3025:P.16:1984:R.2012	864
7	Total Hardness as $CaCO_3$	mg/l	IS 3025:P.21:2009:R.2019	290
8	Calcium as Ca	mg/l	IS 3025:P.40:1991:R.2019	180
9	Magnesium as Mg	mg/l	IS 3025:P.46:1994:R.2019	110
10	Chloride as Cl	mg/l	IS 3025:P.32:1988:R.2019	330
11	Total Alkalinity as $CaCO_3$	mg/l	IS 3025:P.23:1986:R.2019	210
12	Carbonate	mg/l	IS 3025:P.51:1986:R.2017	BDL(DL:1.0)
13	Bicarbonate	mg/l	IS 3025:P.51:1986:R.2017	210
14	Sulfate	mg/l	IS 3025:P.24:1986:R.2019	62
15	Iron	mg/l	IS 3025:P.53:1984:R.2017	0.06

Prepared by
(V.KALAIVANI)

Verified by
(S.SAGATHSRI KRISHNAN)

Authorize Signatory
(S.SURYAKUMAR)

End of the Report

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Email: surivakumarsemban@gmail.com, abmlabnabl@gmail.com
NABL TC-9407

TEST REPORT

Sample Ref No: ABM-TRF-231		Report No. : ABM-TR-821(a)
Issued To:	Thiru.Kandasamy-RST, Chetttikurichi Village, Kayathar(TK),Thoothukudi (DT).	Report Date : 20.02.2023 Page : 1 of 1
Sample Name : Bore Water Sample Description : Colourless Liquid Sample Drawn By/ Date : By hand/16.02.2023 Sample method : ABMEAL/QSP/21 Sample Plan : ABMEAL/QSP/22 Sample Mark : Buffer Zone-IV Site Address : Village : Ramiyapatti District : Thoothukudi State : Tamil Nadu.		Received On : 16.02.2023 Commenced On : 16.02.2023 Completed On : 18.02.2023 Sample latitude : 9° 3'40.92"N Sample Longitude : 77°41'51.25"E

S.No	Parameters	Units	Methods	Results
1.	pH	-	IS 3025:P.11:1983:R.2019	7.15
2	Electrical Conductivity (EC)	µs/cm	IS 3025:P.14:1984:R.2019	1353
3	Turbidity	NTU	IS 3025:P.10:1984:R.2017	**BDL(DL:0.1)**
4	Temperature	°C	IS 3025:P.09:1984:R.2017	25.5
5	Total Suspended Solids (TSS)	mg/l	IS 3025:P.17:1984:R.2017	2
6	Total Dissolved Solids (TDS)	mg/l	IS 3025:P.16:1984:R.2012	820
7	Total Hardness as $CaCO_3$	mg/l	IS 3025:P.21:2009:R.2019	385
8	Calcium as Ca	mg/l	IS 3025:P.40:1991:R.2019	134
9	Magnesium as Mg	mg/l	IS 3025:P.46:1994:R.2019	4
10	Chloride as Cl	mg/l	IS 3025:P.32:1988:R.2019	222
11	Total Alkalinity as $CaCO_3$	mg/l	IS 3025:P.23:1986:R.2019	100
12	Carbonate	mg/l	IS 3025:P.51:1986:R.2017	**BDL(DL:0.1)**
13	Bicarbonate	mg/l	IS 3025:P.51:1986:R.2017	100
14	Sulfate	mg/l	IS 3025:P.24:1986:R.2019	19
15	Iron	mg/l	IS 3025:P.53:1984:R.2017	0.08

Prepared by
(V.KALAIVANI)

Verified by
(S.SAGATHSRI KRISHNAN)

Authorize Signatory
(S.SURYAKUMAR)

End of the Report

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Email: suriyakumarscmban@gmail.com, abmlabnabl@gmail.com
ilac-MRA
NABL
TC-9407

TEST REPORT

Sample Ref No: ABM-TRF-231		Report No. : ABM-TR-822(a)
Issued To:	Thiru.Kandasamy-RST, Chetttikurichi Village, Kayathar(TK),Thoothukudi (DT).	Report Date : 20.02.2023 Page : 1 of 1
Sample Name : Bore Water Sample Description : Colourless Liquid Sample Drawn By/ Date : By hand/16.02.2023 Sample method : ABMEAL/QSP/21 Sample Plan : ABMEAL/QSP/22 Sample Mark : Buffer Zone-V Site Address : Village : Vadakku Konarkottai District : Thoothukudi State : Tamil Nadu.		Received On : 16.02.2023 Commenced On : 16.02.2023 Completed On : 18.02.2023 Sample latitude : 9° 3'8.61"N Sample Longitude : 77°43'42.80"E

