

# **DRAFT ENVIRONMENTAL IMPACT ASSESSMENT & ENVIRONMENT MANAGEMENT PLAN**

**FOR OBTAINING**

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

**“B1” CATEGORY (Cluster) – MINOR MINERAL – CLUSTER –**

**PATTA LAND - FRESH QUARRY**

**Cluster Extent – 9.27.5 Ha**

**(1 Proposed + 1 Existing Quarries)**

**Extent – 4.85.5 Ha**

**Project Proponent**

**Tvl.SKT Mines,**

Thiru.G.Dhamotharan - Partner

S/o. Gangadaran,

No.333, Giberan Street, Neervallur,

Kancheepuram District,

TamilNadu – 631 561

## **TVL.SKT MINES ROUGH STONE AND GRAVEL QUARRY**

| <b>PROJECT LOCATION</b>                                                                                                                                                                                                                        | <b>PROPOSED PRODUCTION</b>                                                                                                                                                                                                                                           |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| S.F.Nos.: 44/13A, 56/1A, 56/2A, 56/2B, 56/3,<br>56/4, 56/5, 56/6, 56/7, 57/1, 58/9, 58/10, 61/4B1,<br>61/4B2, 61/5B, 61/7, 62, 63/1 & 63/2<br>Extent – 4.85.5 Ha<br>Kaganam Village,<br>Vembakkam Taluk<br>Tiruvannamalai District, Tamil Nadu | <b>Mineable Reserves = 7,95,070 m<sup>3</sup> of Rough Stone</b><br><b>&amp; 77,256 m<sup>3</sup> of Gravel</b><br><b>Peak Production = 2,07,900 m<sup>3</sup> of Rough Stone,</b><br><b>&amp; 33,840 m<sup>3</sup> of Gravel</b><br><b>Proposed Depth = 72m bgl</b> |

**File No.11671 ToR Identification: TO24B0108TN5824280N Dated: 01.03.2025**

|                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
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| <b>Environmental Consultant</b><br><b>GEO EXPLORATION AND MINING SOLUTIONS</b><br>Old No. 260-B, New No. 17,<br>Advaitha Ashram Road, Alagapuram,<br>Salem – 636 004, Tamil Nadu, India<br>Accredited for sector 1 Cat ‘A’, sector 31 & 38 Cat ‘B’<br>Certificate No : NABET/EIA/2225/RA 0276<br>Phone: 0427-2431989,<br>Email: infogeoexploration@gmail.com<br>Web: www.gemssalem.com |   <b>Laboratory</b><br><b>EHS 360 LABS PRIVATE LIMITED,</b><br>NABL Accredited laboratory<br>10/2 Ground floor, 50 <sup>th</sup> street, 7 <sup>th</sup> Avenue,<br>Ashok Nagar, Chennai – 600 083.<br> |
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## **Baseline Monitoring Period**

**DECEMBER 2024 to FEBRUARY 2025**

**MAY 2025**

## UNDERTAKING

I G. Dhamotharan – Partner of SKT Mines given undertaking that this EIA & EMP report prepared for our Rough stone and Gravel quarry situated in S.F. No 44/13A, 56/1A, 56/2A, 56/2B, 56/3, 56/4, 56/5, 56/6, 56/7, 57/1, 58/9, 58/10, 61/4B1, 61/4B2, 61/5B, 61/7, 62, 63/1 & 63/2, over an extent of 4.85.5 Ha in Kaganam Village, Vembakkam Taluk, Tiruvannamalai District based on the ToR issued by the State Level Environmental Impact Assessment Authority (SEIAA), Tamil Nadu vide File No.11671 ToR Identification: TO24B0108TN5824280N Dated: 01.03.2025.

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

Signature of the Project Proponent



Thiru. G. Dhamotharan  
(Partner)

Place: Tiruvannamalai

Dated:

## **DECLARATION**

I Dr. M. Ifthikhar Ahmed – EIA Co Ordinator declare that the EIA & EMP report for the Rough stone and Gravel quarry S.F. No 44/13A, 56/1A, 56/2A, 56/2B, 56/3, 56/4, 56/5, 56/6, 56/7, 57/1, 58/9, 58/10, 61/4B1, 61/4B2, 61/5B, 61/7, 62, 63/1 & 63/2, over an extent of 4.85.5 Ha in Kaganam Village, Vembakkam Taluk, Tiruvannamalai District has been prepared by Geo Exploration and Mining Solutions, Salem, Tamil Nadu.

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

Signature of the EIA Co Ordinator



**Dr. M. Ifthikhar Ahmed**

**Managing Partner**

**M/s. Geo Exploration and Mining Solutions**

Place: Salem

Dated:

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

| PROPOSED QUARRIES    |                                                                                                                                                     |         |                                                                                                                                           |              |                                                                                   |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|---------|-------------------------------------------------------------------------------------------------------------------------------------------|--------------|-----------------------------------------------------------------------------------|
| CODE                 | Name of the Owner                                                                                                                                   | Village | S.F. Nos                                                                                                                                  | Extent in Ha | Status                                                                            |
| P1                   | Tvl.SKT Mines<br>No.333, Guberan Street,<br>Neervallur, Kancheepuram,<br>TamilNadu                                                                  | Kaganam | 44/13A, 56/1A, 56/2A,<br>56/2B, 56/3, 56/4, 56/5,<br>56/6, 56/7, 57/1, 58/9,<br>58/10, 61/4B1, 61/4B2,<br>61/5B, 61/7, 62, 63/1 &<br>63/2 | 4.85.5       | File No.11671 ToR<br>Identification:<br>TO24B0108TN5824280<br>N Dated:01.03.2025. |
| TOTAL EXTENT         |                                                                                                                                                     |         |                                                                                                                                           | 4.85.5 ha    |                                                                                   |
| EXISTING QUARRIES    |                                                                                                                                                     |         |                                                                                                                                           |              |                                                                                   |
| CODE                 | Name of the Owner                                                                                                                                   | Village | S.F. Nos                                                                                                                                  | Extent in Ha | Status                                                                            |
| E-1                  | Thiru.R.Kathirvelu,<br>No.19C, Villakadi, Koli<br>Thoppu Street,<br>Kancheepuram.                                                                   | Kaganam | 58/1A, 1B, 2A, 2B, 3, 6,<br>7, 8A, 8B, 59/2A,<br>61/1B, 2A, 2B, 3, 4A,<br>5A & 6                                                          | 4.42.0       | 10.06.2024 to<br>09.06.2029                                                       |
| TOTAL EXTENT         |                                                                                                                                                     |         |                                                                                                                                           | 4.42.0 ha    |                                                                                   |
| ABANDONED QUARRY     |                                                                                                                                                     |         |                                                                                                                                           |              |                                                                                   |
| A-1                  | Thiru S.Sridhar,<br>S/o.T.Sivaprakasam,<br>Managing Director,<br>SKT Mines,<br>No.19C, Villakkadi Koil,<br>Thoppu Street,<br>Kancheepuram – 635 501 | Kaganam | 44/13A, 56/1A, 56/2A,<br>56/2B, 56/3, 56/4, 56/5,<br>56/6, 56/7, 57/1, 58/9,<br>58/10, 61/4B1, 61/4B2,<br>61/5B, 61/7, 62,63/1 &<br>63/2  | 4.85.5       | 17.09.2018 to<br>16.09.2023                                                       |
| TOTAL CLUSTER EXTENT |                                                                                                                                                     |         |                                                                                                                                           | 9.27.5 ha    |                                                                                   |

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

## TERMS OF REFERENCE (ToR) COMPLIANCE

### TVL.SKT MINES

**File No.11671 TOR Identification No. TO24B0108TN5824280N Dated:01.03.2025**

| SEIAA SPECIFIC CONDITIONS |                                                                                                                                         |                                                                                                                 |
|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| <b>1</b>                  | The Public Hearing concerns with respect to impact of mining on water bodies & agriculture should be obtained and addressed in the EMP. | <b>Noted and Agreed</b><br>It will be detailed in the Chapter 7 & 10 after the completion of the Public hearing |

| SPECIFIC CONDITIONS |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                              |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1                   | A Cluster Management Committee (CMC) shall be constituted including all the mines in the cluster as Committee Members for the effective management of the mining operation in the cluster through systematic & scientific approach with appointment of statutory personnel, appropriate environmental monitoring, good maintenance of haul roads and village/panchayat roads, authorized blasting operation etc. The PP shall submit the following details in the form of an Affidavit during the EIA appraisal:<br>(i) Copy of the agreement forming CMC.<br>(ii) The Organisation chart of the Committee with defining the role of the members<br>(iii) The 'Standard Operating Procedures' (SoP) executing the planned activities. | <b>Noted &amp; agreed.</b><br>Copy of affidavit agreement regarding forming CMC will be submitted during the appraisal meeting.                                                                                                                                              |
| 2                   | The Boundary pillars to be erected as per the mine rules and the evidence should be submitted along with the EIA report.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>Noted &amp; agreed.</b><br>PP has erected the Barbed wire fencing around the Project site and PP has carried out the Green belt around the project site and the photographs has been detailed in Chapter - 2                                                              |
| 3                   | The PP shall furnish the details of enumeration of existing trees inside the site and no. of trees to be removed for the proposed quarrying activity and the compensatory planting proposed for the same in the EIA Report.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>Noted and agreed</b><br>There is no existing trees in the project site and PP has carried out green belt activities around 1000 trees in the project site                                                                                                                 |
| 4                   | Since waterbodies are situated nearby and the ultimate depth proposed is 50 m BGL, the PP shall carry out the <b>hydrogeological and hydrological study</b> including the details of waterflow pattern to determine the impacts of the mining operation in the waterbodies and <b>on the ground water level present in the core zone</b> , by involving any one of the reputed Research and Academic Institution - CSIR-Central Institute of Mining & Fuel Research / Dhanbad, NIRM/Bangalore, Centre for Water Resources-IIT-Madras, NIT-Dept of Mining Engg, Surathkal, and Anna University Chennai-Centre for Water Resources (CER), CEG Campus                                                                                    | <b>Noted and agreed.</b><br>The water table in the project site was 78 – 82m Bgl and the proposed depth of the mine was 72m and it will not intersect the water table, the hydrogeology study was carried out by the EIA coordinator and it has been detailed in Chapter - 3 |
| 5                   | The details of enumeration of structures including schools, colleges, primary health centres should be submitted along with the EIA report.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>Noted and agreed</b><br>The structure study has been detailed in the Chapter - 3                                                                                                                                                                                          |
| 6                   | The structures within the radius of (i) 50 m, (ii) 100 m, (iii) 200 m and (iv) 300 m & upto 1km shall be enumerated with details such as dwelling houses with number of occupants, whether it belongs to the owner (or) not, places of worship, industries, factories, sheds, etc. and spell out the mitigation measures to be proposed for the protection of the above structures, if any during the quarrying operations.                                                                                                                                                                                                                                                                                                           | <b>Noted and agreed</b><br>The Bio diversity study has been conducted by the Functional Area Expert approved by the NABET.<br>The same has been detailed in the Chapter No. 3.                                                                                               |

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| 7                                 | The proponent shall furnish photographs of adequate fencing, garland drainage built with siltation tank & green belt along the periphery including replantation of existing trees; maintaining the safety distance between the adjacent quarries & water bodies nearby provided as per the approved mining plan.                                                                                                                                                                                                                                                                                                                                                                                      | <b>Noted and agreed</b><br>The EMP has been prepared for the entire life of the mine i.e., upto the lease period ( 5 Years) and the affidavit will be submitted.                                                                                                                                                                                    |
| 8                                 | The Proponent shall carry out Bio diversity study as a part of EIA study and the same shall be included in the Report.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>Noted and agreed.</b><br>The Bio Diversity study has been carried out by the EIA coordinator and it has been detailed in Chapter - 3                                                                                                                                                                                                             |
| 9                                 | 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.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>Noted and agreed.</b><br>The EMP has been detailed in the Chapter 10 and the Affidavit will be submitted at the time of the Appraisal                                                                                                                                                                                                            |
| 10                                | The PP shall carry out the comprehensive studies on the cumulative environmental impacts of the existing & proposed quarries which included drilling & blasting, loading & hauling on the surrounding village and structures                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <b>Noted and agreed.</b><br>Controlled blasting has been proposed and NONEL detonator has been used for controlling of ground vibration and fly rocks, PP will appoint the DGMS approved Statutory persons for the supervision of the Mine                                                                                                          |
| 11                                | The PP shall prepare a conceptual working plan accommodating the inclusion of haul road accessibility keeping the benches intact, by ensuring the slope stability of the working benches to be constructed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>Noted and agreed.</b><br>Conceptual plan has been attached as Annexure and the Haul roads will be design after the lease execution according to the Mine excavation approach and the formation of the haul roads and accessibility of the haul roads will be detailed in the Surface plan and it will be submitted to the DGMS and in First HYCR |
| 12                                | The PP shall install the CCTV camera for the continuous surveillance of mining activity & furnish the photographic/videographic evidence along with the EIA report.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>Noted and agreed.</b><br>PP will carry out the installation of the CCTV for the continuous monitoring of the Mine working and the details of the CCTV installation will be submitted in the first HYCR.                                                                                                                                          |
| <b>2.SEAC STANDARD CONDITIONS</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                     |
| 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:<br>(i) Original pit dimension<br>(ii) Quantity achieved Vs EC Approved Quantity<br>(iii) Balance Quantity as per Mineable Reserve calculated.<br>(iv) Mined out Depth as on date Vs EC Permitted depth<br>(v) Details of illegal/illicit mining<br>(vi) Violation in the quarry during the past working.<br>(vii) Quantity of material mined out outside the mine lease area<br>(viii) Condition of Safety zone/benches<br>(ix) Revised/Modified Mining Plan showing the benches of not exceeding 6 m height and ultimate depth of not exceeding 50m. | <b>Not Applicable</b><br>Fresh lease                                                                                                                                                                                                                                                                                                                |
| 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.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>Noted &amp; agreed.</b><br>The PP obtained VAO Certificate regarding the location of habitations within 300m radius from the periphery of the site and enclosed with as annexure.                                                                                                                                                                |
| 3                                 | The proponent is requested to carry out a survey and enumerate on the structures located within the radius of (i) 50 m, (ii) 100 m, (iii) 200 m and (iv) 300 m (v) 500m shall be enumerated with details such as dwelling houses with number of occupants, whether it belongs to the owner (or) not, places of worship, industries, factories, sheds, etc with indicating the owner of the building,                                                                                                                                                                                                                                                                                                  | <b>Noted and agreed</b><br>The structure study has been carried out within the radius of 300m.<br>There is no habitation within the radius of 300m from the project site the details of the structures is given in the EIA report, Chapter No. III                                                                                                  |

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|    | nature of construction, age of the building, number of residents, their profession and income, etc.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                              |
| 4  | The PP shall submit a detailed hydrological report indicating the impact of proposed quarrying operations on the waterbodies like lake, water tanks, etc are located within 1 km of the proposed quarry.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>Noted and agreed</b><br>The hydro-geological study was conducted to evaluate the possible impact on the ground water table. No significant impacts are anticipated on the water bodies around the project area. Details are discussed under Chapter No. 3 |
| 5  | The Proponent shall carry out Bio diversity study through reputed Institution and the same shall be included in EIA Report.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>Noted and agreed</b><br>Biodiversity study has been carried out by Functional Area Expert by the NABET accredited consultant.<br>The detailed study is given in the Chapter No.3                                                                          |
| 6  | The DFO letter stating that the proximity distance of Reserve Forests, Protected Areas, Sanctuaries, Tiger reserve etc., up to a radius of 25 km from the proposed site.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>Noted and agreed</b><br>DFO letter will be submitted along with the Final EIA/EMP report                                                                                                                                                                  |
| 7  | In the case of proposed lease in an existing (or old) quarry where the benches are not formed (or) partially formed as per the approved Mining Plan, the Project Proponent (PP) shall the PP shall carry out the scientific studies to assess the slope stability of the working benches to be constructed and existing quarry wall, by involving any one of the reputed Research and Academic Institutions CSIR-Central Institute of Mining & Fuel Research / Dhanbad, NIRM/Bangalore, Division of Geotechnical Engineering-IIT-Madras, NIT-Dept of Mining Engg, Surathkal, and Anna University Chennai-CEG Campus. 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. | <b>Noted and agreed</b><br>Proponent requested as will be carrying the slope stability Plan after commencement of quarrying operation and ensure that the reports will be submitted along with HYCR.                                                         |
| 8  | However, in case of the fresh/virgin quarries, the Proponent shall submit a conceptual 'Slope Stability Plan' for the proposed quarry during the appraisal while obtaining the EC, when the depth of the working is extended beyond 30 m below ground level.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>Noted and agreed</b><br>Proponent requested as will be carrying the slope stability Plan after commencement of quarrying operation and ensure that the reports will be submitted along with HYCR.                                                         |
| 9  | The PP shall furnish the affidavit stating that the blasting operation in the proposed quarry is carried out by the statutory competent person as per the MMR 1961 such as blaster, mining mate, mine foreman, II/I Class mines manager appointed by the proponent.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>Noted and agreed</b><br>Proponent given affidavit stating that the blasting will be carried out under the supervision of Competent person.                                                                                                                |
| 10 | The PP shall present a conceptual design for carrying out only controlled blasting operation involving line drilling and muffle blasting in the proposed quarry such that the blast-induced ground vibrations are controlled as well as no fly rock travel beyond 30 m from the blast site.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>Noted and agreed</b><br>PP will carry out controlled blasting by using of NONEL Detonators                                                                                                                                                                |
| 11 | The EIA Coordinators shall obtain and furnish the details of quarry/quarries operated by the proponent in the past, either in the same location or elsewhere in the State with video and photographic evidences                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>Noted and agreed.</b><br><br>There is no other quarry except this proposal operated by Proponent Tvl SKT Mines                                                                                                                                            |
| 12 | If the proponent has already carried out the mining activity in the proposed mining lease area after 15.01.2016, then the proponent shall furnish the following details from AD/DD, mines,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>Not Applicable</b><br>It is a Fresh Lease Application                                                                                                                                                                                                     |
| 13 | What was the period of the operation and stoppage of the earlier mines with last work permit issued by the AD/DD mines?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Not Applicable</b><br>It is a Fresh Lease Application                                                                                                                                                                                                     |
| 14 | Quantity of minerals mined out.<br>· Highest production achieved in any one year<br>· Detail of approved depth of mining.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>Not Applicable</b><br>It is a Fresh Lease Application                                                                                                                                                                                                     |

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|    | <ul style="list-style-type: none"> <li>· Actual depth of the mining achieved earlier.</li> <li>· Name of the person already mined in that leases area.</li> <li>· If EC and CTO already obtained, the copy of the same shall be submitted.</li> <li>· Whether the mining was carried out as per the approved mine plan (or EC if issued) with stipulated benches.</li> </ul>                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                              |
| 15 | All corner coordinates of the mine lease area, superimposed on a High-Resolution Imagery/Topo sheet, topographic sheet, geomorphology, lithology and geology of the mining lease area should be provided. Such an Imagery of the proposed area should clearly show the land use and other ecological features of the study area (core and buffer zone).                                                                                                                                                                                                                                                       | <b>Noted and agreed</b><br>Satellite imagery of the project area along with boundary coordinates is given in the Chapter No 2, Figure No.2.2, Page No.11.<br>Geomorphology of the area is given in Chapter No 2, Figure No.2.10, Page No.23<br>Land use pattern of the project area is tabulated in the Chapter No.2. Table no 2.4, Pg.No.18 |
| 16 | The PP shall carry out Drone video survey covering the cluster, green belt, fencing, etc.,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>Noted and agreed.</b><br>PP carried out the drone video survey and will be submitted during the appraisal while obtaining the EC.                                                                                                                                                                                                         |
| 17 | The proponent shall furnish photographs of adequate fencing, green belt along the periphery including replantation of existing trees & safety distance between the adjacent quarries & water bodies nearby provided as per the approved mining plan.                                                                                                                                                                                                                                                                                                                                                          | <b>Noted and agreed</b><br>The area has been fenced and plantation activities carried out within the project site.                                                                                                                                                                                                                           |
| 18 | The Project Proponent shall provide the details of mineral reserves and mineable reserves, planned production capacity, proposed working methodology with justifications, the anticipated impacts of the mining operations on the surrounding environment, and the remedial measures for the same.                                                                                                                                                                                                                                                                                                            | <b>Noted and agreed</b><br>The details of mineral reserves have been provided in Chapter No 1,<br>Mineable reserves – 7,95,070 m <sup>3</sup><br>Peak Production – 2,07,900 m <sup>3</sup><br>Proposed Depth – 72m bgl                                                                                                                       |
| 19 | The Project Proponent shall provide the Organization chart indicating the appointment of various statutory officials and other competent persons to be appointed as per the provisions of the Mines Act'1952 and the MMR, 1961 for carrying out the quarrying operations scientifically and systematically in order to ensure safety and to protect the environment.                                                                                                                                                                                                                                          | <b>Noted and agreed.</b><br>The PP provided Organization chart indicating the appointment of various statutory officials and other competent persons to be appointed as per the provisions of the Mines Act - 1952 and the MMR, 1961                                                                                                         |
| 20 | The Project Proponent shall conduct the hydro-geological study considering the contour map of the water table detailing the number of groundwater pumping & open wells, and surface water bodies such as rivers, tanks, canals, ponds, etc. within 1 km (radius) along with the collected water level data for both monsoon and non-monsoon seasons from the PWD / TWAD so as to assess the impacts on the wells due to mining activity. Based on actual monitored data, it may clearly be shown whether working will intersect groundwater. Necessary data and documentation in this regard may be provided. | <b>Noted and agreed</b><br>The hydro-geological study was conducted to evaluate the possible impact on the ground water table. No significant impacts are anticipated on the water bodies around the project area. Details are discussed under Chapter No. 3,                                                                                |
| 21 | The proponent shall furnish the baseline data for the environmental and ecological parameters with regard to surface water/ground water quality, air quality, soil quality & flora/fauna including traffic/vehicular movement study                                                                                                                                                                                                                                                                                                                                                                           | <b>Noted and agreed</b><br>Baseline Data were collected for One Season (Winter) Dec 2024 to Feb 2025 as per CPCB Notification and MoEF & CC Guidelines. Details in Chapter No. 3                                                                                                                                                             |
| 22 | The Proponent shall carry out the Cumulative impact study due to mining operations carried out in the quarry specifically with reference to the specific environment in terms of soil health, biodiversity, air pollution, water pollution, climate change and flood control & health                                                                                                                                                                                                                                                                                                                         | <b>Noted and agreed</b><br>The Cumulative impact study due to mining operations is explained in chapter - 7                                                                                                                                                                                                                                  |



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|    | impacts. Accordingly, the Environment Management plan should be prepared keeping the concerned quarry and the surrounding habitations in the mind.                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                           |
| 23 | Rain water harvesting management with recharging details along with water balance (both monsoon & non-monsoon) be submitted.                                                                                                                                                                                                                                                                                                                          | <b>Noted and agreed</b>                                                                                                                                                                                                                                                                                                                                                   |
| 24 | Land use of the study area delineating forest area, agricultural land, grazing land, wildlife sanctuary, national park, migratory routes of fauna, water bodies, human settlements and other ecological features should be indicated. Land use plan of the mine lease area should be prepared to encompass preoperational, operational and post operational phases and submitted. Impact, if any, of change of land use should be given.              | <b>Noted and agreed</b><br>Land use and land cover of the study area is discussed in Chapter No. 3.<br>Land use plan of the project area showing pre-operational, operational and post-operational phases are discussed in Chapter No. 2                                                                                                                                  |
| 25 | Details of the land for storage of Overburden/Waste Dumps (or) Rejects outside the mine lease, such as extent of land area, distance from mine lease, its land use, R&R issues, if any, should be provided.                                                                                                                                                                                                                                           | <b>Not applicable.</b><br>There is no OB/Waste Dumps has been proposed and the materials excavated from the mine will be utilized 100%                                                                                                                                                                                                                                    |
| 26 | 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.                                          | <b>Not Applicable.</b><br>Project area / Study area is not declared in 'Critically Polluted' Area and does not come under 'Aravalli Range.                                                                                                                                                                                                                                |
| 27 | Description of water conservation measures proposed to be adopted in the Project should be given. Details of rainwater harvesting proposed in the Project, if any, should be provided.                                                                                                                                                                                                                                                                | <b>Noted and agreed</b><br>Part of the working pit will be allowed to collect rain water during the spell of rain will be used for greenbelt development and dust suppression.<br><br>The Mine Closure Plan is prepared for converting the excavated pit into rain water harvesting structure and serve as water reservoir for the project village during draught season. |
| 28 | Impact on local transport infrastructure due to the Project should be indicated.                                                                                                                                                                                                                                                                                                                                                                      | <b>Noted and agreed</b><br>Transportation details mentioned in Chapter -2                                                                                                                                                                                                                                                                                                 |
| 29 | A tree survey study shall be carried out (nos., name of the species, age, diameter etc.,) both within the mining lease applied area & 300m buffer zone and its management during mining activity.                                                                                                                                                                                                                                                     | <b>Noted and agreed</b><br>Details of the trees in the buffer zone given in Chapter No.3&4                                                                                                                                                                                                                                                                                |
| 30 | A detailed mine closure plan for the proposed project shall be included in EIA/EMP report which should be site-specific                                                                                                                                                                                                                                                                                                                               | <b>Noted and agreed</b><br>After the completion of mining operation, the part of the quarried-out land will be utilized as temporary storage reservoir. The details are given in the Chapter No.4                                                                                                                                                                         |
| 31 | As a part of the study of flora and fauna around the vicinity of the proposed site, the EIA coordinator shall strive to educate the local students on the importance of preserving local flora and fauna by involving them in the study, wherever possible                                                                                                                                                                                            | <b>Noted and agreed</b><br>Details are given in the Chapter No.3                                                                                                                                                                                                                                                                                                          |
| 32 | The purpose of Green belt around the project is to capture the fugitive emissions, carbon sequestration and to attenuate the noise generated, in addition to improving the aesthetics. A wide range of indigenous plant species should be planted as given in the Appendix-I in consultation with the DFO, State Agriculture University. The plant species with dense/moderate canopy of native origin should be chosen. Species of small/medium/tall | <b>Noted and agreed</b><br>Noted & agreed. It is proposed to plant a 2400nos of trees in the 7.5m safety barrier and village roads.                                                                                                                                                                                                                                       |

|    |                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                |
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|    | trees alternating with shrubs should be planted in a mixed manner.                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                |
| 33 | 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 | <b>Noted and agreed</b><br>No trees within the project site. It is proposed to plant 2400Nos of Trees in the safety barrier and Village roads.                                 |
| 34 | A Disaster Management Plan shall be prepared and included in the EIA/EMP Report for the complete life of the proposed quarry (or) till the end of the lease period                                                                                                                                                                                                                                                  | <b>Noted and agreed</b><br>Disaster management Plan details in Chapter-7                                                                                                       |
| 35 | A Risk Assessment and management Plan shall be prepared and included in the EIA/EMP Report for the complete life of the proposed quarry (or) till the end of the lease period                                                                                                                                                                                                                                       | <b>Noted and agreed</b><br>A Risk Assessment and management Plan Chapter- 7                                                                                                    |
| 36 | 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.                          | <b>Noted and agreed</b><br>After the lease execution PP will carry out the medical Examination in the Form O under Mine Rules 1955 and reports will be submitted in First HYCR |
| 37 | Public health implications of the Project and related activities for the population in the impact zone should be systematically evaluated and the proposed remedial measures should be detailed along with budgetary allocations.                                                                                                                                                                                   | <b>Noted and agreed</b><br>No Public Health Implications anticipated due to this project.<br>Details of CER are discussed under Chapter 8                                      |
| 38 | The Socio-economic studies should be carried out within a 5 km buffer zone from the mining activity. Measures of socio-economic significance and influence to the local community proposed to be provided by the Project Proponent should be indicated. As far as possible, quantitative dimensions may be given with time frames for implementation.                                                               | <b>Noted and agreed</b><br>The Socio Economic studies has been carried out around the buffer zone and it has been detailed in the chapter - 3                                  |
| 39 | Details of litigation pending against the project, if any, with direction /order passed by any Court of Law against the Project should be given.                                                                                                                                                                                                                                                                    | <b>Noted and agreed</b><br>No, Litigation against this project                                                                                                                 |
| 40 | Benefits of the Project if the Project is implemented should be spelt out. The benefits of the Project shall clearly indicate environmental, social, economic, employment potential, etc.                                                                                                                                                                                                                           | <b>Noted and agreed</b><br>Chapter-8 discussed about benefits of projects.                                                                                                     |
| 41 | If any quarrying operations were carried out in the proposed quarrying site for which now the EC is sought, the Project Proponent shall furnish the detailed compliance to EC conditions given in the previous EC with the site photographs which shall duly be certified by MoEF&CC, Regional Office, Chennai (or) the concerned DEE/TNPCCB.                                                                       | <b>Not Applicable</b><br>It is a Fresh Lease                                                                                                                                   |
| 42 | The PP shall prepare the EMP for the entire life of mine and also furnish the sworn affidavit stating to abide the EMP for the entire life of mine.                                                                                                                                                                                                                                                                 | <b>Noted and agreed</b><br>The EMP prepared for the life of the mine and discussed in chapter 10. And affidavit will be submitted during the time of Appraisal                 |
| 43 | Concealing any factual information or submission of false/fabricated data and failure to comply with any of the conditions mentioned above may result in withdrawal of this Terms of Conditions besides attracting penal provisions in the Environment (Protection) Act, 1986.                                                                                                                                      | Noted & agreed.                                                                                                                                                                |

| SEIAA STANDARD CONDITIONS       |                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                           |
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| 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.                                                                                                                                                                      | <b>Noted and agreed</b><br>The Cluster management committee has been formed covering the existing and proposed quarries in the cluster                                                                                                                                                    |
| 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.,                                                                                                                                                | <b>Noted and agreed</b><br>The information will be shared to the cluster management committee during the monthly meeting.                                                                                                                                                                 |
| 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.                                                                                                                                                            | <b>Noted and agreed</b><br>The list of members of the committee formed will be submitted to AD/Mines before resuming the mining operation.                                                                                                                                                |
| 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.                                                                                              | <b>Noted and agreed</b><br>It is an Fresh quarry the blasting will be carried out by appointing the competent persons approved by DGMS and the blasting pattern and the Frequency of the blasting will be monitored after the lease execution and it will be submitted in the First HYCR. |
| 5                               | The committee shall deliberate on risk & emergency management plan, fire safety & evacuation plan and sustainable development goals pertaining to the cluster in a holistic manner especially during natural calamities like intense rain and the mitigation measures considering the inundation of the cluster and evacuation plan. | <b>Noted and agreed</b><br>The risk management plan and disaster management plan has been prepared and enclosed in this EIA report, Chapter No. 7.                                                                                                                                        |
| 6                               | The Cluster Management Committee shall form Environmental Policy to practice sustainable mining in a scientific and systematic manner in accordance with the law. The role played by the committee in implementing the environmental policy devised shall be given in detail in the EIA Report.                                      | <b>Noted and agreed</b><br>Environmental policy of the cluster management committee is detailed in the EIA Report Chapter No. 6                                                                                                                                                           |
| 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.                                                                                                                                                                     | <b>Noted and agreed</b><br>The Restoration strategy is discussed in the progressive mine closure plan and enclosed in the Scheme of Mining plan.                                                                                                                                          |
| 8                               | The committee shall deliberate on the health of the workers/staff involved in the mining as well as the health of the public in the vicinity.                                                                                                                                                                                        | <b>Noted and agreed</b><br>The information on the health of the workers and the local people will be updated periodically along with medical examination.                                                                                                                                 |
| Agriculture & Agro-Biodiversity |                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                           |
| 9                               | Impact on surrounding agricultural fields around the proposed mining Area.                                                                                                                                                                                                                                                           | <b>Noted and agreed</b><br>Detailed discussed in chapter 4.                                                                                                                                                                                                                               |
| 10                              | Impact on soil flora & vegetation around the project site.                                                                                                                                                                                                                                                                           | Detailed discussed in chapter 4.                                                                                                                                                                                                                                                          |
| 11                              | Details of type of vegetation including no. of trees & shrubs within the proposed mining area and. If so, transplantation of such vegetation all along the boundary of the proposed mining area shall committed mentioned in EMP.                                                                                                    | <b>Noted and agreed</b><br>The area is proposed Lease & Few trees present with in lease.                                                                                                                                                                                                  |
| 12                              | The Environmental Impact Assessment should study the agro-biodiversity, agro-forestry, horticultural plantations, the natural ecosystem, the soil micro flora, fauna and soil seed banks and suggest measures to maintain the natural Ecosystem.                                                                                     | Details in Chapter 3                                                                                                                                                                                                                                                                      |
| 13                              | Action should specifically suggest for sustainable management of the area and restoration of ecosystem for flow of goods and services.                                                                                                                                                                                               | Noted & agreed                                                                                                                                                                                                                                                                            |
| 14                              | The project proponent shall study and furnish the impact of project on plantations in adjoining patta lands, Horticulture, Agriculture and livestock                                                                                                                                                                                 | <b>Noted and agreed</b><br>The project area is dry barren land no agriculture activities carried out. This is a proposed lease area.                                                                                                                                                      |

| <b>Forests</b>           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                       |
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| 15                       | The project proponent shall detailed study on impact of mining on Reserve forests and free ranging wildlife                                                                                                                                                                                                                                                                                                                                                                                                       | <b>Noted and agreed.</b><br>Nearest Reserve Forest is Thandappanthangal-R.F-6.5km-NW                                                                                                  |
| 16                       | The Environmental Impact Assessment should study impact on forest, vegetation, endemic, vulnerable and endangered indigenous flora and fauna.                                                                                                                                                                                                                                                                                                                                                                     | <b>Noted and agreed</b><br>The area is surrounded by Barren land. Details of flora and fauna studies given in the Chapter No.3.                                                       |
| 17                       | The Environmental Impact Assessment should study impact on standing trees and the existing trees should be numbered and action suggested for protection                                                                                                                                                                                                                                                                                                                                                           | No major trees within the project area.                                                                                                                                               |
| 18                       | The Environmental Impact Assessment should study impact on protected areas, Reserve Forests, National Parks, Corridors and Wildlife pathways, near project site                                                                                                                                                                                                                                                                                                                                                   | <b>Noted &amp; agreed.</b><br>Karikili Birds Sanctuary – 32 Km –Northeast<br>Vedanthangal Birds Sanctuary – 36.5 Km East                                                              |
| <b>Water Environment</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                       |
| 19                       | Hydro-geological study considering the contour map of the water table detailing the number of ground water pumping & open wells, and surface water bodies such as rivers, tanks, canals, ponds etc. within 1 km (radius) so as to assess the impacts on the nearby waterbodies due to mining activity. Based on actual monitored data, it may clearly be shown whether working will intersect groundwater. Necessary data and documentation in this regard may be provided, covering the entire mine lease period | <b>Noted and agreed</b><br>There are 7 open wells and 7 bore wells within the radius of 1km from the project area, Hydrogeological study has been conducted by the resistivity method |
| 20                       | Erosion Control measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Noted & agreed                                                                                                                                                                        |
| 21                       | Detailed study shall be carried out in regard to impact of mining around the proposed mine lease area on the nearby Villages, Water-bodies/ Rivers, & any ecological fragile areas.                                                                                                                                                                                                                                                                                                                               | Details in Chapter 2                                                                                                                                                                  |
| 22                       | The project proponent shall study impact on fish habitats and the food WEB/ food chain in the water body and Reservoir                                                                                                                                                                                                                                                                                                                                                                                            | Details in Chapter 2 and 4 impact of bio diversity                                                                                                                                    |
| 23                       | The project proponent shall study and furnish the details on potential fragmentation impact on natural environment, by the activities.                                                                                                                                                                                                                                                                                                                                                                            | Noted & agreed                                                                                                                                                                        |
| 24                       | The project proponent shall study and furnish the impact on aquatic plants and animals in water bodies and possible scars on the landscape, damages to nearby caves, heritage site, and archaeological sites possible land form changes visual and aesthetic impacts.                                                                                                                                                                                                                                             | Noted & agreed.<br>Detailed under Chapter 3.                                                                                                                                          |
| 25                       | The Terms of Reference should specifically study impact on soil health, soil erosion, the soil physical, chemical components and microbial components                                                                                                                                                                                                                                                                                                                                                             | Details in Chapter 3 Soil environment.                                                                                                                                                |
| 26                       | The Environmental Impact Assessment should study on wetlands, water bodies, rivers streams, lakes and farmer sites                                                                                                                                                                                                                                                                                                                                                                                                | Details in Chapter 3 Water environment.                                                                                                                                               |
| 27                       | The EIA shall include the impact of mining activity on the following:<br>a) Hydrothermal/Geothermal effect due to destruction in the Environment.<br>b) Bio-geochemical processes and its foot prints including environmental stress.<br>c) Sediment geochemistry in the surface streams.                                                                                                                                                                                                                         | <b>Noted and agreed</b><br>There are 7 open wells and 7 bore wells within the radius of 1km from the project area, Hydrogeological study has been conducted by the resistivity method |
| <b>Energy</b>            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                       |
| 28                       | The measures taken to control Noise, Air, Water, Dust Control and steps adopted to efficiently utilise the Energy shall be furnished.                                                                                                                                                                                                                                                                                                                                                                             | <b>Noted and agreed</b><br>Details in Chapter 3 environmental monitoring details.                                                                                                     |
| <b>Climate Change</b>    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                       |
| 29                       | The Environmental Impact Assessment shall study in detail the carbon emission and also suggest the                                                                                                                                                                                                                                                                                                                                                                                                                | <b>Noted and agreed</b>                                                                                                                                                               |

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|                                 | measures to mitigate carbon emission including development of carbon sinks and temperature reduction including control of other emission and climate mitigation activities                                                                                                                                                                                                              | Details of carbon emission and mitigation activities are given in the Chapter No.4                                    |
| 30                              | The Environmental Impact Assessment should study impact on climate change, temperature rise, pollution and above soil & below soil carbon stock, soil health and physical, chemical & biological soil features                                                                                                                                                                          | <b>Noted and agreed</b><br>Details in Chapter-3 for meteorological and climate/weather data representation of graphs. |
| 31                              | Impact of mining on pollution leading to GHGs emissions and the impact of the same on the local livelihood.                                                                                                                                                                                                                                                                             | <b>Noted and agreed</b><br>Details of GHGs emissions and mitigation activities are given in the Chapter No.4          |
| <b>Mine Closure Plan</b>        |                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                       |
| 32                              | Detailed Mine Closure Plan covering the entire mine lease period as per precise area communication order issued.                                                                                                                                                                                                                                                                        | Details in Chapter 2 mine closure plan                                                                                |
| <b>EMP</b>                      |                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                       |
| 33                              | Detailed Environment Management Plan along with adaptation, mitigation & remedial strategies covering the entire mine lease period as per precise area communication order issued and the scope for achieving SDGs                                                                                                                                                                      | Detailed under Chapter 10                                                                                             |
| 34                              | The Environmental Impact Assessment should hold detailed study on EMP with budget for Green belt development and mine closure plan including disaster management plan.                                                                                                                                                                                                                  | Details in Green belt development in chapter 4                                                                        |
| <b>Risk Assessment</b>          |                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                       |
| 35                              | To furnish risk assessment and management plan including anticipated vulnerabilities during operational and post operational phases of Mining.                                                                                                                                                                                                                                          | Detailed under Chapter 7                                                                                              |
| <b>Disaster Management Plan</b> |                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                       |
| 36                              | To furnish disaster management plan and disaster mitigation measures in regard to all aspects to avoid/reduce vulnerability to hazards & to cope with disaster/untoward accidents in & around the proposed mine lease area due to the proposed method of mining activity & its related activities covering the entire mine lease period as per precise area communication order issued. | Details in Study 7.3 Disaster Management Plan in Chapter -7                                                           |
| <b>Others</b>                   |                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                       |
| 37                              | The project proponent shall furnish VAO certificate with reference to 300m radius regard to approved habitations, schools, Archaeological sites, Structures, railway lines, roads, water bodies such as streams, odai, vaari, canal, channel, river, lake pond, tank etc.                                                                                                               | Noted & agreed.<br>Detailed under Chapter 4                                                                           |
| 38                              | As per the MoEF& CC office memorandum F.No.22-65/2017-IA.III dated: 30.09.2020 and 20.10.2020 the proponent shall address the concerns raised during the public consultation and all the activities proposed shall be part of the Environment Management Plan.                                                                                                                          | Noted and agreed                                                                                                      |
| 39                              | The project proponent shall study and furnish the possible pollution due to plastic and 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                                                                    | Details of carbon emission and mitigation activities are given in the Chapter No.4                                    |

| STANDARD TERMS OF REFERENCE |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
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| 1                           | Year-wise production details since 1994 should be given, clearly stating the highest production achieved in any one year prior to 1994. It may also be categorically informed whether there had been any increase in production after the EIA Notification 1994 came into force, w.r.t. the highest production achieved prior to 1994.                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>Not applicable.</b><br>This is not a violation category project.<br>This proposal falls under B1 Category                                                                                                                                                                                                                                                                                                                                                                   |
| 2                           | A copy of the document in support of the fact that the Proponent is the rightful lessee of the mine should be given.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | The applied land for quarrying is a Patta Land. Document is enclosed along with Approved Mining Plan as Annexure Volume 1.                                                                                                                                                                                                                                                                                                                                                     |
| 3                           | All documents including approved mine plan, EIA and Public Hearing should be compatible with one another in terms of the mine lease area, production levels, waste generation and its management, mining technology etc. and should be in the name of the lessee.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>Noted &amp; agreed.</b><br>All the Respective documents has been attached as Annexure and it has been submitted to TNPCB Tiruvannamalai                                                                                                                                                                                                                                                                                                                                     |
| 4                           | All corner coordinates of the mine lease area, superimposed on a High-Resolution Imagery/ toposheet, topographic sheet, geomorphology and geology of the area should be provided. Such an Imagery of the proposed area should clearly show the land use and other ecological features of the study area (core and buffer zone).                                                                                                                                                                                                                                                                                                                                                                                                                        | Map showing – Project area is with adjacent quarries details is enclosed in Figure No1.1<br>Project area boundary coordinates superimposed on Toposheet – Figure No. 1.1A<br>Toposheet of the project area covering 10km radius – Figure No. 1.2<br>Geology map of the project area covering 10km radius - Figure No. 2.11                                                                                                                                                     |
| 5                           | Information should be provided in Survey of India Toposheet in 1:50,000 scale indicating geological map of the area, geomorphology of land forms of the area, existing minerals and mining history of the area, important water bodies, streams and rivers and soil characteristics.                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>Map showing –</b><br>Geology map of the project area covering 10km radius - Figure No. 2.11<br>Geomorphological features are incorporated in the Toposheet map covering 10km radius around the project area Figure No. 2.12                                                                                                                                                                                                                                                 |
| 6                           | Details about the land proposed for mining activities should be given with information as to whether mining conforms to the land use policy of the State; land diversion for mining should have approval from State land use board or the concerned authority.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>Noted and Agreed</b><br>The applied area was inspected by the officers of Department of Geology along with revenue officials and found that the land is fit for quarrying under the policy of State Government.                                                                                                                                                                                                                                                             |
| 7                           | It should be clearly stated whether the proponent Company has a well laid down Environment Policy approved by its Board of Directors? If so, it may be spelt out in the EIA Report with description of the prescribed operating process/procedures to bring into focus any infringement/deviation/ violation of the environmental or forest norms/conditions? The hierarchical system or administrative order of the Company to deal with the environmental issues and for ensuring compliance with the EC conditions may also be given. The system of reporting of non-compliances / violations of environmental norms to the Board of Directors of the Company and/or shareholders or stakeholders at large, may also be detailed in the EIA Report. | The proponent has framed their Environmental Policy and the same is discussed in the Chapter No 10.1.                                                                                                                                                                                                                                                                                                                                                                          |
| 8                           | Issues relating to Mine Safety, including subsidence study in case of underground mining and slope study in case of open cast mining, blasting study etc. should be detailed. The proposed safeguard measures in each case should also be provided.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | It is an opencast quarrying operation proposed to operate in Mechanized method. The rough stone formation is a hard, compact and homogeneous body.<br>The height and width of the bench will be maintained as 5m with 90° bench angles.<br>Quarrying activities will be carried out under the supervision of Competent Persons like Mines Manager, Mines Foreman and Mining Mate.<br>Necessary permissions will be obtained from DGMS after obtaining Environmental Clearance. |
| 9                           | The study area will comprise of 10 km zone around the mine lease from lease periphery and the data contained in the EIA such as waste generation etc., should be for the life of the mine / lease period.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>Noted &amp; agreed.</b><br>The study area considered for this study is 10 km radius and all data contained in the EIA report such                                                                                                                                                                                                                                                                                                                                           |

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|    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | as waste generation etc., is for the Life of the Mine / lease period.                                                                                                                                                                                                                                                                                                                                                                            |
| 10 | Land use of the study area delineating forest area, agricultural land, grazing land, wildlife sanctuary, national park, migratory routes of fauna, water bodies, human settlements and other ecological features should be indicated. Land use plan of the mine lease area should be prepared to encompass preoperational, operational and post operational phases and submitted. Impact, if any, of change of land use should be given.                                                                                                                                                                                          | Land use and land cover of the study area is discussed in Chapter No. 3.<br>Land use plan of the project area showing pre-operational, operational and post-operational phases are discussed in Chapter No. 2, Table No 2.3                                                                                                                                                                                                                      |
| 11 | Details of the land for any Over Burden Dumps outside the mine lease, such as extent of land area, distance from mine lease, its land use, R&R issues, if any, should be given                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>Not Applicable.</b><br>There is no waste anticipated during this quarry operation. The entire quarried out rough stone will be transported to the needy customers.<br>No Dumps is proposed outside the lease area.                                                                                                                                                                                                                            |
| 12 | A Certificate from the Competent Authority in the State Forest Department should be provided, confirming the involvement of forest land, if any, in the project area. In the event of any contrary claim by the Project Proponent regarding the status of forests, the site may be inspected by the State Forest Department along with the Regional Office of the Ministry to ascertain the status of forests, based on which, the Certificate in this regard as mentioned above be issued. In all such cases, it would be desirable for representative of the State Forest Department to assist the Expert Appraisal Committees. | <b>Not Applicable.</b><br>There is no Forest Land involved in the proposed project area.<br>The proposed project area is a Patta land.<br>Approved Mining Plan is enclosed as Annexure Volume 1.                                                                                                                                                                                                                                                 |
| 13 | Status of forestry clearance for the broken up area and virgin forestland involved in the Project including deposition of net present value (NPV) and compensatory afforestation (CA) should be indicated. A copy of the forestry clearance should also be furnished.                                                                                                                                                                                                                                                                                                                                                             | <b>Not Applicable.</b><br>The proposed project area does not involve any Forest Land.                                                                                                                                                                                                                                                                                                                                                            |
| 14 | Implementation status of recognition of forest rights under the Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 should be indicated.                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>Not Applicable.</b><br>The project doesn't attract Recognition of Forest Rights Act, 2006.                                                                                                                                                                                                                                                                                                                                                    |
| 15 | The vegetation in the RF / PF areas in the study area, with necessary details, should be given.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | No Reserve Forest within the Study Area.                                                                                                                                                                                                                                                                                                                                                                                                         |
| 16 | A study shall be got done to ascertain the impact of the Mining Project on wildlife of the study area and details furnished. Impact of the project on the wildlife in the surrounding and any other protected area and accordingly, detailed mitigative measures required, should be worked out with cost implications and submitted.                                                                                                                                                                                                                                                                                             | <b>Not Applicable.</b><br>There are No National Parks, Biosphere Reserves, Wildlife Corridors, and Tiger/Elephant Reserves within 10 km Radius from the periphery of the project area.                                                                                                                                                                                                                                                           |
| 17 | Location of National Parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, Ramsar site Tiger/ Elephant Reserves/(existing as well as proposed), if any, within 10 KM of the mine lease should be clearly indicated, supported by a location map duly authenticated by Chief Wildlife Warden. Necessary clearance, as may be applicable to such projects due to proximity of the ecologically sensitive areas as mentioned above, should be obtained from the Standing Committee of National Board of Wildlife and copy furnished                                                                                            | <b>Not Applicable.</b><br>There are no National Parks, Biosphere Reserves, Wildlife Corridors, and Tiger/Elephant Reserves within 10 km Radius from the periphery of the project area.                                                                                                                                                                                                                                                           |
| 18 | A detailed biological study of the study area [core zone and buffer zone (10 KM radius of the periphery of the mine lease)] shall be carried out. Details of flora and fauna, endangered, endemic and RET Species duly authenticated, separately for core and buffer zone should be furnished based on such primary field survey, clearly indicating the Schedule of the fauna present. In case of any scheduled-I fauna found in the study area, the necessary plan along with budgetary provisions for their                                                                                                                    | Detailed biological study of the study area [core zone and buffer zone (10 km radius of the periphery of the mine lease)] was carried out and discussed under Chapter No. 3.<br>There is no schedule I species of animals observed within study area as per Wildlife Protection Act 1972 as well as no species is in vulnerable, endangered or threatened category as per IUCN. There is no endangered red list species found in the study area. |

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|    | conservation should be prepared in consultation with State Forest and Wildlife Department and details furnished. Necessary allocation of funds for implementing the same should be made as part of the project cost.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                        |
| 19 | Proximity to Areas declared as 'Critically Polluted' or the Project areas likely to come under the 'Aravalli Range', (attracting court restrictions for mining operations), should also be indicated and where so required, clearance certifications from the prescribed Authorities, such as the SPCB or State Mining Department should be secured and furnished to the effect that the proposed mining activities could be considered.                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>Not Applicable.</b><br>Project area / Study area is not declared in 'Critically Polluted' Area and does not come under 'Aravalli Range'.                                                                                            |
| 20 | Similarly, for coastal Projects, A CRZ map duly authenticated by one of the authorized agencies demarcating LTL, HTL, CRZ area, location of the mine lease w.r.t CRZ, coastal features such as mangroves, if any, should be furnished. (Note: The Mining Projects falling under CRZ would also need to obtain approval of the concerned Coastal Zone Management Authority).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>Not Applicable.</b><br>The project doesn't attract The C. R. Z. Notification, 2018.                                                                                                                                                 |
| 21 | R&R Plan/compensation details for the Project Affected People (PAP) should be furnished. While preparing the R&R Plan, the relevant State/National Rehabilitation & Resettlement Policy should be kept in view. In respect of SCs /STs and other weaker sections of the society in the study area, a need-based sample survey, family-wise, should be undertaken to assess their requirements, and action programmes prepared and submitted accordingly, integrating the sectoral programmes of line departments of the State Government. It may be clearly brought out whether the village(s) located in the mine lease area will be shifted or not. The issues relating to shifting of village(s) including their R&R and socio-economic aspects should be discussed in the Report.                                                                            | <b>Not Applicable.</b><br>There are no approved habitations within a radius of 300 meters.<br>Therefore, R&R Plan / Compensation details for the Project Affected People (PAP) is not anticipated and Not Applicable for this project. |
| 22 | One season (non-monsoon) [i.e. March-May (Summer Season); October-December (post monsoon season); December-February (winter season)] primary baseline data on ambient air quality as per CPCB Notification of 2009, water quality, noise level, soil and flora and fauna shall be collected and the AAQ and other data so compiled presented date-wise in the EIA and EMP Report. Site-specific meteorological data should also be collected. The location of the monitoring stations should be such as to represent whole of the study area and justified keeping in view the pre-dominant downwind direction and location of sensitive receptors. There should be at least one monitoring station within 500 m of the mine lease in the pre-dominant downwind direction. The mineralogical composition of PM10, particularly for free silica, should be given. | Baseline Data were collected for winter Season Dec 2024 to Feb 2025 as per CPCB Notification and MoEF & CC Guidelines.<br>Details in Chapter No. 3.                                                                                    |
| 23 | Air quality modelling should be carried out for prediction of impact of the project on the air quality of the area. It should also take into account the impact of movement of vehicles for transportation of mineral. The details of the model used and input parameters used for modelling should be provided. The air quality contours may be shown on a location map clearly indicating the location of the site, location of sensitive receptors, if any, and the habitation. The wind roses showing pre-dominant wind direction may also be indicated on the map.                                                                                                                                                                                                                                                                                          | Air Quality Modelling for prediction of incremental GLC's of pollutant was carried out using AERMOD Model. Details in Chapter No. 4,                                                                                                   |
| 24 | The water requirement for the Project, its availability and source should be furnished. A detailed water balance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Total Water Requirement for this project is given in the chapter No 2, Table No 2.13.                                                                                                                                                  |



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|    | should also be provided. Fresh water requirement for the Project should be indicated.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                         |
| 25 | Necessary clearance from the Competent Authority for drawl of requisite quantity of water for the Project should be provided.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Water for dust suppression, greenbelt development and domestic use will be obtained from accumulated rainwater/seepage water in mine pits. Drinking water will be sourced from the approved water vendors, No 2, Table No 2.13.                                         |
| 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.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | The rain water collected in the pits after spell of rain will be used for greenbelt development and dust suppression.                                                                                                                                                   |
| 27 | Impact of the Project on the water quality, both surface and groundwater, should be assessed and necessary safeguard measures, if any required, should be provided.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Impact Studies and Mitigation Measures of Water Quality discussed in Chapter No. 4.                                                                                                                                                                                     |
| 28 | Based on actual monitored data, it may clearly be shown whether working will intersect groundwater. Necessary data and documentation in this regard may be provided. In case the working will intersect groundwater table, a detailed Hydro Geological Study should be undertaken and Report furnished. The Report inter-alia, shall include details of the aquifers present and impact of mining activities on these aquifers. Necessary permission from Central Ground Water Authority for working below ground water and for pumping of ground water should also be obtained and copy furnished.                                                                                                                                                       | <p>The ground water table is at 59-63m below ground level.</p> <p>The ultimate depth of this projects is 49m from the general ground profile.</p>                                                                                                                       |
| 29 | Details of any stream, seasonal or otherwise, passing through the lease area and modification / diversion proposed, if any, and the impact of the same on the hydrology should be brought out.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <p>Highest elevation of the project area is 116m AMSL</p> <p>Ultimate depth of the mine is 72m Bgl</p> <p>Water level in the area is 78 - 82 m BGL</p>                                                                                                                  |
| 30 | Information on site elevation, working depth, groundwater table etc. Should be provided both in AMSL and BGL. A schematic diagram may also be provided for the same.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Progressive greenbelt development plan has been prepared and discussed along with Recommended Species details are given in the Chapter 4, Table No.4.9                                                                                                                  |
| 31 | A time bound Progressive Greenbelt Development Plan shall be prepared in a tabular form (indicating the linear and quantitative coverage, plant species and time frame) and submitted, keeping in mind, the same will have to be executed up front on commencement of the Project. Phase-wise plan of plantation and compensatory afforestation should be charted clearly indicating the area to be covered under plantation and the species to be planted. The details of plantation already done should be given. The plant species selected for green belt should have greater ecological value and should be of good utility value to the local population with emphasis on local and native species and the species which are tolerant to pollution. | Traffic density survey was carried out to analyse the impact of Transportation in the study area as per IRC guidelines 1961 and it is inferred that there is no much significant impact due to the proposed transportation from the project area. Details in Chapter 2. |
| 32 | Impact on local transport infrastructure due to the Project should be indicated. Projected increase in truck traffic as a result of the Project in the present road network (including those outside the Project area) should be worked out, indicating whether it is capable of handling the incremental load. Arrangement for improving the infrastructure, if contemplated (including action to be taken by other agencies such as State Government) should be covered. Project Proponent shall conduct Impact of Transportation study as per Indian Road Congress Guidelines.                                                                                                                                                                         | Infrastructure & other facilities will be provided to the Mine Workers after the grant of quarry lease and the same has been discussed in the Chapter No.2. .                                                                                                           |
| 33 | Details of the onsite shelter and facilities to be provided to the mine workers should be included in the EIA Report.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Discussed in chapter No 2.                                                                                                                                                                                                                                              |
| 34 | Conceptual post mining land use and Reclamation and Restoration of mined out areas (with plans and with                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Details in Chapter 10.                                                                                                                                                                                                                                                  |

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|    | adequate number of sections) should be given in the EIA report.                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                          |
| 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. | Details in Chapter 10.                                                                                                                                   |
| 36 | Public health implications of the Project and related activities for the population in the impact zone should be systematically evaluated and the proposed remedial measures should be detailed along with budgetary allocations.                                                                                                                                                          | Details in Chapter 4,                                                                                                                                    |
| 37 | Measures of socio-economic significance and influence to the local community proposed to be provided by the Project Proponent should be indicated. As far as possible, quantitative dimensions may be given with time frames for implementation.                                                                                                                                           | Environment Management Plan Chapter 10.                                                                                                                  |
| 38 | Detailed environmental management plan (EMP) to mitigate the environmental impacts which, should inter-alia include the impacts of change of land use, loss of agricultural and grazing land, if any, occupational health impacts besides other impacts specific to the proposed Project.                                                                                                  | The outcome of public hearing will be updated in the final EIA/EMP report                                                                                |
| 39 | Public Hearing points raised and commitment of the Project Proponent on the same along with time bound Action Plan with budgetary provisions to implement the same should be provided and also incorporated in the final EIA/EMP Report of the Project.                                                                                                                                    | No litigation is pending in any court against this project.                                                                                              |
| 40 | Details of litigation pending against the project, if any, with direction /order passed by any Court of Law against the Project should be given.                                                                                                                                                                                                                                           | The proposed capital cost for Environmental Monitoring Programme is Rs 3,80,000/- and the recurring cost is Rs 76,000/- per annum. Details in Chapter 6. |
| 41 | The cost of the Project (capital cost and recurring cost) as well as the cost towards implementation of EMP should be clearly spelt out.                                                                                                                                                                                                                                                   | Details in Chapter 10.                                                                                                                                   |
| 42 | A Disaster management Plan shall be prepared and included in the EIA/EMP Report.                                                                                                                                                                                                                                                                                                           | Details in Chapter 7.                                                                                                                                    |
| 43 | Benefits of the Project if the Project is implemented should be spelt out. The benefits of the Project shall clearly indicate environmental, social, economic, employment potential, etc.                                                                                                                                                                                                  | Details in Chapter.8.                                                                                                                                    |
| 44 | <b>Besides the above, the below mentioned general points are also to be followed: -</b>                                                                                                                                                                                                                                                                                                    |                                                                                                                                                          |
| A  | Executive Summary of the EIA/EMP Report                                                                                                                                                                                                                                                                                                                                                    | Encloses as separate volume                                                                                                                              |
| B  | All documents to be properly referenced with index and continuous page numbering.                                                                                                                                                                                                                                                                                                          | All the documents are properly referenced with index and continuous page numbering.                                                                      |
| C  | Where data are presented in the Report especially in Tables, the period in which the data were collected and the sources should be indicated.                                                                                                                                                                                                                                              | List of Tables and source of the data collected are given properly.                                                                                      |
| D  | Project Proponent shall enclose all the analysis/testing reports of water, air, soil, noise etc. using the MoEF & CC / NABL accredited laboratories. All the original analysis/testing reports should be available during appraisal of the Project                                                                                                                                         | Baseline monitoring reports are enclosed with mining plan                                                                                                |
| E  | Where the documents provided are in a language other than English, an English translation should be provided.                                                                                                                                                                                                                                                                              | Not Applicable.                                                                                                                                          |
| F  | The Questionnaire for environmental appraisal of mining projects as devised earlier by the Ministry shall also be filled and submitted.                                                                                                                                                                                                                                                    | Will be enclosed along with Final EIA /EMP Report.                                                                                                       |

|   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                       |
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| G | While preparing the EIA report, the instructions for the Proponents and instructions for the Consultants issued by MoEF & CC vide O.M. No. J-11013/41/2006-IA. II(I) Dated: 4th August, 2009, which are available on the website of this Ministry, should be followed.                                                                                                                                                                                                                  | Instructions issued by MoEF & CC O.M. No. J-11013/41/2006-IA. II (I) Dated: 4th August, 2009 are followed.                            |
| H | Changes, if any made in the basic scope and project parameters (as submitted in Form-I and the PFR for securing the TOR) should be brought to the attention of MoEF & CC with reasons for such changes and permission should be sought, as the TOR may also have to be altered. Post Public Hearing changes in structure and content of the draft EIA/EMP (other than modifications arising out of the P.H. process) will entail conducting the PH again with the revised documentation | Noted & agreed.                                                                                                                       |
| I | As per the circular no. J-11011/618/2010-IA. II(I) Dated: 30.5.2012, certified report of the status of compliance of the conditions stipulated in the environment clearance for the existing operations of the project, should be obtained from the Regional Office of Ministry of Environment, Forest and Climate Change, as may be applicable.                                                                                                                                        | Not applicable.                                                                                                                       |
| J | The EIA report should also include (i) surface plan of the area indicating contours of main topographic features, drainage and mining area, (ii) geological maps and sections and (iii) sections of the mine pit and external dumps, if any, clearly showing the land features of the adjoining area.                                                                                                                                                                                   | Surface Plan – Figure No. 2.2.<br>Geological Plan – Figure No 2.9.<br>Working Plan – Figure No 2.9.<br>Closure Plan – Figure No.2.10. |

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## 1.INTRODUCTION

### 1.0 PREAMBLE

#### Project History: -

The project proponent Tvl. SKT Mines applied for Rough Stone and Gravel Quarry over an extent of 4.85.5 Ha in S.F.No 44/13A, 56/1A, 56/2A, 56/2B, 56/3, 56/4, 56/5, 56/6, 56/7, 57/1, 58/9, 58/10, 61/4B1, 61/4B2, 61/5B, 61/7, 62, 63/1 & 63/2, Kaganam Village, Vembakkam Taluk, Tiruvannamalai District.