S.No	Parameters	Units	Methods	Results
1.	pH	-	IS 3025:P.11:1983:R.2019	7.89
2	Electrical Conductivity (EC)	µs/cm	IS 3025:P.14:1984:R.2019	1198
3	Turbidity	NTU	IS 3025:P.10:1984:R.2017	BDL(DL:0.1)
4	Temperature	°C	IS 3025:P.09:1984:R.2017	27
5	Total Suspended Solids (TSS)	mg/l	IS 3025:P.17:1984:R.2017	2
6	Total Dissolved Solids (TDS)	mg/l	IS 3025:P.16:1984:R.2012	700
7	Total Hardness as $CaCO_3$	mg/l	IS 3025:P.21:2009:R.2019	423
8	Calcium as Ca	mg/l	IS 3025:P.40:1991:R.2019	132
9	Magnesium as Mg	mg/l	IS 3025:P.46:1994:R.2019	14
10	Chloride as Cl^-	mg/l	IS 3025:P.32:1988:R.2019	376
11	Total Alkalinity as $CaCO_3$	mg/l	IS 3025:P.23:1986:R.2019	100
12	Carbonate	mg/l	IS 3025:P.51:1986:R.2017	BDL(DL:1.0)
13	Bicarbonate	mg/l	IS 3025:P.51:1986:R.2017	100
14	Sulfate	mg/l	IS 3025:P.24:1986:R.2019	16
15	Iron	mg/l	IS 3025:P.53:1984:R.2017	0.07

Prepared by
(V.KALAIVANI)

Verified by
(S.SAGATHSRI KRISHNAN)

Authorize Signatory
(S.SURYAKUMAR)

-------- *End of the Report* --------

Note: 1. Test Results Shown in this test report only to the items tested
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Email: suriyakumarscmban@gmail.com, abmlabnabl@gmail.com
TC-9497

TEST REPORT

Sample Ref No: ABM-TRF- 231		Report No. : ABM-TR- 817(b)
Issued To:	Thiru.Kandasamy-RST, Chetttikurichi Village, Kayathar(TK),Thoothukudi (DT).	Report Date : 20.02.2023 Page : 1 of 1
Sample Name : Soil Sample Drawn By/ Date : By hand/16.02.2023 Sample method : ABMEAL/QSP/21 Sample Plan : ABMEAL/QSP/22 Sample Mark : Core Zone Site Address : Village : Chetttikurichi District : Thoothukudi State : Tamil Nadu.		Received On : 16.02.2023 Commenced On : 17.02.2023 Completed On : 18.02.2023 Sample latitude : 9° 4'8.93"N Sample Longitude : 77°43'56.73"E

S.No	Parameters		Test Methods	Units	Results
1.	pH		IS: 2720 (P-26):1987	-	6.25
2.	Electrical Conductivity		IS :14767 : 2000	µs/cm	0.148
3.	Moisture		IS:2720 (P-2):1972	%	2.03
4.	Bulk density		ABMEAL/CH/SO/SOP/18	g/cc	1.03
5.	Water holding capacity		IS :14765 : 2000	%	48
6.	Texture	Sand	IS:10317:1982	%	48
		Silt			32
		Clay			20
					Sandy Loam
7.	Organic Matter		IS:2720 (P-22):1972	%	0.88
8.	Calcium		ABMEAL/CH/SO/SOP/12	%	0.003
9.	Magnesium		ABMEAL/CH/SO/SOP/13	%	BDL(DL:0.1)
10.	Chloride		ABMEAL/CH/SO/SOP/14	%	0.005

BDL = Below Detectable Limit : DL: Detection Limit

Prepared by
(V.KALAIVANI)

Verified by
(S.SAGATHSRI KRISHNAN)

Authorized Signatory
(S.SURYAKUMAR)

------ End of the Report ------

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TC-9497

TEST REPORT

Sample Ref No: ABM-TRF- 231		Report No. : ABM-TR- 818(b)
Issued To:	Thiru.Kandasamy-RST, Chetttikurichi Village, Kayathar(TK),Thoothukudi (DT).	Report Date : 20.02.2023 Page : 1 of 1
Sample Name : Soil Sample Drawn By/ Date : By hand/16.02.2023 Sample method : ABMEAL/QSP/21 Sample Plan : ABMEAL/QSP/22 Sample Mark : Buffer Zone-I Site Address : Village : Chetttikurichi District : Thoothukudi State : Tamil Nadu.		Received On : 16.02.2023 Commenced On : 17.02.2023 Completed On : 18.02.2023 Sample latitude : 9° 3'35.81"N Sample Longitude : 77°44'42.77"E