- Proponent applied for Rough stone and Gravel quarry lease on 24.09.2024
- Precise area communication letter was issued by the District Collector vide RC. No. 299/Kanimam/2024 Dated 08.11.2024
- The Mining plan has been prepared by the Qualified person and got approval vide Letter RC. No. 299/kanimam/2024 Dated 03.12.2024
- The Mining plan has been approved for the quantity of 7,95,070 m<sup>3</sup> of Rough stone 77,256 m<sup>3</sup> Gravel up to the depth of 72m (2m Gravel + 70m Rough Stone) for the period of five years.

As per the EIA Notification, 2006 and subsequent amendments and OM The proposal falls in the B1 Category (Cluster quarries - 1 proposal and 1 Existing quarries forming Cluster Category {Total Extent of the Cluster is 17.09.5 Ha}- Cluster area calculated as per MoEF & CC Notification S.O. 2269(E) Dated 1<sup>st</sup> July 2016).

- Proponent applied for ToR for Environmental Clearance vide online Proposal No. SIA/TN/MIN/515016/2024. dated: 17.12.2024 and obtained Terms of Reference File no.11671 Tor Identification No: TO24B0108TN5824280N Dated 01.03.2025

Based on the ToR Baseline Monitoring study has been carried out for one season ie (**Winter Season**), **December 2024 to February 2025** and this EIA/EMP report is prepared for considering cumulative impacts arising out of this project, the Cumulative Environmental Impact Assessment study is undertaken, which is followed by preparation of a detailed Environmental Management Plan (EMP) to minimize those adverse impacts.

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

### 1.1 PURPOSE OF THE REPORT

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

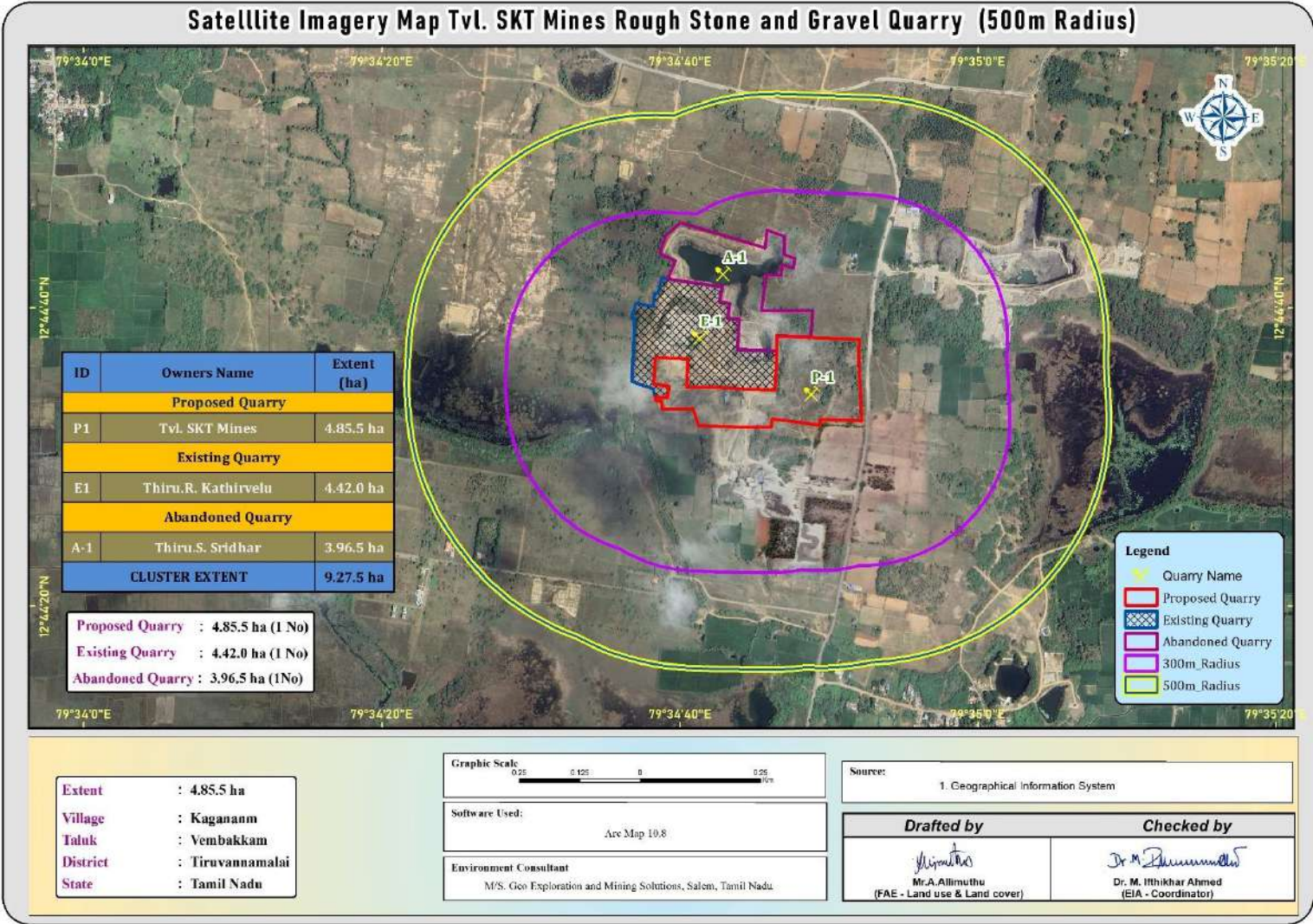
Now, as per Order Dated: 04.09.2018 & 13.09.2018 passed by Hon'ble National Green Tribunal, New Delhi in O.A. No. 173 of 2018 & O.A. No, 186 of 2016 and MoEF & CC Office Memorandum F. No. L-11011/175/2018-IA-II (M) Dated: 12.12.2018 clarified the requirement for EIA, EMP and therefore, Public Consultation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

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

---

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

FIGURE 1.1 SATELLITE IMAGERY CLUSTER QUARRIES



## 1.2 IDENTIFICATION OF PROJECT AND PROJECT PROPONENTS

### 1.2.1 Identification of Project Proponent

**TABLE 1.1: DETAILS OF PROJECT PROPONENT**

|                                      |                                                                                                          |
|--------------------------------------|----------------------------------------------------------------------------------------------------------|
| <b>Name of the Project Proponent</b> | Tvl.SKT Mines Rough Stone and Gravel Quarry                                                              |
| <b>Address</b>                       | Thiru.G.Dhamotharan,<br>S/o. Gangadaran,<br>No.333, Guberan Street, neervallur,<br>Kancheepuram District |
| <b>Mobile</b>                        | +91 9994237437                                                                                           |
| <b>Email</b>                         | sktmines@gamil.com                                                                                       |
| <b>Status</b>                        | Partnership Firm                                                                                         |

### 1.2.2 Identification of Project

**TABLE 1.2: SALIENT FEATURES OF THE PROPOSED PROJECT**

|                                           |                                                                                                                                                                                                                                                                                                                           |                       |
|-------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| Name of the Project                       | Tvl.SKT Mines Rough Stone and Gravel Quarry                                                                                                                                                                                                                                                                               |                       |
| S.F. No.                                  | 44/13A, 56/1A, 56/2A, 56/2B, 56/3, 56/4, 56/5, 56/6, 56/7, 57/1, 58/9, 58/10, 61/4B1, 61/4B2, 61/5B, 61/7, 62, 63/1 & 63/2                                                                                                                                                                                                |                       |
| Extent                                    | 4.85.5 ha                                                                                                                                                                                                                                                                                                                 |                       |
| Village,Taluk and District                | KaganamVillage, Vembakkam Taluk, Tiruvannamalai District.                                                                                                                                                                                                                                                                 |                       |
| Land Type                                 | It is a patta lands, registered in the name of the Tvl. SKT Mines Vide Patta No. 1041                                                                                                                                                                                                                                     |                       |
| Toposheet No                              | 57 P/10                                                                                                                                                                                                                                                                                                                   |                       |
| Latitude between                          | 12° 44'31.9930"N to 12° 44' 38.1096"N                                                                                                                                                                                                                                                                                     |                       |
| Longitude between                         | 79° 34' 38.2512"E to 79°34'52.2018"E                                                                                                                                                                                                                                                                                      |                       |
| Elevation of the area                     | 116m AMSL                                                                                                                                                                                                                                                                                                                 |                       |
| Lease period                              | 5 Years                                                                                                                                                                                                                                                                                                                   |                       |
| Mining Plan period                        | 5 years                                                                                                                                                                                                                                                                                                                   |                       |
| Proposed Depth of Mining                  | 72m bgl<br>(2m Gravel + 70m Rough stone)                                                                                                                                                                                                                                                                                  |                       |
| Geological Resources                      | Rough Stone in m <sup>3</sup>                                                                                                                                                                                                                                                                                             | Gravel m <sup>3</sup> |
|                                           | 33,98,500                                                                                                                                                                                                                                                                                                                 | 97,100                |
| Mineable Reserves                         | 7,95,070                                                                                                                                                                                                                                                                                                                  | 77,256                |
| Year wise Production for first five years | 7,95,070                                                                                                                                                                                                                                                                                                                  | 77,256                |
| Peak Production                           | 2,07,900                                                                                                                                                                                                                                                                                                                  | 33,840                |
| Ultimate Pit Dimension                    | XY-AB: 151m (L) X 162m (W) X 72m BGL(D)<br>X1Y1-CD: 162m (L) X 62m (W) X 27m BGL(D)<br>X1Y1-EF 44m (L) X 38m (W) X 7m BGL(D)<br>X2Y2-EF: 49m (L) X 50m (W) X 22m BGL(D)                                                                                                                                                   |                       |
| Water Level in the region                 | 78-82 m bgl                                                                                                                                                                                                                                                                                                               |                       |
| Method of Mining                          | Opencast Mechanized Mining Method involving drilling and Controlled blasting using Slurry Explosives                                                                                                                                                                                                                      |                       |
| Topography                                | The lease applied area is plain terrain. The area has gentle sloping towards Eastern side and altitude of the area is 116m above from Mean Sea level. The area is covered by 2m thickness of Gravel and followed by Massive Charnockite which is clearly inferred from the surface outcrops & nearby existing quarry pit. |                       |
| Machinery proposed                        | Jack Hammer                                                                                                                                                                                                                                                                                                               | 4 Nos                 |
|                                           | Compressor                                                                                                                                                                                                                                                                                                                | 1 Nos                 |
|                                           | Excavator with Bucket and Rock Breaker                                                                                                                                                                                                                                                                                    | 2 Nos                 |
|                                           | Wagon Drill Machine                                                                                                                                                                                                                                                                                                       | 2 Nos                 |

|                              |                                                                                                                                                                                                                              |            |
|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
|                              | Tippers                                                                                                                                                                                                                      | 5 Nos      |
|                              | Water Sprinkler Tanker                                                                                                                                                                                                       | 1 Nos      |
| Blasting Method              | Controlled Blasting Method by shot hole drilling and small dia of 25mm slurry explosive are proposed to be used for shattering and heaving effect for removal and winning of Rough Stone. No deep hole drilling is proposed. |            |
| Proposed Manpower Deployment | 40 Nos                                                                                                                                                                                                                       |            |
| Project Cost                 | Rs. 3,68,54,000/-                                                                                                                                                                                                            |            |
| EMP Cost                     | Rs. 17,65,000/-                                                                                                                                                                                                              |            |
| Total Project cost           | Rs. 3,93,92,000/-                                                                                                                                                                                                            |            |
| CER Cost                     | Rs. 5,00,000/-                                                                                                                                                                                                               |            |
| Nearby Water Bodies          | Odai                                                                                                                                                                                                                         | 90m SW     |
|                              | Tank                                                                                                                                                                                                                         | 130m West  |
|                              | Tank                                                                                                                                                                                                                         | 370m East  |
|                              | Tank                                                                                                                                                                                                                         | 470m South |
|                              | Mamandur Lake                                                                                                                                                                                                                | 5km East   |
|                              | Palar River                                                                                                                                                                                                                  | 9.5km NE   |
|                              | Cheyyar River                                                                                                                                                                                                                | 9.2km SE   |
| Greenbelt Development Plan   | Proposed to plant 2400 Nos of trees considering 500 Nos of trees/ Ha criteria<br>The plantation will be developed around the project site and nearby village roads                                                           |            |
| Proposed Water Requirement   | 3.5 KLD                                                                                                                                                                                                                      |            |
| Nearest Habitation           | 550m – South East                                                                                                                                                                                                            |            |
| Nearest Reserve Forest       | Thandappanthangal R.F – 6.5 Km – NW (Source - TNGIS)                                                                                                                                                                         |            |
| Nearest Wild Life Sanctuary  | Karikili Birds Sanctuary + 5km Safety distance – 27 Km – NE<br>Vedanthangal Birds Sanctuary + 5km Safety distance – 31.5 km - E                                                                                              |            |

Source: Approved Mining & Land Documents.

### 1.3 BRIEF DESCRIPTION OF THE PROJECT

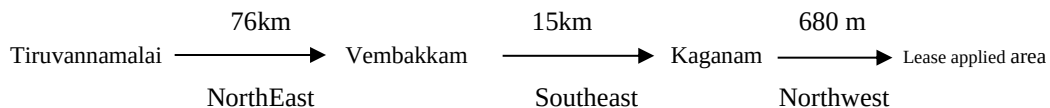
#### 1.3.1 Nature and Size of the Project

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

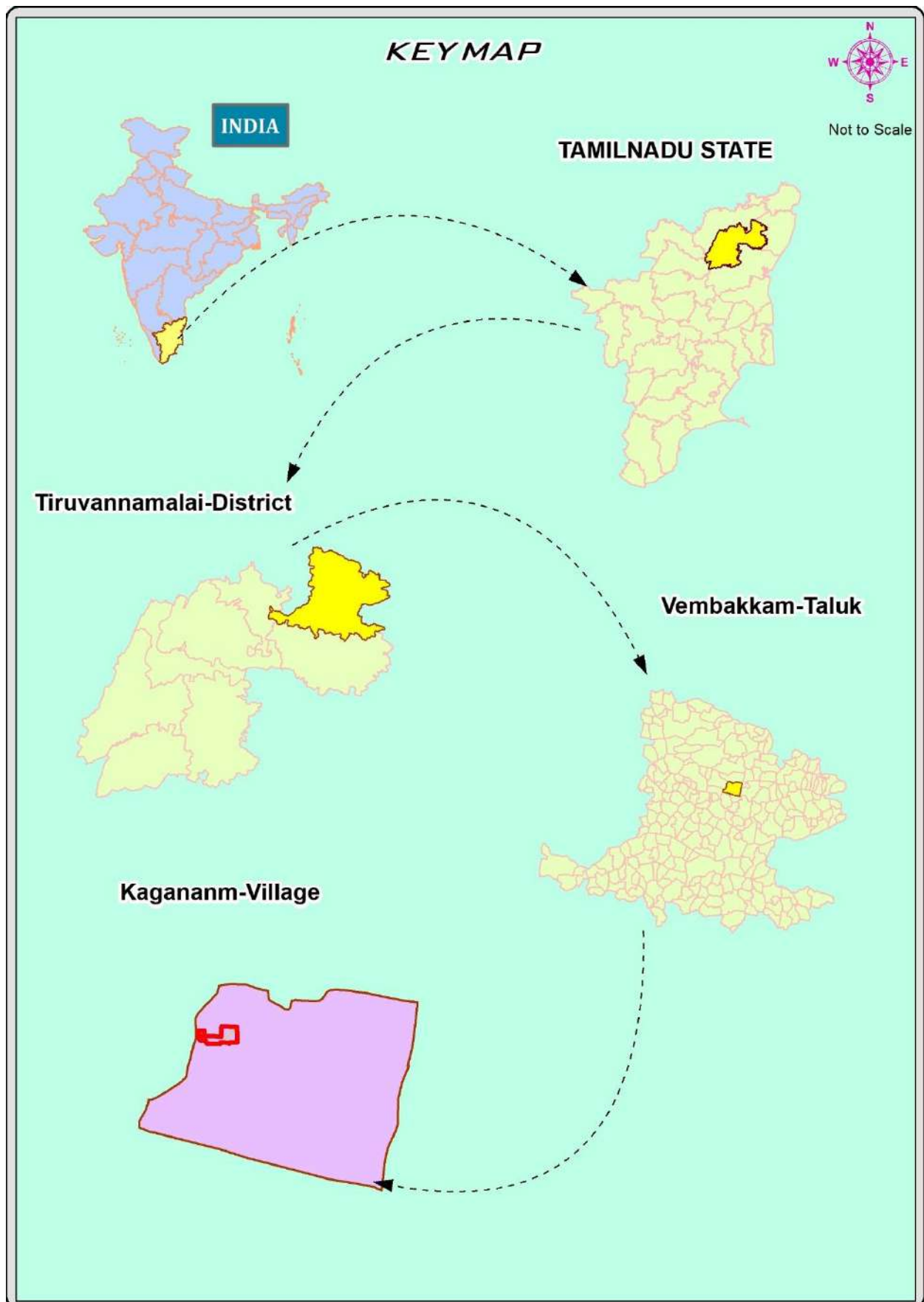
The peak production of Rough stone is 7,95,070 m<sup>3</sup> maximum in a year (530 m<sup>3</sup> per day/ 44 Tippers per day considering 12m<sup>3</sup> per load). The depth of the mining is 72m bgl.

#### 1.3.2 Location of the Project

- The project site is located in Kaganam Village, Vembakkam Taluk and Tiruvannamalai District.
- 76km Northeast of Tiruvannamalai town, 5km Southeast of Vembakkam and lease applied area located along Kaganam Village.





**FIGURE 1.2 LOCATION MAP OF THE PROJECT SITE**

Source: Survey of India Toposheet 57-P/10

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

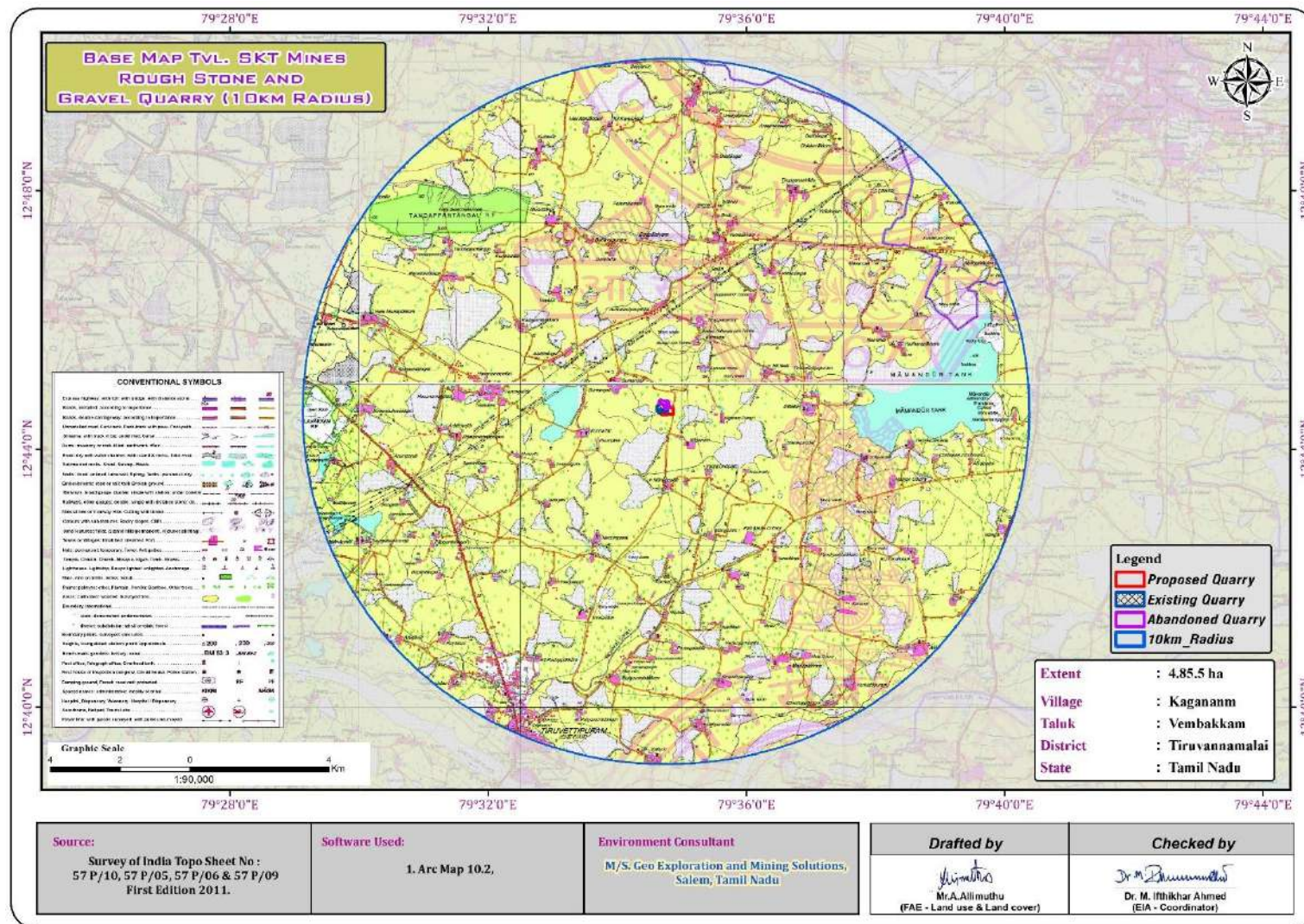
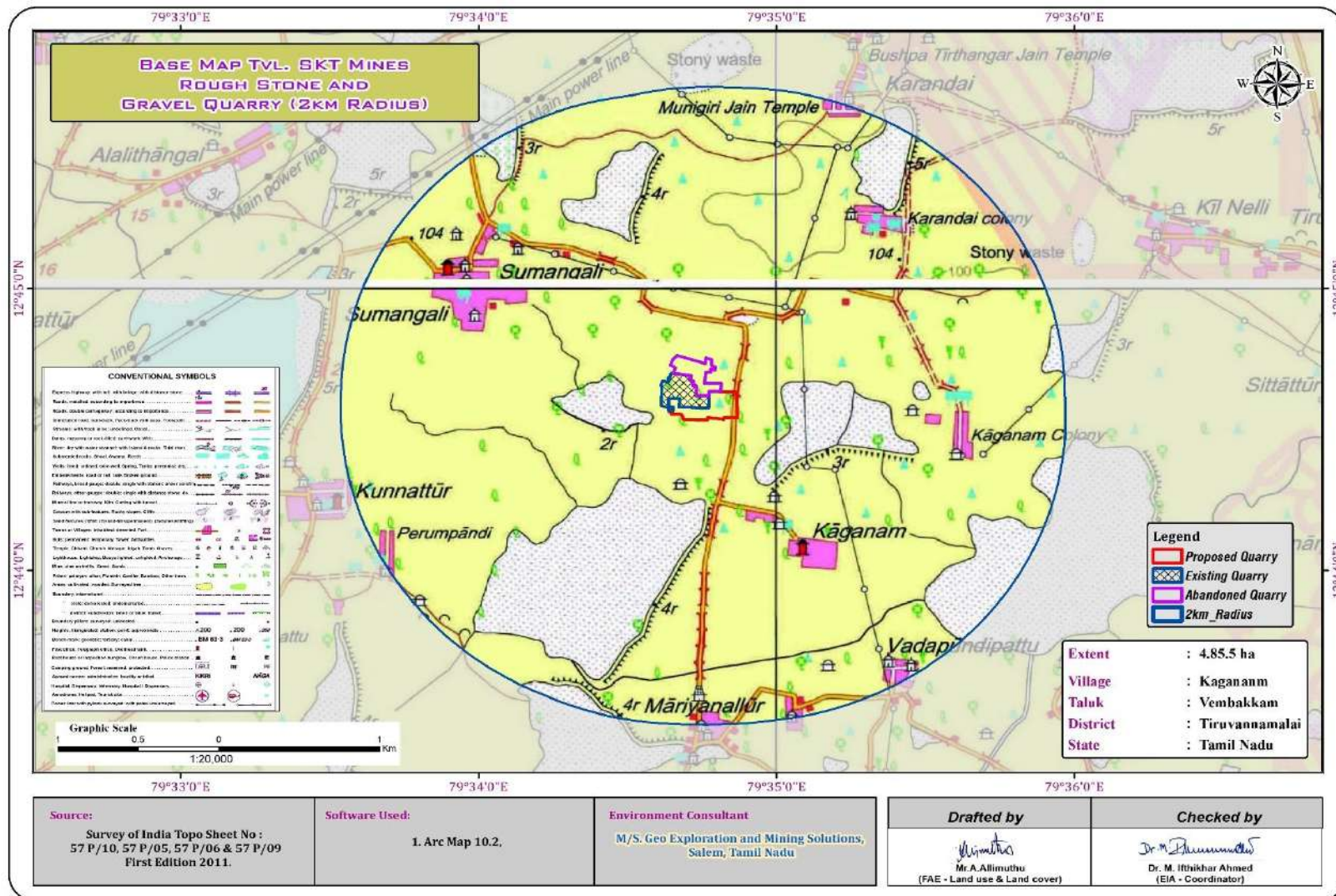




FIGURE 1.4: TOPOSHEET MAP OF THE STUDY AREA 2KM RADIUS



## 1.4 ENVIRONMENTAL CLEARANCE

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

- Screening,
- Scoping
- Public consultation &
- Appraisal

### SCREENING –

- Proponent applied for Rough stone and Gravel quarry lease on 24.09.2024
- Precise area communication letter was issued by the District Collector vide RC. No. 299/Kanimam/2024 Dated 08.11.2024
- The Mining Plan was prepared by Recognized Qualified Person and approved by Assistant Director, Geology and Mining, Tiruvannamalai District, vide vide RC.No. 299/kanimam/2024 Dated.03.12.2024
- The proposed project falls under “B1” Category as per Order Dated: 04.09.2018 & 13.09.2018 passed by Hon'ble National Green tribunal, New Delhi in O.A. No. 173 of 2018 & O.A. No, 186 of 2016 and MoEF & CC Office Memorandum F. No. L-11011/175/2018-IA-II (M) Dated: 12.12.2018
- Proponent applied for ToR for Environmental Clearance vide online Proposal No. SIA/TN/MIN/515016/2024. dated: 17.12.2024.

### SCOPING:

- The proposal was placed in 532<sup>nd</sup> SEAC meeting held on 13.02.2025 and the committee recommended for issue of ToR.
- The proposal was considered in 798<sup>th</sup> SEIAA meeting held on 26.02.2025 and issued Terms of Reference File no.11671 Tor Identification No: TO24B0108TN5824280N Dated 01.03.2025

### PUBLIC CONSULTATION

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

### APPRAISAL –

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

## 1.5 TERMS OF REFERENCE (ToR)

The ToR was issued by the SEIAA vide Terms of Reference File no.11671 Tor Identification No: TO24B0108TN5824280N Dated 01.03. 2025. The Details of the ToR Compliance is given in the Page No. i-xxii.

## 1.6 POST ENVIRONMENT CLEARANCE MONITORING

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

## 1.7 GENERIC STRUCTURE OF EIA DOCUMENT

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

## 1.8 THE SCOPE OF THE STUDY

The main scope of the EIA study is to quantify the cumulative impact in the study area due to cluster quarries and formulate the effective mitigation measures. A detailed account of the emission sources, emissions control equipment, background Air quality levels, Meteorological measurements, Dispersion model and all other aspects of pollution like effluent discharge, Dust generation etc., have been discussed in this report. The baseline monitoring study has been carried out during the summer season (Dec 2024 to Feb 2025) for various environmental components so as to assess the anticipated impacts of the cluster quarry projects on the environment and suggest suitable mitigation measures for likely adverse impacts due to the proposed project.

**TABLE 1.3: ENVIRONMENT ATTRIBUTES**

| Sl.No. | Attributes             | Parameters                                                                   | Source and Frequency                                                                                               |
|--------|------------------------|------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| 1      | Ambient Air Quality    | PM <sub>10</sub> , PM <sub>2.5</sub> , SO <sub>2</sub> , NO <sub>2</sub>     | Continuous 24-hourly samples twice a week for three months at 7 locations (2 Core & 5 Buffer)                      |
| 2      | Meteorology            | Wind speed and direction, temperature, relative humidity and rainfall        | Near project site continuous for three months with hourly recording and from secondary sources of IMD station      |
| 3      | Water quality          | Physical, Chemical and Bacteriological parameters                            | Grab samples were collected at 6 locations – 2 Surface water and 4 Ground water samples; once during study period. |
| 4      | Ecology                | Existing terrestrial and aquatic flora and fauna within 10 km radius circle. | Limited primary survey and secondary data was collected from the Forest department.                                |
| 5      | Noise levels           | Noise levels in dB(A)                                                        | 8 locations – data monitored once for 24 hours during EIA study                                                    |
| 6      | Soil Characteristics   | Physical and Chemical Parameters                                             | Once at 6 locations during study period                                                                            |
| 7      | Land use               | Existing land use for different categories                                   | Based on Survey of India topographical sheet and satellite imagery and primary survey.                             |
| 8      | Socio-Economic Aspects | Socio-economic and demographic characteristics, worker characteristics       | Based on primary survey and secondary sources data like census of India 2011.                                      |

|    |                                              |                                                                                                        |                                                                                                |
|----|----------------------------------------------|--------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|
| 9  | Hydrology                                    | Drainage pattern of the area, nature of streams, aquifer characteristics, recharge and discharge areas | Based on data collected from secondary sources as well as hydro-geology study report prepared. |
| 10 | Risk assessment and Disaster Management Plan | Identify areas where disaster can occur by fires and explosions and release of toxic substances        | Based on the findings of Risk analysis done for the risk associated with mining.               |

Source: Field Monitoring Data

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

- Application for Quarrying Lease as per Tamil Nadu Minor Mineral Concession Rules, 1959.
- Obtained Precise Area Communication Letter as per Tamil Nadu Minor Mineral Concession Rules, 1959 for Preparation of Mining Plan and obtaining Environmental Clearance.
- The Mining Plan has been approved under Rule 41 & 42 as amended of Tamil Nadu Minor Mineral Concession Rules, 1959.
- Environment Protection Act, 1986
- Water (Prevention and control of Pollution) act, 1974
- Air (Prevention and control of Pollution) act, 1981
- Terms of Reference File no.11671 Tor Identification No: TO24B0108TN5824280N Dated 01.03.2025

• \*\*\*\*\*

## 2. PROJECT DESCRIPTION

### 2.0 GENERAL

The Proposed Rough Stone Quarry requires Environmental Clearance. There are 1 proposed and 1 existing quarries forming a cluster; calculated as per MoEF & CC Notification S.O. 2269(E) Dated 1<sup>st</sup> July 2016 and the total extent of cluster is 9.27.5 ha.

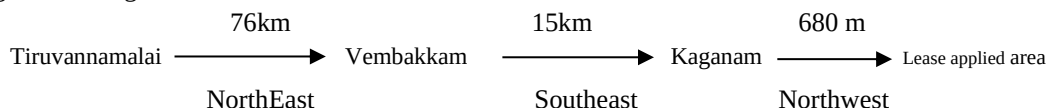
As the extent of cluster are more than 5 ha, the proposal falls under B1 Category as per the Order Dated: 04.09.2018 & 13.09.2018 passed by Hon'ble National Green Tribunal, New Delhi in O.A. No. 173 of 2018 & O.A. No, 186 of 2016 and MoEF & CC Office Memorandum F. No. L-11011/175/2018-IA-II (M) Dated: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

### 2.1 DESCRIPTION OF THE PROJECT

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

### 2.2 LOCATION OF THE PROJECT

The project site is located in Kaganam Village, Vembakkam Taluk and Tiruvannamalai District. 76km Northeast of Tiruvannamalai town, 5km Southeast of Vembakkam and lease applied area located along Kaganam Village.



**TABLE 2.1: SITE CONNECTIVITY**

|                         |                                                                                     |
|-------------------------|-------------------------------------------------------------------------------------|
| Nearest Roadway         | NH – 48 – Ranipet - Sriperuputhur -15 km -NE<br>SH – 5 – Cheyyar – Arcot -6.5 km-SW |
| Nearest Village         | Kaganam – 850 m – South West                                                        |
| Nearest Town            | Kancheepuram – 15 km – NE                                                           |
| Nearest Railway Station | Kancheepuram – 15 km – NE                                                           |
| Nearest Airport         | Chennai – 76 km – NE                                                                |
| Seaport                 | Chennai - 76 km – NE                                                                |

Source: Survey of India Toposheet

**TABLE 2.2: CO-ORDINATES – PROJECT BOUNDARY**

| Corner Nos. | Latitude         | Longitude        |
|-------------|------------------|------------------|
| 1           | 12°44'32.1099" N | 79°34'41.2545" E |
| 2           | 12°44'33.2064" N | 79°34'40.8944" E |
| 3           | 12°44'33.2090" N | 79°34'38.8255" E |
| 4           | 12°44'33.7270" N | 79°34'38.7714" E |
| 5           | 12°44'33.7998" N | 79°34'38.3907" E |
| 6           | 12°44'34.0209" N | 79°34'38.3346" E |

|                                        |                  |                  |
|----------------------------------------|------------------|------------------|
| 7                                      | 12°44'33.9743" N | 79°34'39.1687" E |
| 8                                      | 12°44'34.7493" N | 79°34'39.2675" E |
| 9                                      | 12°44'34.8740" N | 79°34'38.2512" E |
| 10                                     | 12°44'36.6746" N | 79°34'38.3468" E |
| 11                                     | 12°44'36.5655" N | 79°34'40.5388" E |
| 12                                     | 12°44'34.6608" N | 79°34'40.4405" E |
| 13                                     | 12°44'34.6638" N | 79°34'42.8041" E |
| 14                                     | 12°44'34.5478" N | 79°34'44.4612" E |
| 15                                     | 12°44'34.4996" N | 79°34'46.3702" E |
| 16                                     | 12°44'36.6504" N | 79°34'46.4993" E |
| 17                                     | 12°44'37.5680" N | 79°34'46.5069" E |
| 18                                     | 12°44'38.1096" N | 79°34'46.5106" E |
| 19                                     | 12°44'37.8757" N | 79°34'52.0568" E |
| 20                                     | 12°44'37.4608" N | 79°34'52.0045" E |
| 21                                     | 12°44'36.4725" N | 79°34'52.0029" E |
| 22                                     | 12°44'34.8765" N | 79°34'52.0823" E |
| 23                                     | 12°44'32.4766" N | 79°34'52.2018" E |
| 24                                     | 12°44'32.5267" N | 79°34'49.4306" E |
| 25                                     | 12°44'32.1261" N | 79°34'49.3800" E |
| 26                                     | 12°44'32.3624" N | 79°34'47.8539" E |
| 27                                     | 12°44'32.4718" N | 79°34'47.0315" E |
| 28                                     | 12°44'32.5497" N | 79°34'46.1798" E |
| 29                                     | 12°44'31.9930" N | 79°34'46.1197" E |
| 30                                     | 12°44'32.0263" N | 79°34'43.6533" E |
| 31                                     | 12°44'32.0550" N | 79°34'42.5662" E |
| <b>Datum: UTM-WGS84, Zone 44 North</b> |                  |                  |

Source: Approved Mining Plan

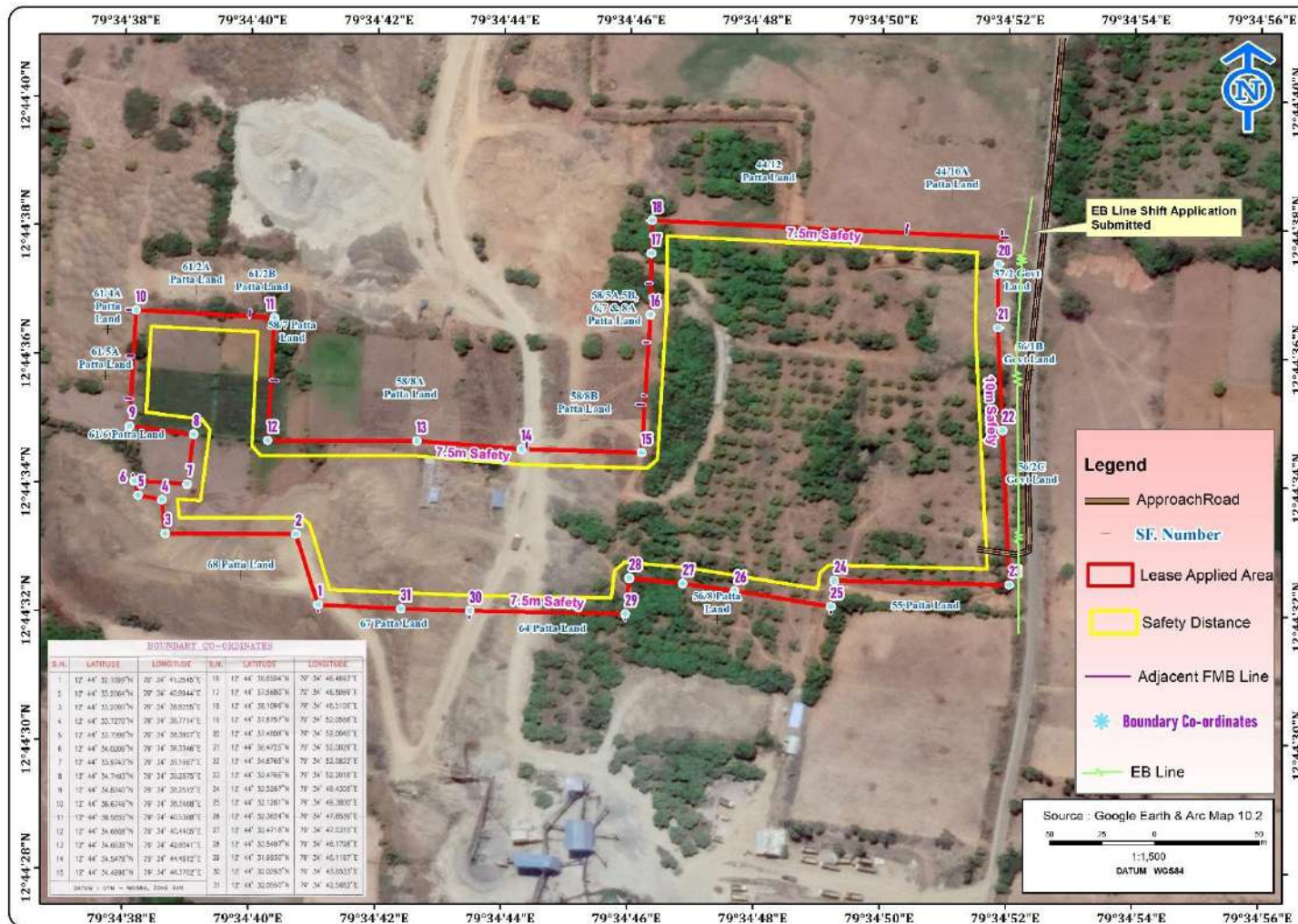
**FIGURE 2.1: TOPOGRAPHICAL VIEW OF PROJECT AREA****project site Photographs**





**FIGURE 2.2: PHOTOGRAPHS OF GREENBELT & FENCING**

FIGURE 2.4: GOOGLE IMAGE OF THE PROJECT AREA



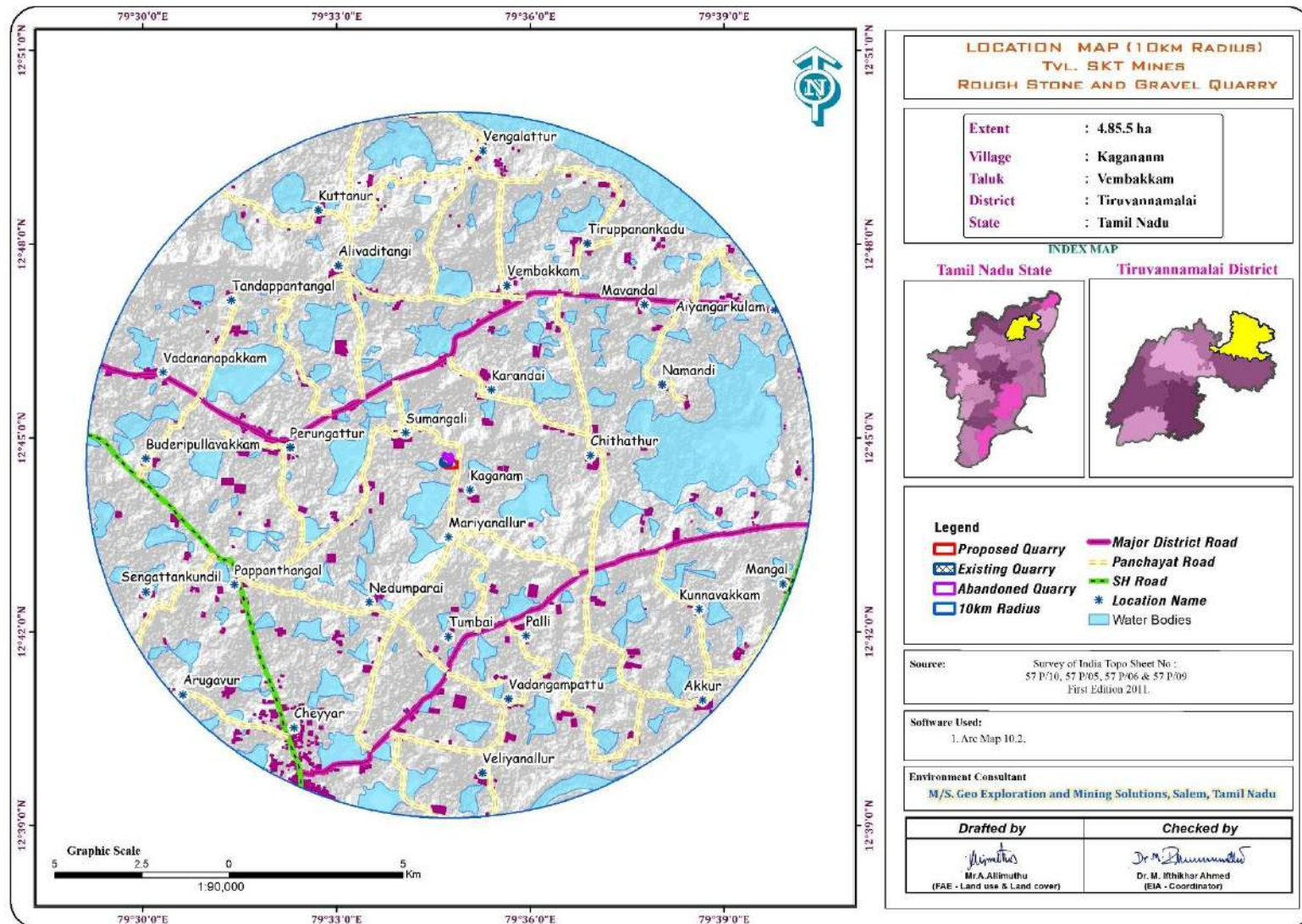
Source: Google Earth Imagery

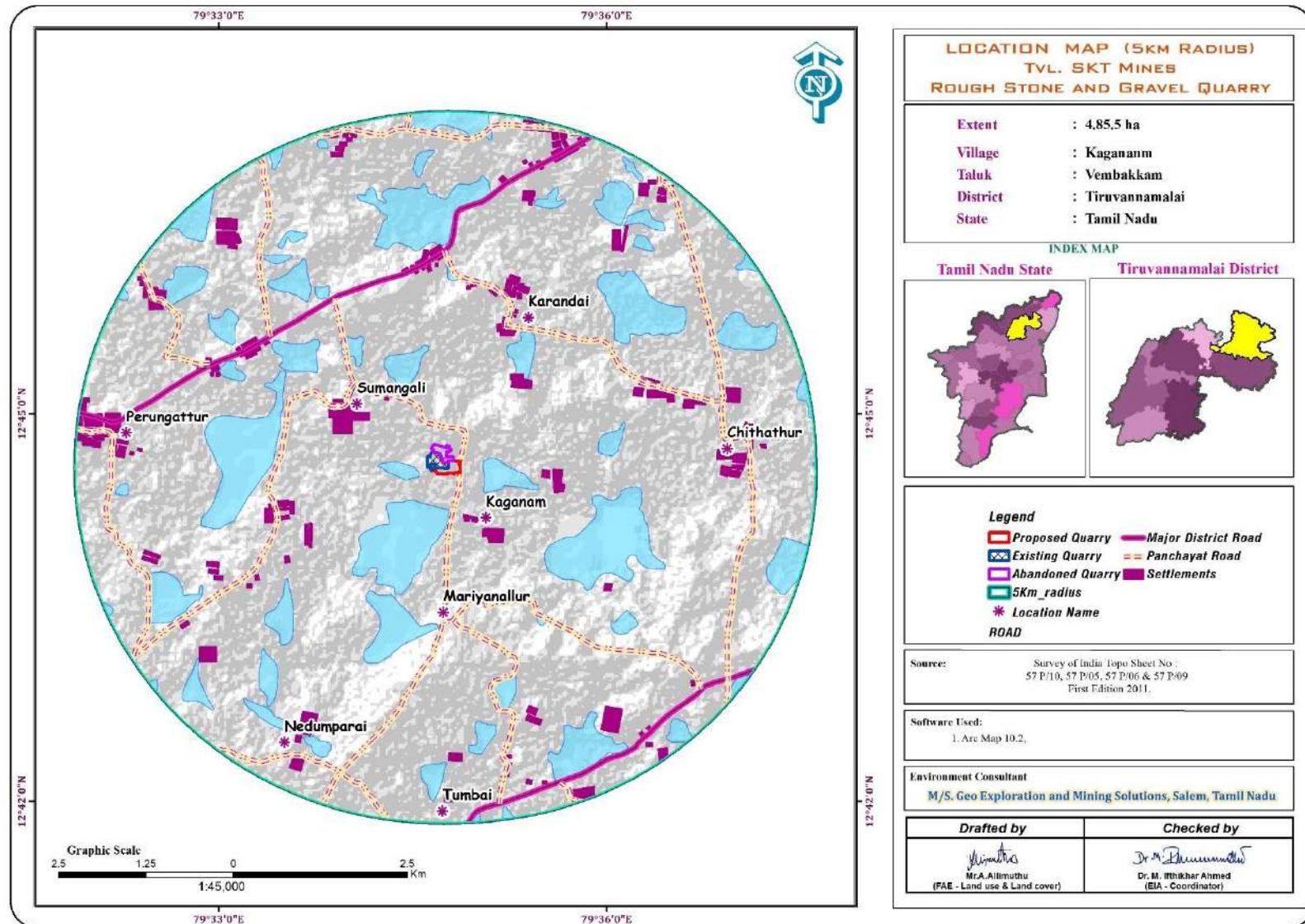
**FIGURE 2.5: QUARRY LEASE PLAN / SURFACE PLANN**



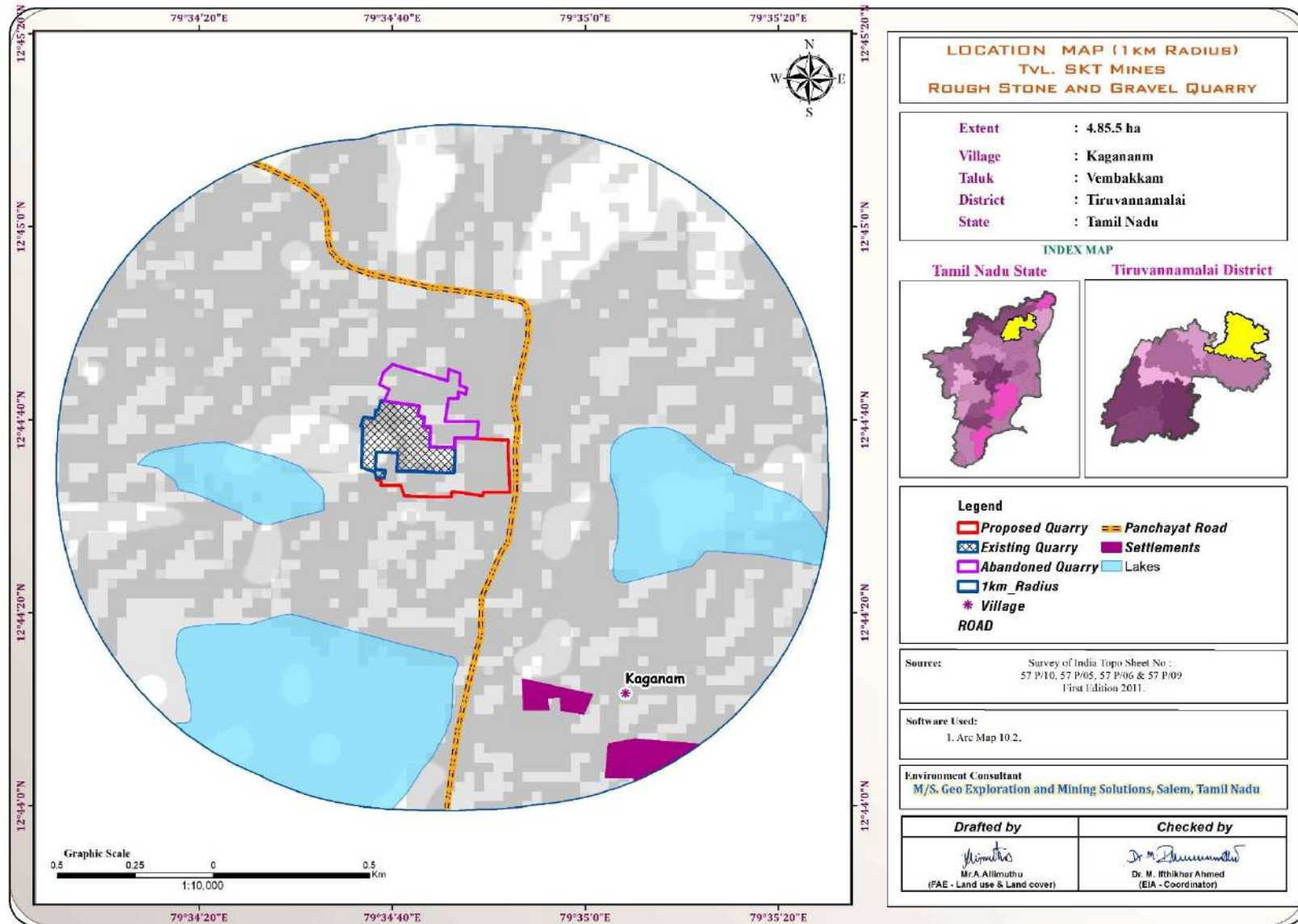
Source: Approved Mining Plan



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

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



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

### 2.2.1 Project Area

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

**TABLE 2.3: LAND USE PATTERN**

| Description          | Present area (Ha) | Proposed Common Boundary             | Present area (Ha) | Leaving Safety and Benches           |
|----------------------|-------------------|--------------------------------------|-------------------|--------------------------------------|
|                      |                   | Area at the end of lease period (Ha) |                   | Area at the end of lease period (Ha) |
| Area under quarrying | Nil               | 4.18.05                              | Nil               | 3.80.68                              |
| Site Services        | Nil               | 0.01.0                               | Nil               | 0.01.0                               |
| Roads                | Nil               | 0.02.0                               | Nil               | 0.02.0                               |
| Green Belt           | Nil               | 0.62.86                              | Nil               | 0.62.86                              |
| Unutilized Area      | 4.85.50           | 0.01.59                              | 4.85.50           | 0.38.96                              |
| <b>Grand Total</b>   | <b>4.85.50</b>    | <b>4.85.50</b>                       | <b>4.85.50</b>    | <b>4.85.50</b>                       |

Source: Approved Mining

### 2.2.2 Size or Magnitude of Operation

**TABLE 2.4: RESOURCES AND RESERVES**

| PARTICULARS                                   | DETAILS                                              |                          |
|-----------------------------------------------|------------------------------------------------------|--------------------------|
|                                               | Rough Stone in m <sup>3</sup>                        | Gravel in m <sup>3</sup> |
| Geological Resources                          | 33,98,500                                            | 97,100                   |
| Mineable Reserves                             | 12,75,585                                            | 86,204                   |
| Production for first five-year plan period    | 7,95,070                                             | 77,256                   |
| Peak Production                               | 2,07,900                                             | 33,840                   |
| Mining Plan Period / Lease Applied Period     | 5 Years                                              |                          |
| Number of Working Days                        | 300 Days                                             |                          |
| Production per day                            | 530                                                  | 85                       |
| No of Lorry loads (12m <sup>3</sup> per load) | 44                                                   | 7                        |
| Total Depth of Mining                         | 72m (2m Gravel +70m Rough stone) below ground level. |                          |

Source: Approved mining plan.