S.No	Parameters		Test Methods	Units	Results
1.	pH		IS: 2720 (P-26):1987	-	8.05
2.	Electrical Conductivity		IS :14767 : 2000	µs/cm	226
3.	Moisture		IS:2720 (P-2):1972	%	3.2
4.	Bulk density		ABMEAL/CH/SO/SOP/18	g/cc	1.15
5.	Water holding capacity		IS :14765 : 2000	%	68
6.	Texture	Sand	IS:10317:1982	%	54
		Silt			24
		Clay			22
					Sandy Clay Loam
7.	Organic Matter		IS:2720 (P-22):1972	%	1.46
8.	Calcium		ABMEAL/CH/SO/SOP/12	%	0.003
9.	Magnesium		ABMEAL/CH/SO/SOP/13	%	BDL(DL:0.1)
10.	Chloride		ABMEAL/CH/SO/SOP/14	%	0.004

BDL = Below Detectable Limit : DL: Detection Limit

Prepared by
(V.KALAIVANI)

Verified by
(S.SAGATHSRI KRISHNAN)

Authorized Signatory
(S.SURYAKUMAR)

-------- *End of the Report* -------

Note 1. Test Results Shown in this test report only to the items tested
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ABM ENVIRONMENTAL AND ANALYTICAL LABORATORY
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NABL TC-9497

TEST REPORT

Sample Ref No: ABM-TRF- 231		Report No. : ABM-TR- 819(b)
Issued To:	Thiru.Kandasamy-RST, Chetttikurichi Village, Kayathar(TK).Thoothukudi (DT).	Report Date : 20.02.2023 Page : 1 of 1
Sample Name : Soil Sample Drawn By/ Date : By hand/16.02.2023 Sample method : ABMEAL/QSP/21 Sample Plan : ABMEAL/QSP/22 Sample Mark : Buffer Zone-II Site Address : Village : Cithamparampatti District : Thoothukudi State : Tamil Nadu.		Received On : 16.02.2023 Commenced On : 17.02.2023 Completed On : 18.02.2023 Sample latitude : 9° 4'20.75"N Sample Longitude : 77°45'19.66"E

S.No	Parameters		Test Methods	Units	Results
1.	pH		IS: 2720 (P-26):1987	-	8.48
2.	Electrical Conductivity		IS :14767 : 2000	µs/cm	240
3.	Moisture		IS:2720 (P-2):1972	%	4.4
4.	Bulk density		ABMEAL/CH/SO/SOP/18	g/cc	1.18
5.	Water holding capacity		IS :14765 : 2000	%	64
6.	Texture	Sand	IS:10317:1982	%	37.1
		Silt			33.3
		Clay			29.6
					Clay Loam
7.	Organic Matter		IS:2720 (P-22):1972	%	1.55
8.	Calcium		ABMEAL/CH/SO/SOP/12	%	0.002
9.	Magnesium		ABMEAL/CH/SO/SOP/13	%	BDL(DL:0.1)
10.	Chloride		ABMEAL/CH/SO/SOP/14	%	0.003

BDL = Below Detectable Limit : DL: Detection Limit

Prepared by
(V.KALAIVANI)

Verified by
(S.SAGATHSRI KRISHNAN)

Authorized Signatory
(S.SURYAKUMAR)

-------- *End of the Report* --------

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NABL TC-9497

TEST REPORT

Sample Ref No: ABM-TRF- 231		Report No. : ABM-TR- 820(b)
Issued To:	Thiru.Kandasamy-RST, Chetttikurichi Village, Kayathar(TK),Thoothukudi (DT).	Report Date : 20.02.2023 Page : 1 of 1
Sample Name : Soil Sample Drawn By/ Date : By hand/16.02.2023 Sample method : ABMEAL/QSP/21 Sample Plan : ABMEAL/QSP/22 Sample Mark : Buffer Zone-III Site Address : Village : Nalanthula District : Thoothukudi State : Tamil Nadu.		Received On : 16.02.2023 Commenced On : 17.02.2023 Completed On : 18.02.2023 Sample latitude : 9° 5'4.76"N Sample Longitude : 77°43'47.11"E

S.No	Parameters		Test Methods	Units	Results
1.	pH		IS: 2720 (P-26):1987	-	8.15
2.	Electrical Conductivity		IS :14767 : 2000	µs/cm	270
3.	Moisture		IS:2720 (P-2):1972	%	3.5
4.	Bulk density		ABMEAL/CH/SO/SOP/18	g/cc	1.22
5.	Water holding capacity		IS :14765 : 2000	%	68
6.	Texture	Sand	IS:10317:1982	%	29.4
		Silt			32.3
		Clay			30.3
					Clay Loam
7.	Organic Matter		IS:2720 (P-22):1972	%	1.32
8.	Calcium		ABMEAL/CH/SO/SOP/12	%	0.002
9.	Magnesium		ABMEAL/CH/SO/SOP/13	%	BDL(DL:0.1)
10.	Chloride		ABMEAL/CH/SO/SOP/14	%	0.004