## 2.3 GEOLOGY

### 2.3.1 Regional Geology

Tiruvannamalai District mainly comprises of rocks of Archaean age. The type of rocks found in the district are Charnockite, Granitic gneiss, Epidote Hornblende Gneiss, Amphibolite, Pyroxenite, Dunite, Migmatites, Banded Magnetite Quartzite, Shale and Clay. Dolerite dykes (Black Granite) are also noticed cutting across the country rocks.

The hard rock terrain comprises predominantly of Charnockite and Khondalite groups and their migmatitic derivatives, supra-crustal sequences of Sathyamangalam and Kolar groups and Peninsular Gneissic Complex (Bhavani Group), intruded by ultramafic-mafic complexes, basic dykes, granites and syenites. The sedimentary rocks of the coastal belt include fluviatile, fluvio-marine and marine sequences, such as Gondwana Supergroup (Carboniferous to Permian and Upper Jurassic to Lower Cretaceous), marine sediments of Cauvery basin (Lower Cretaceous to Paleogene), Cuddalore /Pannambarai Formation (Mio-Pliocene) and sediments of Quaternary and Recent age.

**The Charnockite Group** comprises pyroxene granulite and charnockite. The pyroxene granulite is dark grey, medium grained granulitic rock with typical salt and pepper texture, seen on the weathered surface. It consists of diopside, hypersthene, plagioclase, hornblende, biotite and quartz. Charnockite is the predominant rock in the area. It

is grey, medium to coarse grained, greasy looking with foliation seen prominently on the weathered surface. It is essentially made of smoky or grey quartz, pale grey microcline and hypersthene as major minerals with plagioclase, hornblende and biotite as accessories.

**Migmatite Complex** is represented by hornblende-biotite gneiss, granitic gneiss and pink migmatite. This Complex is a group of banded felsic rocks of varying mineralogical composition that are formed due to the influx of quartzofeldspathic material into high grade metamorphic rocks. Two types of migmatite are seen in the district, one is grey and the other is pink. Next to charnockite, migmatite gneiss is the second most extensive rock. The migmatite gneiss consists of quartz, k-feldspar, plagioclase, hornblende and biotite in varying proportions.

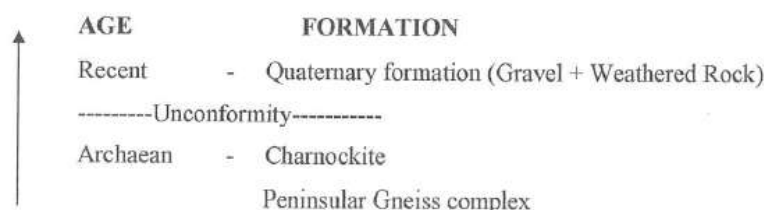
Source: District Survey Report for Minor Minerals Tiruvannamalai District – May 2019.

<https://tiruvannamalai.nic.in/document/district-survey-report-rough-stone/>

Exploration :

No Exploration is required, the Rough stone and Gravel formation is clearly inferred from the existing quarry pit situated on the south side.

The General Geological sequence of the area is given below:



### 2.3.2 Local Geology: -

The study area follows the regional trend and mainly comprises of Hard Rock Formation as a homogeneous formation / Batholith formation of Charnockite. The project areas are plain terrain, The project areas are covered with Gravel formation of 2m thickness; Massive Charnockite formation is found after 2m Gravel formation which is clearly inferred from the existing quarry pit.

### 2.3.3 Hydrogeology

Cheyar River which originates from Jawadhu Hills, flows in a southern direction at first, and turns south-east near Chengam after flowing through Polur, Vandavasi and Cheyyartaluk. Palar rising near Nandidurg in Mysore enters Vellore district passing through Gudiyatham, Walajah and Arakonam taluks before entering into Cheyyartaluk of Tiruvannamalai district and there after enters into Kancheepuram district. Pennaiyar and South Pennaiyar originate from Nandidurg of Karnataka. They pass through Dharmapuri district and enter southern part of Chengam taluk before entering into Viluppuram district. Finally, the river enters into the Bay of Bengal at Cuddalore. The river is dry for the most part of the year. Water flows during the monsoon season when it is fed by the southwest monsoon in catchment area and the northeast monsoon in Tamil Nadu. A dam has been constructed across this river at Sathanur which is a picnic spot in this district. Sathanur Reservoir provides drinking water to Tiruvannamalai town and the water is used for irrigation when the reservoir is filled with surplus water.

The origin, occurrence and movement of groundwater are controlled by geological setup of a terrain. During the study it is inferred that the entire cluster area is a Hard rock terrain and the low resistance encountered at the depth between 57m, hence it is assumed that the possibility of Ground water occurrence will be below this level and it also proved that this hard batholith above 50m will not encounter any subsurface water.

There is a possibility of seepage water from the surface levels i.e., below 30m, this surface water will be collected in the mine pits and later used for dust suppression and afforestation. In the geophysical study it has been clearly inferred that the depth of the quarrying operation will not intersect the ground water table.



### 2.2.2.3 Aquifer Systems:

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

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

#### 2.2.2.3 Alluvial Formations

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

#### Tertiary Cuddalore sandstone

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

#### Cretaceous Formations

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

#### Hard Rock Formations

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

#### Granitic Gneiss

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

#### Charnockite

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

#### Aquifer Parameters

The transmissivity values of fractured aquifers range from  $< 1$  to  $141 \text{ m}^2/\text{day}$  and storativity varies between  $2.84 \times 10^{-5}$  and  $8.9 \times 10^{-3}$ . The transmissivity of sedimentary formation varies from 21 to  $748 \text{ m}^2/\text{day}$  and storativity is in the order of  $2.75 \times 10^{-3}$

| .Actual Rainfall in Mm |       |        |        |        | Normal Rainfall in Mm |
|------------------------|-------|--------|--------|--------|-----------------------|
| 2017                   | 2018  | 2019   | 2020   | 2021   |                       |
| 1251.3                 | 799.2 | 1071.9 | 1034.5 | 1592.5 | 985                   |

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

FIGURE 2.9: REGIONAL GEOLOGY MAP

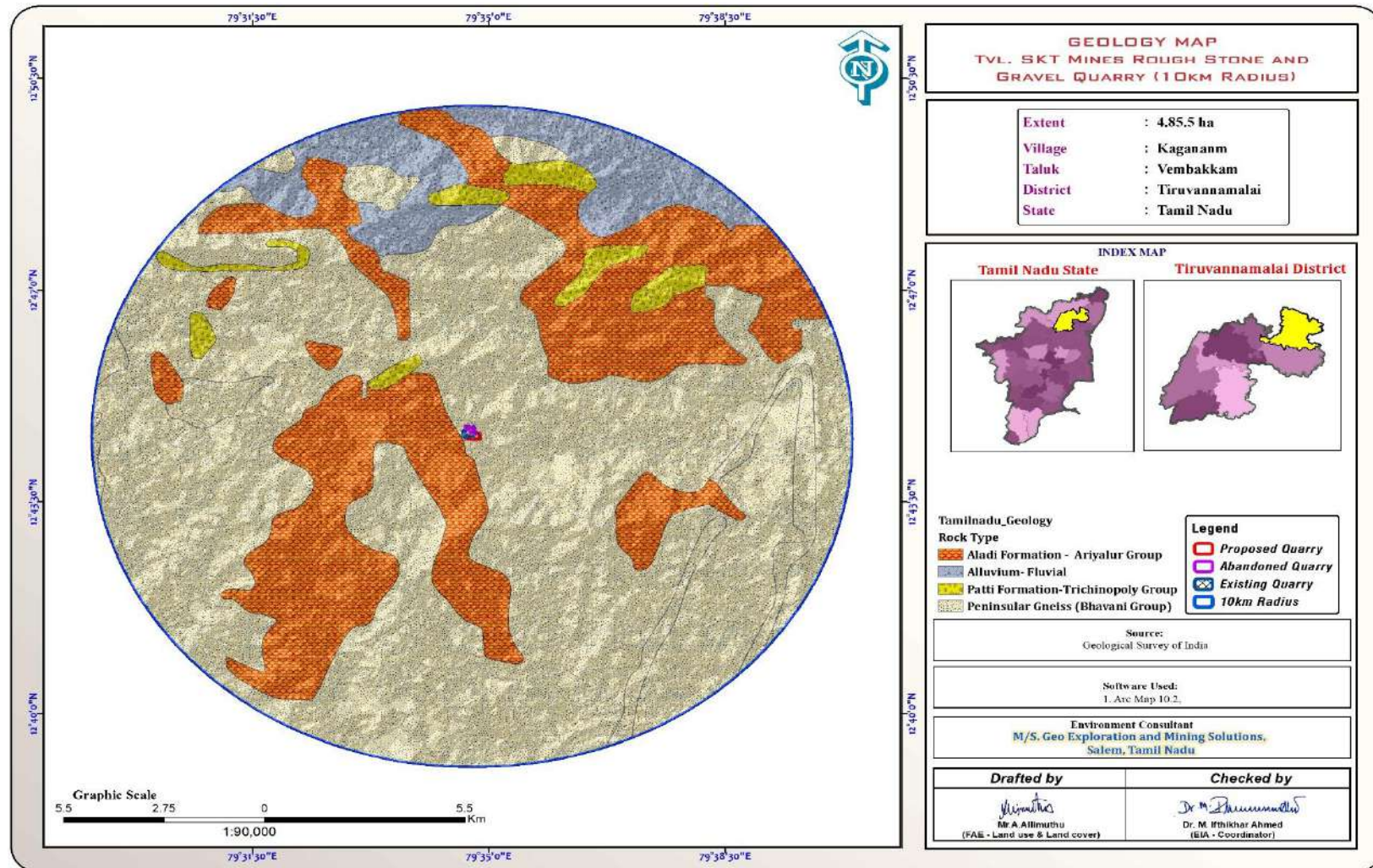
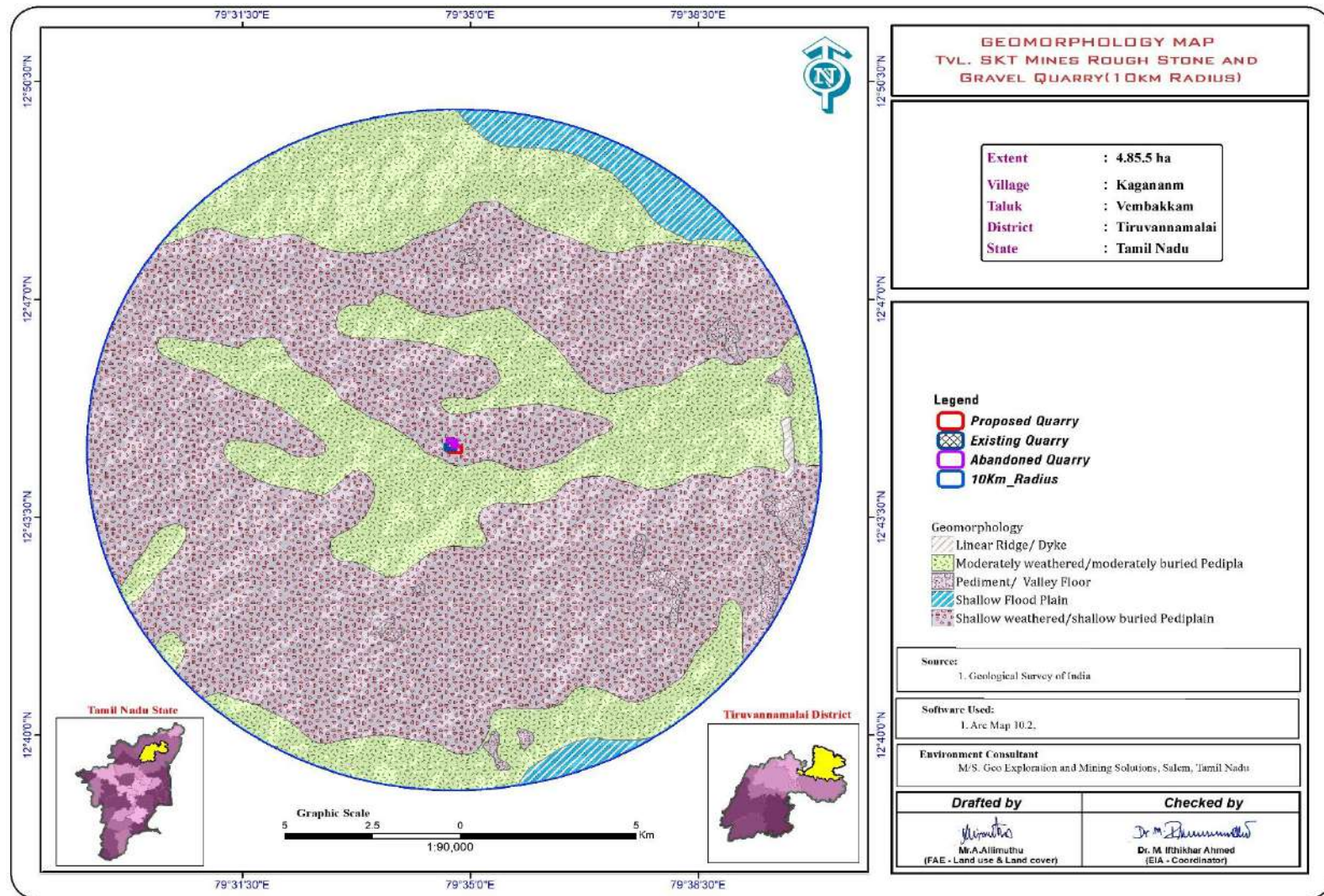




FIGURE 2.10: GEOMORPHOLOGY MAP



## 2.4 RESOURCES AND RESERVES

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

**TABLE 2.5: RESOURCES AND RESERVES**

| Description                                      | Rough Stone m <sup>3</sup> | Gravel m <sup>3</sup> |
|--------------------------------------------------|----------------------------|-----------------------|
| Geological Resource in m <sup>3</sup>            | 33,98,500                  | 97,100                |
| Mineable Resource in m <sup>3</sup>              | 12,75,585                  | 86,204                |
| Year wise production for Five - year plan period | 7,95,070                   | 77,256                |

Source: Approved Mining Plan

**TABLE 2.6: YEAR-WISE PRODUCTION PLAN FOR FIVE YEARS**

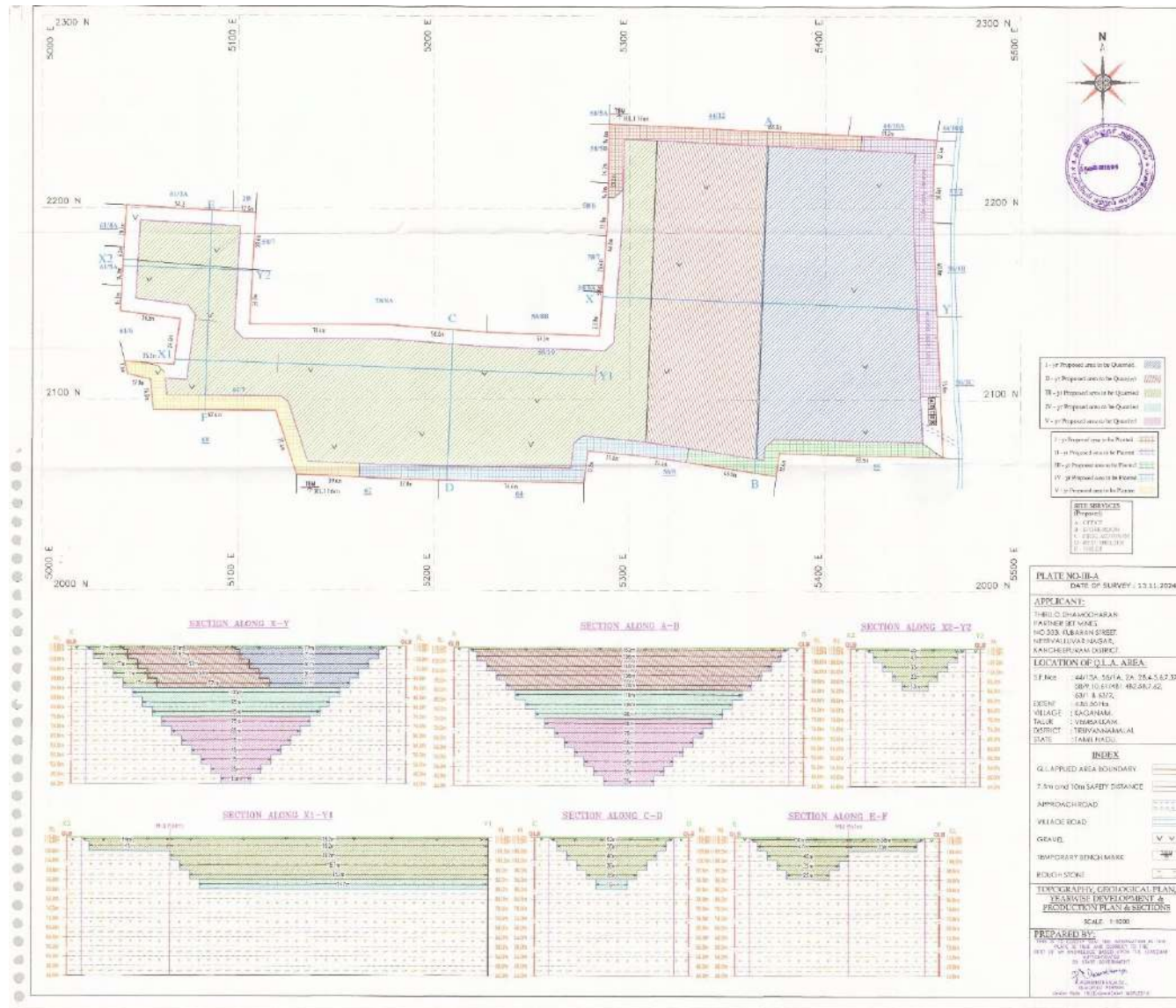
| YEAR         | ROUGH STONE (m <sup>3</sup> ) | GRAVEL (m <sup>3</sup> ) |
|--------------|-------------------------------|--------------------------|
| I            | 1,60,420                      | 24,948                   |
| II           | 1,60,740                      | 18,648                   |
| III          | 2,07,900                      | 33,840                   |
| IV           | 1,63,810                      | -                        |
| V            | 1,02,200                      | -                        |
| <b>TOTAL</b> | <b>7,95,070</b>               | <b>77,256</b>            |

Source: Approved Mining Plan

### Disposal of Waste

The overburden in the form of Gravel formation is about 77,256 m<sup>3</sup> up to depth 2m for during this period. the Gravel will be directly loaded into tippers for the filling and levelling of low-lying areas, this will be done only after obtaining permission and paying necessary seigniorage fees to the Government.

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



Source: Approved Mining Plan

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## Conceptual Mining Plan/ Final Mine Closure Plan

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

**TABLE 2.7: ULTIMATE PIT DIMENSION**

| <b>Pit</b>     | <b>Length (Max) (m)</b> | <b>Width (Max) (m)</b> | <b>Depth (Max)</b> |
|----------------|-------------------------|------------------------|--------------------|
| <b>XY-AB</b>   | 151                     | 162                    | 72m bgl            |
| <b>X1Y1-CD</b> | 162                     | 62                     | 27m bgl            |
| <b>X1Y1-EF</b> | 44                      | 38                     | 7m bgl             |
| <b>X2Y2-EF</b> | 49                      | 50                     | 22m bgl            |

Source: Approved Mining Plan



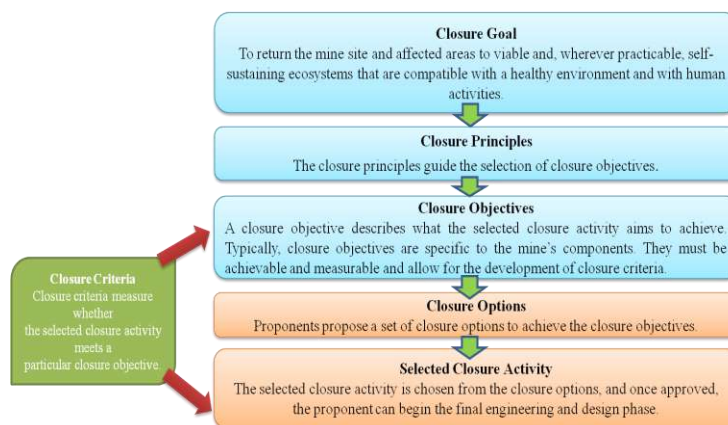
[illegible]

24



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

#### Closure Objectives –



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

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

- The closure of mine is well planned at the initial stage of planning & design consideration by the internal and external stakeholders
- Construction of 2m height bund all along the mine pit boundary and ensure its stability all time & construction of garland drain along the natural slope to avoid sliding and collection of soil to the pit & surface runoff during rainfall
- After complete exploitation of mineral, the lowest bench foot wall side will be maintained as plain surface without any sump pits to avoid any accidents
- All the sharp edges will be dressed to smoother face before the closure of mine and ensure no loose debris on hanging wall side
- The project proponent as a part of social responsibilities assures to supply the stored mine pit water to the nearby villages after effective treatment process as per the standards of TNPCB & TWAD
- Native species will be planted in 3 row patterns on the boundary barriers and 1<sup>st</sup> bench, a full-time sentry will be appointed at the gate to prevent inherent entry of public & cattle.

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

## 2.5 METHOD OF MINING

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

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

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

### 2.5.1 Drilling & Blasting Parameters

Drilling will be carried out using Jack hammer and compressor, the depth of the hole will be maximum 5 m. Drilling & Blasting will be carried out as per parameters given below: -

|                          |   |                                                         |
|--------------------------|---|---------------------------------------------------------|
| Spacing                  | – | 3.5m                                                    |
| Burden                   | – | 2.75 m                                                  |
| Depth of hole            | – | 5 m                                                     |
| Charge per hole          | – | 0.50 – 0.75kg                                           |
| Powder factor            | – | 6.0 tonnes/kg                                           |
| Diameter of hole         | – | 110 mm                                                  |
| Peak production Capacity | = | 530m <sup>3</sup> of Rough stone per day                |
| Spacing X Burden X Depth | = | 2.75 m X 2.75 m X 5 m = 37 m <sup>3</sup>               |
|                          | = | 48 m <sup>3</sup> X 2.6 (Bulk Density) = 96 Ts per hole |

hence for the peak production of 530m<sup>3</sup> (1378 Ts) = 14 Nos of holes to be drilled per day

Explosives per hole = 11.12 kg hence 155 kg of Explosives will be utilized maximum considering the peak production

#### Type of Explosives to be used –

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

## Storage of Explosives –

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

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

### 2.5.2 Extent of Mechanization

**TABLE 2.8 PROPOSED MACHINERY DEPLOYMENT**

| S.NO. | TYPE                                   | NOS | SIZE/CAPACITY | MOTIVE POWER   |
|-------|----------------------------------------|-----|---------------|----------------|
| 1     | Jack hammers                           | 4   | 1.2m to 2.0m  | Compressed air |
| 2     | Compressor                             | 1   | 400psi        | Diesel Drive   |
| 3     | Wagon Drill Machine                    | 2   | 3m to 10m     | Diesel Drive   |
| 4     | Excavator with Bucket and Rock Breaker | 2   | 300 HP        | Diesel Drive   |
| 5     | Tippers                                | 5   | 20 Tonnes     | Diesel Drive   |
| 6     | Water Sprinkling Tanker                | 1   | 10,000 Litres | Diesel Drive   |

Source: Approved Mining Plan

## 2.6 GENERAL FEATURES

### 2.6.1 Existing Infrastructures

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

### 2.6.2 Drainage Pattern

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

### 2.6.3 Traffic Density

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

Traffic density measurements were performed at two locations

1. Kaganam Panchayat Road
2. Kollivakkam - Perunkattur District Road

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

**TABLE.2.9: TRAFFIC SURVEY LOCATIONS**

| Station Code | Road Name                               | Distance and Direction | Type of Road   |
|--------------|-----------------------------------------|------------------------|----------------|
| TS1          | Kaganam Panchayat Road                  | 1.8km South            | Panchayat Road |
| TS2          | Kollivakkam - Perunkattur District Road | 3km NW                 | District Road  |

Source: On-site monitoring by GEMS FAE & TM

**TABLE 2.10: EXISTING TRAFFIC VOLUME**

| Station code | HMV |     | LMV |     | 2/3 Wheelers |     | Total PCU |
|--------------|-----|-----|-----|-----|--------------|-----|-----------|
|              | No  | PCU | No  | PCU | No           | PCU |           |
| TS1          | 100 | 300 | 80  | 80  | 70           | 35  | 415       |
| TS2          | 110 | 330 | 60  | 60  | 80           | 40  | 430       |

Source: On-site monitoring by GEMS FAE & TM

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

**TABLE 2.11: ROUGH STONE & GRAVEL HOURLY TRANSPORTATION REQUIREMENT**

| Transportation of Rough Stone & Gravel per day |                      |               |
|------------------------------------------------|----------------------|---------------|
| Capacity of trucks                             | No. of Trips per day | Volume in PCU |
| 20 tonnes                                      | 44                   | 132           |

**FIGURE.2.13: MINERAL TRANSPORTATION ROUTE MAP****TABLE 2.12: SUMMARY OF TRAFFIC VOLUME**

| Route                                   | Existing Traffic volume in PCU | Incremental traffic due to the project | Total traffic volume | Hourly Capacity in PCU as per IRC – 1960 guidelines |
|-----------------------------------------|--------------------------------|----------------------------------------|----------------------|-----------------------------------------------------|
| Kaganam Panchayat Road                  | 415                            | 132                                    | 547                  | 1500                                                |
| Kollivakkam - Perunkattur District Road | 430                            | 132                                    | 562                  | 1200                                                |

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

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

## 2.6.4 Mineral Beneficiation and Processing

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

## 2.7 PROJECT REQUIREMENT

### 2.7.1 Water Source & Requirement

Detail of water requirements in KLD as given below:

**TABLE 2.13: WATER REQUIREMENT FOR THE PROJECT**

| Purpose               | Quantity       | Source                                           |
|-----------------------|----------------|--------------------------------------------------|
| Dust Suppression      | 2.0 KLD        | From the existing pit or from the water vendors  |
| Green Belt            | 1.0 KLD        | From the existing pit or from the water vendors  |
| Sanitation & Drinking | 0.5 KLD        | From the existing pit or from the water vendors. |
| Total                 | <b>3.5 KLD</b> |                                                  |

Source: Prefeasibility report

### 2.7.2 Power and Other Infrastructure Requirement

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

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

### 2.7.3 Fuel Requirement

One Excavator will excavate 25m<sup>3</sup> of Broken up Rough stone per hour and 60m<sup>3</sup> of Gravel per hour.

Peak production of Rough stone = 530m<sup>3</sup>

Peak production of Gravel = 85m<sup>3</sup>

| Type of machinery                   | Working hours                                                 | Average Diesel consumption/ Hour | Quantity of Diesel in Ltrs |
|-------------------------------------|---------------------------------------------------------------|----------------------------------|----------------------------|
| Working hours of Excavator (Aprx)   | 530m <sup>3</sup> /25m <sup>3</sup> = 21 Hrs<br>(Rough stone) | 22 Ltrs                          | 462                        |
|                                     | 172/60m <sup>3</sup> = 1.5 Hrs                                | 18 Ltrs                          | 27                         |
| Compressor                          | Working hours per day 3 Hrs                                   | 8 Ltrs                           | 24                         |
| Tippers, Motor pumps to drain water | Occasionally                                                  |                                  | 20                         |
| <b>Total Diesel Consumption</b>     |                                                               |                                  | <b>533</b>                 |

The Maximum diesel consumption is around 533 Ltrs per day considering the peak production.

### 2.7.4 Project Cost

The Environmental Management plan has been prepared considering the mode of working, Safety of the employees and Monitoring periods the total Cost is 393 Lakhs.

## 2.8 EMPLOYMENT REQUIREMENT:

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

**TABLE 2.14: PROPOSED MANPOWER DEPLOYMENT**

| Designation                        | No of persons |
|------------------------------------|---------------|
| Mines Manager                      | 1             |
| Geologist                          | 1             |
| Mines Foreman                      | 1             |
| Mate/Blaster                       | 1             |
| Excavator Operator & Tipper Driver | 2             |
| Wagon Drill Operator               | 2             |
| Truck Driver                       | 5             |
| Water Sprinkler Driver             | 1             |
| Jack-Hammer Drillers               | 8             |
| Security                           | 2             |
| Labour & Helper                    | 6             |
| Cleaner & Co-operator              | 10            |
| <b>Total</b>                       | <b>40</b>     |

Source: Approved Mining Plan & Pre-Feasibility report.

## 2.9 PROJECT IMPLEMENTATION SCHEDULE

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

**TABLE 2.15: EXPECTED TIME SCHEDULE**

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

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



### 3. DESCRIPTION OF ENVIRONMENT

#### 3.0 GENERAL

The baseline environment quality represents the background environmental scenario of various environmental components such as Land, Water, Air, Noise, Biological and Socio-economic status of the study area. Field monitoring studies to evaluate the base line status of the project site were carried out covering December 2024 to February 2025 with CPCB guidelines for the following attributes –

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

Environmental data has been collected with reference to cluster quarries by EHS 360 Lab Private Limited, – An accredited by ISO/IEC 17025:2017 (NABL).

#### Study Area

An area of 10 km radius (aerial distance) from the periphery of the cluster is considered for EIA study. The study area has been divided into two zones viz **core zone** and **buffer zone**.

- Core zone is considered as cluster area
- Buffer zone taken as 10km radius from the periphery of the Cluster. Both Core zone and Buffer zone is taken as the study area.

#### Study Period

The baseline study was conducted during the **Winter season** i.e., **December 2024 to February 2025**.

#### Study Methodology

- The project area was surveyed in detail with the help of Total Station Survey instruments and pillars were marked. The boundary coordinates were superimposed on the satellite imagery to understand the relief of the area, besides Land use pattern of the area was studied through the Bhuvan (ISRO)
- Soil samples were collected and analysed for relevant physio-chemical characteristics in order to assess the impact due to mining activities and to recommend saplings for Greenbelt development.
- Ground water samples were collected from the existing bore wells, Surface water was collected from water bodies in the buffer zone and analysed as per CPCB Guidelines.
- An onsite meteorological station was setup in cluster area, to collect data about wind speed, wind direction, temperature, relative humidity, rainfall and general weather conditions were recorded throughout the study period.
- Air quality Data's were collected by installation of Respiratory Dust Samplers (RDS) for Fugitive dust, PM<sub>10</sub> and SO<sub>2</sub>, NO<sub>x</sub> with gaseous attachments & Fine Dust Samplers (FDS) for PM<sub>2.5</sub> and other parameters as per NAAQ norms and analysed for primary air pollutants to work out the existing status of air quality.
- The Noise level measurements were also made at various locations in different intervals of time with the help of sound level meter to establish the baseline noise levels in the impact zone.
- Baseline biological studies were carried out to assess the ecology of the study area to study the existing flora and fauna pattern of the area.

- Socio-Economic survey was conducted at village and household level in the study area to understand the present socio-economic conditions and assess the extent of impact due to the proposed mining project. The sampling methodologies for the various environmental parameters required for the study, frequency of sampling, method of samples analysis, etc., are given below Table 3.1.

**TABLE 3.1: MONITORING ATTRIBUTES AND FREQUENCY OF MONITORING**

| Attribute              | Parameters                                                                                          | Frequency of Monitoring                                         | No. of Locations                     | Protocol                                                                            |
|------------------------|-----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|--------------------------------------|-------------------------------------------------------------------------------------|
| Land-use<br>Land cover | Land-use Pattern within 10 km radius of the study area                                              | Data from census handbook 2011 and from the satellite imagery   | Study Area                           | Satellite Imagery Primary Survey                                                    |
| *Soil                  | Physio-Chemical Characteristics                                                                     | Once during the study period                                    | 6 (1 core & 5 buffer zone)           | IS 2720<br>Agriculture Handbook - Indian Council of Agriculture Research, New Delhi |
| *Water Quality         | Physical, Chemical and Bacteriological Parameters                                                   | Once during the study period                                    | 6 (2 surface water & 4 ground water) | IS 10500& CPCB Standards                                                            |
| Meteorology            | Wind Speed<br>Wind Direction<br>Temperature<br>Cloud cover<br>Dry bulb temperature<br>Rainfall      | 1 Hourly<br>Continuous<br>Mechanical/Auto matic Weather Station | 1                                    | Site specific primary data&<br>Secondary Data from IMD Station                      |
| *Ambient Air Quality   | PM10<br>PM2.5<br>SO2<br>NOX<br>Fugitive Dust                                                        | 24 hourly twice a week<br>(Dec 2024 to May 2025)                | 7 (2 core & 5 buffer)                | IS 5182 Part 1-23<br>National Ambient Air Quality Standards, CPCB                   |
| *Noise Levels          | Ambient Noise                                                                                       | Hourly observation for 24 Hours per location                    | 7 (2 core & 5 buffer zone)           | IS 9989<br>As per CPCB Guidelines                                                   |
| Ecology                | Existing Flora and Fauna                                                                            | Through field visit during the study period                     | Study Area                           | Primary Survey by Quadrate & Transect Study<br>Secondary Data – Forest Working Plan |
| Socio Economic Aspects | Socio–Economic Characteristics, Population Statistics and Existing Infrastructure in the study area | Site Visit & Census Handbook, 2011                              | Study Area                           | Primary Survey, census handbook & need based assessments.                           |

Source: On-site monitoring/sampling by EHS 360Lab Private Limited in association with GEMS

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

### 3.1 LAND ENVIRONMENT

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

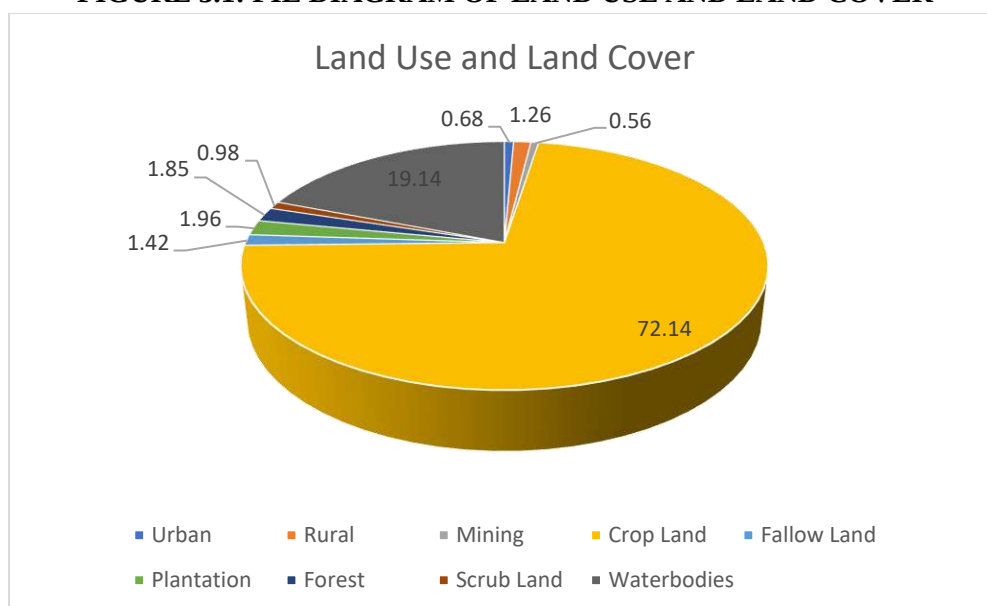
#### 3.1.1 Land Use/ Land Cover

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

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

| S.No                          | CLASSIFICATION | AREA_HA         | AREA_%        |
|-------------------------------|----------------|-----------------|---------------|
| <b>BUILTUP</b>                |                |                 |               |
| 1                             | Urban          | 222.15          | 0.68          |
| 2                             | Rural          | 409.30          | 1.26          |
| 3                             | Mining         | 183.46          | 0.56          |
| <b>AGRICULTURAL LAND</b>      |                |                 |               |
| 4                             | Crop Land      | 23461.00        | 72.14         |
| 5                             | Fallow Land    | 462.09          | 1.42          |
| 6                             | Plantation     | 636.72          | 1.96          |
| <b>FOREST</b>                 |                |                 |               |
| 7                             | Forest         | 602.26          | 1.85          |
| <b>BARREN/WASTE LANDS</b>     |                |                 |               |
| 8                             | Scrub Land     | 317.98          | 0.98          |
| <b>WETLANDS/ WATER BODIES</b> |                |                 |               |
| 9                             | Waterbodies    | 6225.05         | 19.14         |
| <b>TOTAL</b>                  |                | <b>32520.01</b> | <b>100.00</b> |

Source: Survey of India Toposheet and Landsat Satellite Imagery

**FIGURE 3.1: PIE DIAGRAM OF LAND USE AND LAND COVER**

From the above table, pie diagram and land use map it is inferred that the majority of the land in the study area is Agriculture includes crop land and Plantation 75.52% followed by Built-up Lands – 2.5%, Scrub land – 0.98%, and Water bodies 19.14 %.

The total mining area within the study area is 183.46 ha i.e., 0.56%. The cluster area of 9.27.5 ha contributes about 3.50% of the total mining area within the study area. This small percentage of Mining Activities shall not have any significant impact on the environment.

### 3.1.2 Topography

The project area is almost plain terrain having gentle slope towards Eastern side. The altitude of the area is 116m AMSL. The area is covered by 2m thickness of gravel & followed by massive charnockite which is clearly inferred from the surface outcrops.

### 3.1.3 Drainage Pattern of the Area

The drainage pattern of the area is dendritic – sub dendritic. Drainage pattern is the pattern formed by the streams, rivers, and lakes in a particular drainage basin. They are governed by the topography of the land, whether a particular region is dominated by hard or soft rocks, and the gradient of the land. There are no streams, canals or water bodies crossing within the project area.

### 3.1.4 Seismic Sensitivity

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

### 3.1.5 Environmental Features in the Study Area

There is no Wildlife Sanctuaries, National Park and Archaeological monuments within project area. No Protected and Reserved Forest area is involved in the project area. Therefore, there will be no need to

acquisition/diversion of forest land. The details related to the environment sensitivity around the proposed mine lease area i.e. 10 km radius, are given in the below Table 3.3.

FIGURE 3.2: PHYSIOGRAPHIC MAP 10KM RADIUS

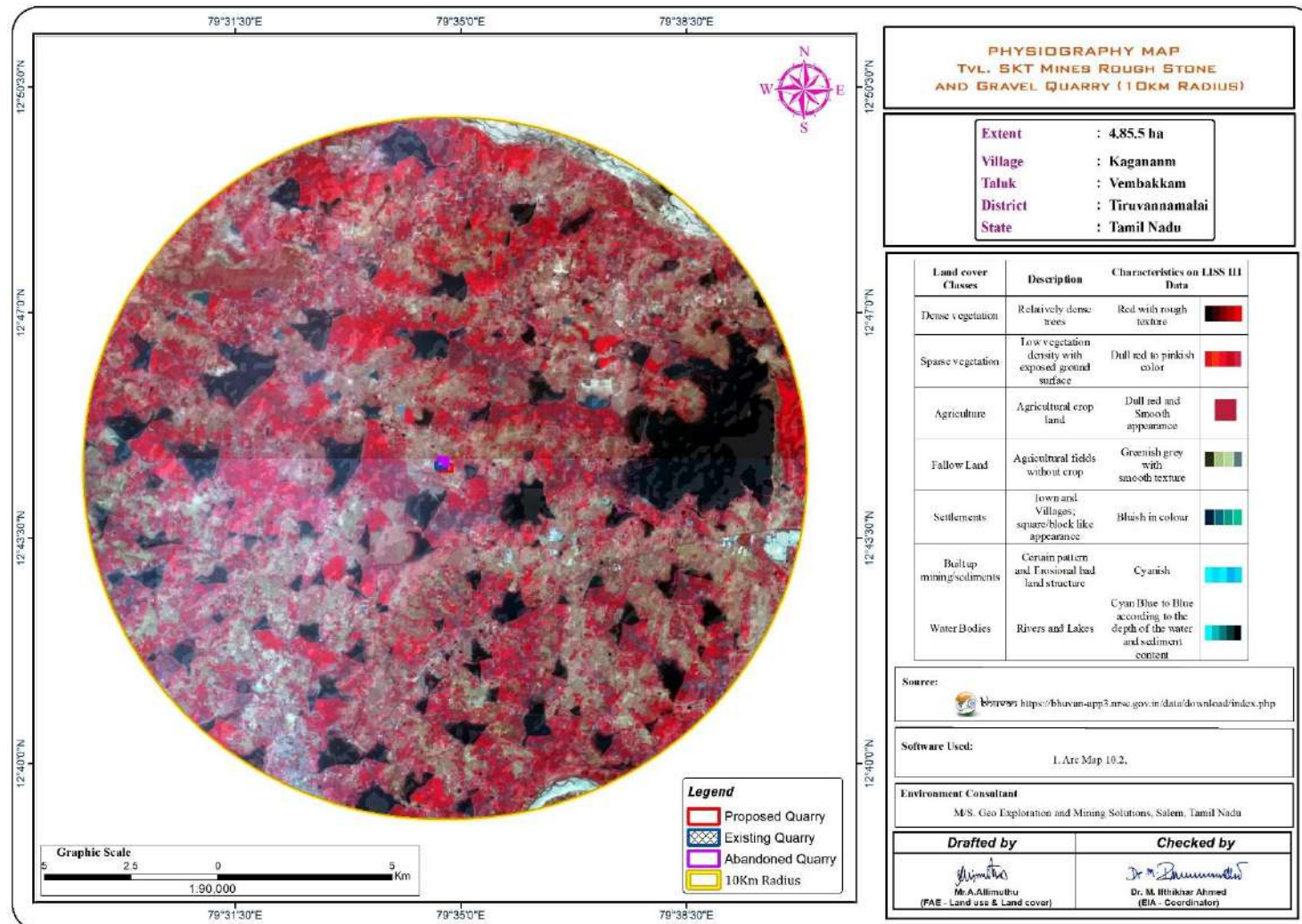
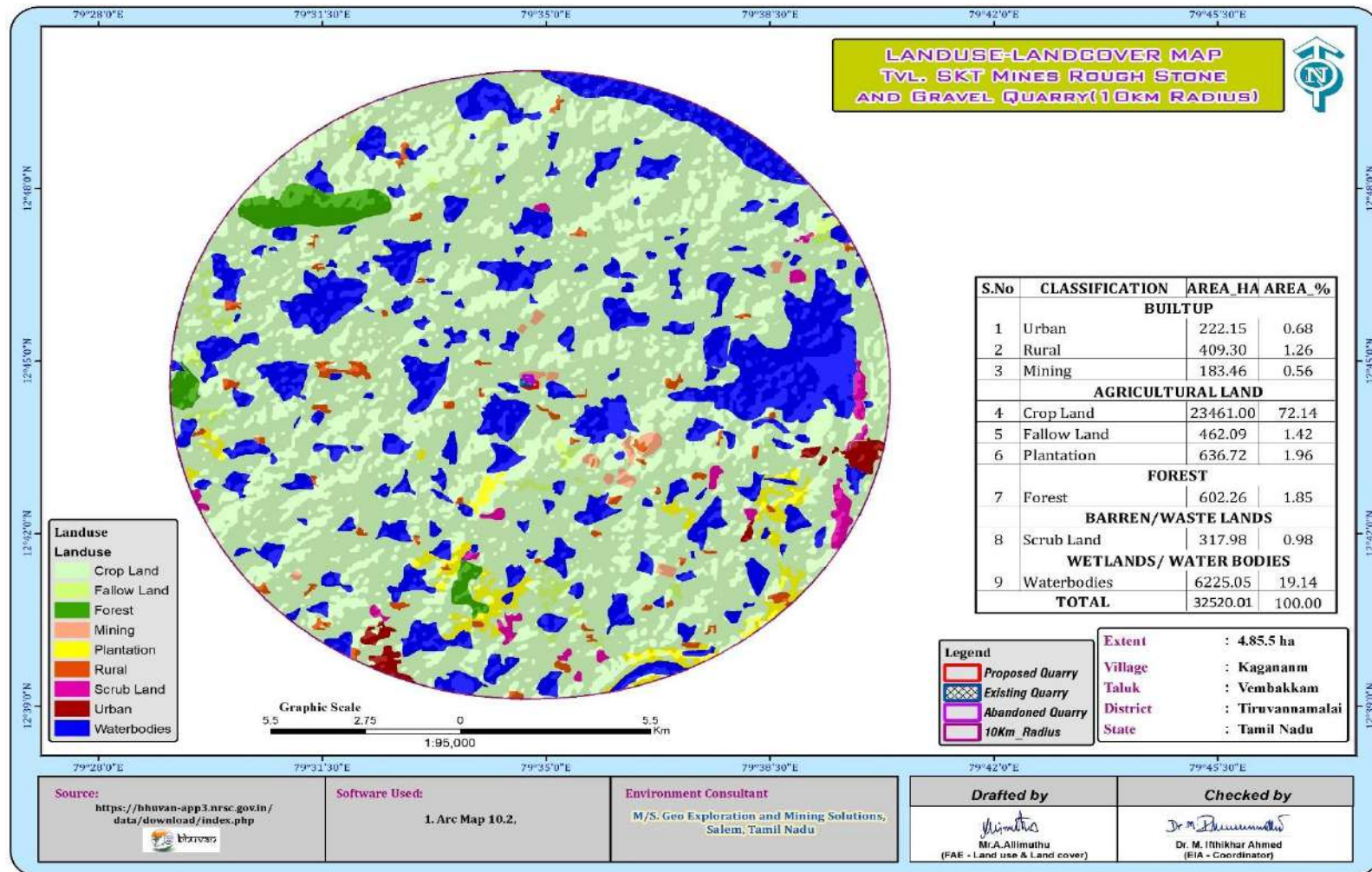


FIGURE 3.3: LAND USE LAND COVER MAP 10KM RADIUS





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

| Sl.No | Sensitive Ecological Features                      | Name                         | Arial Distance in km from Cluster |
|-------|----------------------------------------------------|------------------------------|-----------------------------------|
| 1     | National Park / Wild life Sanctuaries              | Karikili Birds Sanctuary     | 27km – NE                         |
|       |                                                    | Vedanthangal Birds Sanctuary | 31.5km - E                        |
| 2     | Reserve Forest                                     | Thandappanthangal R.F        | 6.5 Km - NW (Source - TNGIS)      |
| 3     | Tiger Reserve/ Elephant Reserve/ Biosphere Reserve | None                         | Nil within 10Km Radius            |
| 4     | Critically Polluted Areas                          | None                         | Nil within 10km Radius            |
| 5     | Mangroves                                          | None                         | Nil within 10km Radius            |
| 6     | Mountains/Hills                                    | None                         | Nil within 10km Radius            |
| 7     | Notified Archaeological Sites                      | None                         | Nil within 10km Radius            |
| 8     | Industries/ Thermal Power Plants                   | None                         | Nil within 10km Radius            |
| 9     | Defence Installation                               | None                         | Nil within 10km Radius            |

Source: Survey of India Toposheet

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

| Sl.No | NAME          | DISTANCE & DIRECTION |
|-------|---------------|----------------------|
| 1     | Odai          | 90m SW               |
| 2     | Tank          | 130m West            |
| 3     | Tank          | 370m East            |
| 4     | Tank          | 470m South           |
| 5     | Mamandur Lake | 5km East             |
| 6     | Palar River   | 9.5km NE             |
| 7     | Cheyar River  | 9.2km SE             |

Source: Village Cadastral Map and Field Survey

**3.1.6 Soil Environment**

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

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

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

**TABLE 3.5: SOIL SAMPLING LOCATIONS**

| S. No | Location Code | Monitoring Locations | Distance & Direction | Coordinates                 |
|-------|---------------|----------------------|----------------------|-----------------------------|
| 1     | S-1           | Core Zone            | Project Area         | 12°44'32.75"N 79°34'48.07"E |
| 2     | S-2           | Kaganam              | 600m SE              | 12°44'13.44"N 79°34'53.69"E |
| 3     | S-3           | Azhividaithangi      | 5.8km NW             | 12°47'26.68"N 79°33'13.97"E |
| 4     | S-4           | Pandiyambakkam       | 5.5km SE             | 12°42'23.78"N 79°36'50.15"E |
| 5     | S-5           | Namandi              | 6.5km NE             | 12°45'48.77"N 79°38'11.85"E |
| 6     | S-6           | Jaderi               | 4.2km SW             | 12°43'13.73"N 79°32'43.71"E |

Source: On-site monitoring/sampling by EHS 360Lab Private Limited lab in association with GEMS.

**Methodology –**

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

**TABLE 3.6: METHODOLOGY OF SAMPLING COLLECTION**

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

Source: On-site monitoring/sampling by EHS 360Lab Private Limited in association with GEMS

**Soil Testing Result –**

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

FIGURE 3.5: SOIL SAMPLING LOCATIONS AROUND 10 KM RADIUS

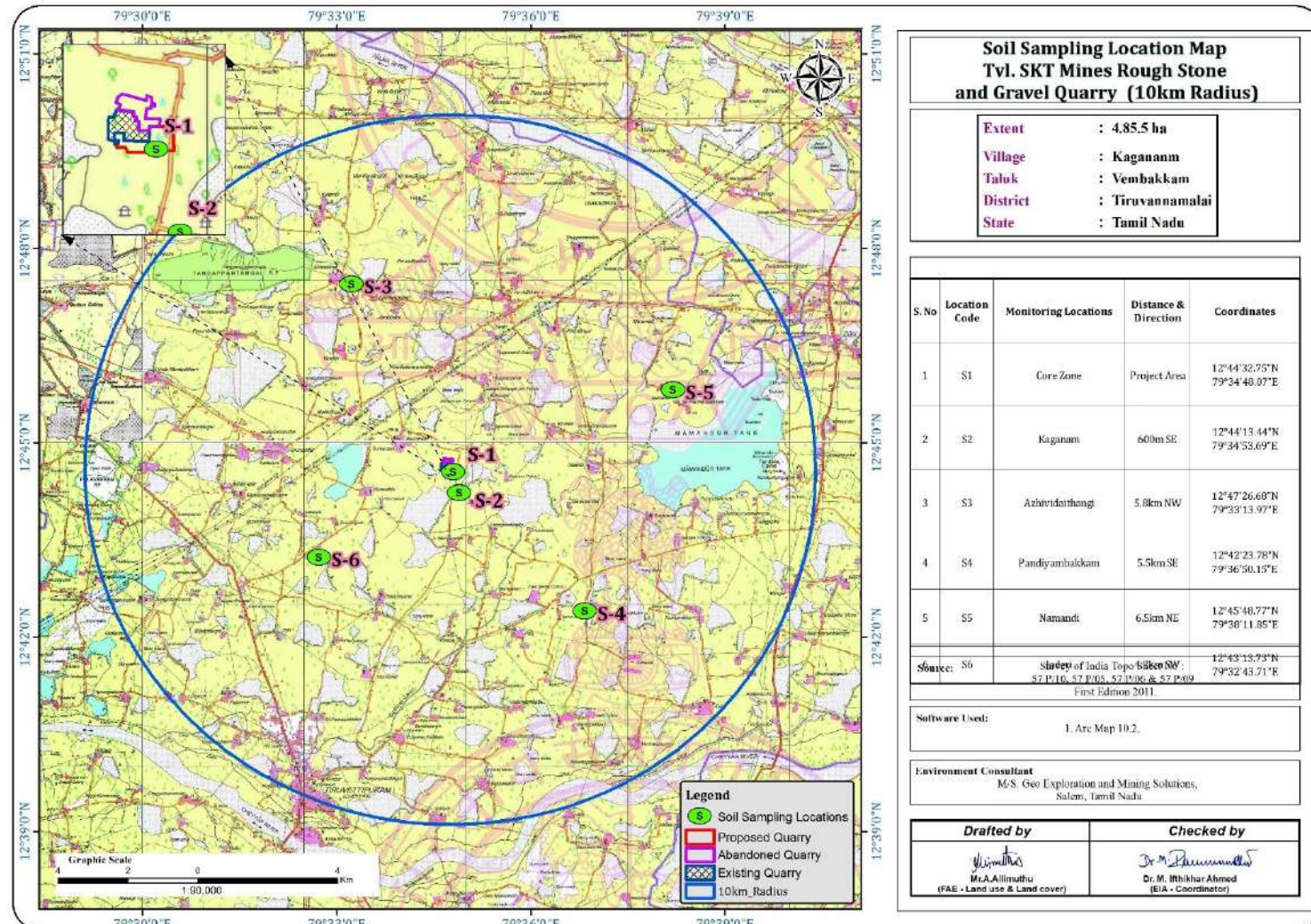
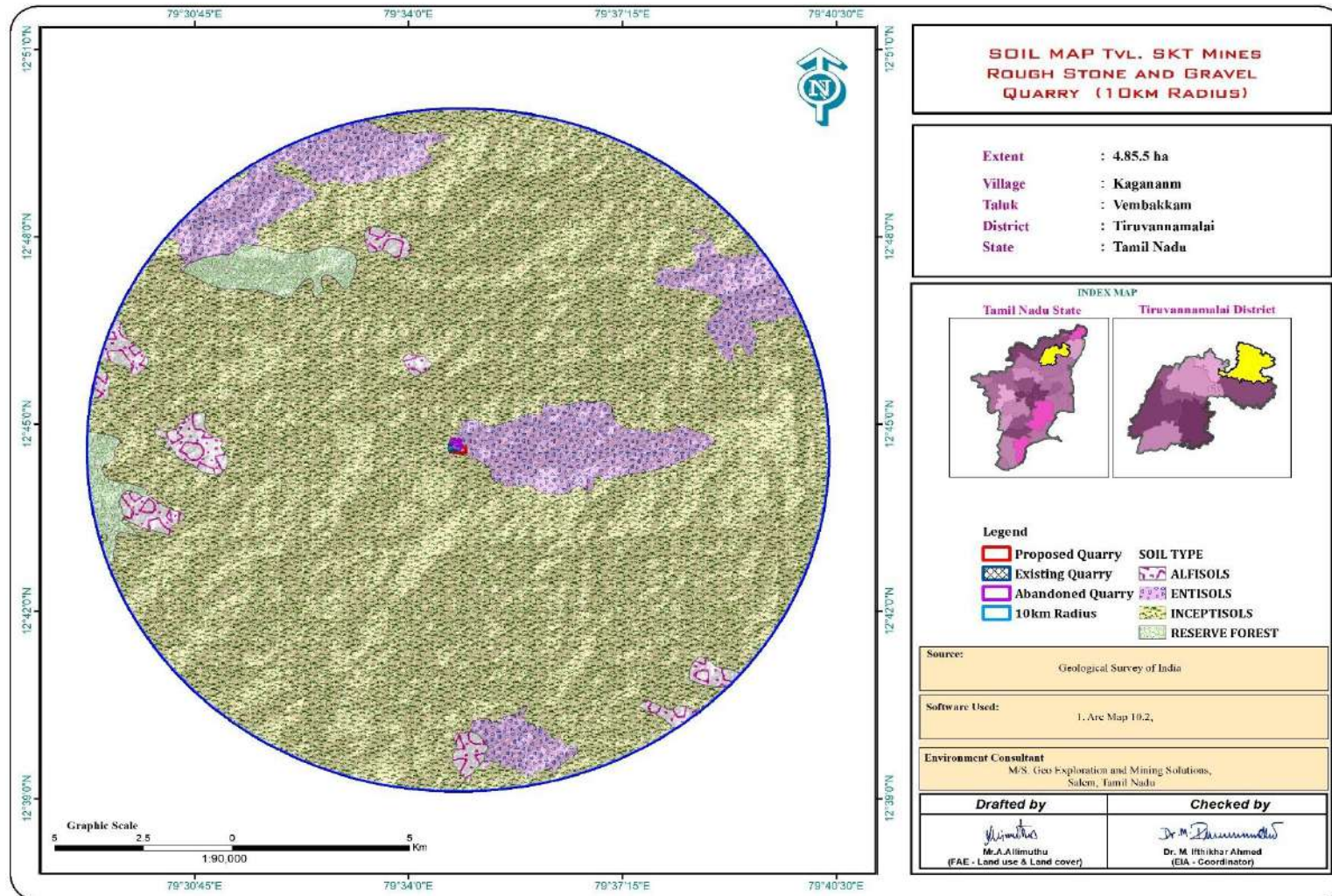




FIGURE 3.6: SOIL MAP



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

| Sl. No | Test Parameters                     | Test Method                                                             | Unit              | S1 Core Zone           | S2 Kaganam             | S3 Azhividaithangi     | S4 Pandiyambakkam      | S5 Namandi             | S6 Jaderi              |
|--------|-------------------------------------|-------------------------------------------------------------------------|-------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| 1      | pH @ 25°C                           | IS 2720 Part 26 - 1987 (Reaff:2016)                                     | -                 | 8.70                   | 8.19                   | 8.44                   | 8.18                   | 8.45                   | 8.17                   |
| 2      | Conductivity @ 25°C                 | IS 14767 - 2000 (Reaff : 2016)                                          | µmhos/cm          | 411 µmhos/cm           | 367 µmhos/cm           | 380 µmhos/cm           | 470 µmhos/cm           | 386 µmhos/cm           | 444 µmhos/cm           |
| 3      | Water Holding Capacity              | By Gravimetric Method                                                   | %                 | 47.5 %                 | 47.4 %                 | 46.5 %                 | 44.7. %                | 46.1 %                 | 45.6 %                 |
| 4      | Bulk Density                        | By Cylindrical Method                                                   | g/cm <sup>3</sup> | 1.05 g/cm <sup>3</sup> | 1.09 g/cm <sup>3</sup> | 1.01 g/cm <sup>3</sup> | 1.06 g/cm <sup>3</sup> | 1.02 g/cm <sup>3</sup> | 1.11 g/cm <sup>3</sup> |
| 5      | Porosity                            | By Gravimetric Method                                                   | %                 | 45.9 %                 | 46.1 %                 | 45.1 %                 | 45.5 %                 | 48.1 %                 | 46.7 %                 |
| 6      | Calcium as Ca                       | Food and Agriculture organization of the united Nation Rome 2007 : 2018 | mg/kg             | 21.4 mg/kg             | 20.5 mg/kg             | 25.4 mg/kg             | 40 mg/kg               | 32.7 mg/kg             | 36.0 mg/kg             |
| 7      | Magnesium as Mg                     | GLCS/SOP/S/021                                                          | mg/kg             | 10.5 mg/kg             | 17.1 mg/kg             | 10.5 mg/kg             | 35.2 mg/kg             | 22.5 mg/kg             | 20.5 mg/kg             |
| 8      | Chloride as Cl                      | APHA 23rd Edn 2019 4500 Cl B                                            | mg/kg             | 11.3 mg/kg             | 6.8 mg/kg              | 17 mg/kg               | 21.6 mg/kg             | 18.1 mg/kg             | 15.1 mg/kg             |
| 9      | Soluble Sulphate as SO <sub>4</sub> | IS 2720 Part 27 : 1977 (Reaff:2015)                                     | %                 | 0.0019 %               | 0.0021 %               | 0.0018 %               | 0.0016 %               | 0.0015 %               | 0.0013 %               |
| 10     | Total Phosphorus as P               | IS 10158 : 1982 (Reaff: 2019)                                           | mg/kg             | 5.5 mg/kg              | 4.45 mg/kg             | 6.33 mg/kg             | 7.05 mg/kg             | 7.01 mg/kg             | 4.14 mg/kg             |
| 11     | Total Nitrogen as N                 | IS 14684 : 1999 (Reaff:2019)                                            | mg/kg             | 409 mg/kg              | 490 mg/kg              | 409.5 mg/kg            | 425.5 mg/kg            | 395.7 mg/kg            | 505.2 mg/kg            |
| 12     | Organic Matter                      | IS : 2720 Part 22: 1972 (Reaff: 2015)                                   | %                 | 1.00 %                 | 2.05 %                 | 2.31 %                 | 1.41 %                 | 2.67 %                 | 1.31 %                 |
| 13     | Organic Carbon                      | IS : 2720 Part 22: 1972 (Reaff: 2015)                                   | %                 | 0.58 %                 | 1.19 %                 | 1.34 %                 | 0.82 %                 | 1.55 %                 | 0.76 %                 |
| 14     | Texture :                           | Gravimetric Method                                                      | -                 | -                      | -                      | -                      | -                      | -                      | -                      |
|        | Clay                                |                                                                         | %                 | 32.5 %                 | 32.6 %                 | 30.6 %                 | 33.1 %                 | 30.9 %                 | 32.5 %                 |
|        | Sand                                |                                                                         | %                 | 24.9 %                 | 33.1 %                 | 29.9 %                 | 30.0 %                 | 29.1 %                 | 35.2 %                 |
|        | Silt                                |                                                                         | %                 | 42.6 %                 | 34.3 %                 | 39.5 %                 | 36.9 %                 | 40.0 %                 | 32.3 %                 |
| 15     | Manganese as Mn                     | USEPA 3050 B – 1996 & USEPA 6010 C - 2000                               | mg/kg             | 9.1 mg/kg              | 16.5 mg/kg             | 9.05 mg/kg             | 4.76 mg/kg             | 11.7 mg/kg             | 5.8 mg/kg              |
| 16     | Zinc as Zn                          |                                                                         | mg/kg             | 4.4 mg/kg              | 4.9 mg/kg              | 1.11 mg/kg             | 4.2 mg/kg              | 2.18 mg/kg             | 5.14 mg/kg             |
| 17     | Boron as B                          |                                                                         | mg/kg             | 2.9 mg/kg              | 1.22 mg/kg             | 2.13 mg/kg             | 1.25 mg/kg             | 6.25 mg/kg             | 0.85 mg/kg             |

|    |                          |                   |                  |                      |                       |                       |                       |                      |                      |
|----|--------------------------|-------------------|------------------|----------------------|-----------------------|-----------------------|-----------------------|----------------------|----------------------|
| 18 | Potassium as K           |                   | mg/kg            | 30.1 mg/kg           | 52.7 mg/kg            | 45.0 mg/kg            | 38.4 mg/kg            | 40.4 mg/kg           | 38.6 mg/kg           |
| 19 | Cadmium as Cd            |                   | mg/kg            | BDL (DL : 1.0 mg/kg) | BDL (DL : 1.0 mg/kg)  | BDL (DL : 1.0 mg/kg)  | BDL (DL : 1.0 mg/kg)  | BDL (DL : 1.0 mg/kg) | BDL (DL : 1.0 mg/kg) |
| 20 | Total Chromium as Cr     |                   | mg/kg            | 1.12                 | 2.02                  | 1.59                  | 4.63                  | 4.08                 | 1.63                 |
| 21 | Copper as Cu             |                   | mg/kg            | BDL (DL : 1.0 mg/kg) | BDL (DL : 1.0 mg/kg)  | BDL (DL : 1.0 mg/kg)  | BDL (DL : 1.0 mg/kg)  | BDL (DL : 1.0 mg/kg) | BDL (DL : 1.0 mg/kg) |
| 22 | Lead as Pb               |                   | mg/kg            | 0.62 mg/kg           | 0.87 mg/kg            | 0.81 mg/kg            | 0.89 mg/kg            | 1.01 mg/kg           | 0.88 mg/kg           |
| 23 | Iron as Fe               |                   | mg/kg            | 16.6 mg/kg           | 21.3 mg/kg            | 9.69 mg/kg            | 10.99 mg/kg           | 7.66 mg/kg           | 8.15 mg/kg           |
| 24 | Cation Exchange Capacity | USEPA 9080 – 1986 | meq/100g of soil | 44 meq/100g of soil  | 40.1 meq/100g of soil | 45.4 meq/100g of soil | 48.2 meq/100g of soil | 48 meq/100g of soil  | 37 meq/100g of soil  |

Source: Sampling Results by EHS 360Lab Private Limited in association with GEMS

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## Interpretation & Conclusion

### Physical Characteristics –

The physical properties of the soil samples were examined for texture, bulk density, porosity and water holding capacity. The soil texture found in the study area is Clay (30.6 % to 33.1%) to Sandy Loam Soil and Bulk Density of Soils in the study area varied between 0.82 – 1.19 g/cm<sup>3</sup>. The Water Holding Capacity is found to be medium i.e., ranging from 38.5-47.8 %.

### Chemical Characteristics –

- The nature of soil is slightly alkaline to strongly alkaline with pH range 8.19-8.70
- The available Nitrogen content range between 395.7 to 505.2 mg/kg
- The available Phosphorus content range between 30.1 to 52.7 mg/kg
- The available Potassium range between 4.45 to 7.05 mg/kg

## 3.2 WATER ENVIRONMENT

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

### 3.2.1 Surface Water Resources:

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

### 3.2.2 Ground Water Resources:

Groundwater occurs in all the crystalline formations of oldest Achaeans and Recent Alluvium. The occurrence and behaviour of groundwater are controlled by rainfall, topography, geomorphology, geology, structures etc., The weathering is controlled by the intensity of weathering and fracturing. Dug wells as wells as bore wells are more common ground water abstraction structures in the area. The diameter of the dug well is in the range of 7 to 10m and depth of dug wells range from 7.2 to 13 m bgl. The dug wells yield up to 1 lps in summer months and few wells remains dry. The yield is adequate for irrigation for one or two crops in monsoon period.

### 3.2.3 Methodology

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

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

Two (2) surface water and Four (4) ground water samples were collected from the study area and were analysed for physio-chemical, heavy metals and bacteriological parameters in order to assess the effect of mining and other activities on surface and ground water. The samples were analysed as per the procedures specified by CPCB, IS-



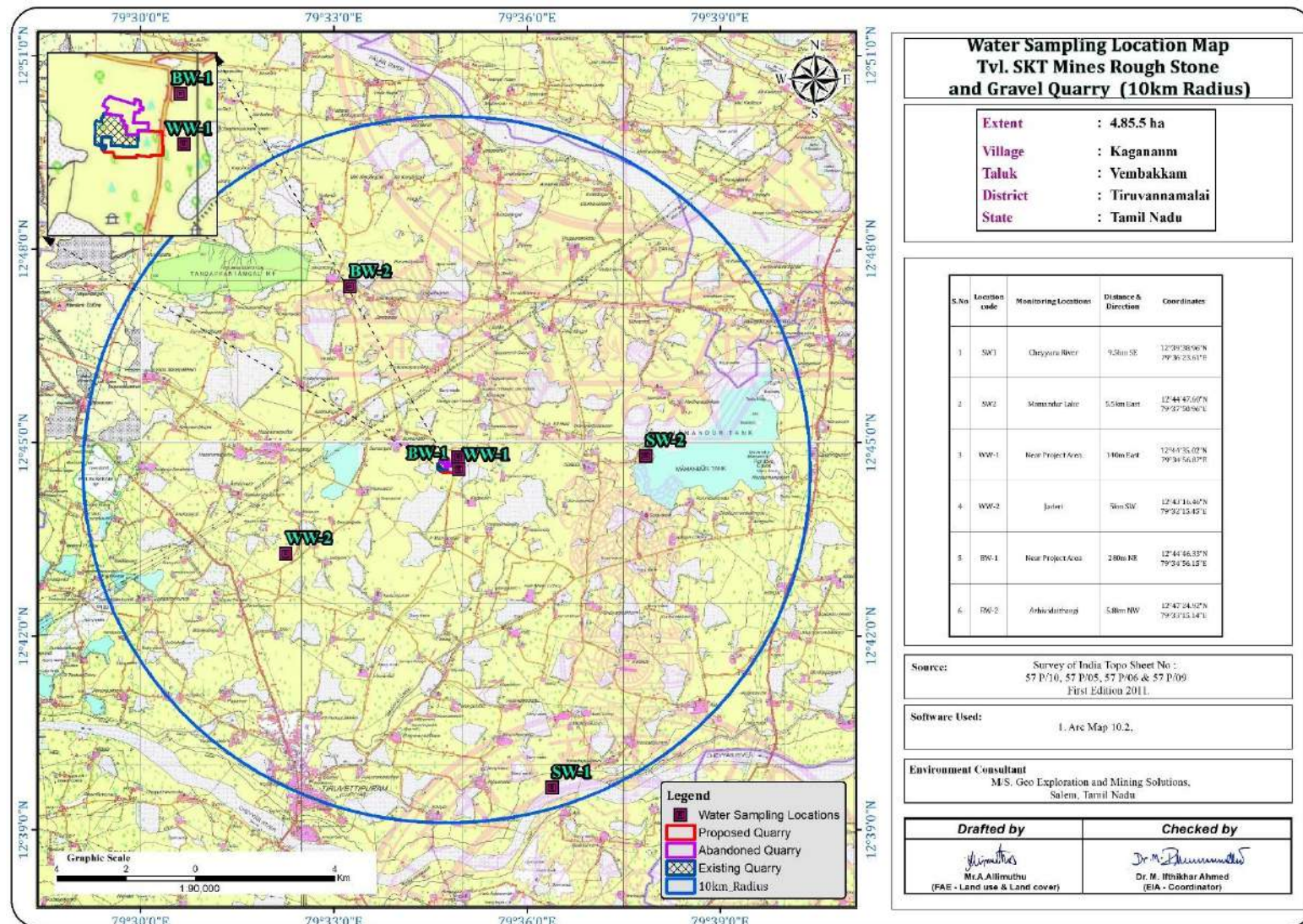
10500:2012 and 'Standard methods for the Examination of Water and Wastewater' published by American Public Health Association (APHA). The water sampling locations are given in Table 3.8 and shown as Figure 3.5.

**TABLE 3.8: WATER SAMPLING LOCATIONS**

| S.NO                 | CODE | LOCATIONS         | DISTANCE & DIRECTION | CO-ORDINATES                |
|----------------------|------|-------------------|----------------------|-----------------------------|
| <b>SURFACE WATER</b> |      |                   |                      |                             |
| 1                    | SW1  | Cheyaru River     | 9.5km SE             | 12°39'38.96"N 79°36'23.61"E |
| 2                    | SW2  | Mamandur Lake     | 5.5km East           | 12°44'47.60"N 79°37'50.96"E |
| <b>GROUND WATER</b>  |      |                   |                      |                             |
| 3                    | WW-1 | Near Project Area | 140m East            | 12°44'35.02"N 79°34'56.87"E |
| 4                    | WW-2 | Jaderi            | 5km SW               | 12°43'16.46"N 79°32'15.45"E |
| 5                    | BW-1 | Near Project Area | 280m NE              | 12°44'46.33"N 79°34'56.15"E |
| 6                    | BW-2 | Azhividaithangi   | 5.8km NW             | 12°47'24.92"N 79°33'15.14"E |

Source: On-site monitoring/sampling by EHS 360 Lab Private Limited in association with GEMS

FIGURE 3.7: WATER SAMPLING LOCATIONS AROUND 10 KM RADIUS



**TABLE 3.9: GROUND WATER SAMPLING RESULTS**

| S.NO | Parameter                                             | WW-1<br>Near Project area | WW-2<br>Jaderi       | BW-1<br>Near Project Area | BW-2<br>Azhividaithangi |
|------|-------------------------------------------------------|---------------------------|----------------------|---------------------------|-------------------------|
| 1    | Color                                                 | 5                         | 5                    | 5                         | 5                       |
| 2    | Odour                                                 | Agreeable                 | Agreeable            | Agreeable                 | Agreeable               |
| 3    | pH@ 25°C                                              | 6.73                      | 7.55                 | 7.09                      | 7.05                    |
| 4    | Electrical Conductivity @ 25°C                        | 820 µmhos/cm              | 1538 µmhos/cm        | 744 µmhos/cm              | 763 µmhos/cm            |
| 5    | Turbidity                                             | 1.0 NTU                   | 1.0 NTU              | 1.0 NTU                   | 1 NTU                   |
| 6    | Total Dissolved Solids                                | 484 mg/l                  | 908 mg/l             | 439 mg/l                  | 450 mg/l                |
| 7    | Total Hardness as CaCO <sub>3</sub>                   | 172.78 mg/l               | 192.98 mg/l          | 160.49 mg/l               | 155.65 mg/l             |
| 8    | Calcium as Ca                                         | 29.7 mg/l                 | 34.5 mg/l            | 25.6 mg/l                 | 25.8 mg/l               |
| 9    | Magnesium as Mg                                       | 24.0 mg/l                 | 26 mg/l              | 23.5 mg/l                 | 22.2 mg/l               |
| 10   | Total Alkalinity                                      | 160 mg/l                  | 170 mg/l             | 150 mg/l                  | 141 mg/l                |
| 11   | Chloride as Cl <sup>-</sup>                           | 115 mg/l                  | 105 mg/l             | 85.2 mg/l                 | 90.1 mg/l               |
| 12   | Sulphate as SO <sub>4</sub> <sup>-</sup>              | 42.1 mg/l                 | 69.5 mg/l            | 51.0 mg/l                 | 68.5 mg/l               |
| 13   | Iron as Fe                                            | 0.29 mg/l                 | 0.3 mg/l             | 0.15 mg/l                 | 0.23 mg/l               |
| 14   | Free Residual Chlorine                                | BDL (DL:0.1 mg/l)         | BDL (DL:0.1 mg/l)    | BDL (DL:0.1 mg/l)         | BDL (DL:0.1 mg/l)       |
| 15   | Fluoride as F                                         | 0.14 mg/l                 | 0.37 mg/l            | 0.21 mg/l                 | 0.29 mg/l               |
| 16   | Nitrates as NO <sub>3</sub>                           | 4.63 mg/l                 | 4.08 mg/l            | 5.15 mg/l                 | 4.38 mg/l               |
| 17   | Copper as Cu                                          | BDL (DL:0.01 mg/l)        | BDL (DL:0.01 mg/l)   | BDL (DL:0.01 mg/l)        | BDL (DL:0.01 mg/l)      |
| 18   | Manganese as Mn                                       | BDL (DL:0.02 mg/l)        | BDL (DL:0.02 mg/l)   | BDL (DL:0.02 mg/l)        | BDL (DL:0.02 mg/l)      |
| 19   | Mercury as Hg                                         | BDL (DL:0.0005 mg/l)      | BDL (DL:0.0005 mg/l) | BDL (DL:0.0005 mg/l)      | BDL (DL:0.0005 mg/l)    |
| 20   | Cadmium as Cd                                         | BDL (DL:0.001 mg/l)       | BDL (DL:0.001 mg/l)  | BDL (DL:0.001 mg/l)       | BDL (DL:0.001 mg/l)     |
| 21   | Selenium as Se                                        | BDL (DL:0.005 mg/l)       | BDL (DL:0.005 mg/l)  | BDL (DL:0.005 mg/l)       | BDL (DL:0.005 mg/l)     |
| 22   | Aluminium as Al                                       | BDL (DL:0.005 mg/l)       | BDL (DL:0.005 mg/l)  | BDL (DL:0.005 mg/l)       | BDL (DL:0.005 mg/l)     |
| 23   | Lead as Pb                                            | BDL (DL:0.005 mg/l)       | BDL (DL:0.005 mg/l)  | BDL (DL:0.005 mg/l)       | BDL (DL:0.005 mg/l)     |
| 24   | Zinc as Zn                                            | BDL(DL : 0.05 mg/l)       | BDL(DL : 0.05 mg/l)  | BDL(DL : 0.05 mg/l)       | BDL(DL : 0.05 mg/l)     |
| 25   | Total Chromium                                        | BDL(DL : 0.02 mg/l)       | BDL(DL : 0.02 mg/l)  | BDL(DL : 0.02 mg/l)       | BDL(DL : 0.02 mg/l)     |
| 26   | Boron as B                                            | BDL(DL : 0.05 mg/l)       | BDL(DL : 0.05 mg/l)  | BDL(DL : 0.05 mg/l)       | BDL(DL : 0.05 mg/l)     |
| 27   | Mineral Oil                                           | BDL(DL : 0.01 mg/l)       | BDL(DL : 0.01 mg/l)  | BDL(DL : 0.01 mg/l)       | BDL(DL : 0.01 mg/l)     |
| 28   | Phenolic Compunds as C <sub>6</sub> H <sub>5</sub> OH | BDL (DL:0.0005 mg/l)      | BDL (DL:0.0005 mg/l) | BDL (DL:0.0005 mg/l)      | BDL (DL:0.0005 mg/l)    |
| 29   | Anionic Detergents as                                 | BDL (DL:0.01 mg/l)        | BDL (DL:0.01 mg/l)   | BDL (DL:0.01 mg/l)        | BDL (DL:0.01 mg/l)      |
| 30   | Cyanide as CN                                         | BDL (DL:0.01 mg/l)        | BDL (DL:0.01 mg/l)   | BDL (DL:0.01 mg/l)        | BDL (DL:0.01 mg/l)      |
| 31   | Barium as Ba                                          | BDL(DL:0.05 mg/l)         | BDL(DL:0.05 mg/l)    | BDL(DL:0.05 mg/l)         | BDL(DL:0.05 mg/l)       |
| 32   | Ammonia (as total ammonia-N)                          | BDL (DL:0.01 mg/l)        | BDL (DL:0.01 mg/l)   | BDL (DL:0.01 mg/l)        | BDL (DL:0.01 mg/l)      |
| 33   | Sulphide as H <sub>2</sub> S                          | BDL (DL:0.01 mg/l)        | BDL (DL:0.01 mg/l)   | BDL (DL:0.01 mg/l)        | BDL (DL:0.01 mg/l)      |

|    |                        |                     |                     |                     |                     |
|----|------------------------|---------------------|---------------------|---------------------|---------------------|
| 34 | Molybdenum as Mo       | BDL (DL:0.02 mg/l)  | BDL (DL:0.02 mg/l)  | BDL (DL:0.02 mg/l)  | BDL (DL:0.02 mg/l)  |
| 35 | Total Arsenic as As    | BDL (DL:0.005 mg/l) | BDL (DL:0.005 mg/l) | BDL (DL:0.005 mg/l) | BDL (DL:0.005 mg/l) |
| 36 | Total Suspended Solids | BDL (DL:1.0 mg/l)   | BDL (DL:1.0 mg/l)   | BDL (DL:1.0 mg/l)   | BDL (DL:1.0 mg/l)   |
| 37 | Total Coliform         | 170 MPN/100ml       | 90 MPN/100ml        | 130 MPN/100ml       | 100 MPN/100ml       |
| 38 | Escherichia coli       | < 1.8 MPN/100ml     | < 1.8 MPN/100ml     | < 1.8 MPN/100ml     | < 1.8 MPN/100ml     |

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

**TABLE 3.10: SURFACE WATER SAMPLING RESULTS**

| Sl. No. | Parameter                                              | Unit      | RESULT               |                     |
|---------|--------------------------------------------------------|-----------|----------------------|---------------------|
|         |                                                        |           | SW1- Cheyyaru River  | SW2- Mamandur Lake  |
| 1       | Colour                                                 | Hazen     | 5 Hazen              | 10 Hazen            |
| 2       | Odour                                                  | -         | Agreeable            | Agreeable           |
| 3       | pH@ 25°C                                               | -         | 7.88                 | 7.61                |
| 4       | Electrical Conductivity @ 25°C                         | µs/cm     | 654 µmhos/cm         | 892 µmhos/cm        |
| 5       | Turbidity                                              | NTU       | 4.1 NTU              | 3.9 NTU             |
| 6       | Total Dissolved Solids                                 | mg /l     | 386 mg/l             | 488 mg/l            |
| 7       | Total Hardness as CaCO <sub>3</sub>                    | mg/l      | 127.95 mg/l          | 189.93 mg/l         |
| 8       | Calcium as Ca                                          | mg/l      | 20.68 mg/l           | 34.1 mg/l           |
| 9       | Magnesium as Mg                                        | mg/l      | 18.57 mg/l           | 25.5 mg/l           |
| 10      | Total Alkalinity as CaCO <sub>3</sub>                  | mg/l      | 111 mg/l             | 143 mg/l            |
| 11      | Chloride as Cl <sup>-</sup>                            | mg/l      | 85.6 mg/l            | 120 mg/l            |
| 12      | Sulphate as SO <sub>4</sub> <sup>-</sup>               | mg/l      | 42.7 mg/l            | 45.3 mg/l           |
| 13      | Iron as Fe                                             | mg/l      | 0.31 mg/l            | 0.12 mg/l           |
| 14      | Free Residual Chlorine                                 | mg/l      | BDL (DL:0.1 mg/l)    | BDL (DL:0.1 mg/l)   |
| 15      | Fluoride as F                                          | mg/l      | 0.22 mg/l            | 0.19 mg/l           |
| 16      | Nitrates as NO <sub>3</sub>                            | mg/l      | 10.1 mg/l            | 8.25 mg/l           |
| 17      | Copper as Cu                                           | mg/l      | BDL (DL:0.01 mg/l)   |                     |
| 18      | Manganese as Mn                                        | mg/l      | BDL (DL:0.02 mg/l)   |                     |
| 19      | Mercury as Hg                                          | mg/l      | BDL (DL:0.0005 mg/l) |                     |
| 20      | Cadmium as Cd                                          | mg/l      | BDL (DL:0.001 mg/l)  |                     |
| 21      | Selenium as Se                                         | mg/l      | BDL (DL:0.005 mg/l)  |                     |
| 22      | Aluminium as Al                                        | mg/l      | BDL (DL:0.005 mg/l)  |                     |
| 23      | Lead as Pb                                             | mg/l      | BDL (DL:0.005 mg/l)  |                     |
| 24      | Zinc as Zn                                             | mg/l      | BDL (DL : 0.05 mg/l) |                     |
| 25      | Total Chromium                                         | mg/l      | BDL (DL : 0.02 mg/l) |                     |
| 26      | Boron as B                                             | mg/l      | BDL (DL : 0.05 mg/l) |                     |
| 27      | Mineral Oil                                            | mg/l      | BDL (DL : 0.01 mg/l) |                     |
| 28      | Phenolic Compounds as C <sub>6</sub> H <sub>5</sub> OH | mg/l      | BDL (DL:0.0005 mg/l) |                     |
| 29      | Anionic Detergents as MBAS                             | mg/l      | BDL (DL:0.01 mg/l)   |                     |
| 30      | Cyanide as CN                                          | mg/l      | BDL (DL:0.01 mg/l)   |                     |
| 31      | Biological Oxygen Demand, 3 days @ 27°C                | mg/l      | 7.8 mg/l             | 10.2 mg/l           |
| 32      | Chemical Oxygen Demand                                 | mg/l      | 30 mg/l              | 40 mg/l             |
| 33      | Dissolved Oxygen                                       | mg/l      | 4.8 mg/l             | 5.1 mg/l            |
| 34      | Barium as Ba                                           | mg/l      | BDL (DL:0.05 mg/l)   | BDL (DL:0.05 mg/l)  |
| 35      | Ammonia (as total ammonia-N)                           | mg/l      | 1.09 mg/l            | 1.25 mg/l           |
| 36      | Sulphide as H <sub>2</sub> S                           | mg/l      | BDL (DL:0.01 mg/l)   | BDL (DL:0.01 mg/l)  |
| 37      | Molybdenum as Mo                                       | mg/l      | BDL (DL:0.02 mg/l)   | BDL (DL:0.02 mg/l)  |
| 38      | Total Arsenic as As                                    | mg/l      | BDL (DL:0.005 mg/l)  | BDL (DL:0.005 mg/l) |
| 39      | Total Suspended Solids                                 | mg/l      | 20.1 mg/l            | 25.9 mg/l           |
| 40      | Total Coliform                                         | MPN/100ml | 480 MPN/100ml        | 440 MPN/100ml       |
| 41      | Escherichia coli                                       | MPN/100ml | 120 MPN/100ml        | 110 MPN/100ml       |

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

### 3.2.4 Interpretation & Conclusion

#### Surface Water

The pH varied from 7.88 – 7.61 while turbidity found within the standards (Optimal pH range for sustainable aquatic life is 6.5 to 8.5 pH).

#### Total Dissolved Solids:

Total Dissolved Solids varied from 386 - 488 mg/l, the TDS mainly composed of carbonates, bicarbonates, Chlorides, phosphates and nitrates of calcium, magnesium, sodium and other organic matter.

#### Other parameters:

Chloride content is 85.6 - 120 mg/l. Nitrates varied from 10.1 – 8.25 mg/l, while sulphates varied from 42.7 – 45.3 mg/l.

#### Ground Water

The pH of the water samples collected ranged from 6.73 – 7.55 and within the acceptable limit of 6.5 to 8.5. pH, Sulphates and Chlorides of water samples from all the sources are within the limits as per the Standard. On Turbidity, the water samples meet the requirement. Total Dissolved Solids were found in the range of 439 - 908mg/l in all samples. Total hardness varied between 155.65 – 192.98 mg/l for all samples.

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

### 3.2.5 Hydrology and Hydrogeological studies

The district is underlain by hard rock formation fissured and fractured crystalline rocks constitute the important aquifer systems in the district. Geophysical prospecting was carried out in that area by SSRMP-80 Instrument by qualified Geo physicist with the help of IGIS software and it was inferred that the low resistance encountered at the depth between 78-82 m bgl. The maximum depth proposed out of proposed projects is 72m (2m Gravel + 70m Rough stone) below ground level.

#### Ground water levels and Flow Direction based on the Bore well and open well Data's

In general, the ground water movement is based on the gradient ie., water moves from the highest static ground water elevation to lowest static ground water elevation point. The ground water movement is important aspect to locating the recharge and discharge areas. Therefore, the data has been collected in the study area. Water level measured in the ten open well and eight borewells.

The average water level in the open well is varies from = 10.3 m to 12.8 m bgl

The water level in the bore well is varies from = 76.4 to 79.5 m bgl

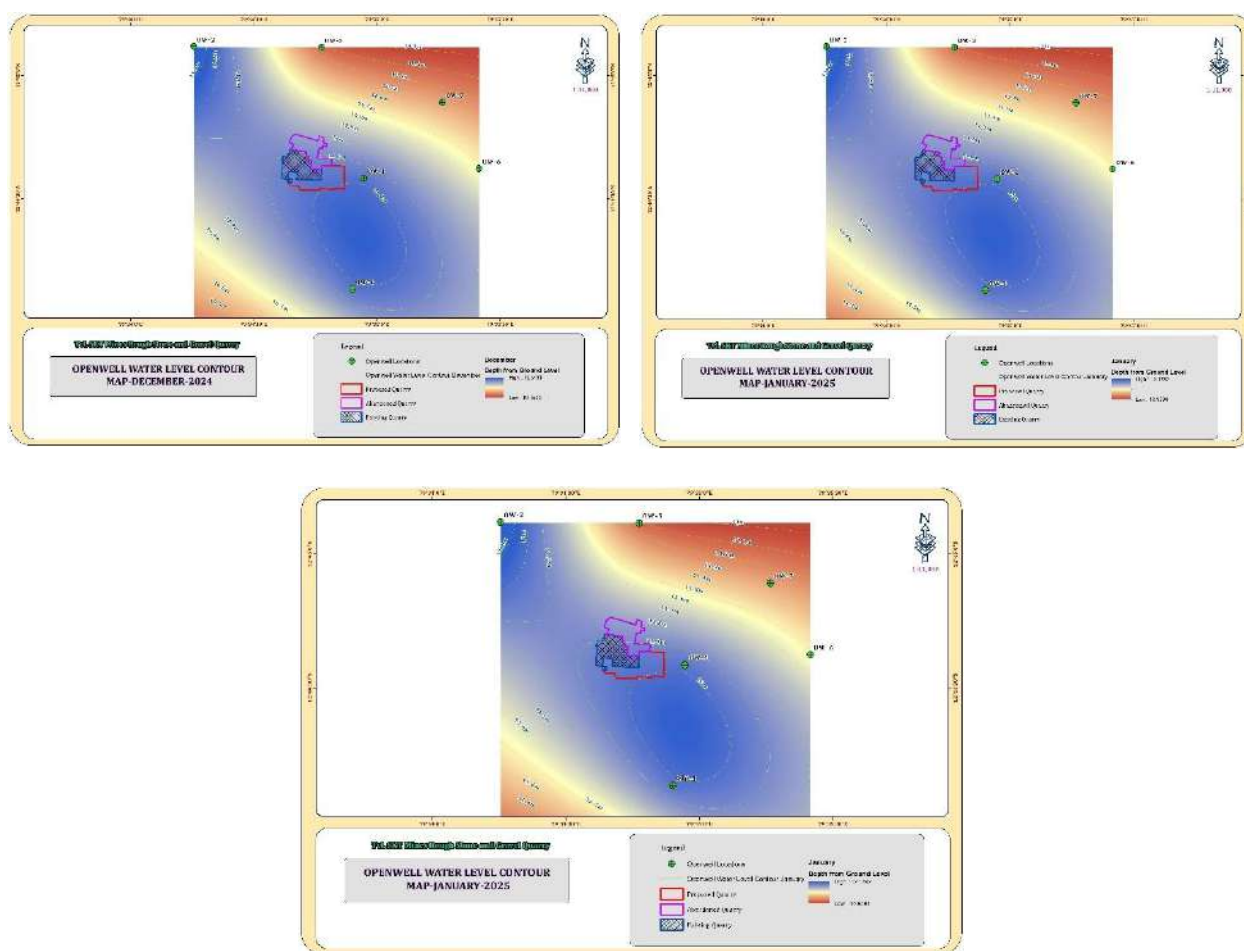
Based on the water level contour map of the open well and bore well the water flow direction in the particular region is towards North side.

The water level in the area is above 78-82 m hence there is no possibilities of water table intersection during the entire mine life period besides it is also inferred topographically that there are no major water bodies intersecting the project area.

**TABLE 3.11: WINTER SEASON WATER LEVEL OF OPEN WELLS 1 KM RADIUS**

| S.NO | LABEL | LONGITUDE          | LATITUDE           | Dec 24 | Jan-25 | Feb 25 |
|------|-------|--------------------|--------------------|--------|--------|--------|
| 1    | OW1   | 79° 34' 56.8172" E | 12° 44' 35.0499" N | 11.2   | 12     | 12.6   |
| 2    | OW2   | 79° 34' 15.3272" E | 12° 45' 07.0465" N | 11.4   | 12.2   | 12.8   |
| 3    | OW3   | 79° 34' 46.4944" E | 12° 45' 06.8890" N | 10.3   | 11.1   | 11.7   |
| 4    | OW4   | 79° 34' 54.0168" E | 12° 44' 08.0223" N | 11.2   | 12     | 12.6   |
| 5    | OW5   | 79° 34' 46.5310" E | 12° 43' 54.8664" N | 10.5   | 11.3   | 11.9   |
| 6    | OW6   | 79° 35' 24.8865" E | 12° 44' 37.3479" N | 10.7   | 11.5   | 12.1   |
| 7    | OW7   | 79° 35' 15.9452" E | 12° 44' 53.4102" N | 10.5   | 11.3   | 11.9   |

Source: Onsite monitoring data

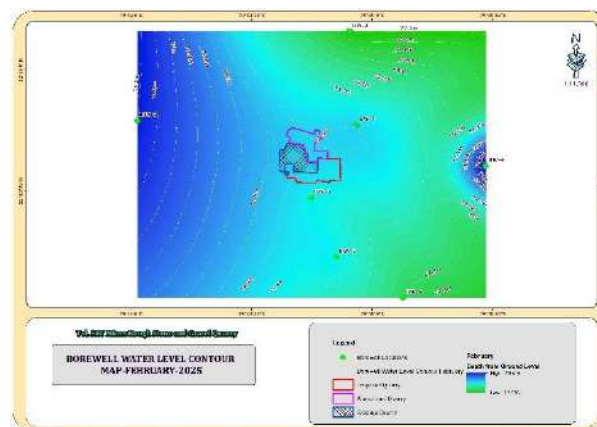
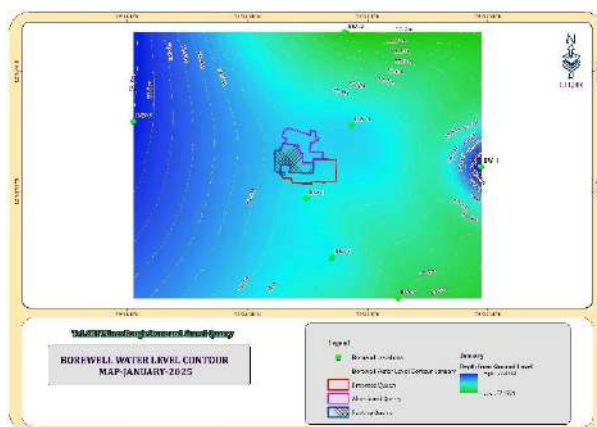
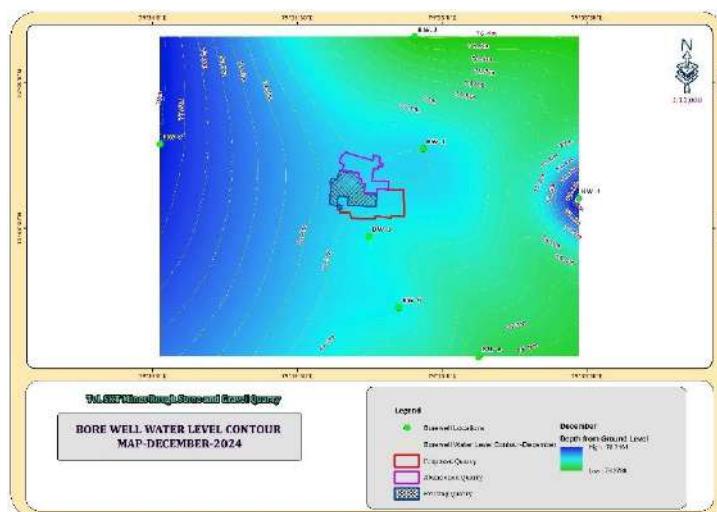
**FIGURE 3.8: OPEN WELL CONTOUR MAP DEC 2024 to FEB 2025**

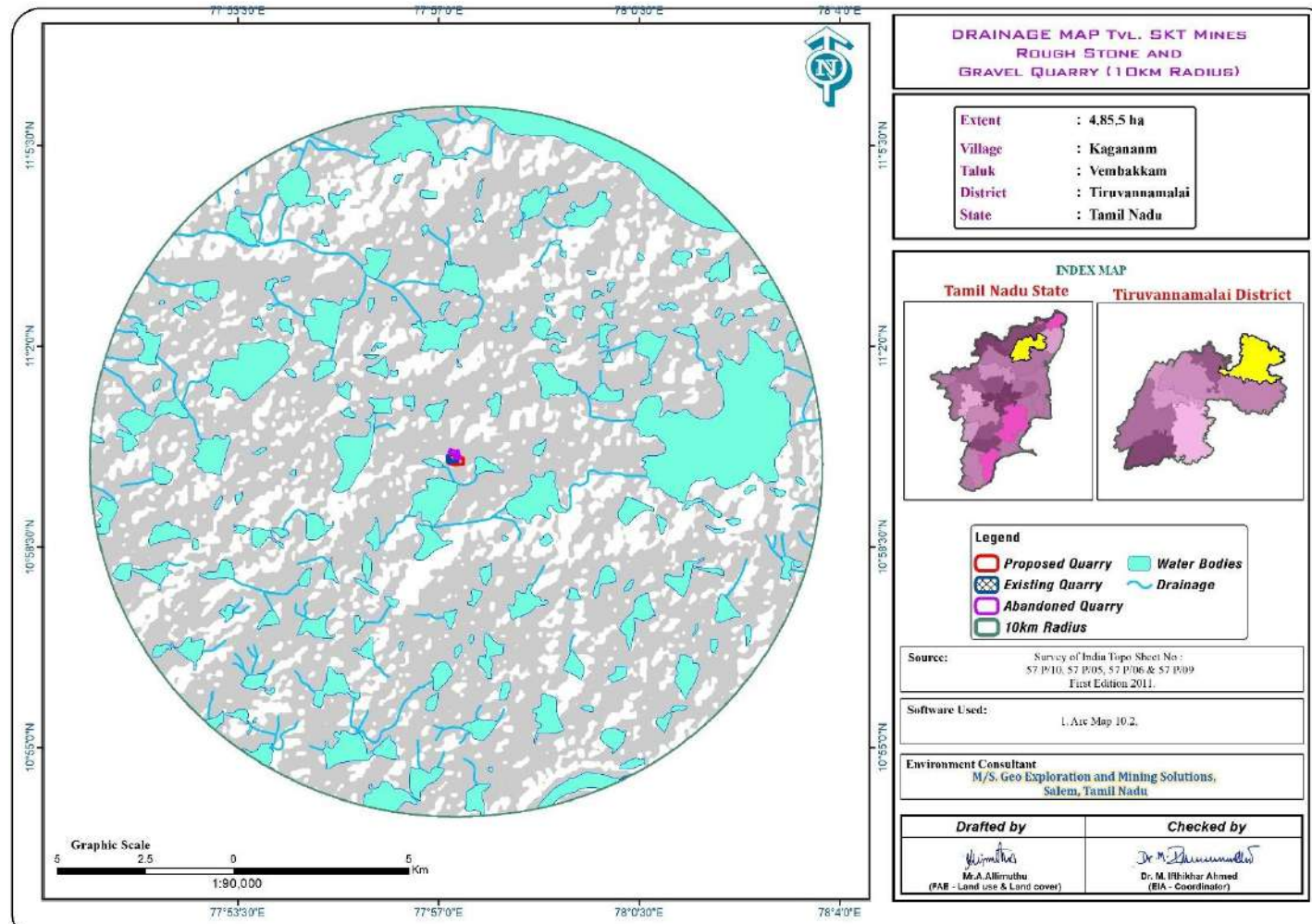


**TABLE 3.12: WINTER SEASON WATER LEVEL OF BOREWELLS 1 KM RADIUS**

| S.NO | LABEL | LONGITUDE          | LATITUDE           | DEC-24 | JAN-25 | FEB-25 |
|------|-------|--------------------|--------------------|--------|--------|--------|
| 1    | BW1   | 79° 34' 56.1239" E | 12° 44' 46.4371" N | 77.3   | 78.1   | 78.5   |
| 2    | BW2   | 79° 34' 54.3699" E | 12° 45' 09.6976" N | 76.4   | 77.2   | 77.6   |
| 3    | BW3   | 79° 34' 44.8863" E | 12° 44' 28.2490" N | 77.2   | 78     | 78.4   |
| 4    | BW4   | 79° 35' 28.2417" E | 12° 44' 36.1616" N | 78.3   | 79.1   | 79.5   |
| 5    | BW5   | 79° 34' 51.1015" E | 12° 44' 13.5719" N | 77.2   | 78     | 78.4   |
| 6    | BW6   | 79° 35' 07.6354" E | 12° 44' 03.4086" N | 76.7   | 77.5   | 77.9   |
| 7    | BW7   | 79° 34' 01.6117" E | 12° 44' 47.4126" N | 78     | 78.8   | 79.2   |

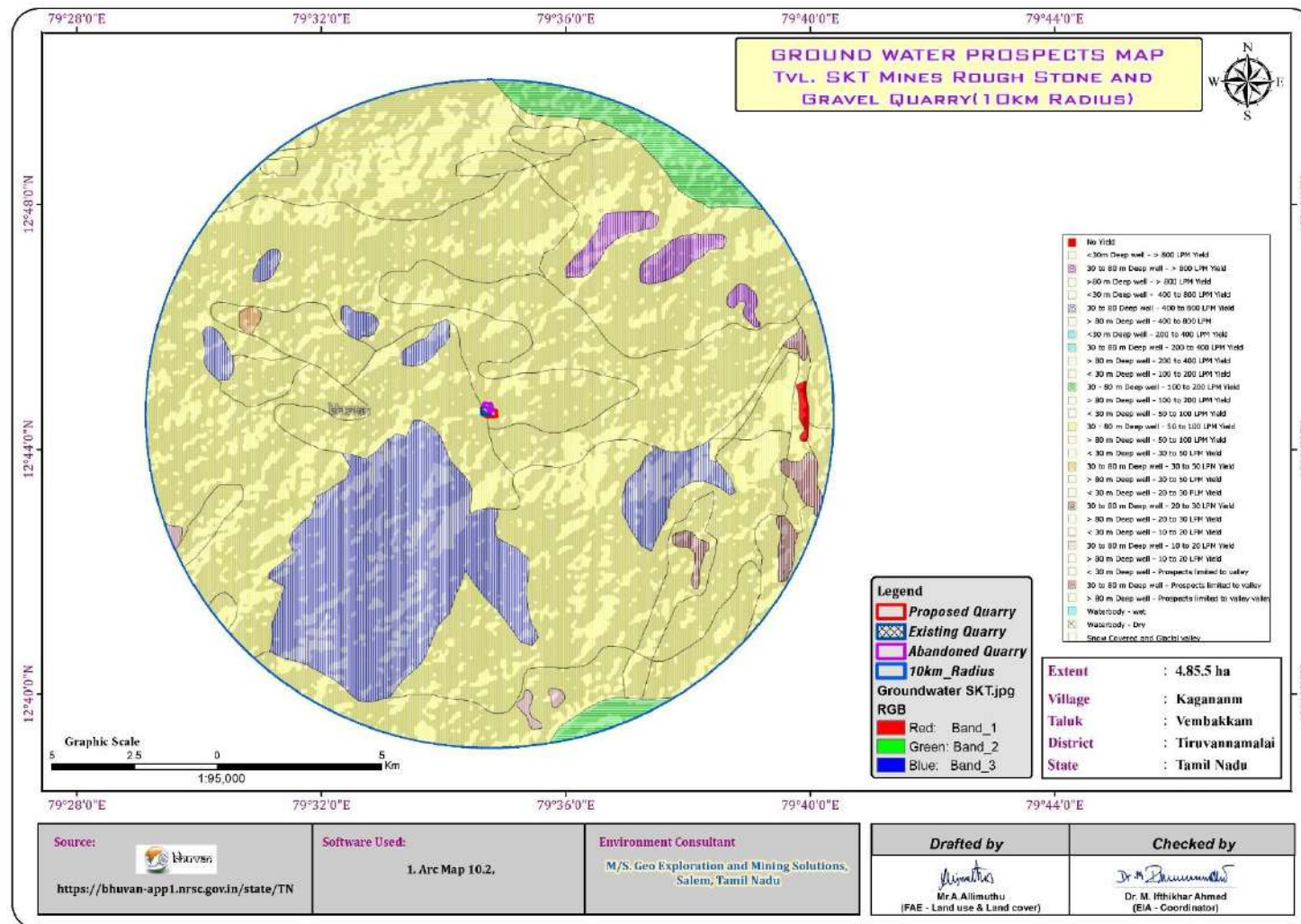
Source: Onsite monitoring data

**FIGURE 3.9: BOREWELL CONTOUR MAP – DEC 2024 to FEB 2025**

**FIGURE 3.10: DRAINAGE MAP AROUND 10 KM RADIUS FROM PROJECT SITE**

Remarks: it is inferred that the area is dendritic to sub dendritic pattern

FIGURE 3.11: GROUND WATER PROSPECT MAP



Remarks: Water table in the area is 30-80m as per the Bhuvan Data

## Geophysical Resistivity Survey

### 3.2.5.1 Methodology and Data Acquisition

The Geophysical Electrical Resistivity survey conducted in the area Schlumberger configuration, Vertical Electrical Sounding (VES) method. Schlumberger electrode set up was employed for making sounding measurements. Since it is least influenced by lateral in homogeneities and is capable of providing higher depth of investigation. This is four electrodes collinear set up where in the outer electrodes send current into the ground and the inner electrodes measure the potential difference.

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

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

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

$\Delta V$  = potential difference between receiving electrodes

$G$  = Geometric Factor.

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

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

$\rho_r$  = Resistivity of Rocks

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

$F$  = Formation Factor

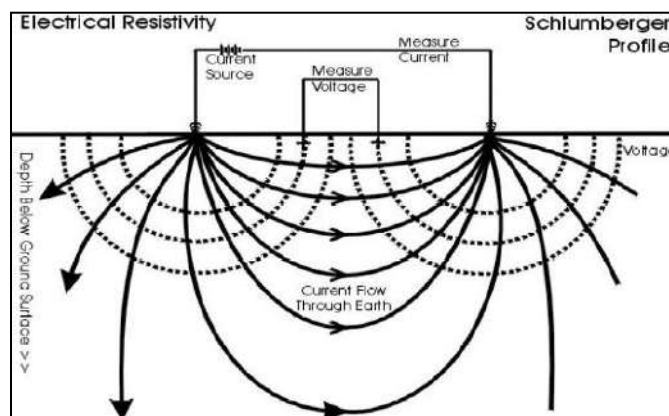
$\emptyset$  = Fractional pore volume

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

### 3.2.5.2 Survey Layout

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

### RESISTIVITY SURVEY PROFILE



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

#### 3.2.5.3 Data Presentation

It was inferred that the low resistance encountered at the depth between 100m. The maximum depth proposed out of proposed projects 72m BGL. Hence there is no possibilities of water table intersection during the entire mine life period besides it is also inferred topographically that there are no major water bodies intersecting the project area.

#### 3.2.5.4 Geophysical Data Interpretation

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

It is inferred that the existing quarries in the surrounding area reaches maximum of 45m and the water table is not intersected, only the seepage water during rainy season encountered from the upper layer and it will be used for the Greenbelt development, Dust suppression and quarrying operation.



### 3.3 AIR ENVIRONMENT

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

The baseline studies on air environment include identification of specific air pollution parameters and their existing levels in ambient air. The ambient air quality with respect to the study zone of 10 km radius around the cluster forms the baseline information. The prime objective of the baseline air quality study was to establish the existing ambient air quality of the study area. These will also be useful for assessing the conformity to standards of the ambient air quality during the operation of proposed projects in cluster.

#### 3.3.1 Meteorology & Climate

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

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

#### Climate

- The climatic conditions of Tiruvannamalai are characterized by a tropical climate. In Tiruvannamalai, the quantity of rainfall during summers surpasses that of winters. This location is classified as Aw by Köppen and Geiger. The average annual temperature is 27.4 °C | 81.3 °F in Tiruvannamalai. The rainfall here is around 811 mm | 31.9 inch per year.
- Tiruvannamalai are in the middle of our planet and the summers are not easy to define. The optimal period to plan a visit would be during the months of January, February, March, September, December.
- In terms of precipitation, the month with the lowest amount of rainfall is February, recording a mere 7 mm | 0.3 inch in its entirety. This denotes an exceptionally dry period within that particular time frame. On average, the highest amount of rainfall occurs during October with a mean value of 154 mm | 6.1 inch.
- The month that experiences the highest temperatures throughout the year is referred to as May, where an average temperature of 31.3 °C | 88.4 °F prevails. On average, the month of January is considered to be the coldest time of year with temperatures averaging at around 23.3 °C | 73.9 °F.

<https://en.climate-data.org/asia/india/tamil-nadu/tiruvannamalai-24067/>

#### Rainfall

**TABLE 3.13: RAINFALL DATA**

| Actual Rainfall in mm |       |        |        |        | Normal Rainfall in mm |
|-----------------------|-------|--------|--------|--------|-----------------------|
| 2017                  | 2018  | 2019   | 2020   | 2021   |                       |
| 1251.3                | 799.2 | 1071.9 | 1034.5 | 1592.5 | 985                   |

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

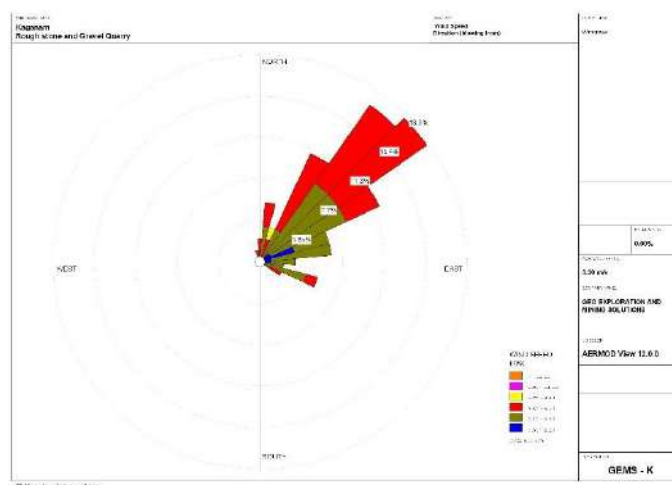
**TABLE 3.14: METEOROLOGICAL DATA RECORDED AT SITE**

| S. No | Parameters                         |      | DEC-2024 | JAN-2025 | FEB 2025 |
|-------|------------------------------------|------|----------|----------|----------|
| 1     | Temperature ( $^{\circ}\text{C}$ ) | Max  | 27.05    | 25.51    | 27.02    |
|       |                                    | Min  | 22.92    | 23.55    | 24.63    |
|       |                                    | Avg. | 24.98    | 24.53    | 25.82    |
| 2     | Relative Humidity (%)              | Avg. | 85.4     | 78.45    | 75.57    |
| 3     | Wind Speed (m/s)                   | Max  | 8.07     | 6.45     | 5.73     |
|       |                                    | Min  | 2.35     | 2.95     | 1.79     |
|       |                                    | Avg. | 5.21     | 4.7      | 3.76     |
| 4     | Cloud Cover (OKTAS)                |      | 0-8      | 0-8      | 0-8      |
| 5     | Wind direction                     |      | NE,NNE   | NE,NNE   | ENE,NE   |

Source: On-site monitoring/sampling by EHS 360Lab Private Limited in association with GEMS

### Correlation between Secondary and Primary Data

The average rain fall over the period of five years is 985mm. The meteorological data collected at the site is almost similar to that of secondary data collected from IMD Tiruvannamalai. A comparison of site data generated during the three months with that of IMD, Tiruvannamalai. Wind rose diagram of the study site is depicted in Figure. 3.13 Predominant downwind direction of the area during study season is -South East to North East.