BDL = Below Detectable Limit : DL: Detection Limit

Prepared by
(V.KALAIVANI)

Verified by
(S.SAGATHSRI KRISHNAN)

Authorized Signatory
(S.SURYAKUMAR)

------- *End of the Report* -------

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TC 9407

TEST REPORT

Sample Ref No: ABM-TRF- 231		Report No. : ABM-TR- 821(b)
Issued To:	Thiru.Kandasamy-RST, Chetttikurichi Village, Kayathar(TK),Thoothukudi (DT).	Report Date : 20.02.2023 Page : 1 of 1
Sample Name : Soil Sample Drawn By/ Date : By hand/16.02.2023 Sample method : ABMEAL/QSP/21 Sample Plan : ABMEAL/QSP/22 Sample Mark : Buffer Zone-III Site Address : Village : Ramiyapatti District : Thoothukudi State : Tamil Nadu.		Received On : 16.02.2023 Commenced On : 17.02.2023 Completed On : 18.02.2023 Sample latitude : 9° 5'4.76"N Sample Longitude : 77°43'47.11"E

S.No	Parameters		Test Methods	Units	Results
1.	pH		IS: 2720 (P-26):1987	-	7.18
2.	Electrical Conductivity		IS :14767 : 2000	µs/cm	190
3.	Moisture		IS:2720 (P-2):1972	%	2.5
4.	Bulk density		ABMEAL/CH/SO/SOP/18	g/cc	1.02
5.	Water holding capacity		IS :14765 : 2000	%	56
6.	Texture	Sand	IS:10317:1982	%	48
		Silt			24
		Clay			28
					Sandy Clay Loam
7.	Organic Matter		IS:2720 (P-22):1972	%	0.78
8.	Calcium		ABMEAL/CH/SO/SOP/12	%	0.004
9.	Magnesium		ABMEAL/CH/SO/SOP/13	%	BDL(DL:0.1)
10.	Chloride		ABMEAL/CH/SO/SOP/14	%	0.005

BDL = Below Detectable Limit : DL: Detection Limit

Prepared by
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Verified by
(S.SAGATHSRI KRISHNAN)

Authorized Signatory
(S.SURYAKUMAR)

End of the Report

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NABL TC-9497

TEST REPORT

Sample Ref No: ABM-TRF- 231		Report No. : ABM-TR- 822(b)
Issued To:	Thiru.Kandasamy-RST, Chetttikurichi Village, Kayathar(TK),Thoothukudi (DT).	Report Date : 20.02.2023 Page : 1 of 1
Sample Name : Soil Sample Drawn By/ Date : By hand/16.02.2023 Sample method : ABMEAL/QSP/21 Sample Plan : ABMEAL/QSP/22 Sample Mark : Buffer Zone-V Site Address : Village : Vadakku Konarkottai District : Thoothukudi State : Tamil Nadu.		Received On : 16.02.2023 Commenced On : 17.02.2023 Completed On : 18.02.2023 Sample latitude : 9° 3'8.61"N Sample Longitude : 77°43'42.80"E

S.No	Parameters		Test Methods	Units	Results
1.	pH		IS: 2720 (P-26):1987	-	6.78
2.	Electrical Conductivity		IS :14767 : 2000	µs/cm	158
3.	Moisture		IS:2720 (P-2):1972	%	2.08
4.	Bulk density		ABMEAL/CH/SO/SOP/18	g/cc	1.05
5.	Water holding capacity		IS :14765 : 2000	%	54
6.	Texture	Sand	IS:10317:1982	%	52
		Silt			28
		Clay			20
					Sandy Loam
7.	Organic Matter		IS:2720 (P-22):1972	%	0.85
8.	Calcium		ABMEAL/CH/SO/SOP/12	%	0.003
9.	Magnesium		ABMEAL/CH/SO/SOP/13	%	BDL(DL0:0.1)
10.	Chloride		ABMEAL/CH/SO/SOP/14	%	0.004

BDL = Below Detectable Limit : DL: Detection Limit

Prepared by
(V.KALAIVANI)

Verified by
(S.SAGATHSRI KRISHNAN)

Authorized Signatory
(S.SURYAKUMAR)