**FIGURE 3.12: WINDROSE DIAGRAM**

In the abstract of collected data wind rose were drawn on presented in figure No.3.13 during the monitoring period in the study area

1. Predominant winds were from NE, NNE, ENE
2. Wind velocity readings were recorded between 0.50 to 8.80m/s
3. Calm conditions prevail of about 0.00 % of the monitoring period
4. Temperature readings ranging from 24.53 to 25.82  $^{\circ}\text{C}$
5. Relative humidity ranging from 75.57 to 85.4 %
6. The monitoring was carried out continuously for three months. (December 2024 to February 2025)



### 3.3.2 Methodology and Objective

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

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

### 3.3.3 Sampling and Analytical Techniques

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

| Parameter       | Method                                                  | Instrument                                                                       |
|-----------------|---------------------------------------------------------|----------------------------------------------------------------------------------|
| PM2.5           | Gravimetric Method<br>Beta attenuation Method           | Fine Particulate Sampler<br>Make – Thermo Environmental<br>Instruments – TEI 121 |
| PM10            | Gravimetric Method<br>Beta attenuation Method           | Respirable Dust Sampler<br>Make –Thermo Environmental<br>Instruments – TEI 108   |
| SO <sub>2</sub> | IS-5182 Part II<br>(Improved West & Gaeke method)       | Respirable Dust Sampler with gaseous<br>attachment                               |
| NO <sub>x</sub> | IS-5182 Part II<br>(Jacob & Hochheiser modified method) | Respirable Dust Sampler with gaseous<br>attachment                               |
| Free Silica     | NIOSH – 7601                                            | Visible Spectrophotometry                                                        |

Source: Sampling Methodology followed by EHS 360Lab Private Limited & CPCB Notification

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

| Sl.No. | Pollutant                                                            | Time Weighted Average      | Concentration in ambient air                 |                                                         |
|--------|----------------------------------------------------------------------|----------------------------|----------------------------------------------|---------------------------------------------------------|
|        |                                                                      |                            | Industrial, Residential, Rural & other areas | Ecologically Sensitive area (Notified by Central Govt.) |
| 1      | Sulphur Dioxide (µg/m <sup>3</sup> )                                 | Annual Avg.*<br>24 hours** | 50.0<br>80.0                                 | 20.0<br>80.0                                            |
| 2      | Nitrogen Dioxide (µg/m <sup>3</sup> )                                | Annual Avg.<br>24 hours    | 40.0<br>80.0                                 | 30.0<br>80.0                                            |
| 3      | Particulate matter (size less than 10µm) PM10 (µg/m <sup>3</sup> )   | Annual Avg.<br>24 hours    | 60.0<br>100.0                                | 60.0<br>100.0                                           |
| 4      | Particulate matter (size less than 2.5 µm PM2.5 (µg/m <sup>3</sup> ) | Annual Avg.<br>24 hours    | 40.0<br>60.0                                 | 40.0<br>60.0                                            |

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

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

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

### 3.3.4 Frequency & Parameters for Sampling

Ambient air quality monitoring has been carried out with a frequency of two samples per week at Seven (7) locations, adopting a continuous 24 hourly (3 shift of 8-hour) schedule for the period Dec 2024 – Feb 2025 The

baseline data of ambient air has been generated for PM<sub>10</sub>, PM<sub>2.5</sub>, Sulphur Dioxide (SO<sub>2</sub>) & Nitrogen Dioxide (NO<sub>2</sub>) Monitoring has been carried out as per the CPCB, MoEF guidelines and notifications.

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

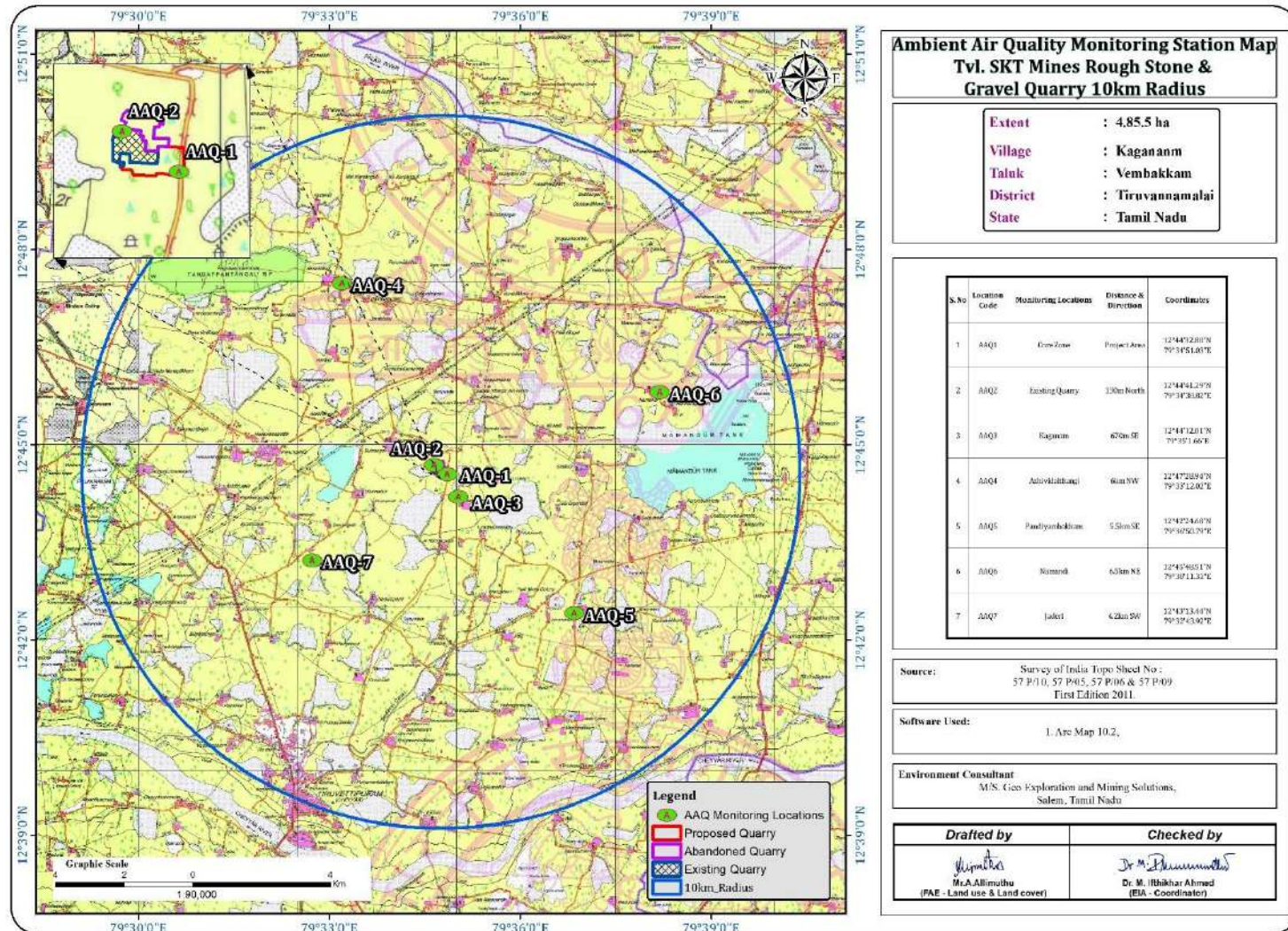
### 3.3.5 Ambient Air Quality Monitoring Stations

Seven (7) monitoring stations were set up in the study area as depicted in Figure 3.15 for assessment of the existing ambient air quality. Details of the sampling locations are as per given below.

**TABLE 3.17: AMBIENT AIR QUALITY (AAQ) MONITORING LOCATIONS**

| S. No | Location Code | Monitoring Locations | Distance & Direction | Coordinates                 |
|-------|---------------|----------------------|----------------------|-----------------------------|
| 1     | AAQ-1         | Core Zone            | Project Area         | 12°44'32.80"N 79°34'51.03"E |
| 2     | AAQ-2         | Existing Quarry      | 130m North           | 12°44'41.29"N 79°34'38.82"E |
| 3     | AAQ-3         | Kaganam              | 670m SE              | 12°44'12.01"N 79°35'1.66"E  |
| 4     | AAQ-4         | Azhividaithangi      | 6km NW               | 12°47'28.94"N 79°33'12.02"E |
| 5     | AAQ-5         | Pandiyambakkam       | 5.5km SE             | 12°42'24.68"N 79°36'50.79"E |
| 6     | AAQ-6         | Namandi              | 6.5km NE             | 12°45'48.51"N 79°38'11.31"E |
| 7     | AAQ-7         | Jaderi               | 4.2km SW             | 12°43'13.44"N 79°32'43.92"E |

Source: On-site monitoring/sampling by EHS 360Lab Private Limited in association with GEMS.

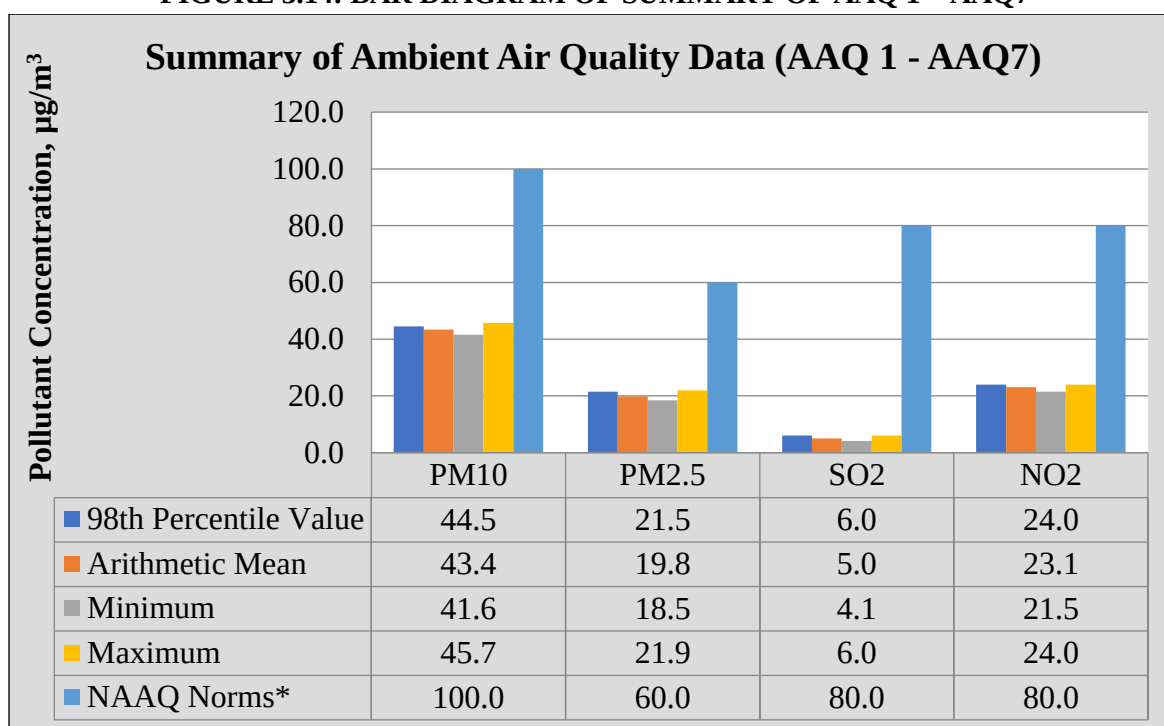
**FIGURE 3.13: AMBIENT AIR QUALITY LOCATIONS AROUND 10 KM RADIUS**

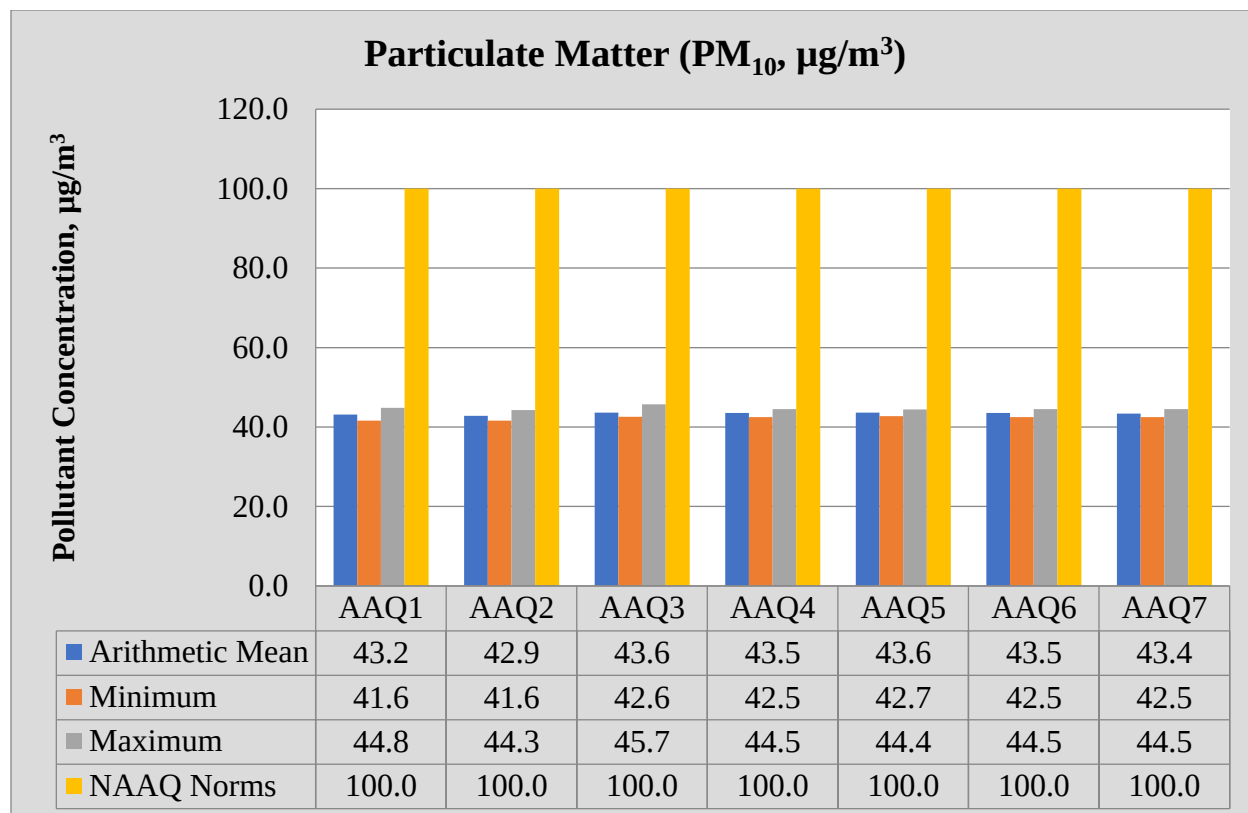
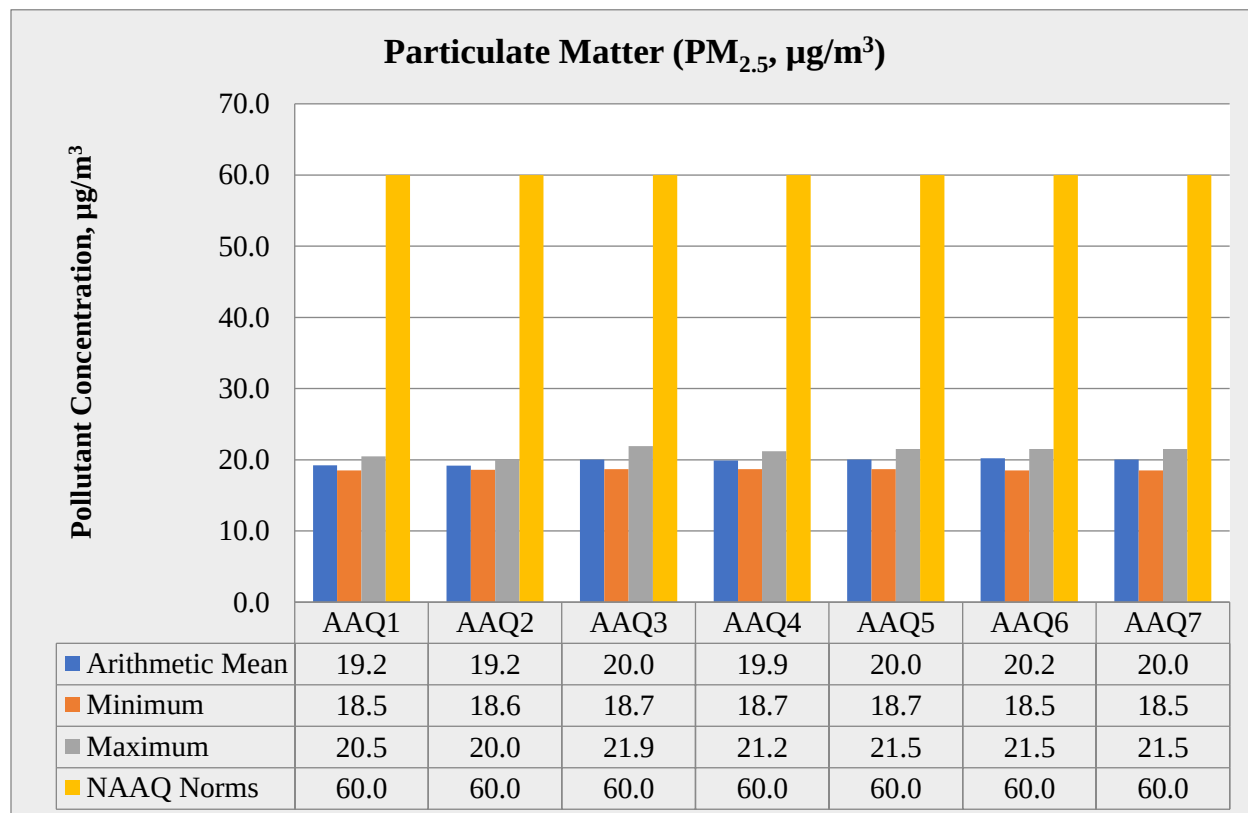
**TABLE 3.18: SUMMARY OF AAQ 1 to AAQ 7**

| <b>PM<sub>10</sub></b>  | <b>AAQ1</b>  | <b>AAQ2</b>  | <b>AAQ3</b>  | <b>AAQ4</b>  | <b>AAQ5</b>  | <b>AAQ6</b>  | <b>AAQ7</b>  |
|-------------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| Arithmetic Mean         | 43.2         | 42.9         | 43.6         | 43.5         | 43.6         | 43.5         | 43.4         |
| Minimum                 | 41.6         | 41.6         | 42.6         | 42.5         | 42.7         | 42.5         | 42.5         |
| Maximum                 | 44.8         | 44.3         | 45.7         | 44.5         | 44.4         | 44.5         | 44.5         |
| <b>NAAQ Norms</b>       | <b>100.0</b> | <b>100.0</b> | <b>100.0</b> | <b>100.0</b> | <b>100.0</b> | <b>100.0</b> | <b>100.0</b> |
| <b>PM<sub>2.5</sub></b> | <b>AAQ1</b>  | <b>AAQ2</b>  | <b>AAQ3</b>  | <b>AAQ4</b>  | <b>AAQ5</b>  | <b>AAQ6</b>  | <b>AAQ7</b>  |
| Arithmetic Mean         | 19.2         | 19.2         | 20.0         | 19.9         | 20.0         | 20.2         | 20.0         |
| Minimum                 | 18.5         | 18.6         | 18.7         | 18.7         | 18.7         | 18.5         | 18.5         |
| Maximum                 | 20.5         | 20.0         | 21.9         | 21.2         | 21.5         | 21.5         | 21.5         |
| <b>NAAQ Norms</b>       | <b>60.0</b>  | <b>60.0</b>  | <b>60.0</b>  | <b>60.0</b>  | <b>60.0</b>  | <b>60.0</b>  | <b>60.0</b>  |
| <b>SO<sub>2</sub></b>   | <b>AAQ1</b>  | <b>AAQ2</b>  | <b>AAQ3</b>  | <b>AAQ4</b>  | <b>AAQ5</b>  | <b>AAQ6</b>  | <b>AAQ7</b>  |
| Arithmetic Mean         | 4.8          | 4.9          | 5.0          | 5.1          | 5.1          | 5.1          | 5.1          |
| Minimum                 | 4.1          | 4.1          | 4.1          | 4.1          | 4.1          | 4.1          | 4.1          |
| Maximum                 | 5.5          | 5.5          | 5.9          | 6.0          | 6.0          | 6.0          | 6.0          |
| <b>NAAQ Norms</b>       | <b>80.0</b>  | <b>80.0</b>  | <b>80.0</b>  | <b>80.0</b>  | <b>80.0</b>  | <b>80.0</b>  | <b>80.0</b>  |
| <b>NO<sub>2</sub></b>   | <b>AAQ1</b>  | <b>AAQ2</b>  | <b>AAQ3</b>  | <b>AAQ4</b>  | <b>AAQ5</b>  | <b>AAQ6</b>  | <b>AAQ7</b>  |
| Arithmetic Mean         | 23.0         | 22.9         | 23.2         | 23.2         | 23.2         | 23.1         | 23.0         |
| Minimum                 | 21.5         | 21.8         | 22.0         | 22.2         | 22.1         | 22.0         | 22.0         |
| Maximum                 | 24.0         | 24.0         | 24.0         | 24.0         | 24.0         | 24.0         | 24.0         |
| <b>NAAQ Norms</b>       | <b>80.0</b>  | <b>80.0</b>  | <b>80.0</b>  | <b>80.0</b>  | <b>80.0</b>  | <b>80.0</b>  | <b>80.0</b>  |

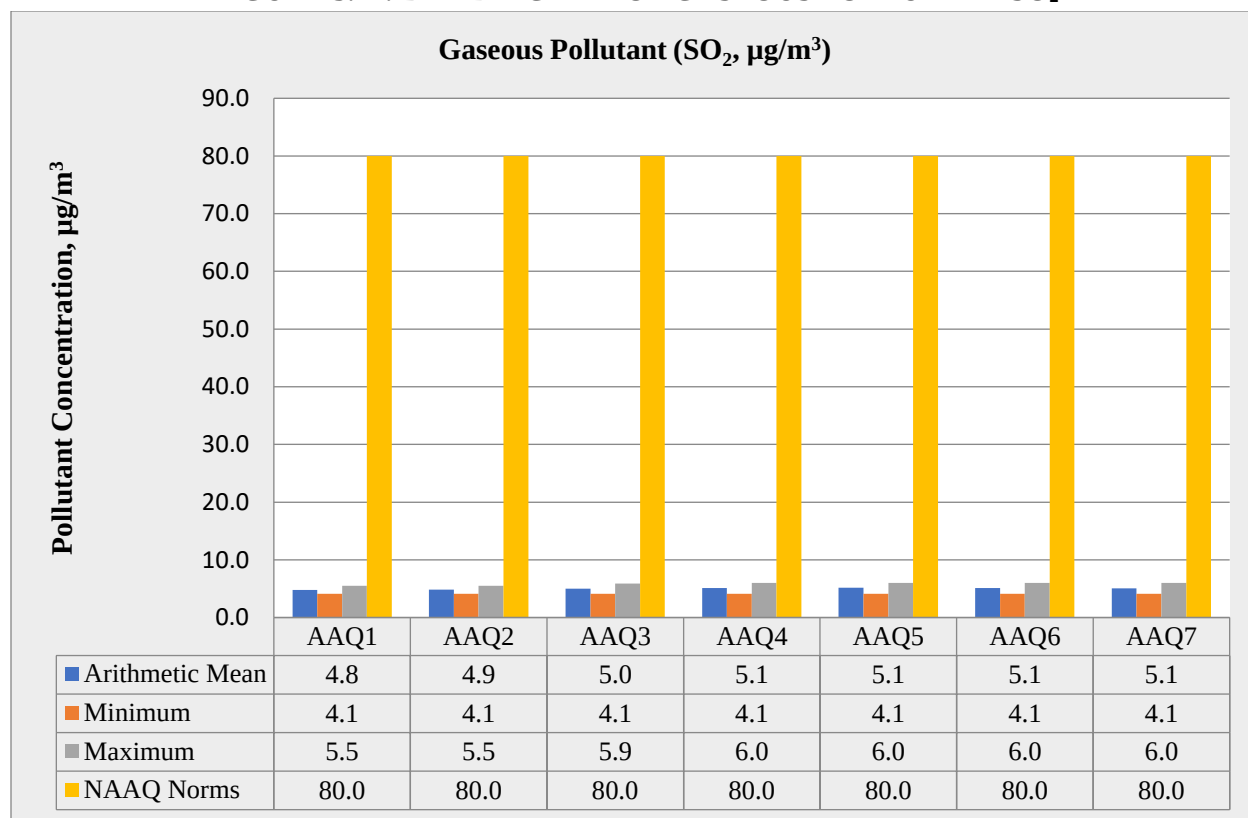
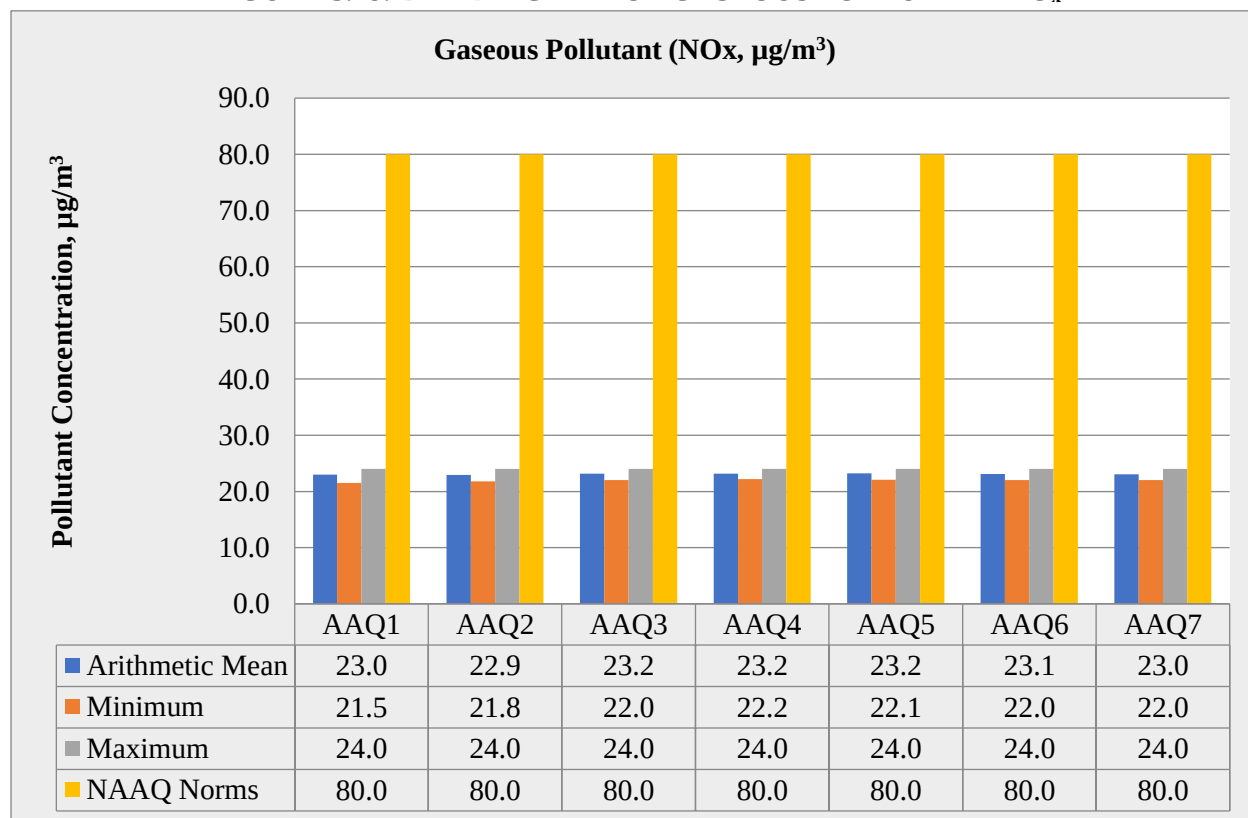
**TABLE 3.19: ABSTRACT OF AMBIENT AIR QUALITY DATA**

| 1  | Parameter                         | PM <sub>10</sub> | PM <sub>2.5</sub> | SO <sub>2</sub> | NO <sub>2</sub> |
|----|-----------------------------------|------------------|-------------------|-----------------|-----------------|
| 2  | No. of Observations               | 182              | 182               | 182             | 182             |
| 3  | 10 <sup>th</sup> Percentile Value | 42.5             | 18.8              | 4.3             | 22.1            |
| 4  | 20 <sup>th</sup> Percentile Value | 42.7             | 18.9              | 4.4             | 22.5            |
| 5  | 30 <sup>th</sup> Percentile Value | 42.9             | 19.1              | 4.7             | 22.6            |
| 6  | 40 <sup>th</sup> Percentile Value | 43.2             | 19.4              | 4.8             | 22.8            |
| 7  | 50 <sup>th</sup> Percentile Value | 43.5             | 19.6              | 5.0             | 23.0            |
| 8  | 60 <sup>th</sup> Percentile Value | 43.7             | 19.9              | 5.1             | 23.4            |
| 9  | 70 <sup>th</sup> Percentile Value | 43.9             | 20.2              | 5.3             | 23.6            |
| 10 | 80 <sup>th</sup> Percentile Value | 44.1             | 20.8              | 5.5             | 23.9            |
| 11 | 90 <sup>th</sup> Percentile Value | 44.3             | 21.1              | 5.8             | 24.0            |
| 12 | 95 <sup>th</sup> Percentile Value | 44.4             | 21.4              | 5.9             | 24.0            |
| 13 | 98 <sup>th</sup> Percentile Value | 44.5             | 21.5              | 6.0             | 24.0            |
| 14 | Arithmetic Mean                   | 43.4             | 19.8              | 5.0             | 23.1            |
| 15 | Geometric Mean                    | 43.4             | 19.8              | 5.0             | 23.1            |
| 16 | Standard Deviation                | 0.7              | 0.9               | 0.5             | 0.7             |
| 17 | Minimum                           | 41.6             | 18.5              | 4.1             | 21.5            |
| 18 | Maximum                           | 45.7             | 21.9              | 6.0             | 24.0            |
| 19 | NAAQ Norms*                       | 100.0            | 60.0              | 80.0            | 80.0            |

**FIGURE 3.14: BAR DIAGRAM OF SUMMARY OF AAQ 1 – AAQ7**

**FIGURE 3.15: BAR DIAGRAM OF PARTICULATE MATTER PM<sub>10</sub>****FIGURE 3.16: BAR DIAGRAM OF PARTICULATE MATTER PM<sub>2.5</sub>**



**FIGURE 3.17: BAR DIAGRAM OF GASEOUS POLLUTANT SO<sub>2</sub>****FIGURE 3.18: BAR DIAGRAM OF GASEOUS POLLUTANT NO<sub>x</sub>**

### 3.3.6 Interpretations & Conclusion

As per monitoring data, PM<sub>10</sub> ranges from 41.6 µg/m<sup>3</sup> to 45.7 µg/m<sup>3</sup>, PM<sub>2.5</sub> data ranges from 18.5 µg/m<sup>3</sup> to 21.9 µg/m<sup>3</sup>, SO<sub>2</sub> ranges from 4.1 µg/m<sup>3</sup> to 6.0 µg/m<sup>3</sup> and NO<sub>2</sub> data ranges from 21.5 µg/m<sup>3</sup> to 24.0 µg/m<sup>3</sup>. The concentration levels of the above criteria pollutants were observed to be well within the limits of NAAQS prescribed by CPCB.

## 3.4 NOISE ENVIRONMENT

The vehicular movement on road and mining activities is the major sources of noise in study area, the environmental assessment of noise from the mining activity and vehicular traffic can be undertaken by taking into consideration various factors like potential damage to hearing, physiological responses, and annoyance and general community responses. The main objective of noise monitoring in the study area is to establish the baseline noise level and assess the impact of the total noise expected to be generated during the project operations around the project site.

### 3.4.1 Identification of Sampling Locations

In order to assess the ambient noise levels within the study area, noise monitoring was carried out at Seven (7) locations. The noise level measurement was carried out at each ambient air quality station. The main aim of the noise level monitoring is

- To assess the ambient Noise level in the study area
- Type of noise pollution generated in the core zone
- To predict the temporal changes in the ambient noise level in the area

The noise level monitoring locations were carried out by covering commercial, residential, rural areas within the radius of 10km. A noise monitoring methodology was chosen such that it best suited the purpose and objectives of the study.

**TABLE 3.20: DETAILS OF SURFACE NOISE MONITORING LOCATIONS**

| S. No | Location Code | Monitoring Locations | Distance & Direction | Coordinates                 |
|-------|---------------|----------------------|----------------------|-----------------------------|
| 1     | N1            | Core Zone            | Project Area         | 12°44'32.25"N 79°34'44.46"E |
| 2     | N2            | Existing Quarry      | 130m North           | 12°44'39.99"N 79°34'37.60"E |
| 3     | N3            | Kaganam              | 600m SE              | 12°44'13.26"N 79°34'54.28"E |
| 4     | N4            | Azhividaithangi      | 5.8km NW             | 12°47'27.98"N 79°33'13.32"E |
| 5     | N5            | Pandiyambakkam       | 5.5km SE             | 12°42'24.15"N 79°36'50.73"E |
| 6     | N6            | Namandi              | 6.5km NE             | 12°45'49.34"N 79°38'11.96"E |
| 7     | N7            | Jaderi               | 4.2km SW             | 12°43'12.83"N 79°32'46.08"E |

Source: On-site monitoring/sampling by EHS 360Lab Private Limited in association with GEMS.

### 3.4.2 Method of Monitoring

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

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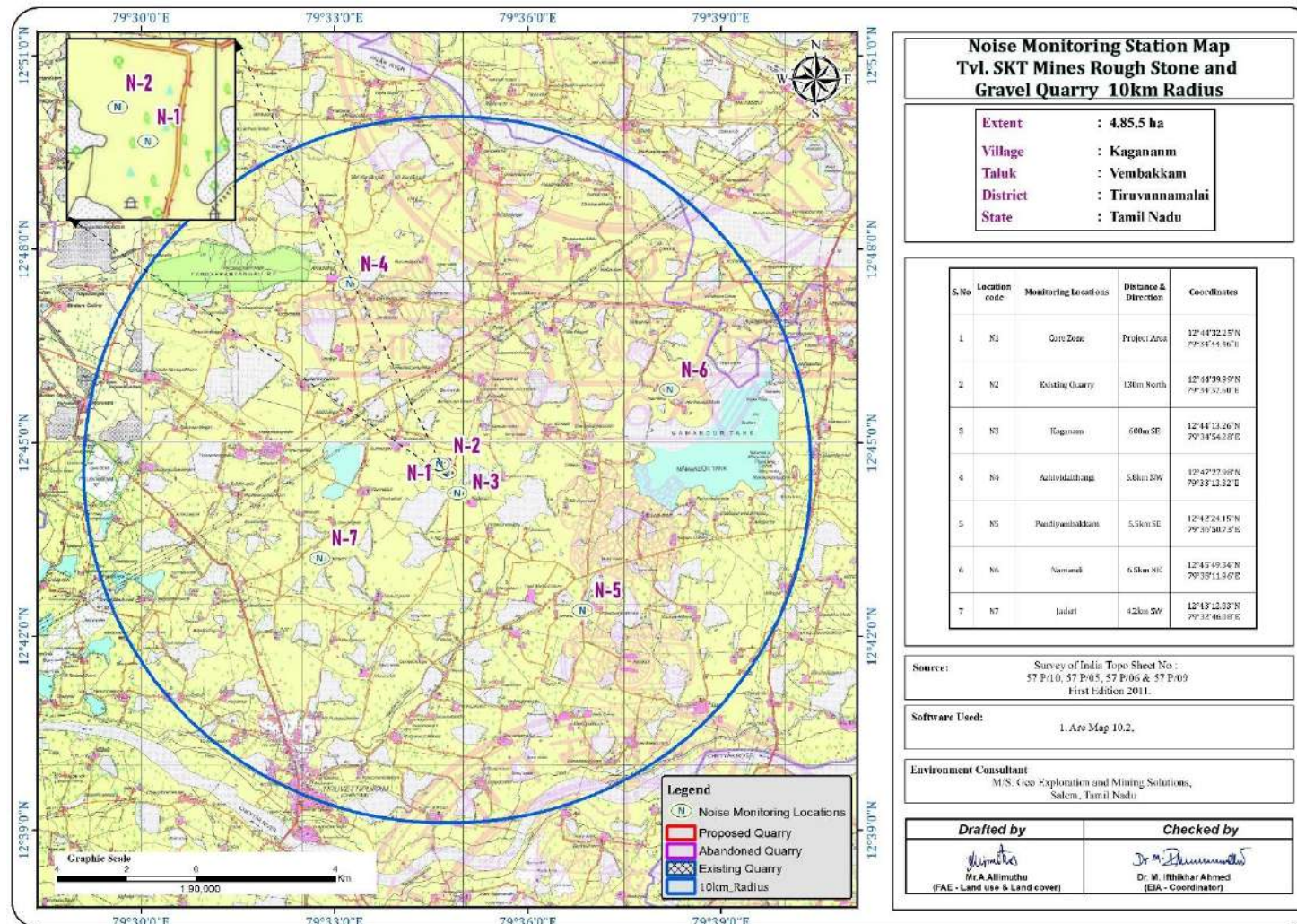
$$Leq = 10 \log L / T \sum (10L_n/10)$$

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

T = Time interval of observation

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

FIGURE 3.19: NOISE MONITORING STATIONS AROUND 10 KM RADIUS



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

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

An analysis of the different Leq data obtained during the study period has been made. Variation was noted during the day-time as well as night-time. The results are presented in below Table 3.32.

Day time: 6:00 hours to 22.00 hours.

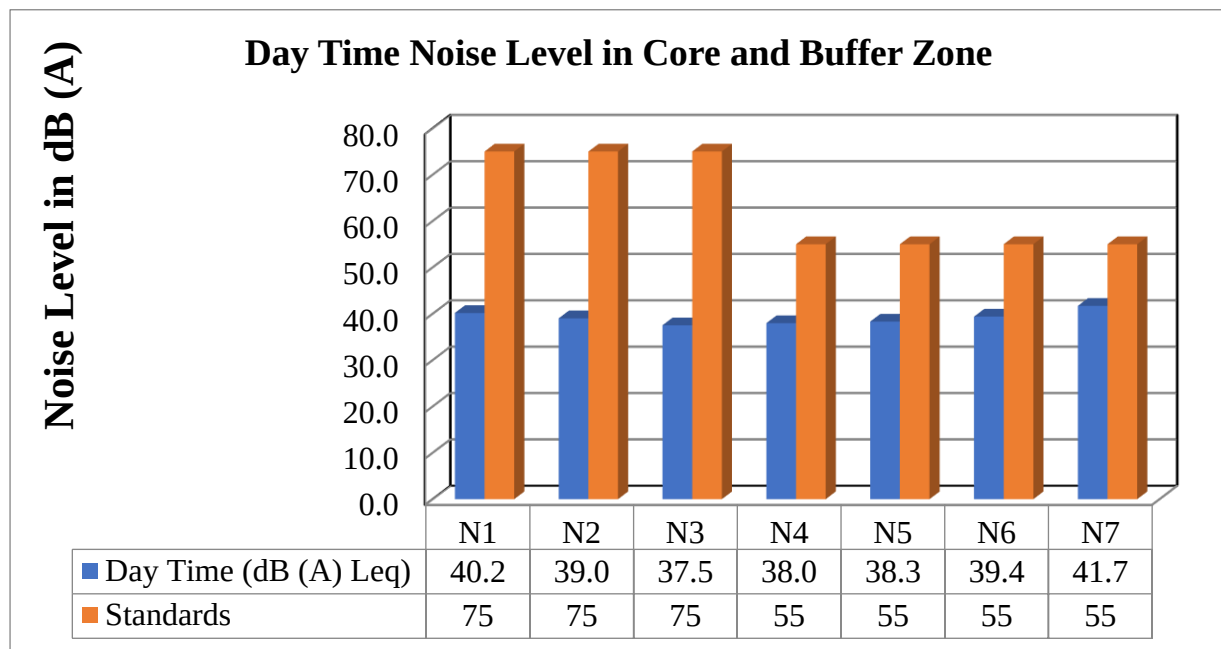
Night time: 22:00 hours to 6.00 hours.

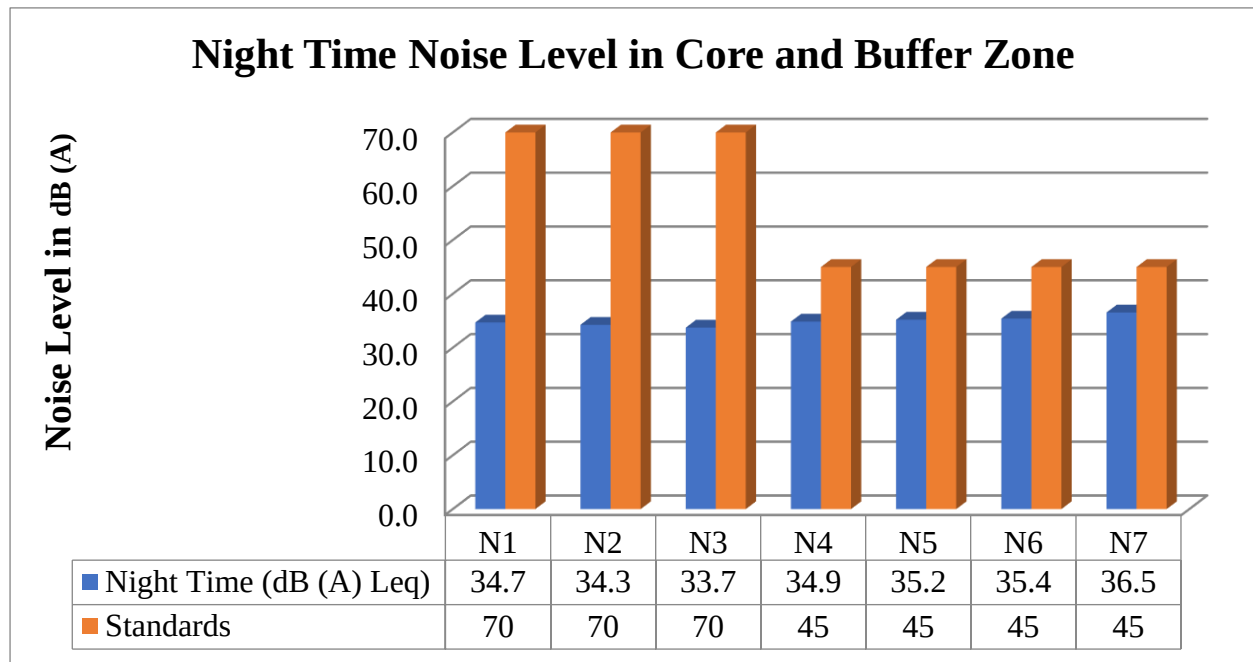
**TABLE 3.21: AMBIENT NOISE QUALITY RESULT**

| S. No | Locations       | Noise level (dB (A) Leq) |            | Ambient Noise Standards                                            |
|-------|-----------------|--------------------------|------------|--------------------------------------------------------------------|
|       |                 | Day Time                 | Night Time |                                                                    |
| 1     | Core Zone       | 40.2                     | 34.7       | <b>Industrial</b><br>Day Time- 75 dB (A)<br>Night Time- 70 dB (A)  |
| 2     | Existing Quarry | 39.0                     | 34.3       |                                                                    |
| 3     | Kaganam         | 37.5                     | 33.7       | <b>Residential</b><br>Day Time- 55 dB (A)<br>Night Time- 45 dB (A) |
| 4     | Azhividaithangi | 38.0                     | 34.9       |                                                                    |
| 5     | Pandiyambakkam  | 38.3                     | 35.2       |                                                                    |
| 6     | Namandi         | 39.4                     | 35.4       |                                                                    |
| 7     | Jaderi          | 41.7                     | 36.5       |                                                                    |

Source: On-site monitoring/sampling by EHS 360 lab Private Limited in association with GEMS

**FIGURE 3.20: DAY TIME NOISE LEVELS IN CORE AND BUFFER ZONE**



**FIGURE 3.21: NIGHT TIME NOISE LEVELS IN CORE AND BUFFER ZONE****3.4.4 Interpretation & Conclusion:**

Ambient noise levels were measured at 7 (Seven) locations around the proposed project area. Noise levels recorded in core zone during day time were from 39.0 – 40.2 dB (A) Leq and during night time were from 37.5 – 41.7 dB (A) Leq. Noise levels recorded in buffer zone during day time were from 34.3 – 34.7 dB (A) Leq and during night time were from 33.7 – 36.5 dB (A) Leq. Thus, the noise level for Industrial and Residential area meets the requirements of CPCB.

**3.5. Biological Environment****3.5.1. Study area Ecology**

The core area extent of 4.85.5 Ha of has an impact on the diversity of flora and fauna of the surrounding area. But present work was carried out on the detailed study of the impacts of the Rough stone and gravel quarry on the ecology and biodiversity of the core lease area with the proper mitigation and sustainable management plan. The proposed mine lease area is situated on a plain terrain. The following methods were applied during the baseline study of flora, fauna and diversity assessment.

**3.5.2. Objectives of Biological Studies**

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

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### 3.5.2.1. District of Tiruvannamalai

Tiruvannamalai is one of the northern districts of Tamil Nadu with Vellore, part of Chengalpattu and South Arcot districts as northern, southern and western boundaries. It is the administrative headquarters of Tiruvannamalai District. This district comprises of Tiruvannamalai, Chengam, Polur, Arni, Cheyyar and Vandavasi taluks. It came into existence on 30th September 1989 after the bifurcation of North Arcot district. The district lies between 11.55° and 13.15° North latitude and 78.20° to 79.50° East longitude. Tiruvannamalai District is located in the Northern part of Tamil Nadu with a distance of 190 km from Chennai and 210 km from Trichy. ([Ref-District Industrial Profile Tiruvannamalai 2019-20](#))

### 3.5.2.2. Forest Types in Tiruvannamalai Forest and Hills

One sixth area of the district is covered by reserve forest and hills which are parts of Eastern Ghats under Jawadhu Hills. The Javadis are the loftiest mountains of the region. They cover the north-western portion of Chengam taluk and the western part of Polur taluk. The general elevation of Jawadhu Hills is 2500 ft. with peaks rising up to 4200 ft. in some parts. Other important peaks of the district are Tiruvannamalai (2668 ft.) and Kalasagiri (2743 ft.). The general slope of the region is from west to east. Total forest coverage is 152810 hec.

### 3.5.2.3. Floral Study

- The floral survey of the project area is based on field survey of the area.
- The local flora was identified by their morphological observation, such as the size, age and shape of the leaf, flowers, fruits, and their bark features of the stem, and also documented their habitat viz. Trees, Shrubs, Herbs, Grasses, Climbers etc.
- After surveying the core and the buffer areas, a detailed floral inventory has been compiled. A list of all plants from the study area was prepared and their habitats were recorded.
- Selection of sampling locations was made with reference to topography, land use, vegetation pattern, wind pattern, etc. The observations were taken on natural vegetation, roadside plantations, and non-forest areas (agricultural fields, in plain areas, village wasteland, etc.) for quantitative representation of different species.

### 3.5.3. Methodology of Sampling

Primary survey was conducted with established and accepted ecological methods in different habitats of study area. The field data collection mainly included biodiversity status assessment of different life forms habit of flora elements such as Trees, Shrubs, Climbers Herbs and Grass. Faunal diversity was assessed by inventorying the taxonomical groups like Mammals, Herpetofauna, birds and butterflies.

Nocturnal faunal species were searched by locating their calls during night time and by searching along the forest shrubs areas, dense dry bushes, below the stones, water bodies. During the study, to know more about the seasonal presence of flora and faunal species, information was obtained from local people and forest department.

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

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



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

The secondary baseline data of flora and fauna has been complied through the following data sources:

1. Forest working plan
2. Schedule I to V: Indian Wildlife (Protection) Act, 1972
3. Vivek Menon, Indian Mammals: A Field Guide. Hachette Book publishing India Pvt.Ltd., India.
4. Daniel J.C. The Book of Indian Reptiles and Amphibians, Bombay Natural History Society., India.
5. Ali, S and Ripley. handbook of the Birds of India and Pakistan together with those of Nepal, Sikkim and Bhutan, Oxford University Press, Bombay.
6. ENVIS Centre on Wildlife and Protected Area.
7. Birds Life Data Zone
8. Ebird.org
9. Global Biodiversity Information Facility

### **3.5.3.1. Sampling**

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

### **3.5.3.2. Sampling Size**

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

### **3.5.3.3. Timing of Study**

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

### **3.5.3.4. Observations from Sampling**

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

### **3.5.3.5. Field Equipment's/ References**

Following tools/equipment were used for conducting phytosociological study.

- Ballpoint pen, Field bags, Field notebooks, field shoes, gloves, GPS, Measuring tapes and scales, Plant cutters, packet lens, ropes etc.
- Canon Mark III Camera with 50-500mm lens– Snap shots taken
- Leica Binoculars (8x 20) to spot/identify species
- IUCN Red Data Book – <https://www.iucnredlist.org/species>

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

## **3.5.4. Part I Field Sampling Techniques (Fauna Sampling)**

### **3.5.4.1. Transect walk – Birds**

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

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### 3.5.4.2. Modified Pollard Walk – for Butterflies

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

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

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

### 3.5.4.4. Observational methods- Mammals

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

### 3.5.5. Flora Composition in the Core Zone (Primary Survey)

Core zone flora sampling was conducted between 8.00 am to 10.00 am in three locations. The proposed applied area exhibiting plain terrain, so we used quadrat sampling methods. Taxonomically a total of 18 species belonging to 12 families have been recorded from the core mining lease area. Based on the habitat classification of the enumerated plants the majority of species were Herbs 10 followed by Shrubs 3, Trees 5, and Climbers 1. Details of flora with the scientific name were mentioned in Table No. 3.53. The result of the core zone of flora studies shows that Asteraceae and Arecaceae are the main dominating species in the study area mentioned in Table No.3.53. No species found as threatened category.

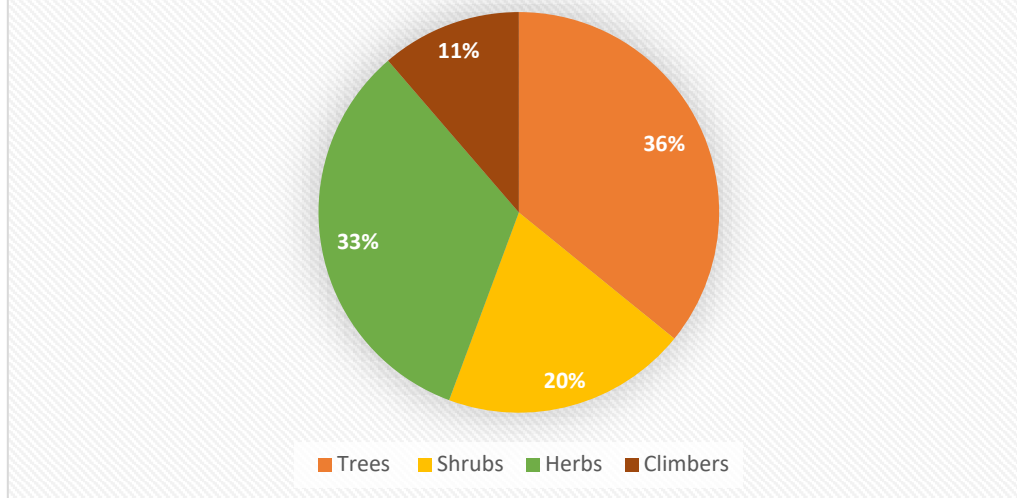
**Table No: 3.22. Flora in the Core zone of Kaganam Village, Rough stone and gravel quarry (Primary data)**

| Sl. No                 | English Name         | Vernacular Name | Scientific Name                 | Family Name      |
|------------------------|----------------------|-----------------|---------------------------------|------------------|
| <b>Trees</b>           |                      |                 |                                 |                  |
| 1.                     | Mesquite             | Mullu maram     | <i>Prosopis juliflora</i>       | Fabaceae         |
| 2.                     | Eucalyptus           | Taila maram     | <i>Eucalyptus obliqua</i>       | Myrtaceae        |
| 3.                     | Neem                 | Vembu           | <i>Azadirachta indica</i>       | Meliaceae        |
| 4.                     | Teak                 | Theaku          | <i>Tectona grandis</i>          | Lamiaceae        |
| 5.                     | Mango                | Maa maram       | <i>Mangifera indica</i>         | Anacardiaceae    |
| <b>Shrubs</b>          |                      |                 |                                 |                  |
| 1.                     | Avaram Senna         | Avarai          | <i>Senna auriculata</i>         | Caesalpinioideae |
| 2.                     | Milk Weed            | Erukku          | <i>Calotropis gigantea</i>      | Apocynaceae      |
| 3.                     | Indian fig opuntia   | Sapathikalli    | <i>Opuntia ficus-indica</i>     | Cactaceae        |
| <b>Herbs and Grass</b> |                      |                 |                                 |                  |
| 1.                     | Coat buttons         | Thatha poo      | <i>Tridax procumbens</i>        | Asteraceae       |
| 2.                     | Indian Acalypha      | Kuppaimeni      | <i>Acalypha indica</i>          | Euphorbiaceae    |
| 3.                     | Bermuda Grass        | Arugampul       | <i>Cynodon dactylon</i>         | Poaceae          |
| 4.                     | Pulapoo              | Polpola         | <i>Aerva lanata</i>             | Amaranthaceae    |
| 5.                     | Carrot grass         | Partiniyam      | <i>Parthenium hysterophorus</i> | Asteraceae       |
| 6.                     | Bindii               | Nerunji mullu   | <i>Tribulus terrestris</i>      | Zygophyllaceae   |
| 7.                     | Chrismas Bush        | Poom pul        | <i>Chromolaena odorata</i>      | Asteraceae       |
| 8.                     | Holy basil           | Thulasi         | <i>Ocimum tenuiflorum</i>       | Lamiaceae        |
| 9.                     | Prickly chaff flower | Nayuruv         | <i>Achyranthes aspera</i>       | Amaranthaceae    |
| 10.                    | Common Tephrosia     | Kolunchi        | <i>Tephrosia purpurea</i>       | Fabaceae         |
| <b>Climbers</b>        |                      |                 |                                 |                  |

|     |              |          |                       |          |
|-----|--------------|----------|-----------------------|----------|
| 11. | Stemmed vine | Perandai | Cissus quadrangularis | Vitaceae |
|-----|--------------|----------|-----------------------|----------|

(Sources: Species observation in the field study)

Fig No. 3.34: Graph Showing % Distribution Of Floral Life Forms (Core zone)



a. *Mangifera indica*



b. *Tectona grandis*



c. *Tephrosia purpurea*



d. *Eucalyptus obliqua*

e. *Prosopis juliflora*f. *Azadirachta indica***Fig No: 3.35. Flora species observation in the Core zone area****3.5.5.1. Tree survey an around 300m radius**

The trees surveys were conducted around 300m radius from the proposed project site. This is the standard scientific method followed by various workers in respect of phytosociological studies (Cottom and Curtis 1956; Ralhan et al. 1982; Saxena and Sing 1982; Nayak et al. 2000; Lu et al. 2004; Nautiyal 2008). While sampling, circumference at breast Height (CBH) of tree species was measured at 1.37m from ground level, along with the name of the species, phenology (flowering, fruiting, and flushes), and uses. After surveying areas, a detailed trees inventory has been compiled. A list of all plants from the study area was prepared and their habitats were recorded. The species of trees were documented during this base line survey. The dominant plant species growing in this area were *Borassus flabellifer*, *Prosopis juliflora*, etc. Please refer the Table No.3.54.

**Table No: 3.23. Tree survey around 300m radius from the proposed project site.**

| S.No         | English Name       | Vernacular Name | Scientific Name      | No of trees |
|--------------|--------------------|-----------------|----------------------|-------------|
| <b>Trees</b> |                    |                 |                      |             |
| 1.           | Acacia Nilotica    | Karuvelam maram | Vachellianilotica    | 12          |
| 2.           | Coconut            | Thennai maram   | Cocos nucifera       | 15          |
| 3.           | Mesquite           | Mullumaram      | Prosopis juliflora   | 26          |
| 4.           | Neem               | Vembu           | Azadirachta indica   | 17          |
| 5.           | Asian Palmyra palm | Panai maram     | Borassus flabellifer | 10          |

(Sources: Species observation in the field study)

**Table No: 3.24. Flora in Buffer Zone of Kaganam Village, Rough stone and gravel quarry, Tiruvannamalai District, Tamil Nadu (Primary data & Secondary data)**

| S.No.        | English Name          | Vernacular Name  | Scientific Name             | Family Name    |
|--------------|-----------------------|------------------|-----------------------------|----------------|
| <b>Trees</b> |                       |                  |                             |                |
| 1.           | White Bark Acacia     | Vela maram       | Vachellia leucophloea       | Fabaceae       |
| 2.           | Indian siris          | Vaaga            | Albizia lebbeck (L.) Willd  | Fabaceae       |
| 3.           | Blue gum              | Thayala maram    | Eucalyptus                  | Myrtaceae      |
| 4.           | Alangium salviifolium | Azhinja maram    | Alangium salviifolium       | Cornaceae      |
| 5.           | Banana tree           | Vazhaimaram      | Musa acuminata              | Musaceae       |
| 6.           | Neem                  | Vembu            | Azadirachta indica          | Meliaceae      |
| 7.           | Tamarind              | Puliyamaram      | Tamarindus indica           | Legumes        |
| 8.           | Mesquite              | Mullu maram      | Prosopis juliflora          | Fabaceae       |
| 9.           | Coral Tree            | Kalyana murungai | Erythrina variegata         | Papilionoide   |
| 10.          | Bamboo                | Moonghil         | Bambusa bambo               | Poaceae        |
| 11.          | Yellow flame tree     | Perunkondrai     | Peltophorum pterocarpum     | Fabaceae       |
| 12.          | Indian almond         | Padam maram      | Terminalia catappa          | Combretaceae   |
| 13.          | Asian Palmyra palm    | Panai maram      | Borassus flabellifer        | Arecaceae      |
| 14.          | Indian ash tree       | Odiya maram      | <b>Lannea coromandelica</b> | Anacardiaceae  |
| 15.          | Lemon                 | Ezhumuchaipalam  | Citrus lemon                | Rutaceae       |
| 16.          | Rusty Acacia          | Parambai         | Acacia ferruginea           | Mimosaceae     |
| 17.          | Mango                 | Manga            | Mangifera indica            | Anacardiaceae  |
| 18.          | Peepal                | Arasanmaram      | Ficus religiosa             | Moraceae       |
| 19.          | Custard apple         | Seethapazham     | Annona reticulata           | Annonaceae     |
| 20.          | Chinaberry            | Malai vembu      | Melia azedarach L.          | Meliaceae      |
| 21.          | Monkey pod tree       | Thungumoonchi    | Samanea saman               | Fabaceae       |
| 22.          | Teak                  | Thekku           | Tectona grandis             | Verbenaceae    |
| 23.          | Indian gooseberry     | Nelli            | Emblica officinalis         | Phyllanthaceae |
| 24.          | Henna                 | Marudaani        | Lawsonia inermis            | Lythraceae     |
| 25.          | Madras thorn          | Kudukapuli       | Pithecellobium dulce        | Fabaceae       |
| 26.          | Malayan Cherry        | Ten Pazham       | Muntingia calabura          | Muntingiaceae  |
| 27.          | Pomegranate           | Mathulai         | Punica granatum             | Lythraceae     |
| 28.          | Jamun Fruit Plant     | Naval maram      | Syzygium cumini             | Myrtaceae      |
| 29.          | Banyan tree           | Alamaram         | Ficus benghalensis          | Moraceae       |
| 30.          | Chinese chaste tree   | Nochi            | Vitex negundo               | Verbenaceae    |
| 31.          | Indian Jujube         | Ilanthai         | Ziziphus jujuba             | Rhamnaceae     |
| 32.          | Millettia pinnata     | Pongam oiltree   | Pongamia pinnata            | Fabaceae       |
| 33.          | Coconut               | Thennai maram    | Cocos nucifera              | Arecaceae      |



|               |                      |                   |                         |                |
|---------------|----------------------|-------------------|-------------------------|----------------|
| 34.           | Guava                | Koyya             | Psidium guajava         | Myrtaceae      |
| 35.           | Pala indigo          | Pala maram        | Wrightia tinctoria      | Apocynaceae    |
| 36.           | Portia tree          | Poovarasan        | Thespesia populnea      | Malvaceae      |
| 37.           | Drumstick tree       | Murunga maram     | Moringa oleifera        | Moringaceae    |
| 38.           | Papaya               | Pappali maram     | Carica papaya L         | Caricaceae     |
| <b>Shrubs</b> |                      |                   |                         |                |
| 1.            | Tanner's cassia      | Avaram            | Senna auriculata        | Fabaceae       |
| 2.            | Hopbush              | Virali            | Dodonaea viscosa        | Sapindaceae    |
| 3.            | Castor oil plant     | Amanakku          | Ricinus communis        | Euphorbiaceae  |
| 4.            | Milk Weed            | Erukku            | Calotropis gigantea     | Apocynaceae    |
| 5.            | Indian Oleander      | Arali             | Nerium indicum          | Apocynaceae    |
| 6.            | Triangular spruge    | Chaturakalli      | Euphorbia antiquorum    | Euphorbiaceae  |
| 7.            | Night shade plan     | Sundaika          | Solanum torvum          | Solanaceae     |
| 8.            | Broom creeper        | Kattukodi         | Cocculus hirsutus       | Menispermaceae |
| 9.            | Solanum pubescens    | Malaisundai       | Solanum pubescens Willd | Solanaceae     |
| 10.           | Thorn apple          | Oomathai          | Datura stramonium       | Solanaceae     |
| 11.           | Shoe flower          | Chemparuthi       | Hibiscus rosa-sinensis  | Malvaceae      |
| 12.           | Purging nut          | Kattamanakku      | Jatropha curcas         | Euphorbiaceae  |
| 13.           | Touch-me-not         | Thottalchinungi   | Mimosa pudica           | Mimosaceae     |
| 14.           | Chinese chastetree   | Nalla nochi       | Vitex negundo L         | Verbinaceae    |
| 15.           | Jackal jujube        | Suraimullu        | Ziziphus oenoplia       | Rhamnaceae     |
| 16.           | Malabar catmint      | Pei veratti       | Anisomeles malabarica   | Lamiaceae      |
| 17.           | Indian mallow        | Thuthi            | Abutilon indicum        | Meliaceae      |
| 18.           | Bush Morning Glory   | Neiveli Kattamani | Ipomoea carnea          | Convolvulaceae |
| 19.           | Lantana              | Unni chedi        | Lantana camara          | Verbenaceae    |
| 20.           | Flame of the Woods   | Idlipoo           | Xoracoc cineas          | Rubiaceae      |
| 21.           | Triangular spruge    | Chaturakalli      | Euphorbia antiquorum    | Euphorbiaceae  |
| <b>Herbs</b>  |                      |                   |                         |                |
| 1.            | Coat buttons         | Thatha poo        | Tridax procumbens       | Asteraceae     |
| 2.            | Malabar catmint      | Peimiratti        | Anisomeles malabarica   | Lamiaceae      |
| 3.            | Eggplant             | Kathrikkai        | Solanum melongena       | Solanaceae     |
| 4.            | Christmas Bush       | Poom pul          | Chromolaena odorata     | Asteraceae     |
| 5.            | Aloe barbadensis     | Katrashai         | Aloe vera               | Asphodelaceae  |
| 6.            | -                    | Karaiyaan poondu  | Lepidagathis cristat    | Acanthaceae    |
| 7.            | Mountain knotgrass   | Thengaipoo kirai  | Aerva lanata            | Amaranthaceae  |
| 8.            | Prickly chaff flower | Nayuruv           | Achyranthes aspera      | Amaranthaceae  |
| 9.            | Bindii               | Nerunchi          | Tribulus terrestris     | Zygophyllaceae |

|                           |                          |                 |                           |                |
|---------------------------|--------------------------|-----------------|---------------------------|----------------|
| 10.                       | Fish poison              | Kolinchai       | Tephrosia purpurea        | Fabaceae       |
| 11.                       | Ban Tulsi                | Melakai poondur | Croton bonplandianus      | Euphorbiaceae  |
| 12.                       | Asthma-plant             | Amman pacharisi | Euphorbia hirta           | Euphorbiaceae  |
| 13.                       | Indian doab              | Arugampul       | Cynodon dactylon          | Poaceae        |
| 14.                       | Spiny amaranth           | Mullu keera     | Amaranthus spinosus       | Amaranthaceae  |
| 15.                       | Chilli                   | Milakai         | Capsicum annuum           | Solanaceae     |
| 16.                       | Indian Copperleaf        | Kuppaimeni      | Acalypha indica           | Euphorbiaceae  |
| 17.                       | Marsh barbel             | Neermulli       | Hygrophila auriculata     | Acanthaceae    |
| 18.                       | Yellow-fruit nightshade  | Kandakathirika  | Solanum surattense        | Solanaceae     |
| 19.                       | Asian spiderflower       | Naaikaduku      | Cleome viscosa L          | Cleomaceae     |
| 20.                       | Tomato                   | Thakkali        | Solanum lycopersicum      | Solanaceae     |
| 21.                       | White dammar             | Mookutipoondur  | Vicoa indica              | Asteraceae     |
| 22.                       | Cleome viscosa           | Nai kadugu      | Celome viscosa            | Capparidaceae  |
| 23.                       | Bindii                   | Nerunji mullu   | Tribulus terrestris       | Zygophyllaceae |
| 24.                       | Digeria muricata         | Thoiya keera    | Digeria muricata          | Amaranthaceae  |
| 25.                       | False daisy              | Karisalankanni  | Eclipta alba              | Asteraceae     |
| 26.                       | Sessile Joyweed          | Ponnakanni      | Alternanthera sessilis    | Amaranthaceae  |
| 27.                       | Field beans              | Avarai          | Hyacinth Beans            | Fabaceae       |
| 28.                       | Common leucas            | Thumbai         | Leucas aspera             | Lamiaceae      |
| 29.                       | Holy basil               | Thulasi         | Ocimum tenuiflorum        | Lamiaceae      |
| 30.                       | Coat buttons             | Thatha poo      | Tridax procumbens         | Asteraceae     |
| 31.                       | Indian mint              | Karpura valli   | Coleus amboinicus         | Lamiaceae      |
| 32.                       | Europeanblack nightshade | Manathakkali    | Solanumnigrum             | Solanaceae     |
| 33.                       | Bright eyes              | Nithiyakalyani  | Catharanthus roseus       | Apocynaceae    |
| 34.                       | Carrot grass             | Partiniyam      | Parthenium hysterophorus  | Asteraceae     |
| 35.                       | Red Spiderling           | Mukirattai      | Boerhavia diffusa         | Nyctaginaceae  |
| <b>Climbers/ Creepers</b> |                          |                 |                           |                |
| 1.                        | Stemmed vine             | Perandai        | Cissus quadrangularis     | Vitaceae       |
| 2.                        | Indian sarsaparilla      | Nannaari        | Hemidesmus indicus        | Apocynaceae    |
| 3.                        | Rosary Pea               | Gundumani       | Abrus precatorius         | Fabaceae       |
| 4.                        | Ivy gourd                | Kovai           | Coccinia grandis          | Cucurbitaceae  |
| 5.                        | Balloon plant            | Mudakrtan       | Cardiospermum halicacabum | Sapindaceae    |
| 6.                        | Butterfly pea            | Sangu poo       | Clitoria ternatea         | Fabaceae       |
| 7.                        | Pointed gourd            | Kovakkai        | Trichosanthes dioica      | Cucurbitaceae  |
| 8.                        | Bottle Guard             | Sorakkai        | Lagenaria siceraria       | Cucurbitaceae  |
| 9.                        | White pumpkin            | Poosanaikkaai   | Cucurbitaceae             | Cucurbitaceae  |
| 10.                       | Wild jasmine             | Malli           | Jasminum augustifolium    | Oleaceae       |



|                |                        |                          |                       |               |
|----------------|------------------------|--------------------------|-----------------------|---------------|
| 11.            | Nut grass              | Korai                    | Cyperus rotandus      | Poaceae       |
| 12.            | Cucumis maderaspatanus | Musumusukkai             | Mukia maderaspatana   | Cucurbitaceae |
| <b>Grasses</b> |                        |                          |                       |               |
| 1.             | Windmill grass         | Chevvarakupul            | Chloris barbata       | Poaceae       |
| 2.             | Jungle rice            | Kuthirai vaalKattu arusi | Echinochloa colona    | Poaceae       |
| 3.             | Swollen Windmill Grass | Kondai Pul               | Chloris barbata       | Poaceae       |
| 4.             | Eragrostis             | Pullu                    | Eragrostis ferruginea | Poaceae       |
| 5.             | Mauritian Grass        | Moongil pul              | Apluda mutica         | Amaranthaceae |

**(Sources:**

[Species observation in the field study](#)

[Tamil Nadu state Forest department working plan](#)

[Plant resources of tiruvannamalai district tamilnadu India](#)

[medicinal plant diversity in tiruvannamalai hill, tiruvannamalai, Tamil Nadu](#)

[file:///C:/Users/Kishore%20K/Downloads/An Ethnobotanical Survey of Medicinal Or%20\(1\).pdf](file:///C:/Users/Kishore%20K/Downloads/An%20Ethnobotanical%20Survey%20of%20Medicinal%20Plants%20in%20Tiruvannamalai%20Hill.pdf)

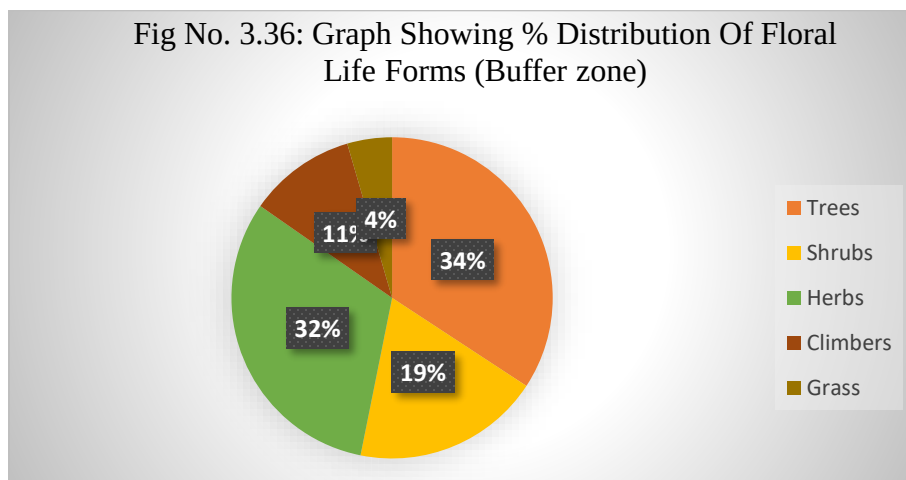
### 3.6. Flora Composition in the Buffer Zone

Buffer zone flora sampling was conducted between 10.00 am to 4.00 pm in eight different locations in 10 km radius as per the ToR. The most important and widely used methods for a general assessment is belt transect methods. The study area was divided according to habitat types followed the random sampling methods in the selected area. The area exhibiting plain terrain. so we used quadrat sampling methods. Similar habitats may be found in the buffer area as well, although there is a wider variety of plants there than in the core zone area. There are no National Parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, Ramsar sites, Tiger/Elephant Reserves/ (existing as well as proposed) within 10 km of the mine lease area. There are no protected forests within the project area and there are 130 species in the buffer zone study area in total, based on records. The floral (111) varieties among them Trees 38, Herbs 35, Shrubs 21, Climbers/Creepers 12, and Grasses 5 were identified. The result of the buffer zone of flora studies shows that Fabaceae and Cucurbitaceous, Euphorbiaceous is the main dominating species in the study area mentioned in Table No.3.56. There are no impacts due to this mining activity. There are no Rare, Endangered, and Threatened Flora species in the mining area and their surrounding study area. Apart from the proposed project area, there is agricultural land. Horticulture and agricultural land are untouched. There are no Rare, Endangered, and Threatened Flora species in the mining area and their surrounding study area. A list of floral species has been prepared based on primary survey (site observations) and discussion with local people. The total number of different plant life forms under trees, shrubs, herbs, and climbers is shown in Table no 3.56 and their % distribution is shown in Figure no 3.36.

**Table No: 3.25 Number of floral life forms in the Study Area**

| S. No                       | Plant Life Form  | Number of Species |
|-----------------------------|------------------|-------------------|
| 1                           | Trees            | 38                |
| 2                           | Shrubs           | 21                |
| 3                           | Herbs            | 35                |
| 4                           | Climber/Creepers | 12                |
| 6                           | Grasses          | 5                 |
| <b>Total No. of Species</b> |                  | <b>111</b>        |

**Fig No. 3.36: Graph Showing % Distribution Of Floral Life Forms (Buffer zone)**





a. *Lantana camara*



b. *Jatropha curcas*



c. *Calotropis gigantea*



d. *Azardicata indica*



e. *Borassus flabellifer*



f. *Borassus flabellifer*



g. *Mangifera indica*



h. *Cissus quadrangularis*

**Fig No: 3.37. Flora species observation in the Buffer zone area**



### 3.6.1. Drainage and Irrigation

#### 3.6.2. Sources of Irrigation

There are no perennial rivers in the district. The district was mostly drained by Cheyyar river, a major tributary of river Palar, originating from the forest area of Jawadhu hills and traveling through Chengam, Polur, Arni and Cheyyar taluks before confluence with river Palar in Kancheepuram district. Other minor streams in the district like, Kamandala Naga Nadhi, Thenpennai, Thurinjalaru and Suganadhi were the important seasonal rivers in the district.

Tanks and dug wells were the major sources of irrigation in the district. The district had 604 major tanks (with ayacut of 40 ha. or more) and 1,361 small tanks (with ayacut of less than 40 ha.) There were 1,050 private bore wells, 200 dug-cum-bore wells and 1, 54,415 open wells in the district. Sathanur reservoir is built across the Thenpennai river with an ayacut of 18,882 ha. Benefiting both Tiruvannamalai and Villupuram districts.

#### 3.6.3. Crop Patterns in Tiruvannamalai District

Agriculture is the main occupation in the district. The gross and net cultivated areas were 3, 04,929 and 2, 42,387 ha. respectively. The cropping intensity was 126 per cent and the ratio of net sown area to cultivable area (indicating extent of use of cultivable area) was 67.60 per cent only. Paddy, sugarcane and groundnut were the major crops grown in the district. More details refer- [\(Source: G-Return 2017-18, Season Crop Report 2015-16.\)](#)

#### 3.6.4. Agriculture & Horticulture

##### 3.6.4.1. Agricultural

Agriculture is the main source of livelihood for the people in the district. The district is dependent on seasonal rains for successful agricultural operations. Different crops in dry and wet lands are cultivated in the district. Some of the taluks, in particular, which enjoy irrigation facilities are Tiruvannamalai, Cheyyar, Polur and Vandavasi.

Paddy is the main agricultural crop in this district. In 2017-18, paddy & Cereal was sown in 161709 hectares that was 51.4 percent to the total crop sown area in the district. But, groundnut sown in the district which was 20.3 percent in 63862 hectares.

##### 3.6.4.2. Horticulture

As horticultural crops, different types of fruits and vegetables are grown largely in the district. However, due to hot weather and dry climate, not many horticultural crops are cultivated. More details refer- [\(Source: G-Return 2017-18, Season Crop Report 2015-16.\)](#)

##### 3.6.4.2.1. Medicinal and economic importance

Ethnobotanical survey and documentation of medicinal, field grown, ornamental, and wild plants were carried out in and around Kaganam village, Tiruvannamalai district, Tamilnadu. This study aimed to identify plants collected for medicinal and other purposes by the local people of the village. A total of 17 and more plant species were observed in this study. These plant species, belonging to 12 families are tabulated below.

There is very limited information available regarding medicinal plants used by traditional healers and general people in villages, for treating common ailments and diseases. It is very urgent need for identifying and documenting these valuable resources before they become inaccessible and extinct. Ethnobotanical survey is highly needed for the conservation of plants.

**Table No. 3.26. Medicinal and economic importance**

| S.No | Botanical name                        | Family        | Vernacular name |
|------|---------------------------------------|---------------|-----------------|
| 1.   | <i>Abrus precatorius L.</i>           | Fabaceae      | Gundumani       |
| 2.   | <i>Abutilon indicum (Link) Sweet.</i> | Malvaceae     | Thuthi          |
| 3.   | <i>Acalypha indica L</i>              | Euphorbiaceae | Kuppaimeni      |

|     |                                                         |                |                            |
|-----|---------------------------------------------------------|----------------|----------------------------|
| 4.  | <i>Achyranthes aspera L</i>                             | Amaranthaceae  | Naaiuruvi                  |
| 5.  | <i>Aegle marmalos (L.) Corrêa.</i>                      | Rutaceae       | Vilvam                     |
| 6.  | <i>Aloe vera (L.) Burm.f.</i>                           | Asphodelaceae  | Sotrukkatrazhai            |
| 7.  | <i>Alternanthera sessilis (L.)</i>                      | Amaranthaceae  | Ponnaankanni               |
| 8.  | <i>Amaranthus spinosa L.</i>                            | Amaranthaceae  | Mullu keerai               |
| 9.  | <i>Andrographis paniculata (Burm.f.) Wall. ex Nees.</i> | Acanthaceae    | Nila vembu, Siriyaa nantai |
| 10. | <i>Azadirachta indica A. Juss</i>                       | Meliaceae      | Vembu                      |
| 11. | <i>Cissus quadrangularis L</i>                          | Vitaceae       | Pirandai                   |
| 12. | <i>Citrus medica L</i>                                  | Rutaceae       | Elumichai                  |
| 13. | <i>Eclipta prostrata L.</i>                             | Asteraceae     | Karisalankanni             |
| 14. | <i>Justicia adhatoda L.</i>                             | Acanthaceae    | Adathoda                   |
| 15. | <i>Melia azedarach L</i>                                | Meliaceae      | Malai veambu               |
| 16. | <i>Phyllanthus niruri L</i>                             | Phyllanthaceae | Keezhanelli                |
| 17. | <i>Smilax zeylanica L.</i>                              | Smilacaceae    | Kaatukodi                  |

### 3.6.5. The vegetation in the RF / PF areas, ecologically sensitive areas etc.

There are no National Parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, Ramsar sites, Tiger/Elephant Reserves/ (existing as well as proposed) within 10 km of the mine lease area. There are no protected forests within the project area. Hence submission of clearance from the National Board of Wildlife does not arise. No Wildlife Sanctuary in the study area. In addition, No Biosphere Reserves, Wildlife corridors, or, Tiger / Elephant reserves within 10 km of the project area. No protected (PF) forests either in the mine lease area or in the buffer zone. Thus, no forest land is involved in any manner.

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

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

### 3.7. Fauna

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

#### 3.7.1. Fauna Composition in the Core Zone

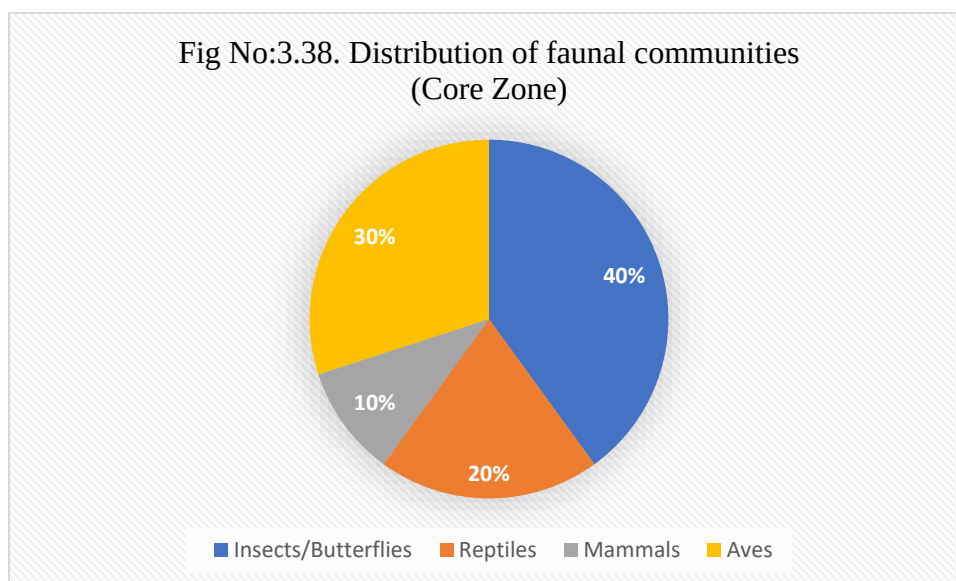
Core zone fauna samplings were conducted between 6.00 am to 8.00 am in three locations. A total of 10 varieties of species were observed in the Core zone of Kaganam Village, Rough stone and gravel quarry (Table No.3.58) among them numbers of Insects/ Butterflies 4, Reptiles 2, Mammals 1, and Avian 3. A total of 10 species have been recorded from the core mining lease area. None of these species are threatened or endemic in the study area and surroundings. There is no Schedule I species and 6 species are under Schedule IV according to the Indian Wildlife Act 1972. A total of 3 species of bird were sighted in the mining lease area. There are no critically endangered, endangered, vulnerable, and endemic species were observed. Details of fauna in the core zone with the scientific name were mentioned in Table No. 3.58.

**Table No: 3.27. Fauna in the Core zone of Kaganam Village, Rough stone and gravel quarry (Primary data)**

| SI. No | Common Name | Family Name | Scientific Name | Schedule WPA1972 |
|--------|-------------|-------------|-----------------|------------------|
|--------|-------------|-------------|-----------------|------------------|

| <b>Insects/Butterflies</b> |               |               |                             |             |
|----------------------------|---------------|---------------|-----------------------------|-------------|
| 1.                         | Striped tiger | Nymphalidae   | <i>Danaus plexippus</i>     | Schedule IV |
| 2.                         | Common Tiger  | Nymphalidae   | <i>Danaus genutia</i>       | Schedule IV |
| 3.                         | Grasshopper   | Acrididae     | <i>Hieroglyphus sp</i>      | NL          |
| 4.                         | Common Tiger  | Nymphalidae   | <i>Danaus genutia</i>       | NL          |
| <b>Reptiles</b>            |               |               |                             |             |
| 1.                         | Garden lizard | Agamidae      | <i>Calotes versicolor</i>   | NL          |
| 2.                         | Common skink  | Scincidae     | <i>Mabuya carinatus</i>     | NL          |
| <b>Mammals</b>             |               |               |                             |             |
| 1.                         | Common rat    | Muridae       | <i>Rattus rattus</i>        | Schedule IV |
| <b>Aves</b>                |               |               |                             |             |
| 1.                         | Black drongo  | Dicruridae    | <i>Dicrurus macrocercus</i> | Schedule IV |
| 2.                         | Common myna   | Sturnidae     | <i>Acridotheres tristis</i> | Schedule IV |
| 3.                         | Sunbird       | Nectariniidae | <i>Cinnyris asiaticus</i>   | Schedule IV |

(Sources: Species observation in the field study)



### 3.7.2. Fauna Composition in the Buffer Zone

The Buffer zone fauna samplings were conducted between 6.00 am to 8.00 am and 2.30 pm to 6.30 pm in different locations. As animals, especially vertebrates move from place to place in search of food, shelter, mate or other biological needs, separate lists for core and buffer areas are not feasible however, a separate list of fauna pertaining to core and buffer zone are listed separately. There is no reserve forest present in the project site. As such there are no chances of occurrence of any rare or endangered or endemic or threatened (REET) species within the core or buffer area.

There are no Sanctuaries, National Parks, Tiger Reserve or Biosphere reserves or Elephant Corridor or other protected areas within 10 km radius of from the core area. It is evident from the available records, reports, and circumstantial evidence that the entire study area including the core and buffer areas were free from any endangered animals. There were no resident birds other than common bird species such as Red-whiskered Bulbul, Asian Koel, House crow, Black drangos, Crows, Pond heron etc.

The list of Mammals (\*directly sighted animals & Secondary data) is given in table No.3.59. The list of bird species recorded during the field survey and literature from the study area are given in Table 3.60. The list of reptilian species recorded during the field survey and literature from the study area is given in Table 3.61. The list of insect species recorded during the field survey and literature from the study area are given in Table 3.62. The list of Butterflies species recorded during the field survey and literature from the study area are given in Table 3.63. It is



apparent from the list that none of the species either spotted or reported is included in Schedule I of the Wildlife Protection Act. Similarly, none of them comes under the REET category.

Taxonomically a total of 67 species recorded were from the buffer zone area. Based on habitat classification the majority of species were birds 25, followed by Butterflies 15, Reptiles 10, Insects 5, Mammals 8, and Amphibians 4. There are four Schedule II species, two species are under the schedule III and thirty-nine species are under Schedule IV according to the Indian Wildlife Act 1972. A total of 25 species of bird were sighted in the study area. There are no critically endangered, endangered, vulnerable, and endemic species were observed. There are no impacts on nearby fauna species.

Dominant species are mostly birds, butterflies, and insects, and four amphibians was observed during the extensive field visit *Sphaerotheca breviceps*, *Euphlyctis hexadactylus*, *Bufo melanostictus*, etc. There is no Schedule I Species in the study area. There are no critically endangered, endangered, vulnerable, and endemic species were observed.

**Table No. 3.28. List of Fauna & Their Conservation Status,  
Mammals: (\*directly sighted animals & Secondary data)**

| SI. No | Scientific Name              | Common Name/English Name  | Schedule list WPA 1972 |
|--------|------------------------------|---------------------------|------------------------|
| 1.     | <i>Herpestes edwardsi</i>    | Indian Grey Mongoose      | Schedule II            |
| 2.     | <i>Mus booduga</i>           | Little Indian field mouse | Schedule IV            |
| 3.     | <i>Bandicota bengalensis</i> | Indian mole-rat           | Schedule IV            |
| 4.     | <i>Mus musculus</i>          | House mouse               | Schedule IV            |
| 5.     | <i>Funambulus palmarum</i>   | Common Palm Squirrel      | Schedule IV            |
| 6.     | <i>Rattus rattus</i>         | Black rat                 | Schedule IV            |
| 7.     | <i>Bandicota indica</i>      | Rat                       | Schedule IV            |
| 8.     | <i>Lepus nigricollis</i>     | Indian Hare               | Schedule IV            |

**Table No. 3.29. Listed birds (Primary data and Secondary data)**

| SI. No | Scientific Name                    | Common Name               | Schedule list WPA 1972 |
|--------|------------------------------------|---------------------------|------------------------|
| 1.     | <i>Alcedo atthis</i>               | Common Kingfisher         | Schedule IV            |
| 2.     | <i>Copsychus fulicatus</i>         | Indian robin              | Schedule IV            |
| 3.     | <i>Corvus splendens</i>            | House crow                | Schedule V             |
| 4.     | <i>Dicrurus macrocercus</i>        | Black Drongo              | Schedule IV            |
| 5.     | <i>Halcyon smyrnensis</i>          | White-breasted kingfisher | Schedule IV            |
| 6.     | <i>Bubulcus ibis</i>               | Cattle Egret              | Schedule IV            |
| 7.     | <i>Hypsipetes madagascariensis</i> | Black bulbul              | Schedule IV            |
| 8.     | <i>Columba livia</i>               | Rock pigeon               | Schedule IV            |
| 9.     | <i>Acridotheres tristis</i>        | Common myna               | Schedule IV            |
| 10.    | <i>Psittacula krameri</i>          | Rose ringed parakeet      | Schedule IV            |
| 11.    | <i>Coturnix coturnix</i>           | Grey quail                | Schedule IV            |
| 12.    | <i>Passer domesticus</i>           | House Sparrow             | Schedule IV            |
| 13.    | <i>Pycnonotus cafer</i>            | Red vented Bulbul         | Schedule IV            |
| 14.    | <i>Accipiter badius</i>            | Shikra                    | Schedule IV            |
| 15.    | <i>Cuculus canorus</i>             | Cuckoo                    | Schedule IV            |
| 16.    | <i>Merops orientalis</i>           | Small green bee eater     | Schedule IV            |
| 17.    | <i>Nectarinia minima</i>           | Small sunbird             | Schedule IV            |
| 18.    | <i>Ardeola grayii</i>              | Pond Heron                | Schedule IV            |
| 19.    | <i>Spilopelia chinensis</i>        | Spotted dove              | Schedule IV            |
| 20.    | <i>Egretta garzetta</i>            | Little Egret              | Schedule IV            |
| 21.    | <i>Apus apus</i>                   | Common swift              | Schedule IV            |
| 22.    | <i>Ardea cinerea</i>               | Grey heron                | Schedule IV            |
| 23.    | <i>Megalaima zeylanica</i>         | Brown-headed barbet       | Schedule IV            |

|     |                              |               |             |
|-----|------------------------------|---------------|-------------|
| 24. | <i>Eudynamys scolopacea</i>  | Koel          | Schedule IV |
| 25. | <i>Coracias benghalensis</i> | Indian roller | Schedule IV |

**Table No 3.30. List of Reptiles either spotted or reported from the study area.  
(\*indicates direct observations & Secondary data)**

| SI. No | Scientific Name                  | Common Name/English Name | Schedule list WPA 1972 |
|--------|----------------------------------|--------------------------|------------------------|
| 1.     | <i>Calotes versicolor</i>        | Oriental garden lizard   | NL                     |
| 2.     | <i>Hemidactylus flaviviridis</i> | House lizards            | Schedule IV            |
| 3.     | <i>Naja naja</i>                 | Indian cobra             | Sch II (Part II)       |
| 4.     | <i>Ahaetulla nasuta</i>          | Green vine snake         | Schedule IV            |
| 5.     | <i>Ptyas mucosa</i>              | Rat snake                | Sch IV (Part II)       |
| 6.     | <i>Bungarus caeruleus</i>        | Common krait             | Schedule IV            |
| 7.     | <i>Mabuya carinatus</i>          | Common skink             | NL                     |
| 8.     | <i>Vipera russeli</i>            | Russell's viper          | Sch II (Part II)       |
| 9.     | <i>Nerodia piscator</i>          | Fresh water snake        | Sch III (Part II)      |
| 10.    | <i>Groemyda bijuga</i>           | Fresh water tortoise     | Sch III (Part II)      |

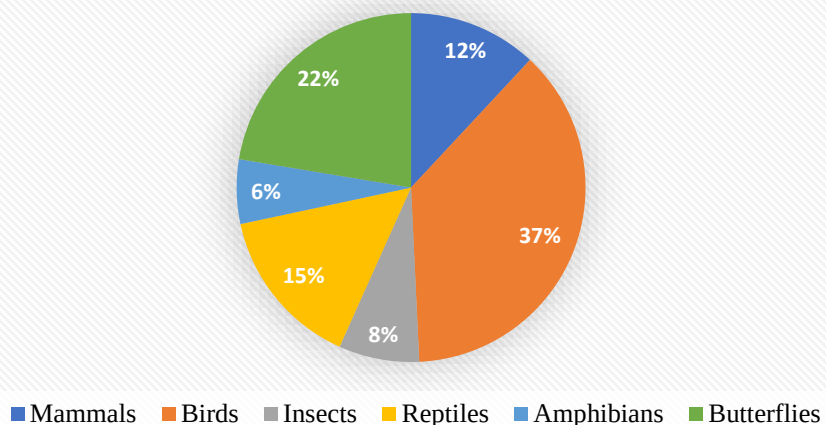
**Table No. 3.31. List of insects either spotted or reported from the study area**

| SI. No | Scientific Name             | Common Name      | Schedule list WPA 1972 |
|--------|-----------------------------|------------------|------------------------|
| 1.     | <i>Apis cerana</i>          | Indian honey bee | -                      |
| 2.     | <i>Hamitermes silvestri</i> | Termite          | NE                     |
| 3.     | <i>Hieroglyphus sp</i>      | Grasshopper      | NL                     |
| 4.     | <i>Camponotus Vicinus</i>   | Ant              | NL                     |
| 5.     | <i>Ceratogomphus pictus</i> | Dragonfly        | -                      |

**Table No. 3.32. List of Butterflies reported from the study area and Secondary data**

| SI. No | Scientific Name                 | Common Name       | Schedule |
|--------|---------------------------------|-------------------|----------|
| 1.     | <i>Papilio clytia</i>           | Common mime       | -        |
| 2.     | <i>Euploea core</i>             | Euploea core      | -        |
| 3.     | <i>Pachliopta aristolochiae</i> | Common rose       | -        |
| 4.     | <i>Papilio polytes</i>          | Common mormon     | -        |
| 5.     | <i>Spialia galba</i>            | Indian Skipper    | -        |
| 6.     | <i>Danaus genutia</i>           | Common tiger      | -        |
| 7.     | <i>Pachliopta hector</i>        | Crimson rose      | -        |
| 8.     | <i>Eurema brigitta</i>          | Eurema brigitta   | -        |
| 9.     | <i>Hypolimnas bolina</i>        | Hypolimnas bolina | -        |
| 10.    | <i>Castalius rosimon</i>        | Common Pierrot    | -        |
| 11.    | <i>Curetis thetis</i>           | Indian Sunbeam    | -        |
| 12.    | <i>Troides minos</i>            | Southern birdwing | -        |
| 13.    | <i>Papilio demoleus</i>         | Lime Butterfly    | -        |
| 14.    | <i>Ariadne merione</i>          | Common Castor     | -        |
| 15.    | <i>Neptis hylas</i>             | Neptis hylas      | -        |

Fig No:3.39. Distribution Of Faunal Communities  
(Buffer Zone)



Livestock like cattle, buffalo, goat, poultry, duck and pig are reared for dairy products, meat, and egg and for agriculture purpose. Majority of cattle and buffalo are of local variety. Backyard poultry farms are mostly common in this area; however, some commercial poultry farms are also recorded in the study area. The study area is marked with moderate population of flora and fauna. With reference to the Wildlife Protection Act 1972 total number of wildlife tabulated in this study can be characterized as given in the Table 3.64.



a. *Calotes versicolor*



b. *Corvus splendens*



c. *Zizina Otis indica*



d. *Ceratogomphus pictus*



e. *Sympetrum fonscolombii*



f. *Dicrurus macrocercus*



g. *Danainae*



h. *Alcedo atthis*



i. *Picidae*



j. *Psittacula krameri*



k. *Meropsorientalis*



l. *Acridotheres tristis*

**Fig No: 3.33. Species observation in the field study (Buffer Zone)****Table No 3.64 Description of Flora & Fauna**

| S. No        | Type of Species                    | Name                        | Local Name |
|--------------|------------------------------------|-----------------------------|------------|
| <b>Flora</b> |                                    |                             |            |
| 1.           | Endangered species                 | None                        | None       |
| 2.           | Threatened species                 | None                        | None       |
| 3.           | Near Threatened species            | None                        | None       |
| 4.           | Vulnerable species                 | None                        | None       |
| <b>Fauna</b> |                                    |                             |            |
| 5.           | Endangered species                 | None                        | None       |
| 6.           | Threatened species                 | None                        | None       |
| 7.           | Near Threatened species            | None                        | None       |
| 8.           | Vulnerable species                 | None                        | None       |
| 9.           | Migratory Corridors & Flight Paths | No corridors & flight paths | -          |
| 10.          | Breeding & Spawning grounds        | None                        | -          |
| 11.          | Invasive Alien species             | None                        | None       |

### 3.8. Aquatic Ecology

Mining activities will not have an impact on aquatic ecosystems because no effluent discharge from the Rough stone and gravel quarry is planned. There are no natural perennial surface water bodies, such as marshes, rivers, streams, lakes, or agricultural sites, inside the mining lease area. The study region contains a few seasonal bodies of water. There is no aquatic flora and, aquatic fauna. Hence, it does not harbour any significant aquatic life. Therefore, the project is not likely to affect the aquatic ecology. Aquatic weeds are found to be growing everywhere in 10 km radius area, in every water bog, pond, etc. Tyche angustata can be found growing all along the drains of villages, small water-logged depressions, and agricultural fields lacking water but containing enough moisture to support its growth. And where water is present, Eichhornia crassipes has taken its roots and covers the entire water surface by its sprawl and invasion.

#### 3.8.1. Objectives of Aquatic Studies

- ❖ Generating data through actual field collection in these locations over the study period;
- ❖ Impacts on aquatic fauna/flora
- ❖ Consulted with locals to obtain knowledge about aquatic flora and animals.

#### 3.8.2. Macrophytes

The macrophytes observed within the study area are tabulated in Table No 3.66

**Table No.3.34 Description of Macrophytes**

| Sl. No | Scientific name           | Common Name         | Vernacular Name (Tamil) | IUCN Red List of Threatened Species |
|--------|---------------------------|---------------------|-------------------------|-------------------------------------|
| 1.     | <i>Eichornia crassipe</i> | Water hyacinth      | Agayatamarai            | NA                                  |
| 2.     | <i>Aponogeton natans</i>  | Floating lace plant | Kottikizhnagu           | NA                                  |
| 3.     | <i>Nymphaea nouchali</i>  | Blue water lily     | Nellambal               | LC                                  |
| 4.     | <i>Carex cruciata</i>     | Cross Grass         | Koraipullu              | NA                                  |
| 5.     | <i>Cyperus exultates</i>  | Tall Flat Sedge     | Koraikizhangu           | LC                                  |

Sources: [Species observation in the field study](#)



### 3.8.3. Aquatic Faunal Diversity

Amphibian species like the common Indian Burrowing frog, and green pond frog, and etc. were sighted near the water bodies located in the study area.

**Table No. 3.35. List of Amphibians either spotted or reported from the study area**

| SI. No | Scientific Name                | Common Name/English Name | Schedule list wildlife Protection act 1972 |
|--------|--------------------------------|--------------------------|--------------------------------------------|
| 1.     | <i>Sphaerotheca breviceps</i>  | Indian Burrowing frog    | Schedule IV                                |
| 2.     | <i>Euphlyctis hexadactylus</i> | Green pond frog          | Schedule IV                                |
| 3.     | <i>Bufome lanostictus</i>      | Indian Toad              | Schedule IV                                |
| 4.     | <i>Euphlyctis cynophlyctis</i> | Skipper                  | Schedule IV                                |

### 3.8.4. Fishes

Fish is commonly found in all types of natural water bodies and very common source of food in Eastern South India. The local fishermen were enquired and also the secondary resources were reviewed to collect information on the fishes found in the study area. Few common species are; Catla, Mrigal, Ticto barb, Greenstripe barb, Roho and Pool barb etc., Species of fish reported in the study area are given in table 3.68. During the field investigation, all of the lakes were quite dry. Only the lakes gather fish data.

**Table No 3.36. Based on Actual Sighting, based on inputs from locals and Perused from Secondary Data**

| S. No | Common name      | Scientific name          | Family        |
|-------|------------------|--------------------------|---------------|
| 1.    | Mrigal           | <i>Cirrhinus mrigala</i> | Chordata      |
| 2.    | Rohu             | <i>Labeo rohita</i>      | Cyprinidae    |
| 3.    | Catfish          | <i>Siluriformes</i>      | Diplomystidae |
| 4.    | Greenstripe barb | <i>Puntius vittatus</i>  | Cyprininae    |

#### Sources:

[Invasive Alien Species | IUCN](https://www.inaturalist.org/places/tiruvannamalai)

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

[Ali, S and Ripley, S.D. 1969. Handbook of the Birds of India and Pakistan together with those of Nepal, Sikkim, Bhutan and Ceylon. 3. Stone Curlews to Owls. Oxford University Press, Bombay, 327pp.](#)

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### 3.9. Findings/Results

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

| S.No | Ecological sensitive habitat                                                                | Direction and Distance from the project site                  |
|------|---------------------------------------------------------------------------------------------|---------------------------------------------------------------|
| 1.   | National Parks/ Wildlife Sanctuary/ Biosphere reserves/ Elephant Reserve/ Any Other Reserve | Nil                                                           |
| 2.   | Reserved Forests                                                                            | Nil                                                           |
| 3.   | Wildlife Corridors & Routes                                                                 | No notified wildlife corridors are present in 10 km vicinity. |



|    |                                              |             |
|----|----------------------------------------------|-------------|
| 4. | Wetlands / Water bodies                      | -           |
| 5. | Ramsar Site                                  | Nil         |
| 6. | Important Bird Habitats                      | Nil         |
| 7. | Breeding/nesting areas of endangered species | Not present |
| 8. | Mangroves                                    | None        |

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

### 3.10. Conclusion

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

### 3.6 Socio Economic Environment

There is no Approved habitation/ village within the radius of 300m from the project area. Socio-economic study is an essential part of environmental study. It includes demographic structure of the area, provision of basic amenities viz., housing, education, health and medical services, occupation, water supply, sanitation, communication, transportation, prevailing diseases pattern as well as feature like temples, historical monuments etc., at the baseline level. This will help in visualizing and predicting the possible impact depending upon the nature and magnitude of the project.

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

#### 3.6.1 Objectives of the Study

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

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

#### 3.6.2 Scope of Work

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

#### 3.6.3 Administrative Setup of Tiruvannamalai District

Tiruvannamalai district is divided into 12 taluks. The taluks are further divided into 18 blocks, which further divided into 860 villages. In 2011, Tiruvannamalai had population of 24,64,875 of which male and female were 12,35,889 and 12,28,986 respectively. In 2001 census, Tiruvannamalai had a population of 21,86,125 of which males were 10,95,859 and remaining 10,90,266 were females. Tiruvannamalai District population constituted 3.42

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% of total Maharashtra population. In 2001 census, this figure for Tiruvannamalai District was at 3.50 % of Maharashtra population.

There was change of 12.75 % in the population compared to population as per 2001. In the previous census of India 2001, Tiruvannamalai District recorded increase of 7.01 % to its population compared to 1991.

#### **3.6.4 Study area**

Kaganam village is situated in Teshil Vembakkam District Tiruvannamalai and in State of Tamil Nadu India. Village has population of 806 as per census data of 2011, in which male population is 422 and female population is 384. Total geographical area of Kaganam village is 452.24 Hectares. Population density of Kaganam is 2 persons per Hectares. Total number of house hold in village is 203.

**TABLE 3.37 – POPULATION CHARACTERISTICS AROUND 10KM RADIUS**

| S.No | Name of the Village | No. of Households | Total Population | Population Male | Population female | SC Population Male | SC Population female | Total Literates Male | Total Literates Female | Total Illiterates Male | Total Illiterates Female |
|------|---------------------|-------------------|------------------|-----------------|-------------------|--------------------|----------------------|----------------------|------------------------|------------------------|--------------------------|
| 1.   | Akkur               | 754               | 2896             | 1454            | 1442              | 293                | 290                  | 1086                 | 862                    | 368                    | 580                      |
| 2.   | Alanthangal         | 134               | 541              | 271             | 270               | 0                  | 0                    | 123                  | 86                     | 148                    | 184                      |
| 3.   | Arasankuppam        | 241               | 1106             | 538             | 568               | 483                | 502                  | 361                  | 330                    | 177                    | 238                      |
| 4.   | Arugavoor           | 374               | 1547             | 773             | 774               | 346                | 359                  | 545                  | 413                    | 228                    | 361                      |
| 5.   | Arumparuthi         | 152               | 738              | 367             | 371               | 52                 | 63                   | 184                  | 140                    | 183                    | 231                      |
| 6.   | Athi                | 208               | 796              | 425             | 371               | 0                  | 0                    | 341                  | 256                    | 84                     | 115                      |
| 7.   | Azhinjalpattu       | 226               | 892              | 426             | 466               | 133                | 153                  | 307                  | 261                    | 119                    | 205                      |
| 8.   | Azhividaithangi     | 1146              | 4494             | 2251            | 2243              | 359                | 373                  | 1619                 | 1215                   | 632                    | 1028                     |
| 9.   | Barathanthangal     | 131               | 515              | 263             | 252               | 0                  | 0                    | 204                  | 147                    | 59                     | 105                      |
| 10.  | Booderi             | 187               | 764              | 372             | 392               | 0                  | 0                    | 263                  | 199                    | 109                    | 193                      |
| 11.  | Chellaperumpulimedu | 130               | 545              | 277             | 268               | 4                  | 1                    | 194                  | 126                    | 83                     | 142                      |
| 12.  | Chithathur          | 657               | 2654             | 1284            | 1370              | 276                | 311                  | 889                  | 751                    | 395                    | 619                      |
| 13.  | Chozhavaram         | 340               | 1316             | 670             | 646               | 312                | 298                  | 513                  | 428                    | 157                    | 218                      |
| 14.  | Duli                | 291               | 1154             | 579             | 575               | 112                | 108                  | 448                  | 333                    | 131                    | 242                      |
| 15.  | Hariharapakkam      | 263               | 1094             | 565             | 529               | 0                  | 0                    | 332                  | 227                    | 233                    | 302                      |
| 16.  | Hasanamapettai      | 404               | 1582             | 807             | 775               | 0                  | 0                    | 716                  | 621                    | 91                     | 154                      |
| 17.  | Jaderi              | 137               | 530              | 270             | 260               | 1                  | 1                    | 220                  | 123                    | 50                     | 137                      |
| 18.  | Kaganam             | 203               | 806              | 422             | 384               | 237                | 222                  | 294                  | 174                    | 128                    | 210                      |
| 19.  | Kammanthangal       | 162               | 645              | 323             | 322               | 0                  | 0                    | 269                  | 228                    | 54                     | 94                       |
| 20.  | Kanagampakkam       | 55                | 231              | 126             | 105               | 0                  | 0                    | 97                   | 49                     | 29                     | 56                       |
| 21.  | Karanai             | 139               | 677              | 351             | 326               | 345                | 321                  | 250                  | 176                    | 101                    | 150                      |
| 22.  | Karanthai           | 221               | 881              | 451             | 430               | 300                | 296                  | 384                  | 306                    | 67                     | 124                      |
| 23.  | Kazhivur            | 433               | 1714             | 844             | 870               | 188                | 204                  | 580                  | 455                    | 264                    | 415                      |
| 24.  | Kizhnelli           | 402               | 1580             | 783             | 797               | 129                | 136                  | 502                  | 350                    | 281                    | 447                      |
| 25.  | Kizhnethapakkam     | 321               | 1314             | 656             | 658               | 287                | 287                  | 473                  | 348                    | 183                    | 310                      |
| 26.  | Kodaivampakkam      | 204               | 843              | 404             | 439               | 0                  | 0                    | 324                  | 235                    | 80                     | 204                      |
| 27.  | Kunnathur           | 303               | 1433             | 718             | 715               | 291                | 280                  | 526                  | 390                    | 192                    | 325                      |
| 28.  | Kunnavakkam         | 315               | 1259             | 643             | 616               | 341                | 329                  | 487                  | 362                    | 156                    | 254                      |
| 29.  | Kuthanur            | 846               | 3509             | 1780            | 1729              | 287                | 276                  | 1303                 | 849                    | 477                    | 880                      |
| 30.  | Madipakkam          | 291               | 1262             | 625             | 637               | 422                | 419                  | 517                  | 438                    | 108                    | 199                      |
| 31.  | Mahaianampakkam     | 407               | 1707             | 892             | 815               | 397                | 348                  | 701                  | 495                    | 191                    | 320                      |
| 32.  | Mamandur            | 1021              | 4287             | 2155            | 2132              | 196                | 194                  | 1679                 | 1260                   | 476                    | 872                      |
| 33.  | Mangal              | 174               | 767              | 377             | 390               | 204                | 203                  | 297                  | 228                    | 80                     | 162                      |
| 34.  | Marivanallur        | 131               | 506              | 245             | 261               | 0                  | 0                    | 179                  | 142                    | 66                     | 119                      |
| 35.  | Melboodri           | 102               | 431              | 230             | 201               | 6                  | 3                    | 179                  | 112                    | 51                     | 89                       |
| 36.  | Moranam             | 612               | 2512             | 1275            | 1237              | 665                | 626                  | 1028                 | 846                    | 247                    | 391                      |
| 37.  | Namandi             | 318               | 2031             | 1185            | 846               | 283                | 259                  | 946                  | 485                    | 239                    | 361                      |

|     |                    |     |      |      |      |     |     |      |      |     |     |
|-----|--------------------|-----|------|------|------|-----|-----|------|------|-----|-----|
| 38. | Narasamangalam     | 392 | 1703 | 856  | 847  | 3   | 4   | 613  | 432  | 243 | 415 |
| 39. | Nedumpirai         | 349 | 1418 | 706  | 712  | 114 | 113 | 581  | 482  | 125 | 230 |
| 40. | Ozhukkavakkam      | 62  | 213  | 106  | 107  | 1   | 1   | 94   | 76   | 12  | 31  |
| 41. | Paingkinar         | 628 | 2678 | 1363 | 1315 | 500 | 478 | 1106 | 905  | 257 | 410 |
| 42. | Palli              | 688 | 2722 | 1348 | 1374 | 590 | 575 | 1034 | 797  | 314 | 577 |
| 43. | Pandivampakkam     | 248 | 937  | 484  | 453  | 181 | 175 | 374  | 290  | 110 | 163 |
| 44. | Pappanthangal      | 492 | 1948 | 991  | 957  | 193 | 194 | 763  | 577  | 228 | 380 |
| 45. | Perivakoil         | 132 | 582  | 297  | 285  | 38  | 38  | 210  | 144  | 87  | 141 |
| 46. | Perumanthangal     | 319 | 1259 | 629  | 630  | 0   | 0   | 483  | 372  | 146 | 258 |
| 47. | Perumpallam        | 257 | 1004 | 494  | 510  | 52  | 67  | 354  | 242  | 140 | 268 |
| 48. | Perumpandi         | 12  | 57   | 30   | 27   | 0   | 0   | 14   | 11   | 16  | 16  |
| 49. | Perumpulimedu      | 153 | 565  | 288  | 277  | 0   | 0   | 226  | 160  | 62  | 117 |
| 50. | Perungalathur      | 447 | 1777 | 909  | 868  | 236 | 218 | 736  | 612  | 173 | 256 |
| 51. | Perungattur        | 895 | 3735 | 1839 | 1896 | 470 | 471 | 1488 | 1267 | 351 | 629 |
| 52. | Pillanthangal      | 316 | 1308 | 653  | 655  | 129 | 124 | 464  | 354  | 189 | 301 |
| 53. | Pulivarampakkam    | 373 | 1673 | 850  | 823  | 522 | 508 | 680  | 509  | 170 | 314 |
| 54. | Pullavakkam        | 263 | 1091 | 551  | 540  | 0   | 0   | 374  | 240  | 177 | 300 |
| 55. | Ramakrishnapuram   | 354 | 1422 | 694  | 728  | 0   | 0   | 447  | 349  | 247 | 379 |
| 56. | Seleri             | 150 | 548  | 281  | 267  | 44  | 37  | 218  | 148  | 63  | 119 |
| 57. | Sengattankundil    | 386 | 1636 | 819  | 817  | 262 | 269 | 577  | 493  | 242 | 324 |
| 58. | Sirungattur        | 370 | 1593 | 809  | 784  | 402 | 389 | 605  | 505  | 204 | 279 |
| 59. | Siruvelivanallur   | 272 | 1137 | 566  | 571  | 0   | 0   | 461  | 367  | 105 | 204 |
| 60. | Sumangali          | 432 | 1628 | 804  | 824  | 162 | 162 | 559  | 364  | 245 | 460 |
| 61. | Thalikkal          | 136 | 525  | 245  | 280  | 136 | 146 | 182  | 158  | 63  | 122 |
| 62. | Thandappanthangal  | 274 | 1117 | 561  | 556  | 311 | 296 | 422  | 313  | 139 | 243 |
| 63. | Thenkazhani        | 599 | 2494 | 1199 | 1295 | 0   | 3   | 965  | 777  | 234 | 518 |
| 64. | Thennampattu       | 575 | 2339 | 1184 | 1155 | 321 | 314 | 938  | 617  | 246 | 538 |
| 65. | Thenpoondipattu    | 123 | 525  | 261  | 264  | 161 | 147 | 192  | 123  | 69  | 141 |
| 66. | Thiruppanamoor     | 574 | 2233 | 1104 | 1129 | 510 | 500 | 797  | 660  | 307 | 469 |
| 67. | Thiruppanangadu    | 437 | 1863 | 870  | 993  | 456 | 453 | 631  | 560  | 239 | 433 |
| 68. | Thiruvadiravapuram | 159 | 631  | 318  | 313  | 0   | 0   | 247  | 211  | 71  | 102 |
| 69. | Thumbai            | 166 | 633  | 321  | 312  | 120 | 115 | 240  | 151  | 81  | 161 |
| 70. | Umaivalpuram       | 230 | 884  | 437  | 447  | 2   | 1   | 295  | 205  | 142 | 242 |
| 71. | Vada Mavanthal     | 456 | 1930 | 972  | 958  | 108 | 120 | 760  | 574  | 212 | 384 |
| 72. | Vadaelapakkam      | 34  | 144  | 73   | 71   | 0   | 0   | 53   | 36   | 20  | 35  |
| 73. | Vadangampattu      | 175 | 644  | 325  | 319  | 0   | 0   | 213  | 153  | 112 | 166 |
| 74. | Vadapoondipattu    | 240 | 969  | 472  | 497  | 305 | 300 | 371  | 326  | 101 | 171 |
| 75. | Vadathandalam      | 344 | 1342 | 670  | 672  | 31  | 36  | 505  | 362  | 165 | 310 |
| 76. | Velivanallur       | 357 | 1538 | 791  | 747  | 211 | 196 | 536  | 359  | 255 | 388 |
| 77. | Vellakulam         | 178 | 830  | 420  | 410  | 77  | 72  | 338  | 259  | 82  | 151 |
| 78. | Vembakkam          | 775 | 3177 | 1573 | 1604 | 307 | 337 | 1246 | 1071 | 327 | 533 |
| 79. | Vengalathur        | 543 | 2315 | 1159 | 1156 | 333 | 352 | 878  | 688  | 281 | 468 |
| 80. | Vinnavadi          | 303 | 1235 | 601  | 634  | 18  | 20  | 453  | 383  | 148 | 251 |