ENVIRONMENTAL AND ANALYTICAL LABORATORY SALEM

-------- *End of the Report* --------

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NABL TC-9497

TEST REPORT

Sample Ref No: ABM-TRF-231		Report No. : ABM-TR-817(c)
Issued To:	Thiru.Kandasamy-RST, Chetttikurichi Village, Kayathar(TK),Thoothukudi (DT).	Report Date : 20.02.2023 Page : 1 of 1

Sample Description	: AMBIENT AIR	Received On	: 16.02.2023
Sampling Method	: IS 5182(Part-14):2000	Commenced On	: 16.02.2023
Date of Sampling	: 15.02.2023	Completed On	: 18.02.2023
Sample Mark	: Core Zone	Sample latitude	: 9° 3'58.61"N
Sample Drawn By/ Date	: By hand/16.02.2023	Sample Longitude	: 77°43'54.43"E
Sampling Method	: ABMEAL/QSP/22		
Ambient Temperature	: 34°C		
Relative Humidity	: 89 %		
Site Address	: Village : Chetttikurichi District : Thoothukudi State : Tamil Nadu.		

S.NO	PARAMETERS	PROTOCOL	UNIT	RESULT
1	Particulate Matter(PM2.5)	IS 5182 (Part 24): 2019	$\mu g/m^3$	27
2	Respirable Particulate Matter(PM10)	IS 5182 (Part 23): 2006	$\mu g/m^3$	49
3	Sulphur Dioxide(SO_2)	IS 5182 (Part 2): 2006	$\mu g/m^3$	15
4	Nitrogen Dioxide(NO_2)	IS 5182(Part 6) : 2006	$\mu g/m^3$	22
5	Ozone(O_3)	IS 5182(Part 9): 1974	$\mu g/m^3$	35
6	Ammonia(NH_3)	IS 5182 (Part 25): 2018	$\mu g/m^3$	29
7	Nickel(Ni)	IS 5182 (Part 26) : 2020	$\mu g/m^3$	BDL(DL:0.1)
8	Lead(Pb)	IS 5180(Part22): 2004	$\mu g/m^3$	BDL(DL:0.1)

BDL = Below Detectable Limit ; DL = Detection Limit

Prepared by
(V.KALAIVANI)

Verified by
(V.KALAIVANI)

Authorized Signatory
(S.SURYAKUMAR)

--------- End of the Report ---------

Note: 1. Test Results Shown in this test report only to the items tested
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NABL TC 9407

TEST REPORT

Sample Ref No: ABM-TRF-231		Report No. : ABM-TR-818(c)
Issued To:	Thiru.Kandasamy-RST, Chetttikurichi Village, Kayathar(TK),Thoothukudi (DT).	Report Date : 20.02.2023 Page : 1 of 1

Sample Description	: AMBIENT AIR	Received On	: 16.02.2023
Sampling Method	: IS 5182(Part-14):2000	Commenced On	: 16.02.2023
Date of Sampling	: 15.02.2023	Completed On	: 18.02.2023
Sample Mark	: Buffer Zone-I	Sample latitude	: 9° 3'37.82"N
Sample Drawn By/ Date	: By hand/16.02.2023	Sample Longitude	: 77°44'39.16"E
Sampling Method	: ABMEAL/QSP/22		
Ambient Temperature	: 32°C		
Relative Humidity	: 76 %		
Site Address	: Village : Chetttikurichi District : Thoothukudi State : Tamil Nadu.		

S.NO	PARAMETERS	PROTOCOL	UNIT	RESULT
1	Particulate Matter(PM2.5)	IS 5182 (Part 24): 2019	$\mu g/m^3$	28
2	Respirable Particulate Matter(PM10)	IS 5182 (Part 23): 2006	$\mu g/m^3$	44
3	Sulphur Dioxide(SO_2)	IS 5182 (Part 2): 2006	$\mu g/m^3$	12
4	Nitrogen Dioxide(NO_2)	IS 5182(Part 6) : 2006	$\mu g/m^3$	25
5	Ozone(O_3)	IS 5182(Part 9): 1974	$\mu g/m^3$	32
6	Ammonia(NH_3)	IS 5182 (Part 25): 2018	$\mu g/m^3$	26
7	Nickel(Ni)	IS 5182 (Part 26) : 2020	$\mu g/m^3$	BDL(DL:0.1)
8	Lead(Pb)	IS 5180(Part22): 2004	$\mu g/m^3$	BDL(DL:0.1)

BDL = Below Detectable Limit ; DL = Detection Limit

Prepared by
(V.KALAIVANI)

Verified by
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Authorized Signatory
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--------- *End of the Report* ---------

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NABL TC 9497

TEST REPORT

Sample Ref No: ABM-TRF-231		Report No. : ABM-TR-819(c)
Issued To:	Thiru.Kandasamy-RST, Chetttikurichi Village, Kayathar(TK),Thoothukudi (DT).	Report Date : 20.02.2023 Page : 1 of 1

Sample Description	: AMBIENT AIR	Received On	: 16.02.2023
Sampling Method	: IS 5182(Part-14):2000	Commenced On	: 16.02.2023
Date of Sampling	: 15.02.2023	Completed On	: 18.02.2023
Sample Mark	: Buffer Zone-II	Sample latitude	: 9° 4'19.82"N
Sample Drawn By/ Date	: By hand/16.02.2023	Sample Longitude	: 77°45'17.16"E
Sampling Method	: ABMEAL/QSP/22		
Ambient Temperature	: 30°C		
Relative Humidity	: 65 %		
Site Address	: Village : Cithamparampatti District : Thoothukudi State : Tamil Nadu.		

S.NO	PARAMETERS	PROTOCOL	UNIT	RESULT
1	Particulate Matter(PM2.5)	IS 5182 (Part 24): 2019	$\mu g/m^3$	24
2	Respirable Particulate Matter(PM10)	IS 5182 (Part 23): 2006	$\mu g/m^3$	48
3	Sulphur Dioxide(SO_2)	IS 5182 (Part 2): 2006	$\mu g/m^3$	11
4	Nitrogen Dioxide(NO_2)	IS 5182(Part 6) : 2006	$\mu g/m^3$	21
5	Ozone(O_3)	IS 5182(Part 9): 1974	$\mu g/m^3$	30
6	Ammonia(NH_3)	IS 5182 (Part 25): 2018	$\mu g/m^3$	24
7	Nickel(Ni)	IS 5182 (Part 26) : 2020	$\mu g/m^3$	BDL(DL:0.1)
8	Lead(Pb)	IS 5180(Part22): 2004	$\mu g/m^3$	BDL(DL:0.1)

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Verified by
(V.KALAIVANI)

Authorized Signatory
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TC-9497

TEST REPORT

Sample Ref No: ABM-TRF-231		Report No. : ABM-TR-820(c)
Issued To:	Thiru.Kandasamy-RST, Chetttikurichi Village, Kayathar(TK),Thoothukudi (DT).	Report Date : 20.02.2023 Page : 1 of 1

Sample Description	: AMBIENT AIR	Received On	: 16.02.2023
Sampling Method	: IS 5182(Part-14):2000	Commenced On	: 16.02.2023
Date of Sampling	: 15.02.2023	Completed On	: 18.02.2023
Sample Mark	: Buffer Zone-IV	Sample latitude	: 9° 5'4.53"N
Sample Drawn By/ Date	: By hand/16.02.2023	Sample Longitude	: 77°43'49.61"E
Sampling Method	: ABMEAL/QSP/22		
Ambient Temperature	: 31°C		
Relative Humidity	: 72 %		
Site Address	: Village : Nalanthula District : Thoothukudi State : Tamil Nadu.		

S.NO	PARAMETERS	PROTOCOL	UNIT	RESULT
1	Particulate Matter(PM2.5)	IS 5182 (Part 24): 2019	$\mu g/m^3$	29
2	Respirable Particulate Matter(PM10)	IS 5182 (Part 23): 2006	$\mu g/m^3$	46
3	Sulphur Dioxide(SO_2)	IS 5182 (Part 2): 2006	$\mu g/m^3$	16
4	Nitrogen Dioxide(NO_2)	IS 5182(Part 6) : 2006	$\mu g/m^3$	23
5	Ozone(O_3)	IS 5182(Part 9): 1974	$\mu g/m^3$	36
6	Ammonia(NH_3)	IS 5182 (Part 25): 2018	$\mu g/m^3$	30
7	Nickel(Ni)	IS 5182 (Part 26) : 2020	$\mu g/m^3$	BDL(DL:0.1)
8	Lead(Pb)	IS 5180(Part22): 2004	$\mu g/m^3$	BDL(DL:0.1)

BDL = Below Detectable Limit ; DL = Detection Limit

Prepared by
(V.KALAIVANI)

Verified by
(V.KALAIVANI)

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NABL TC 9497

TEST REPORT

Sample Ref No: ABM-TRF-231		Report No. : ABM-TR-821(c)
Issued To:	Thiru.Kandasamy-RST, Chetttikurichi Village, Kayathar(TK),Thoothukudi (DT).	Report Date : 20.02.2023 Page : 1 of 1

Sample Description	: AMBIENT AIR	Received On	: 16.02.2023
Sampling Method	: IS 5182(Part-14):2000	Commenced On	: 16.02.2023
Date of Sampling	: 15.02.2023	Completed On	: 18.02.2023
Sample Mark	: Buffer Zone-IV	Sample latitude	: 9° 3'39.81"N
Sample Drawn By/ Date	: By hand/16.02.2023	Sample Longitude	: 77°41'51.82"E
Sampling Method	: ABMEAL/QSP/22		
Ambient Temperature	: 32°C		
Relative Humidity	: 66 %		
Site Address	: Village : Ramiyapatti District : Thoothukudi State : Tamil Nadu.		