**TABLE 3.38– OCCUPATIONAL CHARACTERISTICS AROUND 10KM RADIUS**

| S.No | Name of the Village | Total Worker Population Male | Total Worker Population Female | Main Working Population Male | Main Working Population Female | Main Cultivator Population Male | Main Cultivator Population Female | Main Agricultural Labourers Population Male | Main Agricultural Labourers Population Female | Non Working Population Male | Non Working Population Female |
|------|---------------------|------------------------------|--------------------------------|------------------------------|--------------------------------|---------------------------------|-----------------------------------|---------------------------------------------|-----------------------------------------------|-----------------------------|-------------------------------|
| 1    | Akkur               | 845                          | 635                            | 650                          | 401                            | 254                             | 138                               | 118                                         | 134                                           | 163                         | 186                           |
| 2    | Alanthangal         | 158                          | 131                            | 141                          | 121                            | 68                              | 61                                | 30                                          | 49                                            | 17                          | 10                            |
| 3    | Arasankuppam        | 311                          | 275                            | 219                          | 144                            | 73                              | 80                                | 27                                          | 14                                            | 89                          | 124                           |
| 4    | Arugavoor           | 518                          | 411                            | 490                          | 339                            | 154                             | 139                               | 31                                          | 142                                           | 28                          | 72                            |
| 5    | Arumparuthi         | 197                          | 204                            | 191                          | 197                            | 87                              | 88                                | 34                                          | 34                                            | 6                           | 7                             |
| 6    | Athi                | 255                          | 187                            | 49                           | 18                             | 2                               | 0                                 | 6                                           | 5                                             | 198                         | 161                           |
| 7    | Azhinjalpattu       | 275                          | 169                            | 106                          | 67                             | 13                              | 3                                 | 16                                          | 16                                            | 167                         | 102                           |
| 8    | Azhividaithangi     | 1419                         | 1213                           | 458                          | 146                            | 76                              | 30                                | 66                                          | 30                                            | 955                         | 1061                          |
| 9    | Barathanthangal     | 166                          | 136                            | 163                          | 132                            | 63                              | 71                                | 18                                          | 30                                            | 3                           | 4                             |
| 10   | Booderi             | 238                          | 229                            | 221                          | 98                             | 45                              | 13                                | 124                                         | 82                                            | 14                          | 122                           |
| 11   | Chellaperumpulimedu | 148                          | 101                            | 147                          | 100                            | 60                              | 39                                | 46                                          | 49                                            | 1                           | 1                             |
| 12   | Chithathur          | 791                          | 500                            | 694                          | 194                            | 64                              | 4                                 | 246                                         | 77                                            | 89                          | 219                           |
| 13   | Chozhavaram         | 440                          | 323                            | 418                          | 303                            | 126                             | 67                                | 73                                          | 158                                           | 22                          | 20                            |
| 14   | Duli                | 363                          | 303                            | 233                          | 77                             | 29                              | 13                                | 29                                          | 22                                            | 128                         | 226                           |
| 15   | Hariharapakkam      | 367                          | 320                            | 360                          | 303                            | 12                              | 9                                 | 107                                         | 213                                           | 5                           | 13                            |
| 16   | Hasanamapettai      | 504                          | 278                            | 475                          | 248                            | 39                              | 30                                | 9                                           | 10                                            | 29                          | 29                            |
| 17   | Jaderi              | 175                          | 168                            | 160                          | 86                             | 22                              | 0                                 | 41                                          | 35                                            | 12                          | 69                            |
| 18   | Kaganam             | 240                          | 136                            | 225                          | 30                             | 24                              | 1                                 | 102                                         | 18                                            | 14                          | 105                           |
| 19   | Kammanthangal       | 220                          | 71                             | 214                          | 60                             | 2                               | 1                                 | 37                                          | 30                                            | 6                           | 11                            |
| 20   | Kanagampakkam       | 84                           | 50                             | 36                           | 16                             | 3                               | 2                                 | 0                                           | 0                                             | 3                           | 2                             |
| 21   | Karanai             | 235                          | 215                            | 235                          | 215                            | 85                              | 57                                | 79                                          | 156                                           | 0                           | 0                             |
| 22   | Karanthai           | 298                          | 281                            | 107                          | 80                             | 33                              | 30                                | 47                                          | 41                                            | 190                         | 200                           |
| 23   | Kazhiyur            | 511                          | 500                            | 375                          | 280                            | 93                              | 63                                | 109                                         | 144                                           | 129                         | 190                           |
| 24   | Kizhnelli           | 542                          | 437                            | 484                          | 376                            | 152                             | 139                               | 101                                         | 148                                           | 26                          | 33                            |
| 25   | Kizhnethapakkam     | 425                          | 373                            | 370                          | 191                            | 94                              | 7                                 | 136                                         | 136                                           | 54                          | 178                           |
| 26   | Kodaiyampakkam      | 264                          | 253                            | 244                          | 162                            | 71                              | 15                                | 96                                          | 136                                           | 18                          | 81                            |
| 27   | Kunnathur           | 406                          | 266                            | 330                          | 131                            | 101                             | 6                                 | 79                                          | 103                                           | 73                          | 131                           |
| 28   | Kunnavakkam         | 352                          | 205                            | 310                          | 163                            | 47                              | 3                                 | 162                                         | 143                                           | 36                          | 25                            |
| 29   | Kuthanur            | 1120                         | 920                            | 1113                         | 915                            | 191                             | 156                               | 716                                         | 701                                           | 3                           | 2                             |
| 30   | Madipakkam          | 412                          | 355                            | 409                          | 345                            | 220                             | 17                                | 146                                         | 308                                           | 3                           | 8                             |

|    |                   |      |      |      |     |     |     |     |     |     |     |
|----|-------------------|------|------|------|-----|-----|-----|-----|-----|-----|-----|
| 31 | Mahajanampakkam   | 553  | 360  | 547  | 345 | 173 | 45  | 116 | 246 | 6   | 15  |
| 32 | Mamandur          | 1367 | 1124 | 1021 | 724 | 371 | 257 | 174 | 297 | 325 | 354 |
| 33 | Mangal            | 180  | 29   | 110  | 12  | 6   | 0   | 72  | 5   | 66  | 16  |
| 34 | Mariyanallur      | 173  | 170  | 155  | 161 | 22  | 8   | 34  | 83  | 16  | 5   |
| 35 | Melboodri         | 127  | 95   | 112  | 53  | 27  | 2   | 62  | 48  | 15  | 42  |
| 36 | Moranam           | 807  | 516  | 757  | 496 | 168 | 102 | 429 | 350 | 43  | 18  |
| 37 | Namandi           | 431  | 350  | 430  | 347 | 77  | 60  | 177 | 242 | 1   | 3   |
| 38 | Narasamangalam    | 547  | 431  | 540  | 407 | 104 | 84  | 171 | 228 | 7   | 23  |
| 39 | Nedumpirai        | 486  | 471  | 82   | 27  | 4   | 1   | 5   | 1   | 125 | 147 |
| 40 | Ozhukkavakkam     | 71   | 47   | 68   | 44  | 2   | 2   | 57  | 36  | 3   | 3   |
| 41 | Paingkinar        | 728  | 392  | 690  | 369 | 85  | 10  | 163 | 248 | 37  | 13  |
| 42 | Palli             | 870  | 764  | 589  | 398 | 127 | 116 | 99  | 149 | 249 | 296 |
| 43 | Pandiyampakkam    | 299  | 189  | 286  | 180 | 115 | 66  | 97  | 100 | 11  | 5   |
| 44 | Pappanthangal     | 622  | 354  | 617  | 264 | 219 | 140 | 74  | 72  | 5   | 85  |
| 45 | Periyakoil        | 185  | 172  | 180  | 162 | 95  | 124 | 8   | 27  | 5   | 10  |
| 46 | Perumanthangal    | 369  | 346  | 353  | 320 | 10  | 5   | 143 | 285 | 15  | 24  |
| 47 | Perumpallam       | 308  | 225  | 302  | 221 | 67  | 58  | 55  | 96  | 6   | 4   |
| 48 | Perumpandi        | 19   | 10   | 4    | 0   | 2   | 0   | 0   | 0   | 15  | 10  |
| 49 | Perumpulimedu     | 176  | 148  | 163  | 97  | 74  | 35  | 42  | 43  | 11  | 49  |
| 50 | Perungalathur     | 624  | 501  | 111  | 74  | 56  | 13  | 14  | 39  | 510 | 424 |
| 51 | Perungattur       | 1061 | 875  | 1019 | 757 | 65  | 17  | 374 | 543 | 40  | 110 |
| 52 | Pillanthangal     | 316  | 227  | 199  | 46  | 122 | 16  | 45  | 25  | 104 | 163 |
| 53 | Puliyampakkam     | 507  | 317  | 281  | 134 | 49  | 18  | 49  | 41  | 226 | 181 |
| 54 | Pullavakkam       | 339  | 205  | 326  | 119 | 101 | 36  | 127 | 74  | 12  | 86  |
| 55 | Ramakrishnapuram  | 449  | 254  | 391  | 90  | 153 | 5   | 94  | 65  | 54  | 154 |
| 56 | Seleri            | 105  | 78   | 87   | 61  | 40  | 2   | 8   | 24  | 18  | 17  |
| 57 | Sengattankundil   | 501  | 280  | 431  | 257 | 312 | 238 | 9   | 8   | 11  | 15  |
| 58 | Sirungattur       | 461  | 241  | 421  | 222 | 28  | 2   | 230 | 194 | 33  | 18  |
| 59 | Siruveliyallur    | 352  | 332  | 297  | 111 | 113 | 14  | 62  | 59  | 54  | 216 |
| 60 | Sumangali         | 477  | 376  | 470  | 344 | 113 | 14  | 115 | 268 | 7   | 27  |
| 61 | Thalikkal         | 132  | 124  | 17   | 7   | 6   | 3   | 1   | 0   | 40  | 23  |
| 62 | Thandappanthangal | 334  | 323  | 254  | 242 | 82  | 95  | 121 | 123 | 72  | 74  |
| 63 | Thenkazhani       | 750  | 627  | 614  | 280 | 92  | 51  | 40  | 75  | 130 | 320 |
| 64 | Thennampattu      | 742  | 728  | 723  | 708 | 373 | 331 | 198 | 340 | 16  | 10  |
| 65 | Thenpoondipattu   | 167  | 155  | 165  | 149 | 55  | 53  | 31  | 54  | 2   | 5   |
| 66 | Thiruppanamoor    | 688  | 559  | 623  | 336 | 210 | 74  | 114 | 161 | 60  | 222 |
| 67 | Thiruppanangadu   | 557  | 546  | 526  | 480 | 80  | 74  | 224 | 305 | 27  | 62  |



|    |                    |     |     |     |     |     |     |     |     |     |     |
|----|--------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 68 | Thiruvadirayapuram | 197 | 161 | 197 | 161 | 92  | 106 | 1   | 0   | 0   | 0   |
| 69 | Thumbai            | 214 | 174 | 212 | 140 | 61  | 12  | 57  | 87  | 1   | 34  |
| 70 | Umaiypuram         | 263 | 241 | 217 | 109 | 122 | 7   | 72  | 102 | 46  | 125 |
| 71 | Vada Mavanthal     | 561 | 307 | 436 | 247 | 7   | 8   | 149 | 164 | 121 | 49  |
| 72 | Vadaelapakkam      | 43  | 31  | 43  | 31  | 0   | 1   | 24  | 29  | 0   | 0   |
| 73 | Vadangampattu      | 182 | 131 | 176 | 129 | 4   | 0   | 138 | 118 | 6   | 2   |
| 74 | Vadapoondipattu    | 332 | 267 | 244 | 166 | 162 | 36  | 48  | 73  | 59  | 70  |
| 75 | Vadathandalam      | 433 | 231 | 428 | 218 | 68  | 30  | 74  | 96  | 4   | 10  |
| 76 | Veliyanallur       | 509 | 440 | 491 | 409 | 239 | 219 | 137 | 169 | 16  | 29  |
| 77 | Vellakulam         | 252 | 265 | 150 | 119 | 1   | 0   | 92  | 102 | 101 | 143 |
| 78 | Vembakkam          | 914 | 504 | 812 | 222 | 298 | 91  | 67  | 26  | 100 | 276 |
| 79 | Vengalathur        | 695 | 607 | 459 | 223 | 184 | 73  | 82  | 83  | 216 | 236 |
| 80 | Vinnavadi          | 469 | 477 | 467 | 475 | 305 | 332 | 66  | 99  | 2   | 2   |

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### 3.6.5 Basic Amenities

A better network of physical infrastructure facilities (well-built roads, rail links, irrigation, power and telecommunication, information technology, market-network and social infrastructure support, viz., health and education, water and sanitation, veterinary services and co-operative) is essential for development of the rural economy.

A review of infrastructure facilities available in the area has been given on the basis of field survey. In this study the villages which fall within 10 km radius around the site has been covered. Infrastructure facilities available in the area are presented below.

All basic amenities Education (higher education, colleges, universities, Medical college, Transport facilities, Railway station, Bus station area available in the district headquarters. Tiruvannamalai at a distance of 90km – South west)

### 3.6.6 Recommendation and Suggestion

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

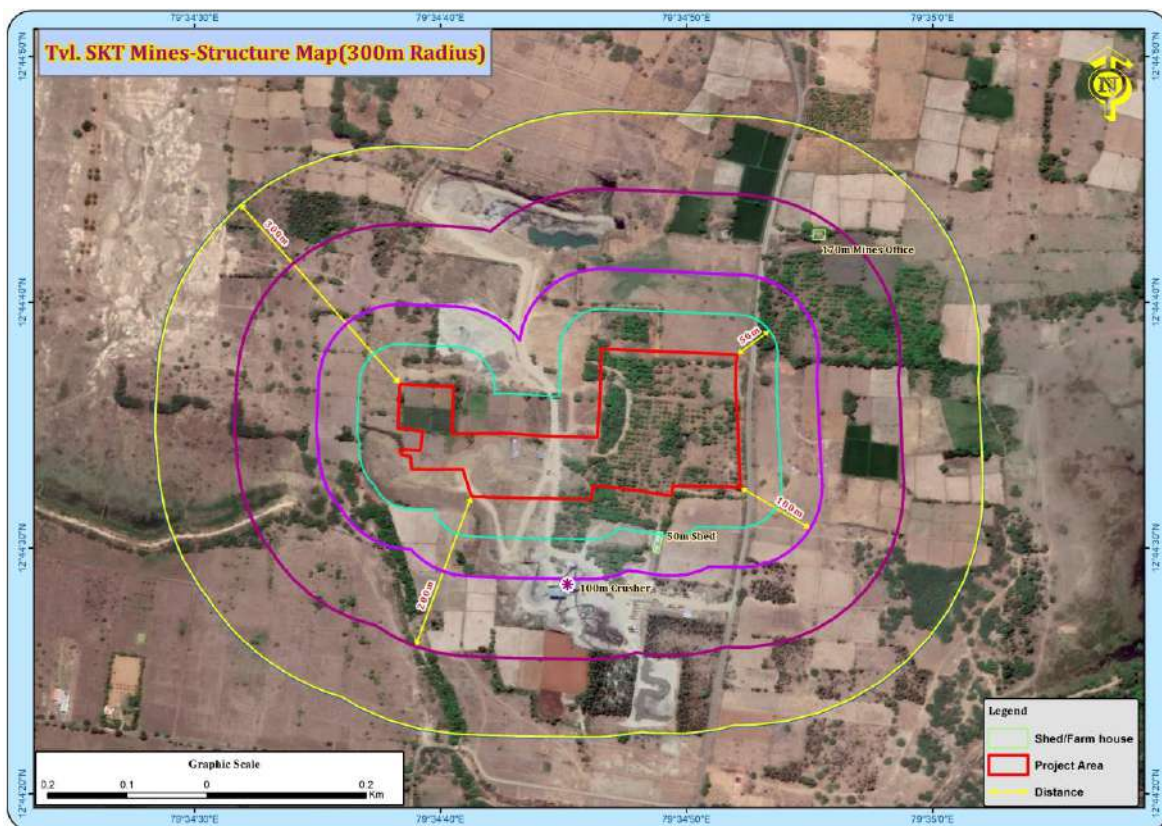
### 3.6.7 Conclusion

The socio-economic study of surveyed villages gives a clear picture of its population, average household size, literacy rate and sex ratio etc. It is also found that a part of population is suffering from lack of permanent job to run their day-to-day life. Their expectation is to earn some income for their sustainability on a long-term basis.

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

The nearby villages within 5kms radius have PHC, Anganwadi school, Post office, Telegram, Government and Private school, bus connectivity besides.

### 3.7 Structure Study



| Structure Numbers | Distance & Direction from the project site | Structure Details and Usage Purpose | Type of Structure (Kutchha/Cement/Framed Structures) | No. of Occupants | Structure belongs to owner (Yes/No) | Remarks                                 |
|-------------------|--------------------------------------------|-------------------------------------|------------------------------------------------------|------------------|-------------------------------------|-----------------------------------------|
| 1                 | 50m – South                                | Shed                                | Sheet Structure                                      | Nil              | Yes                                 | Used to Store Mines materials – No Stay |
| 2                 | 100m – South                               | Crusher                             | Framed Structure                                     | 4 Nos            | Yes                                 | Production of M-Sand, P-Sand and Jelly  |
| 3                 | 170m – NE                                  | Mines Office                        | Sheet & RCC Structure                                | 2 Nos            | No                                  | Used to store mines documents – No Stay |

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## 4. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

### 4.0 GENERAL

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

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

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

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

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

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

### 4.1 LAND ENVIRONMENT:

#### 4.1.2 Anticipated Impact

- 4.85.5 Ha of the land will be under mining since the Permanent or temporary change on land use and land cover will occur
- Movement of heavy vehicles sometimes cause problems to agricultural land, human habitations due to dust, noise and it also causes traffic hazards.
- Due to degradation of land by pitting the aesthetic environment of the core zone may be affected.
- Earthworks during the rainy season increase the potential for soil erosion and sediment laden water entering the water ways.

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

### 4.1.2 Mitigation Measures

- The 4.85.5 Ha of the land will be converted into temporary reservoir which will full fill the water scarcity in the drought season and the nearby agriculture land will have benefitted by the supply of water
- About 2400 Nos of trees will be planted in the lease area and approach road will retain the eco system
- The mining activity will be gradual confined in blocks and excavation will be undertaken progressively along with other mitigative measures like phase wise development in the production
- Construction of garland drains all around the quarry pits and construction of silt trap at strategic location in lower elevations to prevent erosion due to surface runoff during rainfall and also to collect the storm water for various uses within the proposed area.
- Green belt development along the boundary within safety zone. The small quantity of water stored in the mined-out pit will be used for greenbelt.
- Thick plantation will be carried out on unutilized area, top benches of mined out pits, on safety barrier, etc.,
- Fencing will be constructed before starting the mining operation and it will be maintained in the conceptual stage Security will be posted round the clock, to prevent inherent entry of the public and cattle.

### 4.1.3 Soil Environment

#### 4.1.4 Impact on Soil Environment

- Removal of vegetation cover
- Soil Erosion in the project site during rainy season due to quarry operation

#### 4.1.5 Mitigation Measures

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

#### 4.1.6 Waste Dump Management

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

## 4.2 WATER ENVIRONMENT

### 4.2.1 Anticipated Impact

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

- 
- The sewage from soak pit may percolate to the ground water table and contaminate it.
  - Surface drainage may be affected due to Mining
  - Abstraction of water may lead to depletion of water table
  - 3.5 KLD water will be utilized for the quarrying operation

#### 4.2.2 Mitigation Measures

- Water for the quarrying operation such as sprinkling on haul roads, Greenbelt development will be sourced from the lower part of the mine pit which is specifically allotted to collect the rain water.
- Garland drain, settling tank will be constructed along the proposed mining lease area. The Garland drain will be connected to settling tank and sediments will be trapped in the settling traps and only clear water will be discharged out to the natural drainage
- Rainwater will be collected in sump in the mining pits and will be allowed to store and pumped out to surface settling tank of 15 m x 10m x 3m to remove suspended solids if any. This collected water will be judiciously used for dust suppression and such sites where dust likely to be generated and for developing green belt. The proponent will collect and judiciously utilize the rainwater as part of rainwater harvesting system.
- Periodic (every 6 months once) analysis of quarry pit water and ground water quality in nearby villages.
- Domestic sewage from site office & urinals/latrines provided in ML is discharged in septic tank followed by soak pits.
- Waste water discharge from mine will be treated in settling tanks before using for dust suppression and tree plantation purposes.
- De-silting will be carried out before and immediately after the monsoon season.

### 4.3 AIR ENVIRONMENT

#### 4.3.1. Anticipated Impact

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

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

Wind erosion of the exposed areas and the air borne particulate matter generated by quarrying operation, and transportation are mainly PM<sub>10</sub> & PM<sub>2.5</sub> and emissions of Sulphur dioxide (SO<sub>2</sub>) & Oxides of Nitrogen (NO<sub>x</sub>) due to excavation/loading equipment and vehicles plying on haul roads are the cause of air pollution in the project area.

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

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



## AERMOD Software.

Prediction of impacts on air environment has been carried out taking into consideration cumulative production all the quarries fall in the Cluster. Air environment and net increase in emissions by Open pit source modelling in AERMOD Software AERMOD 9.61.

### 4.3.2.1 Emission Estimation

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

The general equation for emissions estimation is:

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

Where:

E = emissions;

A = activity rate;

EF = emission factor, and

ER =overall emission reduction efficiency, %

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

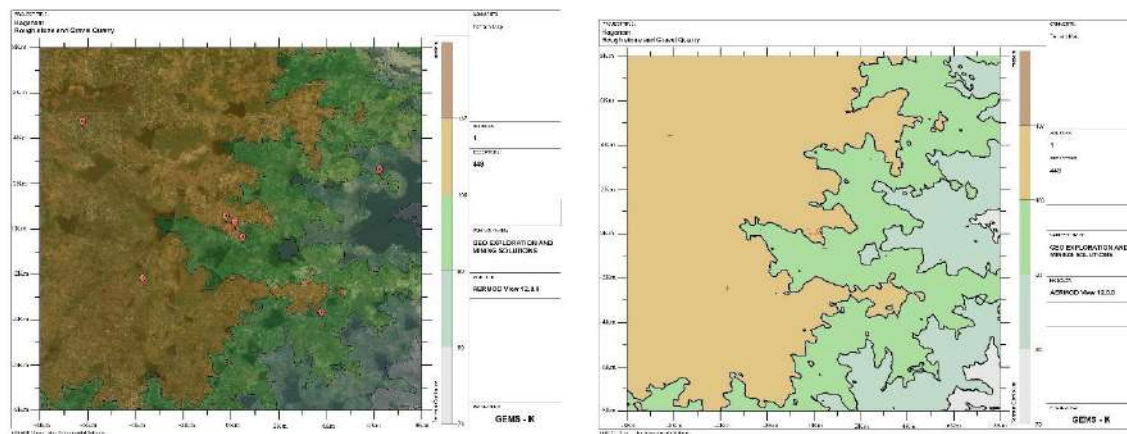
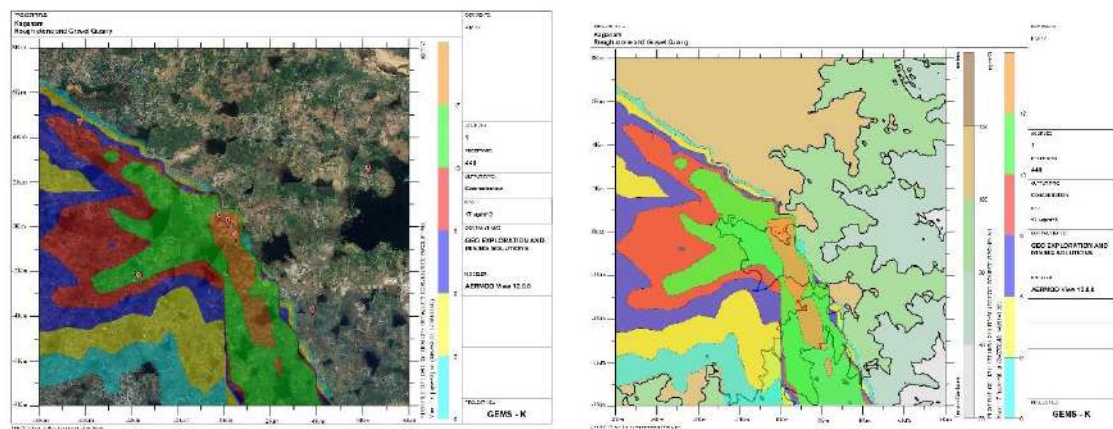
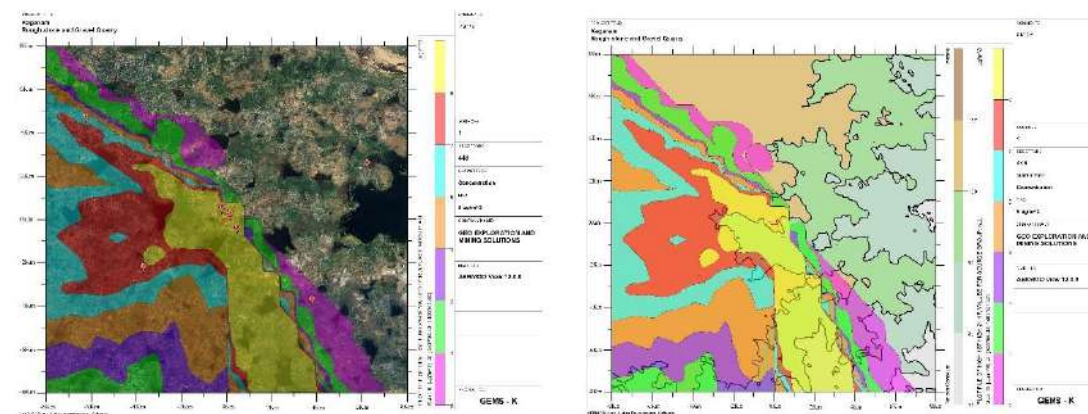
### 4.3.2 Frame work of Computation & Model details

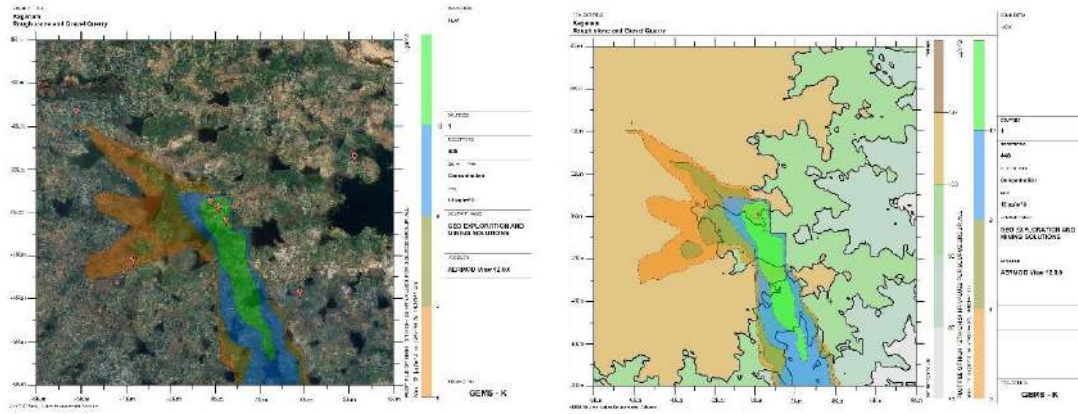
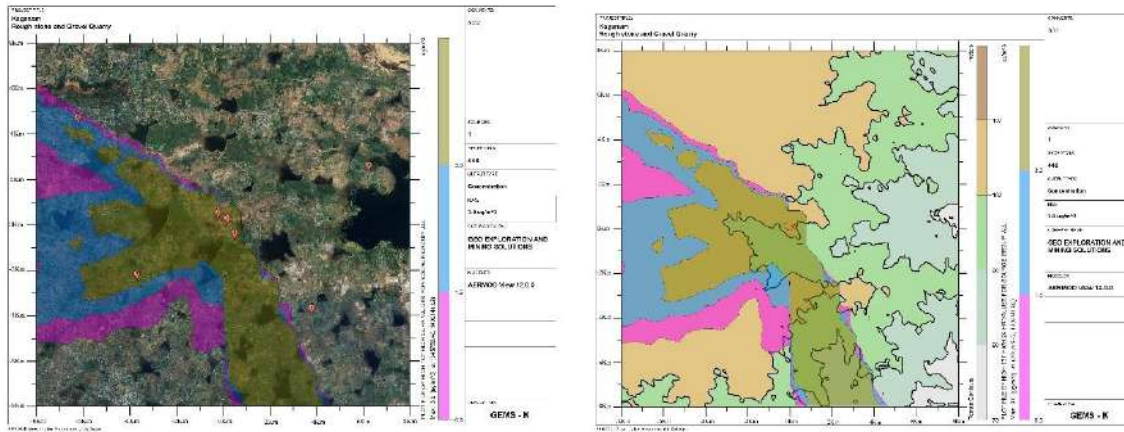
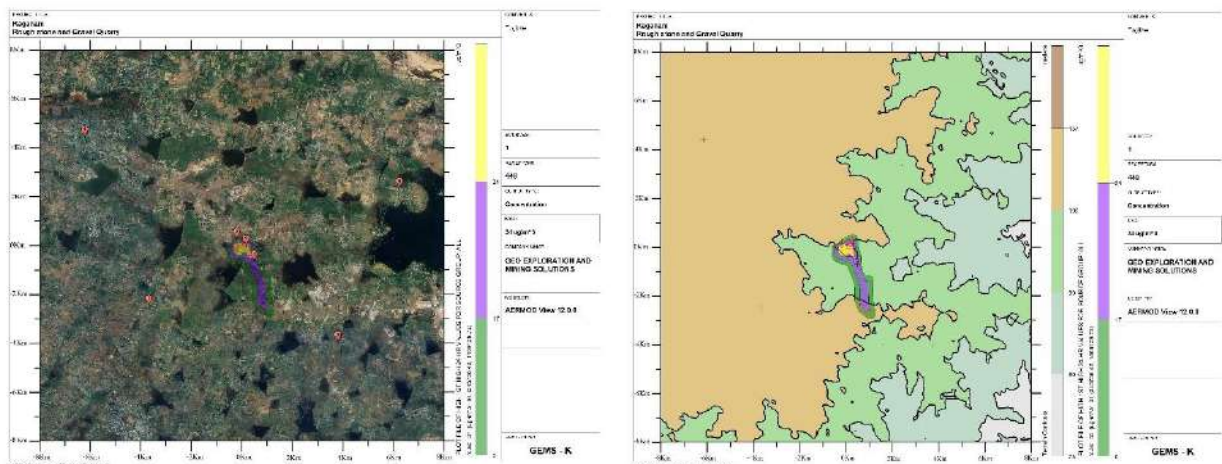
Suspended Particulate Matter (SPM) is the major pollutant occurred during quarrying activities. The prediction included the impact of Excavation, Drilling, Blasting (Occasionally), loading and movement of vehicles during transportation and meteorological parameters such as wind speed, wind direction, temperature, rainfall, humidity and Cloud cover.

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

**TABLE 4.1: ESTIMATED EMISSION RATE**

| PM <sub>10</sub> |              |             |       |
|------------------|--------------|-------------|-------|
| Activity         | Source type  | Value       | Unit  |
| Drilling         | Point Source | 0.192457925 | g/s   |
| Blasting         | Point Source | 0.063869491 | g/s   |
| Mineral Loading  | Point Source | 0.055119373 | g/s   |
| Haul Road        | Line Source  | 0.002617542 | g/s/m |
| Overall Mine     | Area Source  | 0.109887926 | g/s   |
| SO <sub>2</sub>  |              |             |       |
| Activity         | Source type  | Value       | Unit  |
| Overall Mine     | Area Source  | 0.007712708 | g/s   |
| NO <sub>x</sub>  |              |             |       |
| Overall Mine     | Area Source  | 0.001024054 | g/s   |

**FIGURE 4.1: AERMOD TERRAIN MAP****FIGURE 4.2: PREDICTED INCREMENTAL CONCENTRATION OF PM<sub>10</sub>****FIGURE 4.3: PREDICTED INCREMENTAL CONCENTRATION OF PM<sub>2.5</sub>**

**FIGURE 4.4: PREDICTED INCREMENTAL CONCENTRATION OF NO<sub>x</sub>****FIGURE 4.5: PREDICTED INCREMENTAL CONCENTRATION OF SO<sub>2</sub>****FIGURE 4.6: PREDICTED INCREMENTAL CONCENTRATION OF FUGITIVE DUST**

### 4.3.2.1 Model Results

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

**TABLE 4.2: INCREMENTAL & RESULTANT GLC OF PM<sub>10</sub>**

| Station Code | Location                       | X Coordinate (m) | Y Coordinate (m) | Average Baseline PM <sub>10</sub> (µg/m <sup>3</sup> ) | Incremental value of PM <sub>10</sub> due to mining (µg/m <sup>3</sup> ) | Total PM <sub>10</sub> (µg/m <sup>3</sup> ) |
|--------------|--------------------------------|------------------|------------------|--------------------------------------------------------|--------------------------------------------------------------------------|---------------------------------------------|
| AAQ1         | 12°44'32.80"N<br>79°34'51.03"E | 162              | -34              | 43.2                                                   | 17.89                                                                    | 61.09                                       |
| AAQ2         | 12°44'41.29"N<br>79°34'38.82"E | -207             | 227              | 42.9                                                   | 17.23                                                                    | 60.13                                       |
| AAQ3         | 12°44'12.01"N<br>79°35'1.66"E  | 484              | -676             | 43.6                                                   | 17.52                                                                    | 61.12                                       |
| AAQ4         | 12°47'28.94"N<br>79°33'12.02"E | -6230            | 4408             | 43.5                                                   | 10.40                                                                    | 53.9                                        |
| AAQ5         | 12°42'24.68"N<br>79°36'50.79"E | 3794             | -3991            | 43.6                                                   | 0                                                                        | 43.6                                        |
| AAQ6         | 12°45'48.51"N<br>79°38'11.31"E | 6231             | 2302             | 43.5                                                   | 0                                                                        | 43.5                                        |
| AAQ7         | 12°43'13.44"N<br>79°32'43.92"E | -3692            | -2483            | 43.4                                                   | 14.00                                                                    | 57.4                                        |

**TABLE 4.3: INCREMENTAL & RESULTANT GLC OF PM<sub>2.5</sub>**

| Station Code | Location                       | X Coordinate (m) | Y Coordinate (m) | Average Baseline PM <sub>2.5</sub> (µg/m <sup>3</sup> ) | Incremental value of PM <sub>2.5</sub> due to mining (µg/m <sup>3</sup> ) | Total PM <sub>2.5</sub> (µg/m <sup>3</sup> ) |
|--------------|--------------------------------|------------------|------------------|---------------------------------------------------------|---------------------------------------------------------------------------|----------------------------------------------|
| AAQ1         | 12°44'32.80"N<br>79°34'51.03"E | 162              | -34              | 19.2                                                    | 9.76                                                                      | 28.96                                        |
| AAQ2         | 12°44'41.29"N<br>79°34'38.82"E | -207             | 227              | 19.2                                                    | 9.19                                                                      | 28.39                                        |
| AAQ3         | 12°44'12.01"N<br>79°35'1.66"E  | 484              | -676             | 20.0                                                    | 9.48                                                                      | 29.48                                        |
| AAQ4         | 12°47'28.94"N<br>79°33'12.02"E | -6230            | 4408             | 19.9                                                    | 6.81                                                                      | 26.71                                        |
| AAQ5         | 12°42'24.68"N<br>79°36'50.79"E | 3794             | -3991            | 20.0                                                    | 0.73                                                                      | 20.73                                        |
| AAQ6         | 12°45'48.51"N<br>79°38'11.31"E | 6231             | 2302             | 20.2                                                    | 0                                                                         | 20.0                                         |
| AAQ7         | 12°43'13.44"N<br>79°32'43.92"E | -3692            | -2483            | 20.0                                                    | 8.14                                                                      | 28.14                                        |

**TABLE 4.4: INCREMENTAL & RESULTANT GLC OF SO<sub>2</sub>**

| Station Code | Location                    | X Coordinate (m) | Y Coordinate (m) | Average Baseline SO <sub>2</sub> (µg/m <sup>3</sup> ) | Incremental value due to mining (µg/m <sup>3</sup> ) | Total SO <sub>2</sub> (µg/m <sup>3</sup> ) |
|--------------|-----------------------------|------------------|------------------|-------------------------------------------------------|------------------------------------------------------|--------------------------------------------|
| AAQ1         | 12°44'32.80"N 79°34'51.03"E | 162              | -34              | 4.8                                                   | 3.10                                                 | 7.9                                        |
| AAQ2         | 12°44'41.29"N 79°34'38.82"E | -207             | 227              | 4.9                                                   | 3.04                                                 | 7.94                                       |
| AAQ3         | 12°44'12.01"N 79°35'1.66"E  | 484              | -676             | 5.0                                                   | 3.07                                                 | 8.07                                       |
| AAQ4         | 12°47'28.94"N 79°33'12.02"E | -6230            | 4408             | 5.1                                                   | 2.30                                                 | 7.4                                        |
| AAQ5         | 12°42'24.68"N 79°36'50.79"E | 3794             | -3991            | 5.1                                                   | 0                                                    | 5.1                                        |
| AAQ6         | 12°45'48.51"N 79°38'11.31"E | 6231             | 2302             | 5.1                                                   | 0                                                    | 5.1                                        |
| AAQ7         | 12°43'13.44"N 79°32'43.92"E | -3692            | -2483            | 5.1                                                   | 3.00                                                 | 8.1                                        |

**TABLE 4.5: INCREMENTAL & RESULTANT GLC OF NO<sub>x</sub>**

| Station Code | Location                       | X Coordinate (m) | Y Coordinate (m) | Average Baseline NO <sub>x</sub> (µg/m <sup>3</sup> ) | Incremental value due to mining (µg/m <sup>3</sup> ) | Total NO <sub>x</sub> (µg/m <sup>3</sup> ) |
|--------------|--------------------------------|------------------|------------------|-------------------------------------------------------|------------------------------------------------------|--------------------------------------------|
| AAQ1         | 12°44'32.80"N<br>79°34'51.03"E | 162              | -34              | 23.0                                                  | 12.69                                                | 35.69                                      |
| AAQ2         | 12°44'41.29"N<br>79°34'38.82"E | -207             | 227              | 22.9                                                  | 12.13                                                | 35.03                                      |
| AAQ3         | 12°44'12.01"N<br>79°35'1.66"E  | 484              | -676             | 23.2                                                  | 12.39                                                | 35.59                                      |
| AAQ4         | 12°47'28.94"N<br>79°33'12.02"E | -6230            | 4408             | 23.2                                                  | 0                                                    | 23.2                                       |
| AAQ5         | 12°42'24.68"N<br>79°36'50.79"E | 3794             | -3991            | 23.2                                                  | 0                                                    | 23.2                                       |
| AAQ6         | 12°45'48.51"N<br>79°38'11.31"E | 6231             | 2302             | 23.1                                                  | 0                                                    | 23.1                                       |
| AAQ7         | 12°43'13.44"N<br>79°32'43.92"E | -3692            | -2483            | 23.0                                                  | 2.10                                                 | 25.10                                      |

From the resultant of cumulative concentration i.e., Background + Incremental Concentration of pollutant in all the receptor locations without effective mitigation measures are still within the prescribed NAAQ limits of 100, 80 & 80 µg/m<sup>3</sup> for PM<sub>10</sub>, SO<sub>2</sub> & NO<sub>x</sub> respectively. By adopting suitable mitigation measures, the pollutant levels in the atmosphere can be further being controlled.

#### 4.3.4. Mitigation Measures

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

##### Advantages of Wet Drilling: -

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



- 
- The rate of penetration of drill will be increased.
  - Due to the dust free atmosphere visibility will be improved resulting in safer working conditions.

#### **Blasting –**

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

#### **Haul Road & Transportation –**

- Water will be sprinkled on haul roads twice a day to avoid dust generation during transportation
- Transportation of material will be carried out during day time and material will be covered with tarpaulin
- The speed of tippers plying on the haul road will be limited below 20 km/hr to avoid generation of dust.
- Water sprinkling on haul roads & loading points will be carried out twice a day
- Main source of gaseous pollution will be from vehicle used for transportation of mineral; therefore, weekly maintenance of machines improves combustion process & makes reduction in the pollution.
- The un-metalled haul roads will be compacted weekly before being put into use.
- Over loading of tippers will be avoided to prevent spillage.
- It will be ensured that all transportation vehicles carry a valid PUC certificate
- Grading of haul roads and service roads to clear accumulation of loose materials

#### **Green Belt –**

- 2025 Nos of trees will be planted through this project in the lease area and village roads (Approach Road) to prevent the generation of dust due to movement of dumpers/trucks
- Green belt of adequate width will be developed around the project areas

#### **Occupational Health –**

- Dust mask will be provided to the workers and their use will be strictly monitored
- Annual medical checkups, trainings and campaigns will be arranged to ensure awareness about importance of wearing dust masks among all mine workers & tipper drivers
- Ambient Air Quality Monitoring will be conducted six months once to assess effectiveness of mitigation measures proposed

### **4.4 NOISE ENVIRONMENT**

Noise pollution is mainly due to operation like drilling & blasting and plying of trucks & HEMM. These activities will not cause any problem to the inhabitants of this area because there is no human settlement within 300m radius from the project site. Noise modelling has been carried out considering blasting and compressor operation (drilling) and transportation activities.

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

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

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

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

Where:

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

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

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

#### 4.4.1 Anticipated Impact

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

- Source data
- Receptor data
- Attenuation factor

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

**TABLE 4.7: ACTIVITY AND NOISE LEVEL PRODUCED BY MACHINERY**

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

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

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

**TABLE 4.8: PREDICTED NOISE INCREMENTAL VALUES**

| Location ID                         | N1   | N2   | N3   | N4   | N5   | N6   | N7   |
|-------------------------------------|------|------|------|------|------|------|------|
| Maximum Monitored Value (Day) dB(A) | 44.5 | 45.3 | 44.5 | 43.2 | 43.2 | 46.5 | 49.7 |
| Incremental Value dB(A)             | 60.1 | 58.5 | 41.5 | 25.0 | 25.5 | 23.4 | 27.8 |
| Total Predicted Noise level dB(A)   | 60.2 | 58.7 | 46.3 | 43.3 | 43.3 | 46.5 | 49.7 |

The incremental noise level is found within the range of 58.5 – 60.1 dB (A) in Core Zone and 23.4 – 41.5 dB (A) in Buffer zone. The noise level at different receptors in buffer zone is lower due to the distance involved and other topographical features adding to the noise attenuation. The resultant Noise level due to monitored values and calculated values at the receptors are based on the mathematical formula considering attenuation due to Green Belt as



4.9 dB (A) the barrier effect. From the above table, it can be seen that the ambient noise levels at all the locations are within permissible limits of Industrial area (core zone) & Residential area (buffer zone) as per The Noise Pollution (Regulation And Control) Rules, 2000 (The Principal Rules were published in the Gazette of India, vide S.O. 123(E), dated 14.2.2000 and subsequently amended vide S.O. 1046(E), dated 22.11.2000, S.O. 1088(E), dated 11.10.2002, S.O. 1569 (E), dated 19.09.2006 and S.O. 50 (E) dated 11.01.2010 under the Environment (Protection) Act, 1986.).

#### 4.4.2 Mitigation Measures

The following noise mitigation measures are proposed for control of Noise

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

#### 4.4.3 Ground Vibrations

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

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

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

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

Where –

V = peak particle velocity (mm/s)

K = site and rock factor constant

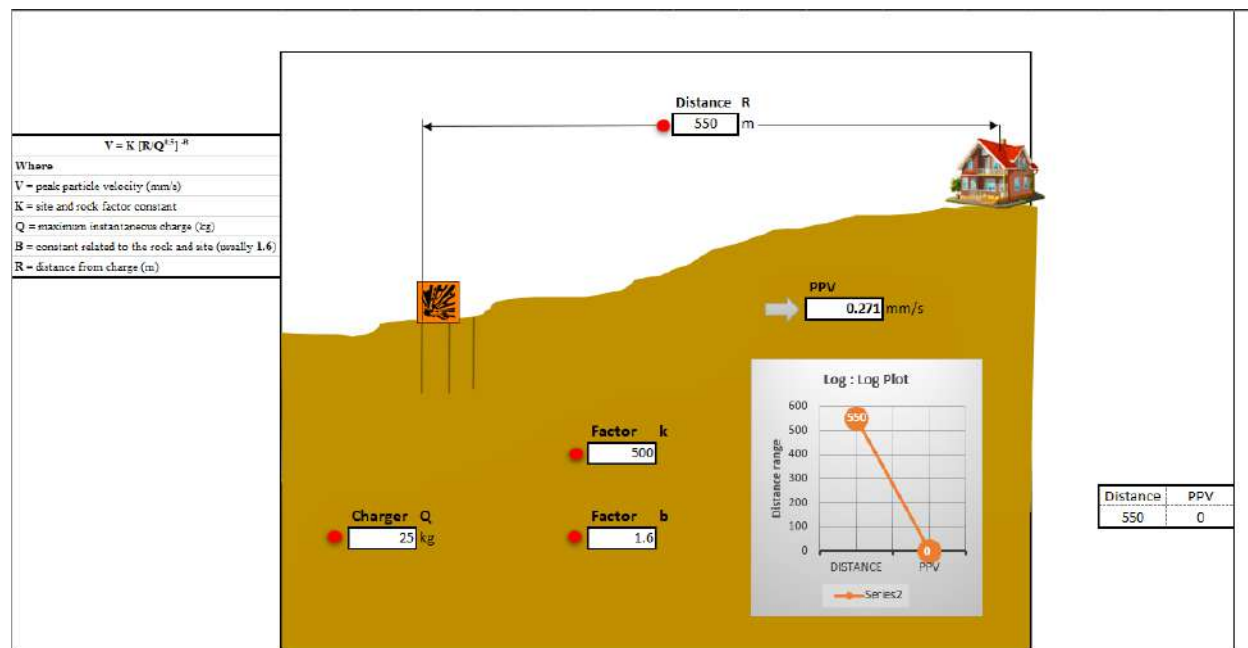
Q = maximum instantaneous charge (kg)

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

R = distance from charge (m)

**TABLE 4.9: PREDICTED PPV VALUES DUE TO BLASTING**

| Maximum Charge in kgs | Nearest Habitation in m | PPV in m/ms |
|-----------------------|-------------------------|-------------|
| 25                    | 550-SE                  | 0.271       |

**FIGURE 4.7: GROUND VIBRATION PREDICTION**

From the above graph, the charge per blast of 25 kg is well below the Peak Particle Velocity of 8 mm/s as per Directorate General of Mines Safety for safe level criteria through Circular No. 7 dated 29/8/1997. But the all the project proponents ensure that the charge per blast shall be less than 2kg and carry out blasting twice or thrice a day based on the onsite conditions under the supervision of competent person employed. However, as per statutory requirement control measures will be adopted to avoid the impacts due to ground vibrations and fly rocks due to blasting.

#### 4.4.3.1 Mitigation Measures

- It is proposed to carry out blasting operation 25kg per round so that the vibration will be minimal
- The mining operation will be carried out without deep hole drilling, 25mm small dia cartridge will be utilized for the blasting
- The blasting operations in the project site without deep hole drilling and blasting using delay detonators, which reduces the ground vibrations;
- Proper quantity of explosive, suitable stemming materials and appropriate delay system will be adopted to avoid overcharging and for safe blasting;
- Adequate safe distance from blasting will be maintained as per DGMS guidelines;
- Blasting shelter will be provided as per DGMS guidelines;
- Blasting operations will be carried out only during day time;
- The charge per delay will be minimized and preferably a greater number of delays will be used per blasts;
- During blasting, other activities in the immediate vicinity will be temporarily stopped;
- Drilling parameters like depth, diameter and spacing will be properly designed to give proper blast;

- A fully trained explosives blast man (Mining Mate, Mines Foreman, 2<sup>nd</sup> Class Mines Manager/ 1<sup>st</sup> Class Mines Manager) will be appointed.
- A set of shot firing rules will be drawn up and blasting shall commence outlining the detailed operating procedures that will be followed to ensure that shot firing operations on site take place without endangering the workforce or public.
- The detonators will be connected in a predetermined sequence to ensure that only one charge is detonated at any one time and a NONEL or similar type initiation system will be used.
- The detonation delay sequence shall be designed so as to ensure that firing of the holes is in the direction of free faces so as to minimise vibration effects.
- Appropriate blasting techniques shall be adopted such that the predicted peak particle velocity shall not exceed 8 mm/s.
- Vibration monitoring will be carried out every 6 months to check the efficacy of blasting practices

#### **4.5. Impact on the Biological Environment**

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

1. Dust particle settles on neighbouring agricultural land, it is located about 100m on the south west side. Mostly dust emission from nearby crusher unit and during operation and minerals are transported in approach roads.
2. Dust deposition on leaf observed on nearby lease boundary local plant species which may result in decline the rate of photosynthesis and retards the plant growth.

##### **4.5.2 Mitigation Measures**

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

Drone survey was covered the green belt and fencing as per the terms of references. The green belt and plantation purposes in and around the proposed mine lease area native species, fruit-bearing trees, medicinal plants, and dense canopy trees should be selected. These species should be tolerant to pollution levels as per Bio- Geography zones of India.

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

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

Extensive green belt development will be started during the construction phase, which will continue till the operation of the plant. About 500 trees will be planted per hectare all around the plant, approach roads, and township premises. Locally available types of trees that are resistant to pollutants will be planted. In addition to the above, all open spaces available within the premises will be developed as nurseries, parks, gardens, and other forms of greenery. 5 m wide greenbelt will be developed along the plant premises, as per land available.

###### **4.5.3.3. Development of Green Belt**

The plantation matrix adopted for the green belt development includes pit of 0.3 m x 0.3 m in size with a spacing of 3 m x 3 m. In addition, earth filling and manure may also be required for the proper nutritional balance and nourishment of the sapling. It is also recommended that the plantation has to be taken up randomly and the landscaping aspects could be taken into consideration. Multi-layered plantations comprising of medium height trees (7 m to 10 m) and shrubs (5 m height) are proposed for the green belt.

###### **4.5.3.4. Selection of Plant Species for Green Belt Development**

It is also recommended that the plantation has to be taken up randomly and the landscaping aspects could be taken into consideration. Multi-layered plantations comprising of medium height trees (7 m to 10 m) and shrubs (5 m height) are proposed for the green belt. Green belt is plantation of trees for reducing the air pollution as they absorb both gaseous and particulate pollutant, thus removing them from atmosphere. Green plants form a surface capable of absorbing air pollutants and forming sinks for pollutants. It improves the aesthetic value of local environment. Under present project, green belts have been planned with emphasis on creating biodiversity; enhance natural surroundings and mitigating pollution. Regional tree saplings in eco-friendly bags like *Pterocarpus marsupium*, *Pongamia pinnata*, *Limonia acidissima*, and *Cassia roxburghii* will be planted along the Lease boundary and avenues as well as over non-active dumps with intervals 3m in between with the GPS Coordinates. The greenbelt development plan aims to overall improvement in the environmental conditions of the region Native plant species will be preferred.

- The species should be wind-firm and deep-rooted.
- The species should form a dense canopy.
- Fast-growing plants will be planted
- Species tolerance to air pollution like SO<sub>2</sub> and NO<sub>2</sub> should be preferred.
- Plants having large leaf area index will be considered
- Soil improving plants (Nitrogen fixing rapidly decomposable leaf litter).
- Attractive appearance with good flowering and fruit-bearing.
- Birds and insects attract tree species.
- Roadsides will be planted with local vegetation.

**Table No 4.1. List of plant species proposed for Greenbelt development**

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

(\*Source: Term of Reference-ToR)

**Table No 4.2. Species suitable for abatement of noise and dust pollution**

| S. No | Botanical name            | Common name     |
|-------|---------------------------|-----------------|
| 1     | <i>Azadirachta indica</i> | Vembhu maram    |
| 2     | <i>Ficus religiosa</i>    | Arasan maram    |
| 3     | <i>Ficus hispida</i>      | Aththi maram    |
| 4     | <i>Syzygium cumini</i>    | Naval maram     |
| 5     | <i>Tamarindus indica</i>  | Puliyamaram     |
| 6     | <i>Mangifera indica</i>   | Manga maram     |
| 7     | <i>Delonix regia</i>      | Neruppu Kondrai |
| 8     | <i>Cassia Fistula</i>     | Sara Kondrai    |

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

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

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

#### 4.5.4. Anticipated Impact on Fauna

- Noise generation due to vehicle may affect avifauna.
- The lease area is not inhabited by any wild life, as there is no forest cover, hence there will not be any effect on migration or extinction of wildlife.
- There is no National Park, Biosphere Reserve, Wildlife corridors, and Tiger/Elephant Reserve found within 10 km radius of the project site.

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

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

#### 4.5.3. Impact on Aquatic Biodiversity

- The major river and lake along the project sites doesn't have a rich biodiversity and almost all the species of both fauna and flora listed are either least concerned or not evaluated.
- There is no impact on fish habitats and the food WEB/ food chain in the water body and Reservoir.

**Table No. 4.3. Overall Ecological impact assessments of Kaganam Village, Rough stone and gravel quarry, Vembakkam Taluk, Tiruvannamalai District and Tamil Nadu.**

| S.No | Attributes                                                                                                          | Assessment                                                                                                                       |
|------|---------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
|      | Activities of the project affect the breeding/nesting sites of birds and animals                                    | No breeding and nesting site was identified in the mining lease site. The fauna sighted mostly migrated from the buffer area.    |
| 2    | Located near an area populated by rare or endangered species                                                        | No Endangered, Critically Endangered, or vulnerable species were sighted in the core mining lease area.                          |
| 3    | Proximity to national park/wildlife sanctuary/reserve forest /mangroves/ coastline/estuary/sea                      | Nil                                                                                                                              |
| 4    | The proposed project restricts access to waterholes for wildlife                                                    | 'No '                                                                                                                            |
| 5    | Proposed mining project impact surface water quality that also provides water to wildlife                           | 'No 'scheduled or threatened wildlife animals are sighted regularly core in the core area.                                       |
| 6    | Proposed mining project increase siltation that would affect nearby biodiversity areas.                             | Surface runoff management such as drains is constructed properly so there will be no siltation effect in the nearby mining area. |
| 7    | Risk of fall/slip or cause death to wild animals due to project activities.                                         | 'No'                                                                                                                             |
| 8    | The project release effluents into a water body that also supplies water to a wildlife.                             | No water body near to core zone so the chances of water becoming polluted is low.                                                |
| 9    | Mining projects affect the forest-based livelihood/ any specific forest product on which local livelihood depended. | 'No'                                                                                                                             |
| 10   | The project likely to affect migration routes.                                                                      | 'No 'migration route was observed during the monitoring period.                                                                  |

|    |                                                                                      |                                                                                                                                      |
|----|--------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| 11 | The project is likely to affect the flora of an area, which have medicinal value     | ‘No‘                                                                                                                                 |
| 12 | Forestland is to be diverted, has carbon high sequestration.                         | ‘No ‘There was no forest land diverted.                                                                                              |
| 13 | The project is likely to affect wetlands, Fish breeding grounds, and marine ecology. | ‘No‘. Wetland was not present in the near core Mining lease area. No breeding and nesting ground is present in the core mining area. |

(\*Source: [EIA Guidance Manual-Mining and Minerals, 2010](#))

**TABLE 4.10: RECOMMENDED SPECIES FOR GREENBELT DEVELOPMENT PLAN**

| Sl.No | Name of the plant (Botanical) | Family Name | Common Name          | Habit |
|-------|-------------------------------|-------------|----------------------|-------|
| 1     | <i>Azadirachta indica</i>     | Meliaceae   | Neem, Vembu          | Tree  |
| 2     | <i>Albiziafalcataria</i>      | Fabaceae    | Tamarind, Puliymaram | Tree  |
| 3     | <i>Polyalthialongifolia</i>   | Annonaceae  | Kattumaram           | Tree  |
| 4     | <i>Borassus Flabellifer</i>   | Arecaceae   | Palmyra Palm         | Tree  |

The 7.5m Safety distance along the boundary has been identified to be utilized for subsequent Afforestation. However, the afforestation should always be carried out in a systematic and scientific manner. Regional trees like Neem, Pongamia, Pinnata will be planted along the Lease boundary and avenue plantation will be carried out in the project site. The rate of survival expected to be 80% in this area. Greenbelt development Plan is given in

**TABLE 4.11: GREENBELT DEVELOPMENT PLAN**

| Year | No. of trees proposed to be planted | Area to be covered in m <sup>2</sup>                                                                                             | Name of the species                |
|------|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| I    | 2400                                | The safety zone along the boundary barrier has been identified to be utilized for Greenbelt development and along village roads. | Neem, Vilvam, Panai, Ashokha etc., |

## 4.6 SOCIO ECONOMIC

### 4.6.1 Anticipated Impact

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

### 4.6.2 Mitigation Measures

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

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## 4.7 OCCUPATIONAL HEALTH AND SAFETY

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

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

### 4.7.1 Respiratory Hazards

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

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

### 4.7.2 Noise

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

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

### 4.7.3 Physical Hazards

The following measures are proposed for control of physical hazards

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

### 4.7.4 Occupational Health Survey

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

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

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

## 4.8 MINE WASTE MANAGEMENT

No waste is anticipated, the entire mined out material will be sold to needy crushers and customers.