S.NO	PARAMETERS	PROTOCOL	UNIT	RESULT
1	Particulate Matter(PM2.5)	IS 5182 (Part 24): 2019	$\mu g/m^3$	31
2	Respirable Particulate Matter(PM10)	IS 5182 (Part 23): 2006	$\mu g/m^3$	47
3	Sulphur Dioxide(SO_2)	IS 5182 (Part 2): 2006	$\mu g/m^3$	13
4	Nitrogen Dioxide(NO_2)	IS 5182(Part 6) : 2006	$\mu g/m^3$	24
5	Ozone(O_3)	IS 5182(Part 9): 1974	$\mu g/m^3$	34
6	Ammonia(NH_3)	IS 5182 (Part 25): 2018	$\mu g/m^3$	27
7	Nickel(Ni)	IS 5182 (Part 26) : 2020	$\mu g/m^3$	BDL(DL:0.1)
8	Lead(Pb)	IS 5180(Part22): 2004	$\mu g/m^3$	BDL(DL:0.1)

BDL = Below Detectable Limit ; DL = Detection Limit

Prepared by
(V.KALAIVANI)

Verified by
(V.KALAIVANI)

Authorized Signatory
(S.SURYAKUMAR)

--------- End of the Report ---------

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ABM ENVIRONMENTAL AND ANALYTICAL LABORATORY
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NABL TC 9407

TEST REPORT

Sample Ref No: ABM-TRF-231		Report No. : ABM-TR-822(c)
Issued To:	Thiru.Kandasamy-RST, Chetttikurichi Village, Kayathar(TK),Thoothukudi (DT).	Report Date : 20.02.2023 Page : 1 of 1
Sample Description : AMBIENT AIR Sampling Method : IS 5182(Part-14):2000 Date of Sampling : 15.02.2023 Sample Mark : Buffer Zone-IV Sample Drawn By/ Date : By hand/16.02.2023 Sampling Method : ABMEAL/QSP/22 Ambient Temperature : 30°C Relative Humidity : 71 % Site Address : Village : Vadakku Konarkottai District : Thoothukudi State : Tamil Nadu.		Received On : 16.02.2023 Commenced On : 16.02.2023 Completed On : 18.02.2023 Sample latitude : 9° 3'10.26"N Sample Longitude : 77°43'44.65"E

S.NO	PARAMETERS	PROTOCOL	UNIT	RESULT
1	Particulate Matter(PM2.5)	IS 5182 (Part 24): 2019	$\mu g/m^3$	30
2	Respirable Particulate Matter(PM10)	IS 5182 (Part 23): 2006	$\mu g/m^3$	45
3	Sulphur Dioxide(SO_2)	IS 5182 (Part 2): 2006	$\mu g/m^3$	14
4	Nitrogen Dioxide(NO_2)	IS 5182(Part 6) : 2006	$\mu g/m^3$	20
5	Ozone(O_3)	IS 5182(Part 9): 1974	$\mu g/m^3$	31
6	Ammonia(NH_3)	IS 5182 (Part 25): 2018	$\mu g/m^3$	25
7	Nickel(Ni)	IS 5182 (Part 26) : 2020	$\mu g/m^3$	BDL(DL:0.1)
8	Lead(Pb)	IS 5180(Part22): 2004	$\mu g/m^3$	BDL(DL:0.1)

BDL = Below Detectable Limit ; DL = Detection Limit

Prepared by
(V.KALAIVANI)

Verified by
(V.KALAIVANI)

Authorized Signatory
(S.SURYAKUMAR)

--------- *End of the Report* ---------

Note 1. Test Results Shown in this test report only to the items tested
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NABL TC 9407

TEST REPORT		
Sample Ref No: ABM-TRF-231		Report No. : ABM-TR-817(d)
Issued To:	Thiru.Kandasamy-RST, Chetttikurichi Village, Kayathar(TK),Thoothukudi (DT).	Report Date : 20.02.2023 Page : 1 of 1
Sample Name : NOISE Monitoring Date : 15.02.2023 Site Address : Village : Chetttikurichi District : Thoothukudi State : Tamil Nadu.		Data Received On : 16.02.2023

S.NO	PARAMETERS	TEST METOD	UNIT	LOCATION	RESULT
1	NOISE	IS:9989-1981	dB(A)	N	42.9
2				W	47.2
3				E	44.5
4				S	39.9
5				Core Zone	44.1

Prepared by
(V.KALAIVANI)

Verified by
(S.SURYAKUMAR)

ENVIRONMENTAL AND ANALYTICAL LABORATORY SALEM

End of the Report

Note: 1. Test Results Shown in this test report only to the items tested
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NABL TC 9497

TEST REPORT		
Sample Ref No: ABM-TRF-231		Report No. : ABM-TR-818(d)
Issued To:	Thiru.Kandasamy-RST, Chetttikurichi Village, Kayathar(TK),Thoothukudi (DT).	Report Date : 20.02.2023 Page : 1 of 1
Sample Name : NOISE Monitoring Date : 15.02.2023 Site Address : Village : Chetttikurichi District : Thoothukudi State : Tamil Nadu.		Data Received On : 16.02.2023

S.NO	PARAMETERS	TEST METOD	UNIT	LOCATION	RESULT
1	NOISE	IS:9989-1981	dB(A)	SE	45.1

Prepared by
(V.KALAIVANI)

Verified by
(S.SURYAKUMAR)

--------- *End of the Report* -------

ENVIRONMENTAL AND ANALYTICAL LABORATORY SALEM

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TC-9497

TEST REPORT		
Sample Ref No: ABM-TRF-231		Report No. : ABM-TR-819(d)
Issued To:	Thiru.Kandasamy-RST, Chetttikurichi Village, Kayathar(TK),Thoothukudi (DT).	Report Date : 20.02.2023 Page : 1 of 1
Sample Name : NOISE Monitoring Date : 15.02.2023 Site Address : Village : Cithamparampatti District : Thoothukudi State : Tamil Nadu.		Data Received On : 16.02.2023

S.NO	PARAMETERS	TEST METOD	UNIT	LOCATION	RESULT
1	NOISE	IS:9989-1981	dB(A)	NE	43.4

Prepared by
(V.KALAIVANI)

Verified by
(S.SURYAKUMAR)

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ENVIRONMENTAL AND ANALYTICAL LABORATORY SALEM

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TC-9497

TEST REPORT

Sample Ref No: ABM-TRF-231		Report No. : ABM-TR-820(d)
Issued To:	Thiru.Kandasamy-RST, Chetttikurichi Village, Kayathar(TK),Thoothukudi (DT).	Report Date : 20.02.2023 Page : 1 of 1
Sample Name : NOISE Monitoring Date : 15.02.2023 Site Address : Village : Nalanthula District : Thoothukudi State : Tamil Nadu.		Data Received On : 16.02.2023

S.NO	PARAMETERS	TEST METOD	UNIT	LOCATION	RESULT
1	NOISE	IS:9989-1981	dB(A)	N	42.3

Prepared by
(V.KALAIVANI)

Verified by
(S.SURYAKUMAR)

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ABM ENVIRONMENTAL AND ANALYTICAL LABORATORY SALEM

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NABL TC-9497

TEST REPORT		
Sample Ref No: ABM-TRF-231		Report No. : ABM-TR-821(d)
Issued To:	Thiru.Kandasamy-RST, Chetttikurichi Village, Kayathar(TK),Thoothukudi (DT).	Report Date : 20.02.203 Page : 1 of 1
Sample Name : NOISE Monitoring Date : 15.02.2023 Site Address : Village : Ramiyapatti District : Thoothukudi State : Tamil Nadu.		Data Received On : 16.02.2023

S.NO	PARAMETERS	TEST METOD	UNIT	LOCATION	RESULT
1	NOISE	IS:9989-1981	dB(A)	W	42.6

Prepared by
(V.KALAIVANI)

Verified by
(S.SURYAKUMAR)

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TEST REPORT

Sample Ref No: ABM-TRF-231		Report No. : ABM-TR-822(d)
Issued To:	Thiru.Kandasamy-RST, Chetttikurichi Village, Kayathar(TK),Thoothukudi (DT).	Report Date : 20.02.2023 Page : 1 of 1
Sample Name : NOISE Monitoring Date : 15.02.2023 Site Address : Village : Vadakku Konarkottai District : Thoothukudi State : Tamil Nadu.		Data Received On : 16.02.2023

S.NO	PARAMETERS	TEST METOD	UNIT	LOCATION	RESULT
1	NOISE	IS:9989-1981	dB(A)	S	39.5

Prepared by
(V.KALAIVANI)

Verified by
(S.SURYAKUMAR)

--------- End of the Report ---------

ABM ENVIRONMENTAL AND ANALYTICAL LABORATORY * SALEM

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