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## 4.9 MINE CLOSURE

The ultimate depth of the mine is 72m bgl and the life of the mine is 5 years, after completion of mining operation the following action will be taken in the project site as a part of Mine closure plan

- The total Mined out land would be around 4.85.5 Ha this land will be converted into temporary water reservoir which will facilitate to collect the rain water
- The stagnant water will be supplied to the nearby agriculture land during drought seasons
- Fencing will be re constructed around the pit after closure, the warning/ danger display board will be placed on all the sides of the project site
- The un utilized area and haul roads will be converted as plantation area, fruit bearing trees will be planted to retain the eco system of the area
- Final Mine closure plan will be prepared and submitted to the concerned authority

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

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

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

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

### 4.9.1 Mine Closure Criteria

The criteria involved in mine closure are discussed below:

#### 4.9.1.1 Physical Stability

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

#### 4.9.1.2 Chemical Stability

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

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#### 4.9.1.3 Biological Stability

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The stability of the surrounding environment is primarily dependent upon the physical and chemical characteristics of the site, whereas the biological stability of the mine site itself is closely related to rehabilitation and final land use. Nevertheless, biological stability can significantly influence physical or chemical stability by stabilizing soil cover, prevention of erosion/wash off, leaching, etc.,

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

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

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

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

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### **5.0 INTRODUCTION**

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

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

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

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

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

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

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

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

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

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

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

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

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## **6. ENVIRONMENTAL MONITORING PROGRAMME**

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### **6.0 GENERAL**

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

### **6.1 METHODOLOGY OF MONITORING MECHANISM**

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

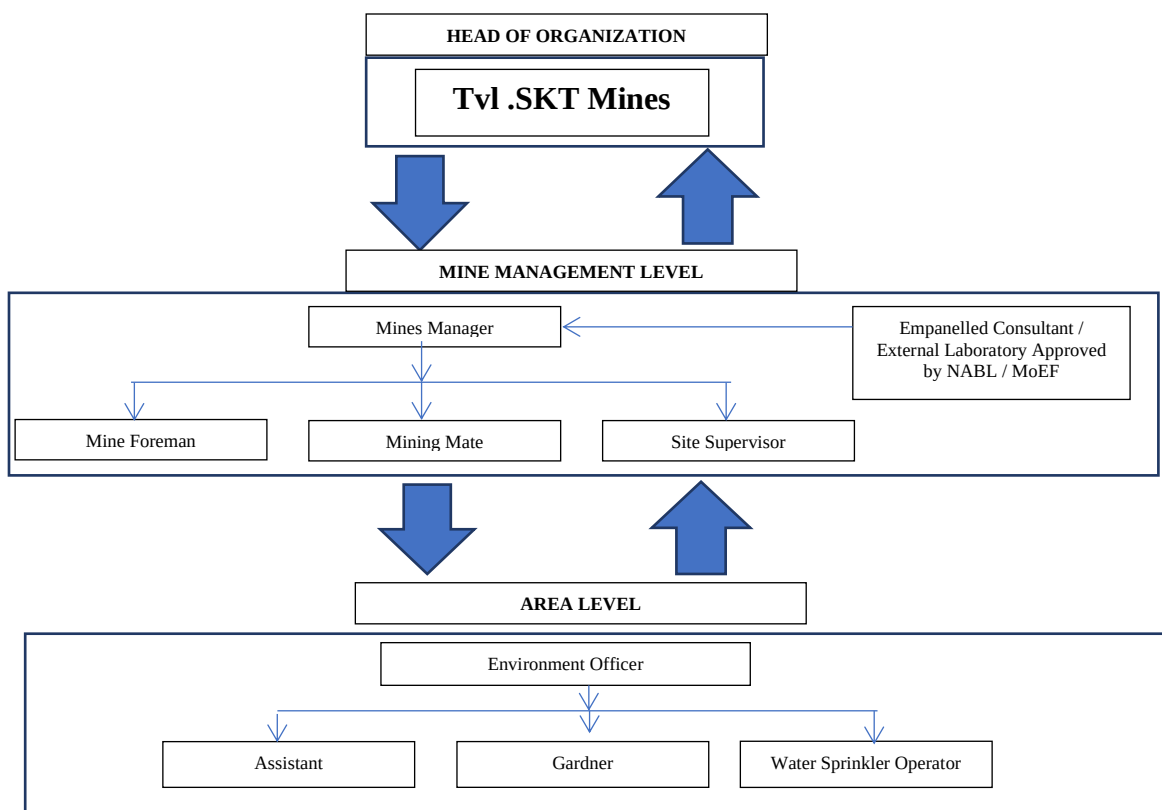
An Environment monitoring cell (EMC) will be constituted to monitor the implementation of EMP and other environmental protection measures in all the proposed quarries.

The responsibilities of this cell will be:

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

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

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

**FIGURE 6.1: PROPOSED ENVIRONMENTAL MONITORING CELL**

## 6.2 IMPLEMENTATION SCHEDULE OF MITIGATION MEASURES

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

**TABLE 6.1 IMPLEMENTATION SCHEDULE**

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

### 6.3 MONITORING SCHEDULE AND FREQUENCY

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

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

The details of monitoring are detailed in Table 6.2

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

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

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

### 6.4 BUDGETARY PROVISION FOR EMP

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

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

**TABLE 6.3 ENVIRONMENT MONITORING PROGRAM BUDGET**

| S.No. | Parameter     | Capital Cost | Recurring Cost per annum |
|-------|---------------|--------------|--------------------------|
| 1     | Air Quality   | Rs. 76,000/- | Rs. 76,000/-             |
| 2     | Meteorology   |              |                          |
| 3     | Water Quality |              |                          |
| 4     | Hydrology     |              |                          |

|              |                 |                    |                    |
|--------------|-----------------|--------------------|--------------------|
| 5            | Soil Quality    |                    |                    |
| 6            | Noise Quality   |                    |                    |
| 7            | Vibration Study |                    |                    |
| <b>Total</b> |                 | <b>Rs 76,000/-</b> | <b>Rs 76,000/-</b> |

Source: Approved Mining Plan

## 6.5 REPORTING SCHEDULES OF MONITORED DATA

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

Periodical reports to be submitted to: -

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

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

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



## 7. ADDITIONAL STUDIES

### 7.0 GENERAL

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

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

### 7.1. PUBLIC CONSULTATION

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

### 7.2 RISK ASSESSMENT

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

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

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

**TABLE 7.1 RISK ASSESSMENT& CONTROL MEASURES**

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

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

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

Source: Analysed and Proposed by FAE & EC

### 7.3 DISASTER MANAGEMENT PLAN

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

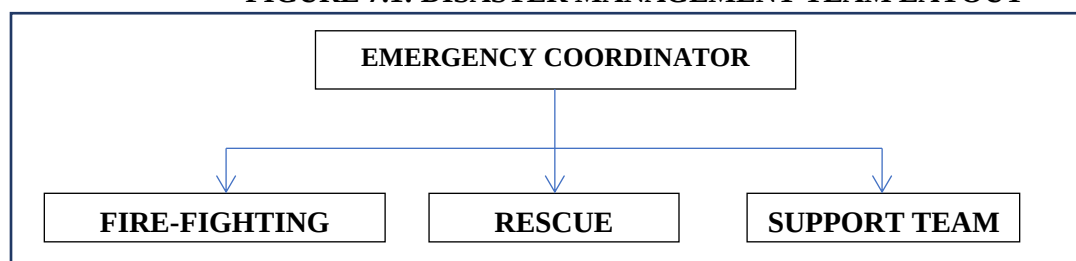
The Disaster Management Plan is aimed to ensure safety of life, protection of environment, protection of installation, restoration of production and salvage operations in this same order of priorities.

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

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

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

**FIGURE 7.1: DISASTER MANAGEMENT TEAM LAYOUT**



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

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

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

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

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

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

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

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

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

#### **(c) Communication and advisory team**

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

#### **(d) Roll call coordinator**

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

#### **(e) Search and rescue team**

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

#### **(f) Emergency security controller**

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

### Emergency control procedure –

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

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

### Proposed fire extinguishers at different locations –

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

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

| LOCATION               | TYPE OF FIRE EXTINGUISHERS                                             |
|------------------------|------------------------------------------------------------------------|
| Electrical Equipment's | CO <sub>2</sub> type, foam type, dry chemical powder type              |
| Fuel Storage Area      | CO <sub>2</sub> type, foam type, dry chemical powder type, Sand bucket |
| Office Area            | Dry chemical type, foam type                                           |

### Alarm system to be followed during disaster –

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

## 7.4 CUMULATIVE IMPACT STUDY

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

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

| PROPOSED QUARRIES |                                                                                                                                                     |         |                                                                                                                                           |              |                                                                                   |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|---------|-------------------------------------------------------------------------------------------------------------------------------------------|--------------|-----------------------------------------------------------------------------------|
| CODE              | Name of the Owner                                                                                                                                   | Village | S.F. Nos                                                                                                                                  | Extent in Ha | Status                                                                            |
| P1                | Tvl.SKT Mines<br>No.333, Guberan Street,<br>Neervallur, Kancheepuram,<br>TamilNadu                                                                  | Kaganam | 44/13A, 56/1A, 56/2A,<br>56/2B, 56/3, 56/4, 56/5,<br>56/6, 56/7, 57/1, 58/9,<br>58/10, 61/4B1, 61/4B2,<br>61/5B, 61/7, 62, 63/1 &<br>63/2 | 4.85.5       | File No.11671 ToR<br>Identification:<br>TO24B0108TN5824280<br>N Dated:01.03.2025. |
|                   | TOTAL EXTENT                                                                                                                                        |         |                                                                                                                                           | 4.85.5       |                                                                                   |
| EXISTING QUARRIES |                                                                                                                                                     |         |                                                                                                                                           |              |                                                                                   |
| CODE              | Name of the Owner                                                                                                                                   | Village | S.F. Nos                                                                                                                                  | Extent in Ha | Status                                                                            |
| E-1               | Thiru.R.Kathirvelu,<br>No.19C, Villakadi, Koli<br>Thoppu Street,<br>Kancheepuram.                                                                   | Kaganam | 58/1A, 1B, 2A, 2B, 3, 6,<br>7, 8A, 8B, 59/2A,<br>61/1B, 2A, 2B, 3, 4A,<br>5A & 6                                                          | 4.42.0       | 10.06.2024 to<br>09.06.2029                                                       |
|                   | TOTAL EXTENT                                                                                                                                        |         |                                                                                                                                           | 4.42.0 ha    |                                                                                   |
| ABANDONED QUARRY  |                                                                                                                                                     |         |                                                                                                                                           |              |                                                                                   |
| A-1               | Thiru S.Sridhar,<br>S/o.T.Sivaprakasam,<br>Managing Director,<br>SKT Mines,<br>No.19C, Villakkadi Koil,<br>Thoppu Street,<br>Kancheepuram – 635 501 | Kaganam | 44/13A, 56/1A, 56/2A,<br>56/2B, 56/3, 56/4, 56/5,<br>56/6, 56/7, 57/1, 58/9,<br>58/10, 61/4B1, 61/4B2,<br>61/5B, 61/7, 62,63/1 &<br>63/2  | 4.85.5       | 17.09.2018 to<br>16.09.2023                                                       |
|                   | TOTAL CLUSTER EXTENT                                                                                                                                |         |                                                                                                                                           | 9.27.5 ha    |                                                                                   |

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

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

|                             |                                                                                                                               |
|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| Name of the Project         | Tvl. SKT Mines Rough Stone and Gravel Quarry                                                                                  |
| S.F. No.                    | 44/13A, 56/1A, 56/2A, 56/2B, 56/3, 56/4, 56/5, 56/6, 56/7, 57/1, 58/9, 58/10,<br>61/4B1, 61/4B2, 61/5B, 61/7, 62, 63/1 & 63/2 |
| Extent                      | 4.85.5 ha                                                                                                                     |
| Village, Taluk and District | Kaganam Village, Vembakkam Taluk, Tiruvannamalai District.                                                                    |
| Land Type                   | It is a patta lands, registered in the name of the Tvl. SKT Mines<br>Vide Patta No. 1041                                      |
| Toposheet No                | 57 P/10                                                                                                                       |
| Latitude between            | 12° 44'31.9930"N to 12° 44' 38.1096"N                                                                                         |
| Longitude between           | 79° 34' 38.2512"E to 79°34'52.2018"E                                                                                          |
| Elevation of the area       | 116m AMSL                                                                                                                     |
| Lease period                | 5 Years                                                                                                                       |
| Mining Plan period          | 5 years                                                                                                                       |
| Proposed Depth of Mining    | 72m bgl<br>(2m Gravel + 70m Rough stone)                                                                                      |

|                                           |                                                                                                                                                                                                                                                                                                                           |                       |
|-------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| Geological Resources                      | Rough Stone in m <sup>3</sup>                                                                                                                                                                                                                                                                                             | Gravel m <sup>3</sup> |
|                                           | 33,98,500                                                                                                                                                                                                                                                                                                                 | 97,100                |
| Mineable Reserves                         | 7,95,070                                                                                                                                                                                                                                                                                                                  | 77,256                |
| Year wise Production for first five years | 7,95,070                                                                                                                                                                                                                                                                                                                  | 77,256                |
| Peak Production                           | 2,07,900                                                                                                                                                                                                                                                                                                                  | 33,840                |
| Ultimate Pit Dimension                    | XY-AB: 151m (L) X 162m (W) X 72m BGL(D)<br>X1Y1-CD: 162m (L) X 62m (W) X 27m BGL(D)<br>X1Y1-EF: 44m (L) X 38m (W) X 7m BGL(D)<br>X2Y2-EF: 49m (L) X 50m (W) X 22m BGL(D)                                                                                                                                                  |                       |
| Water Level in the region                 | 78-82 m bgl                                                                                                                                                                                                                                                                                                               |                       |
| Method of Mining                          | Opencast Mechanized Mining Method involving drilling and Controlled blasting using Slurry Explosives                                                                                                                                                                                                                      |                       |
| Topography                                | The lease applied area is plain terrain. The area has gentle sloping towards Eastern side and altitude of the area is 116m above from Mean Sea level. The area is covered by 2m thickness of Gravel and followed by Massive Charnockite which is clearly inferred from the surface outcrops & nearby existing quarry pit. |                       |
| Machinery proposed                        | Jack Hammer                                                                                                                                                                                                                                                                                                               | 4 Nos                 |
|                                           | Compressor                                                                                                                                                                                                                                                                                                                | 1 Nos                 |
|                                           | Excavator with Bucket and Rock Breaker                                                                                                                                                                                                                                                                                    | 2 Nos                 |
|                                           | Wagon Drill Machine                                                                                                                                                                                                                                                                                                       | 2 Nos                 |
|                                           | Tippers                                                                                                                                                                                                                                                                                                                   | 5 Nos                 |
|                                           | Water Sprinkler Tanker                                                                                                                                                                                                                                                                                                    | 1 Nos                 |
| Blasting Method                           | Controlled Blasting Method by shot hole drilling and small dia of 25mm slurry explosive are proposed to be used for shattering and heaving effect for removal and winning of Rough Stone. No deep hole drilling is proposed.                                                                                              |                       |
| Proposed Manpower Deployment              | 40 Nos                                                                                                                                                                                                                                                                                                                    |                       |
| Project Cost                              | Rs. 3,68,54,000/-                                                                                                                                                                                                                                                                                                         |                       |
| EMP Cost                                  | Rs. 17,65,000/-                                                                                                                                                                                                                                                                                                           |                       |
| Total Project cost                        | Rs. 3,93,92,000/-                                                                                                                                                                                                                                                                                                         |                       |
| CER Cost                                  | Rs. 5,00,000/-                                                                                                                                                                                                                                                                                                            |                       |
| Nearby Water Bodies                       | Odai                                                                                                                                                                                                                                                                                                                      | 90m SW                |
|                                           | Tank                                                                                                                                                                                                                                                                                                                      | 130m West             |
|                                           | Tank                                                                                                                                                                                                                                                                                                                      | 370m East             |
|                                           | Tank                                                                                                                                                                                                                                                                                                                      | 470m South            |
|                                           | Mamandur Lake                                                                                                                                                                                                                                                                                                             | 5km East              |
|                                           | Palar River                                                                                                                                                                                                                                                                                                               | 9.5km NE              |
|                                           | Cheyar River                                                                                                                                                                                                                                                                                                              | 9.2km SE              |
| Greenbelt Development Plan                | Proposed to plant 2400 Nos of trees considering 500 Nos of trees/ Ha criteria<br>The plantation will be developed around the project site and nearby village roads                                                                                                                                                        |                       |
| Proposed Water Requirement                | 3.5 KLD                                                                                                                                                                                                                                                                                                                   |                       |
| Nearest Habitation                        | 550m – South East                                                                                                                                                                                                                                                                                                         |                       |
| Nearest Reserve Forest                    | Thandappanthangal R.F – 6.5 Km – NW (Source - TNGIS)                                                                                                                                                                                                                                                                      |                       |
| Nearest Wild Life Sanctuary               | Karikili Birds Sanctuary + 5km Safety distance – 27 Km – NE<br>Vedanthangal Birds Sanctuary + 5km Safety distance – 31.5 km - E                                                                                                                                                                                           |                       |

Source: Approved Mining Plan



**TABLE 7.5: SALIENT FEATURES OF PROPOSAL “E1”**

|                                   |                                                                                                                   |                       |                       |
|-----------------------------------|-------------------------------------------------------------------------------------------------------------------|-----------------------|-----------------------|
| Name of the Mine                  | Thiru. R.Kathirvelu Rough Stone & Gravel Quarry                                                                   |                       |                       |
| Land Type                         | Patta Land                                                                                                        |                       |                       |
| S.F. Nos                          | 58/1A, 58/1B, 58/2A, 58/2B, 58/3, 58/6, 58/7, 58/8A, 58/8B, 59/2A, 61/1B, 61/2A, 61/2B, 61/3, 61/4A, 61/5A & 61/6 |                       |                       |
| Village                           | Kaganam Village                                                                                                   |                       |                       |
| Extent                            | 4.42.0 ha                                                                                                         |                       |                       |
| Geological Reserves               | Rough Stone                                                                                                       | Weathered Rock        | Gravel                |
|                                   | 19,83,285 m <sup>3</sup>                                                                                          | 44,073 m <sup>3</sup> | 88,146 m <sup>3</sup> |
| Mineable Reserves                 | Rough Stone                                                                                                       | Weathered Rock        | Gravel                |
|                                   | 10,18,230 m <sup>3</sup>                                                                                          | 35,703 m <sup>3</sup> | 74,124 m <sup>3</sup> |
| Mining Plan Period / Lease Period | 5 Years                                                                                                           |                       |                       |
| Ultimate Pit Dimension            | Pit – I 194 m (L) * 183 m (W) * 48 m (D)                                                                          |                       |                       |
| Toposheet No                      | 57 P/10                                                                                                           |                       |                       |
| Latitude                          | 12°44'33.97" N 12°44'41.99" N                                                                                     |                       |                       |
| Longitude                         | 79°34'36.73" E 79°34'46.50" E                                                                                     |                       |                       |
| Blasting                          | Usage of Slurry Explosive with MSD detonators                                                                     |                       |                       |
| Manpower Deployment               | 32 Nos                                                                                                            |                       |                       |
| Total Project Cost                | Project Cost                                                                                                      | Rs. 98,68,000/-       |                       |

Source: Approved Mining Plan

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

**Air Environment –**

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

**TABLE 7.6: CUMULATIVE PRODUCTION LOAD OF ROUGH STONE**

| Quarry             | Production for five-year plan period | Per Year Production in m <sup>3</sup> | Per Day Production in m <sup>3</sup> | Number of Lorry Load Per Day |
|--------------------|--------------------------------------|---------------------------------------|--------------------------------------|------------------------------|
| P1                 | 7,95,070                             | 1,59,014                              | 530                                  | 44                           |
| E1                 | 10,18,230                            | 2,03,646                              | 678                                  | 56                           |
| <b>Grand Total</b> | <b>18,13,300</b>                     | <b>3,62,660</b>                       | <b>1,208</b>                         | <b>100</b>                   |

**TABLE 7.7: CUMULATIVE PRODUCTION LOAD OF GRAVEL**

| Quarry             | Production for five-year plan period | Per Year Production in m <sup>3</sup> | Per Day Production in m <sup>3</sup> | Number of Lorry Load Per Day |
|--------------------|--------------------------------------|---------------------------------------|--------------------------------------|------------------------------|
| P1                 | 77,256                               | 25,752                                | 85                                   | 7                            |
| E1                 | 74,154                               | 24,718                                | 82                                   | 7                            |
| <b>Grand Total</b> | <b>1,51,410</b>                      | <b>50,470</b>                         | <b>167</b>                           | <b>14</b>                    |

On a cumulative basis considering the proposed quarries, it can be seen that the overall production of Rough Stone is 1,208 m<sup>3</sup> per day and overall production of Gravel is 167 m<sup>3</sup> per day with a capacity of 100 trips of Rough Stone per day and 14 Trips per day of Gravel from the cluster.

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

Based on the above production quantities the emissions due to various activities in all the 3 mines includes various activities like ground preparation, excavation, handling and transport of ore. These activities have been analysed systematically basing on USEPA-Emission Estimation Technique Manual, for Mining AP-42, to arrive at possible emissions to the atmosphere and estimated emissions are given in Table 7.18.

**TABLE 7.8: EMISSION ESTIMATION FROM QUARRIES WITHIN 500 METER RADIUS**

| <b>EMISSION ESTIMATION FOR QUARRY “P1”</b>   |                 |                    |              |             |
|----------------------------------------------|-----------------|--------------------|--------------|-------------|
|                                              | <b>Activity</b> | <b>Source type</b> | <b>Value</b> | <b>Unit</b> |
| Estimated Emission Rate for PM <sub>10</sub> | Drilling        | Point Source       | 0.192457925  | g/s         |
|                                              | Blasting        | Point Source       | 0.063869491  | g/s         |
|                                              | Mineral Loading | Point Source       | 0.055119373  | g/s         |
|                                              | Haul Road       | Line Source        | 0.002617542  | g/s/m       |
|                                              | Overall Mine    | Area Source        | 0.109887926  | g/s         |
| Estimated Emission Rate for SO <sub>2</sub>  | Overall Mine    | Area Source        | 0.007712708  | g/s         |
| Estimated Emission Rate for NO <sub>x</sub>  | Overall Mine    | Area Source        | 0.001024054  | g/s         |
| <b>EMISSION ESTIMATION FOR QUARRY “E1”</b>   |                 |                    |              |             |
|                                              | <b>Activity</b> | <b>Source type</b> | <b>Value</b> | <b>Unit</b> |
| Estimated Emission Rate for PM <sub>10</sub> | Drilling        | Point Source       | 0.207285038  | g/s         |
|                                              | Blasting        | Point Source       | 0.092566584  | g/s         |
|                                              | Mineral Loading | Point Source       | 0.056373205  | g/s         |
|                                              | Haul Road       | Line Source        | 0.002651689  | g/s/m       |
|                                              | Overall Mine    | Area Source        | 0.115343834  | g/s         |
| Estimated Emission Rate for SO <sub>2</sub>  | Overall Mine    | Area Source        | 0.009011413  | g/s         |
| Estimated Emission Rate for NO <sub>x</sub>  | Overall Mine    | Area Source        | 0.001172378  | g/s         |

Source: Emission Calculation

**TABLE 7.9: INCREMENTAL & RESULTANT GLC WITHIN CLUSTER**

| <b>PM<sub>10</sub> in µg/m<sup>3</sup></b>  |                             |
|---------------------------------------------|-----------------------------|
| Background                                  | 44.7                        |
| Incremental                                 | 14.82                       |
| Resultant                                   | 59.52                       |
| NAAQ Norms                                  | <b>100 µg/m<sup>3</sup></b> |
| <b>PM<sub>2.5</sub> in µg/m<sup>3</sup></b> |                             |
| Background                                  | 20.5                        |
| Incremental                                 | 6.90                        |
| Resultant                                   | 27.4                        |
| NAAQ Norms                                  | <b>60 µg/ m<sup>3</sup></b> |
| <b>So<sub>2</sub> in µg/m<sup>3</sup></b>   |                             |
| Background                                  | 6.3                         |
| Incremental                                 | 1.79                        |
| Resultant                                   | 8.09                        |
| NAAQ Norms                                  | <b>80 µg/ m<sup>3</sup></b> |
| <b>No<sub>2</sub> in µg/m<sup>3</sup></b>   |                             |
| Background                                  | 21.3                        |
| Incremental                                 | 9.85                        |
| Resultant                                   | 31.15                       |
| NAAQ Norms                                  | <b>80 µg/ m<sup>3</sup></b> |

### Noise Environment –

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

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

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

Where:

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

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

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

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

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

**TABLE 7.10: PREDICTED NOISE INCREMENTAL VALUES FROM CLUSTER**

| Location ID        | Background Value (Day) dB(A) | Incremental Value dB(A) | Total Predicted dB(A) | Residential Area Standards dB(A) |
|--------------------|------------------------------|-------------------------|-----------------------|----------------------------------|
| Habitation Near P1 | 48.2                         | 47.3                    | 46.3                  | 55                               |
| Habitation Near E1 | 36.5                         | 48.1                    | 48.4                  |                                  |

Source: Lab Monitoring Data

The incremental noise level is found within the range of 48.1 – 47.3 dB (A) in Buffer zone. The noise level at different receptors in buffer zone is lower due to the distance involved and other topographical features adding to the noise attenuation. The resultant Noise level due to monitored values and calculated values at the receptors are based on the mathematical formula considering attenuation due to Green Belt as 4.9 dB (A) the barrier effect. From the above table, it can be seen that the ambient noise levels at all the locations near habitations are within permissible limits of Residential Area (buffer zone) as per THE NOISE POLLUTION (REGULATION AND CONTROL) RULES, 2000 (The Principal Rules were published in the Gazette of India, vide S.O.123(E), dated 14.2.2000 and subsequently amended vide S.O. 1046(E), dated 22.11.2000, S.O. 1088(E), dated 11.10.2002, S.O. 1569 (E), dated 19.09.2006 and S.O. 50 (E) dated 11.01.2010 under the Environment(Protection) Act, 1986).

### Ground Vibrations

Ground vibrations due to mining activities in all the 4 Mines within cluster are anticipated due to operation of Mining Machines like Excavators, drilling and blasting, transportation vehicles, etc. However, the major source of ground vibration from all the 4 mines is blasting. The major impact of the ground vibrations is observed on the domestic houses located in the villages nearby the mine lease area. The kuchha houses are more prone to cracks and damage due to the vibrations induced by blasting whereas RCC framed structures can withstand more ground vibrations. Apart from this, the ground vibrations may develop a fear factor in the nearby settlements nearby the mining areas and may cause injury to persons or damage to the structures. Nearest Habitations from 4 mines respectively are as in below Table 7.21.

**TABLE 7.11: NEAREST HABITATION FROM EACH MINE**

| Location ID        | Distance & Direction |
|--------------------|----------------------|
| Habitation Near P1 | 550m - SE            |
| Habitation Near E1 | 650m - SE            |

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

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

Where –

V = peak particle velocity (mm/s)

K = site and rock factor constant

Q = maximum instantaneous charge (kg)

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

R = distance from charge (m)

**TABLE 7.12: GROUND VIBRATIONS AT 2 MINES**

| Location ID | Maximum Charge in kgs | Nearest Habitation in m | PPV in m/ms  |
|-------------|-----------------------|-------------------------|--------------|
| P1          | 20                    | 600m - SW               | <b>0.197</b> |
| E1          | 20                    | 1.2km                   | 0.065        |

Source: Blasting Calculations

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

### **Socio Economic Environment –**

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

**TABLE 7.13: SOCIO ECONOMIC BENEFITS FROM 2 MINES**

| Location ID  | Project Cost              | CER                   |
|--------------|---------------------------|-----------------------|
| P1           | <b>Rs.3,86,19,000/-</b>   | Rs.5,00,000           |
| E1           | Rs. 98,68,000/-           | Rs 5,00,000/-         |
| <b>Total</b> | <b>Rs. 4,84,87,000 /-</b> | <b>Rs.10,00,000/-</b> |

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

- Proposed Projects shall fund towards CER – **Rs 5,00,000/-**
- 

**TABLE 7.14: EMPLOYMENT BENEFITS FROM 6 MINES**

| Description        | Employment |
|--------------------|------------|
| P1                 | 40         |
| E1                 | 32         |
| <b>Grand Total</b> | <b>72</b>  |

A total of 40 people will get employment due to 1 proposed mine in cluster and 32 people are already employed at existing mines.

**TABLE 7.15: GREENBELT DEVELOPMENT BENEFITS FROM 6 MINES**

| CODE           | No of Trees proposed to be planted | Area Covered Sq.m                                                                                       | Name of the Species                |
|----------------|------------------------------------|---------------------------------------------------------------------------------------------------------|------------------------------------|
| P1             | 2400                               | The safety zone along the boundary barrier has been identified to be utilized for Greenbelt development | Neem, Vilvam, Panai, Ashokha etc., |
| E1             | 2400                               |                                                                                                         |                                    |
| <b>G.Total</b> | <b>4800</b>                        |                                                                                                         |                                    |

Based on the Proposed Mining Plans it's anticipated that there shall growth of native species of Neem, Vilvam, Panai, Ashokha etc. in the Cluster at a rate of 4800 Trees Planted over a period of 5 Years with Survival Rate of 80% by proposed quarry.

## 7.5 PLASTIC WASTE MANAGEMENT PLAN

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

### Objective –

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

**TABLE 7.16: ACTION PLAN TO MANAGE PLASTIC WASTE**

| Sl.No. | Activity                                                                                                                                                                                                                                          | Responsibility |
|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| 1      | Framing of Layout Design by incorporating provision of the Rules, user fee to be charged from waste generators for plastic waste management, penalties/fines for littering, burning plastic waste or committing any other acts of public nuisance | Mines Manager  |
| 2      | Enforcing waste generators to practice segregation of bio-degradable, recyclable and domestic hazardous waste                                                                                                                                     | Mines Manager  |
| 3      | Collection of plastic waste                                                                                                                                                                                                                       | Mines Foreman  |
| 4      | Setting up of Material Recovery Facilities                                                                                                                                                                                                        | Mines Manager  |
| 5      | Segregation of Recyclable and Non-Recyclable plastic waste at Material Recovery Facilities                                                                                                                                                        | Mines Foreman  |
| 6      | Channelization of Recyclable Plastic Waste to registered recyclers                                                                                                                                                                                | Mines Foreman  |
| 7      | Channelization of Non-Recyclable Plastic Waste for use either in Cement kilns, in Road Construction                                                                                                                                               | Mines Foreman  |
| 8      | Creating awareness among all the stakeholders about their responsibility                                                                                                                                                                          | Mines Manager  |
| 9      | Surprise checking's of littering, open burning of plastic waste or committing any other acts of public nuisance                                                                                                                                   | Mine Owner     |

Source: Proposed by FAE's and EC

## 7.6 CLUSTER MANAGEMENT COMMITTEE

The cluster management committee is proposed to form including of 1 Proposed quarry and 1 existing quarry total extent of the cluster is 9.27.5 Ha

In the cluster management committee, the following Environmental Management plan will be followed the activities such as

- Transportation of Minerals and blasting activities with the coordination between the individual quarry owners.
- Sprinkling of water regularly thrice a day in the mutual understanding with the quarry owners
- Carrying out blasting operation as specified times by the Mines Managers and as per the EIA report
- Usage of Haul roads in a time specified by the Cluster Management Committee
- Following Safe operating procedure prescribed by the Mines Manager during natural calamities
- Planting Trees in the Government Land, School and within the project site
- Celebrating Safety month, Environmental Month along with the Mines Managers in every six months once
- Regularly follow the health of the workers and take medical examination as per the DGMS norms under the guidance of Mines Manager
- Meet at Association Hall monthly once to review the Environmental Management and Safety activities prescribed by the Cluster Management Committee
- We have read and understood all the above steps and we ensure to follow these specific steps Quarry owners in the Cluster management committee

#### Quarries in the Cluster Management Committee

| PROPOSED QUARRIES |                                                                                                                                                     |         |                                                                                                                                           |              |                                                                                   |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|---------|-------------------------------------------------------------------------------------------------------------------------------------------|--------------|-----------------------------------------------------------------------------------|
| CODE              | Name of the Owner                                                                                                                                   | Village | S.F. Nos                                                                                                                                  | Extent in Ha | Status                                                                            |
| P1                | Tvl.SKT Mines<br>No.333, Guberan Street,<br>Neervallur, Kancheepuram,<br>TamilNadu                                                                  | Kaganam | 44/13A, 56/1A, 56/2A,<br>56/2B, 56/3, 56/4, 56/5,<br>56/6, 56/7, 57/1, 58/9,<br>58/10, 61/4B1, 61/4B2,<br>61/5B, 61/7, 62, 63/1 &<br>63/2 | 4.85.5       | File No.11671 ToR<br>Identification:<br>TO24B0108TN5824280<br>N Dated:01.03.2025. |
|                   | TOTAL EXTENT                                                                                                                                        |         |                                                                                                                                           | 4.85.5       |                                                                                   |
| EXISTING QUARRIES |                                                                                                                                                     |         |                                                                                                                                           |              |                                                                                   |
| CODE              | Name of the Owner                                                                                                                                   | Village | S.F. Nos                                                                                                                                  | Extent in Ha | Status                                                                            |
| E-1               | Thiru.R.Kathirvelu,<br>No.19C, Villakadi, Koli<br>Thoppu Street,<br>Kancheepuram.                                                                   | Kaganam | 58/1A, 1B, 2A, 2B, 3, 6,<br>7, 8A, 8B, 59/2A,<br>61/1B, 2A, 2B, 3, 4A,<br>5A & 6                                                          | 4.42.0       | 10.06.2024 to<br>09.06.2029                                                       |
|                   | TOTAL EXTENT                                                                                                                                        |         |                                                                                                                                           | 4.42.0 ha    |                                                                                   |
| ABANDONED QUARRY  |                                                                                                                                                     |         |                                                                                                                                           |              |                                                                                   |
| A-1               | Thiru S.Sridhar,<br>S/o.T.Sivaprakasam,<br>Managing Director,<br>SKT Mines,<br>No.19C, Villakkadi Koil,<br>Thoppu Street,<br>Kancheepuram – 635 501 | Kaganam | 44/13A, 56/1A, 56/2A,<br>56/2B, 56/3, 56/4, 56/5,<br>56/6, 56/7, 57/1, 58/9,<br>58/10, 61/4B1, 61/4B2,<br>61/5B, 61/7, 62,63/1 &<br>63/2  | 4.85.5       | 17.09.2018 to<br>16.09.2023                                                       |
|                   | TOTAL CLUSTER EXTENT                                                                                                                                |         |                                                                                                                                           | 9.27.5 ha    |                                                                                   |

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**STANDARD OPERATING PROCEDURE FOR KAGANAM CLUSTER MANAGEMENT COMMITTEE**

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**1. Maintenance of Haul Roads and Village Roads:**

- Water will be sprinkled on haul roads twice a day to avoid dust generation during transportation
- Transportation of material will be carried out during day time and material will be covered with tarpaulin
- The speed of tippers plying on the haul road will be limited below 20 km/hr to avoid generation of dust.
- Water sprinkling on haul roads & loading points will be carried out twice a day
- Main source of gaseous pollution will be from vehicle used for transportation of mineral; therefore, weekly maintenance of machines improves combustion process & makes reduction in the pollution.
- The un-metalled haul roads will be compacted weekly before being put into use.
- Over loading of tippers will be avoided to prevent spillage.
- It will be ensured that all transportation vehicles carry a valid PUC certificate
- Grading of haul roads and service roads to clear accumulation of loose materials

**2. Maintenance of Drilling Activities**

- In this system dust gets suppressed close to its formation. Dust suppression become very effective and the work environment will be improved from the point of occupational comfort and health.
- Due to dust free atmosphere, the life of engine, compressor etc., will be increased.
- The life of drill bit will be increased.
- The rate of penetration of drill will be increased.
- Due to the dust free atmosphere visibility will be improved resulting in safer working conditions.
- Usage of sharp drill bits while drilling which will help in reducing noise;
- Secondary blasting will be totally avoided and hydraulic rock breaker will be used for breaking boulders;
- Controlled blasting with proper spacing, burden, stemming and optimum charge/delay will be maintained;
- The blasting will be carried out during favourable atmospheric condition and less human activity timings by using nonelectrical initiation system;
- Proper maintenance, oiling and greasing of machines will be done every week to reduce generation of noise;
- Provision of sound insulated chambers for the workers working on machines (HEMM) producing higher levels of noise;
- Silencers / mufflers will be installed in all machineries;
- Green Belt/Plantation will be developed around the project area and along the haul roads. The plantation minimizes propagation of noise;
- Personal Protective Equipment (PPE) like ear muffs/ear plugs will be provided to the operators of HEMM and persons working near HEMM and their use will be ensured through training and awareness.
- Regular medical check-up and proper training to personnel to create awareness about adverse noise level effects



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### 3. Maintenance of Blasting Activities

- Establish time of blasting to suit the local conditions and water sprinkling on blasting face
- Avoid blasting i.e., when temperature inversion is likely to occur and strong wind blows towards residential areas
- Controlled blasting includes Adoption of suitable explosive charge and short delay detonators, adequate stemming of holes at collar zone and restricting blasting to a particular time of the day i.e., at the time lunch hours (1.00 PM to 2.00 PM), controlled charge per hole as well as charge per round of hole
- Before loading of material water will be sprayed on blasted material
- Dust mask will be provided to the workers and their use will be strictly monitored
- The blasting operations in the cluster quarries are carried out without deep hole drilling and blasting using delay detonators, which reduces the ground vibrations;
- Proper quantity of explosive, suitable stemming materials and appropriate delay system will be adopted to avoid overcharging and for safe blasting;
- Adequate safe distance from blasting will be maintained as per DGMS guidelines;
- Blasting shelter will be provided as per DGMS guidelines;
- Blasting operations will be carried out only during day time;
- The charge per delay will be minimized and preferably a greater number of delays will be used per blasts;
- During blasting, other activities in the immediate vicinity will be temporarily stopped;
- Drilling parameters like depth, diameter and spacing will be properly designed to give proper blast;
- A fully trained explosives blast man (Mining Mate, Mines Foreman, 2<sup>nd</sup> Class Mines Manager/ 1<sup>st</sup> Class Mines Manager) will be appointed.
- A set of shot firing rules will be drawn up and blasting shall commence outlining the detailed operating procedures that will be followed to ensure that shot firing operations on site take place without endangering the workforce or public.
- Sufficient angular stemming material will be used to confine the explosive force and minimise environmental disturbance caused by venting / misfire.
- The detonators will be connected in a predetermined sequence to ensure that only one charge is detonated at any one time and a NONEL or similar type initiation system will be used.
- The detonation delay sequence shall be designed so as to ensure that firing of the holes is in the direction of free faces so as to minimise vibration effects.
- Appropriate blasting techniques shall be adopted such that the predicted peak particle velocity shall not exceed 8 Hz.
- Vibration monitoring will be carried out every 6 months to check the efficacy of blasting practices

### 4. Maintenance of Greenbelt Activities

- Planting of trees all along main mine haul roads and regular grading of haul roads will be practiced to prevent the generation of dust due to movement of dumpers/trucks
  - Green belt of adequate width will be developed around the project areas
  - Suitable plan for conservation of Schedule-I Species have prepared and necessary fund for implement for the same will be made.
  - All the preventive measures will be taken for growth & development of fauna.
  - Creating and development awareness for nature and wildlife in the adjoin villages.
  - The workers shall be trained to not harm any wildlife, should it come near the project site. No work shall be carried out after 6.00 pm
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## 5. Maintenance of Occupational Health

- Dust mask will be provided to the workers and their use will be strictly monitored
- Annual medical checkups, trainings and campaigns will be arranged to ensure awareness about importance of wearing dust masks among all mine workers & tipper drivers
- Ambient Air Quality Monitoring will be conducted six months once to assess effectiveness of mitigation measures proposed
- Specific personnel training on work-site safety management will be taken up;
- Work site assessment will be done by rock scaling of each surface exposed to workers to prevent accidental rock falling and / or landslide, especially after blasting activities;
- Natural barriers, temporary railing, or specific danger signals will be provided along rock benches or other pit areas where work is performed at heights more than 2m from ground level;
- Maintenance of yards, roads and footpaths, providing sufficient water drainage and preventing slippery surfaces with an all-weather surface, such as coarse gravel will be taken up

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

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

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

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

Essential medicines will be provided at the site. The medicines and other test facilities will be provided at free of cost. The first aid box will be made available at the mine for immediate treatment.

First aid training will be imparted to the selected employees regularly. The lists of first aid trained members shall be displayed at strategic places.

## 6. Cluster Management Committee Policy

- Meet the requirements of all laws, acts, regulations, and standards relevant to its operations and activities
  - Implement a program to train employees in general environmental issues and individual workplace environmental responsibilities
  - Allocate necessary resources to ensure the implementation of the environmental policy
  - Ensure that an effective closure strategy is in place at all stages of project development and that progressive reclamation is undertaken as early as possible to reduce potential long-term environmental and community impacts
  - Implement monitoring programme to provide early warning of any deficiency or unanticipated performance in environmental safeguards
  - Conduct periodic reviews to verify environmental performance and to continuously strive towards improvement
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- Monitoring of the water/ waste water quality, air quality and solid waste generated
  - Analysis of the water and air samples collected through external laboratory
  - Implementation and monitoring of the pollution control and protective measures/ devices which shall include financial estimation, ordering, installation of air pollution control equipment, waste water treatment plant, etc.
  - Co-ordination of the environment related activities within the project as well as with outside agencies
  - Collection of health statistics of the workers and population of the surrounding villages
  - Green belt development
  - Monitoring the progress of implementation of the environmental monitoring programme

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

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## 8.PROJECT BENEFITS

### 8.0 GENERAL

The Proposed Project for Quarrying Rough Stone and Gravel at Kaganam Village aims to produce 7,95,070 m<sup>3</sup> Rough Stone over a period of 5 Years and Gravel 77,256 m<sup>3</sup> for period of 3 years. This will enhance the socio-economic activities in the adjoining areas and will result in the following benefits.

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

### 8.1 EMPLOYMENT POTENTIAL

It is proposed to provide employment to about 40 persons for carrying out mining operations and give preference to the local people in providing employment in the three proposed quarries in the cluster. In addition, there will be opportunity for indirect employment to many people in the form of contractual jobs, business opportunities, service facilities etc. the economic status of the local people will be enhanced due to mining project.

### 8.2 SOCIO-ECONOMIC WELFARE MEASURES PROPOSED

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

### 8.3 IMPROVEMENT IN PHYSICAL INFRASTRUCTURE

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

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

### 8.4 IMPROVEMENT IN SOCIAL INFRASTRUCTURE

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

### 8.5 OTHER TANGIBLE BENEFITS

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

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

## CORPORATE SOCIAL RESPONSIBILITY

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

### CSR Cost Estimation

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

## CORPORATE ENVIRONMENT RESPONSIBILITY

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

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

**TABLE 8.1 CER – ACTION PLAN**

| Activity                                                                                                                                                                                                                                                                                                                     | CER           |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| <ul style="list-style-type: none"> <li>• Renovation/ Construction of Existing Toilet</li> <li>• Providing Environmental Related books to the school Library</li> <li>• Carrying out plantation and maintenance in the school Ground</li> <li>• Any other requirements in consultation with the school Head master</li> </ul> | Rs 5,00,000/- |

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

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

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## 10. ENVIRONMENTAL MANAGEMENT PLAN

### 10.0. GENERAL

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

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

### 10.1. ENVIRONMENTAL POLICY

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

#### **The Proponent Tvl. SKT Mines will –**

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

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

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

The said team will be responsible for:

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



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

## 10.2. LAND ENVIRONMENT MANAGEMENT –

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

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

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

Source: Proposed by FAE's & EIA Coordinator

## 10.3. SOIL MANAGEMENT

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

**TABLE 10.2. PROPOSED CONTROLS FOR SOIL MANAGEMENT**

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

Source: Proposed by FAE's & EIA Coordinator

#### 10.4. WATER MANAGEMENT

In the proposed quarrying project, no process is involved for the effluent generation, only oil & grease from the machinery wash is anticipated and domestic sewage from mines office. The quarrying operation is proposed upto a depth of 72 m BGL, the water table in the area is 78-82 m below ground level, hence the proposed project will not intersect the Ground water table during entire quarry period.

**TABLE 10.3. PROPOSED CONTROLS FOR WATER ENVIRONMENT**

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

Source: Proposed by FAE's & EIA Coordinator

#### 10.5. AIR QUALITY MANAGEMENT

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

**TABLE 10.4. PROPOSED CONTROLS FOR AIR ENVIRONMENT**

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

Source: Proposed by FAE's & EIA Coordinator

#### 10.6. NOISE POLLUTION CONTROL

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

**TABLE 10.5.: PROPOSED CONTROLS FOR NOISE ENVIRONMENT**

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

Source: Proposed by FAE's & EIA Coordinator

### 10.7. GROUND VIBRATION AND FLY ROCK CONTROL

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

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

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

Source: Proposed by FAE's & EIA Coordinator

### 10.8. BIOLOGICAL ENVIRONMENT MANAGEMENT

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

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

- Greenbelt development all along the safety barrier of the project area

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

#### 10.8.1. Green Belt Development Plan

About 2400 nos. of saplings is proposed to be planted for the Mining plan period in safety barrier of applied mine lease area with survival rate 80%. The greenbelt development plan has been prepared keeping in view the land use changes that will occur due to mining operation in the area.

**TABLE 10.7: PROPOSED GREENBELT ACTIVITIES**

| Year | No. of trees proposed to be planted | Area to be covered                                              | Name of the species               |
|------|-------------------------------------|-----------------------------------------------------------------|-----------------------------------|
| I    | 2400                                | The plantation is along the safety distance, village road etc.. | Neem, Panai, Vilvam, Ashoka etc., |

Source: Approved Mining plan

The objectives of the greenbelt development plan are –

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

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

#### 10.8.2. Species Recommended for Plantation

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

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

**TABLE 10.8. RECOMMENDED SPECIES FOR THE PLANTSATION**

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

Source: Proposed by FAE's & EIA Coordinator

### 10.9. OCCUPATIONAL SAFETY & HEALTH MANAGEMENT

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

#### 10.9.1. Medical Surveillance and Examinations –

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

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

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

**TABLE 10.9. MEDICAL EXAMINATION SCHEDULE**

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

#### 10.9.2 Proposed Occupational Health and Safety Measures –

- The mine site will have adequate drinking water supply so that workers do not get dehydrated.
- Lightweight and loose-fitting clothes having light colours will be preferred to wear.

- Noise exposure measurements will be taken to determine the need for noise control strategies.
- The personal protective equipment will be provided for mine workers.
- At noisy working activity, exposure time will be minimized.
- Dust generating sources will be identified and proper control measure will be adopted.
- Periodic medical examinations will be provided for all workers.
- In respect of contract work, safety code for contractors and workers will be implemented. They will be allowed to work under strict supervision of statutory person/officials only after they will impart training at vocational training centres. All personal protective equipment's will be provided to them.
- A safety committee meeting every month will be organized to discuss the safety of the mines and the persons employed.
- Celebration of annual mines safety week and environmental week in order to develop safety awareness and harmony amongst employees and co quarry owners.

**FIGURE 10.1.: PERSONAL PROTECTIVE EQUIPMENT TO THE MINE WORKERS**



### 10.9.3: Health and Safety Training Programme

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

### 10.9.4.: Budgetary Provision for Environmental Management –

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

**TABLE 10.10: EMP BUDGET FOR PROPOSED PROJECT**

| <b>Activities</b>        | <b>Mitigation Measure</b>                                                                                                                | <b>Provision for Implementation</b>                                                                                                 | <b>Capital</b> | <b>Recurring</b> |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|----------------|------------------|
| <b>Air Environment</b>   | Haul road maintenance & Water sprinkling                                                                                                 | Lump sum fund allocation for daily maintenance of haul roads and thrice a day water sprinkling by fixed sprinklers or water tankers | 0              | 50000            |
|                          | Muffle blasting – To control fly rocks during blasting                                                                                   | Lump sum fund allocation<br>Blasting face will be covered with sand bags / steel mesh / old tyres / used conveyor belts             | 0              | 5000             |
|                          | Wet drilling procedure                                                                                                                   | Lump sum fund allocation for ensuring wet drilling by covering drill holes with wet gunny bags and spraying water while drilling    | 0              | 10000            |
|                          | No overloading of trucks/tippers/tractors                                                                                                | Lump sum fund allocation<br>Manual Monitoring through Security guard                                                                | 0              | 5000             |
|                          | Stone carrying trucks will be covered by tarpaulin                                                                                       | Lump sum fund allocation<br>Manual Monitoring through Security guard                                                                | 0              | 5000             |
|                          | Enforcing speed limits of 20 km/hr within ML area                                                                                        | Lump sum fund allocation<br>Manual Monitoring through Security guard                                                                | 0              | 5000             |
|                          | Regular monitoring of exhaust fumes as per RTO norms                                                                                     | Lump sum fund allocation<br>Manual Monitoring through Security guard                                                                | 0              | 5000             |
|                          | Installing wheel wash system near gate of quarry                                                                                         | Installation + Maintenance + Supervision                                                                                            | 50000          | 5000             |
| <b>Noise Environment</b> | Source of noise will be during operation of transportation vehicles, HEMM for this proper maintenance will be done at regular intervals. | Provision made in Operating Cost                                                                                                    | 0              | 0                |
|                          | Oiling & greasing of Transport vehicles and HEMM at regular interval will be done                                                        | Provision made in Operating Cost                                                                                                    | 0              | 0                |
|                          | Adequate silencers will be provided in all the diesel engines of vehicles.                                                               | Provision made in Operating Cost                                                                                                    | 0              | 0                |



|                         |                                                                                                                     |                                                                                |       |       |
|-------------------------|---------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|-------|-------|
|                         | It will be ensured that all transportation vehicles carry a fitness certificate.                                    | Provision made in Operating Cost                                               | 0     | 0     |
|                         | Safety tools and implements that are required will be kept adequately near blasting site at the time of charging.   | Provision made in OHS part                                                     | 0     | 0     |
|                         | Line Drilling all along the boundary to reduce the PPV from blasting activity and implementing controlled blasting. | Provision made in Operating Cost                                               | 0     | 0     |
|                         | Proper warning system before blasting will be adopted and clearance of the area before blasting will be ensured.    | Blowing Whistle by Mining Mate / Blaster / Competent Person                    | 0     | 0     |
|                         | Provision for Portable blaster shed                                                                                 | Installation of Portable blasting shelter                                      | 50000 | 2000  |
|                         | NONEL Blasting will be practiced to control Ground vibration and fly rocks                                          | Rs. 30/- per 6 Tonnes of Blasted Material                                      | 0     | 0     |
| <b>Waste Management</b> | Waste management (Spent Oil, Grease etc.,)                                                                          | Provision for domestic waste collection and disposal through authorized agency | 5000  | 20000 |
|                         |                                                                                                                     | Installation of dust bins                                                      | 5000  | 2000  |
|                         | Bio toilets will be made available outside mine lease on the land of owner itself                                   | Provision made in Operating Cost                                               | 0     | 0     |
| <b>Mine Closure</b>     | 1. Progressive Closure Activity - Surface Runoff management                                                         | Provision made in Operating Cost                                               | 0     | 0     |
|                         | 2. Progressive Closure Activity Barbed Wire Fencing to quarry area will be provisioned.                             | Provision made in Operating Cost                                               | 0     | 0     |
|                         | 3. Greenbelt development under safety zone during the Scheme period (150 Saplings)                                  | Provision made in Operating Cost                                               | 0     | 0     |

|                                                               |                                                                                                                                                                                          |                                                                                                       |        |        |
|---------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|--------|--------|
| <b>Implementation of EC, Mining Plan &amp; DGMS Condition</b> | Size 6' X 5' with blue background and white letters as mentioned in MoM Appendix II by the SEAC TN                                                                                       | Fixed Display Board at the Quarry Entrance as permanent structure mentioning Environmental Conditions | 10000  | 1000   |
|                                                               | Air, Water, Noise and Soil Quality Sampling every 6 Months for Compliance Report of EC Conditions                                                                                        | Submission of 2 Half Yearly Compliance - Lab Monitoring Report as per CPCB norms                      | 0      | 100000 |
|                                                               | To control the dust deposition on the North side                                                                                                                                         | Erection of Sheet fencing to control the dust deposition in the agriculture lands                     | 50,000 | 5,000  |
|                                                               | Workers will be provided with Personal Protective Equipment's                                                                                                                            | Lumpsum fund allocation                                                                               | 50000  | 15000  |
|                                                               | Health check up for workers will be provisioned                                                                                                                                          | IME & PME Health check up for all the employees will be covered batch wise.                           | 0      | 50000  |
|                                                               | First aid facility will be provided                                                                                                                                                      | Lumpsum fund allocation                                                                               | 0      | 5000   |
|                                                               | Mine will have safety precaution signages, boards.                                                                                                                                       | Provision for signages and boards made                                                                | 10000  | 2000   |
|                                                               | No parking will be provided on the transport routes. Separate provision on the south side of the hill will be made for vehicles /HEMMs. Flaggers will be deployed for traffic management | Lumpsum fund allocation                                                                               | 50000  | 10000  |
|                                                               | Installation of CCTV cameras in the mines and mine entrance                                                                                                                              | Camera 4 Nos, DVR, Monitor with internet facility                                                     | 30000  | 5000   |

|              |                                                                   |                                                                   |                 |                 |
|--------------|-------------------------------------------------------------------|-------------------------------------------------------------------|-----------------|-----------------|
|              | Appointment of Competent person for ensuring the safety operation | Provision made in operational cost                                | 0               | 0               |
|              | Slope stability action plan                                       | Slope stability action plan in the end of fourth year plan period | 200000          | 0               |
| <b>CER</b>   | As per MoEF &CC OM 22-65/2017-IA.III Dated 25.02.2021             | Lumpsum fund allocation                                           | 300000          | 0               |
| <b>TOTAL</b> |                                                                   |                                                                   | <b>8,10,000</b> | <b>3,07,000</b> |

\*Marked cost is already discussed in the mining plan hence that is not included in the total Environmental Management plan cost Total Cost for the five years.

Total Cost for 5 years – **Rs.8.10 Lakhs**

Cost inflation 5% per annum

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

#### **10.10.: CONCLUSION –**

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

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## 11. SUMMARY AND CONCLUSION

This EIA & EMP report prepared for the proposed Rough Stone and Gravel Quarry project located in S.F. No 44/13A, 56/1A, 56/2A, 56/2B, 56/3, 56/4, 56/5, 56/6, 56/7, 57/1, 58/9, 58/10, 61/4B1, 61/4B2, 61/5B, 61/7, 62, 63/1 and 63/2, Kaganam Village, Vembakkam Taluk and Tiruvannamalai District belongs to Tvl. SKT Mines the Project falls in the Cluster category consist of 1 Proposed, 1 Existing Quarries falls under “B” category as per MoEF & CC Notification S.O. 3977 (E).

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

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

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

The main scope of the EIA study is to quantify the cumulative impact in the study area due to cluster quarries and formulate the effective mitigation measures for each individual leases. A detailed account of the emission sources, emissions control equipment, background Air quality levels, Meteorological measurements, Dispersion model and all other aspects of pollution like effluent discharge, Dust generation etc., have been discussed in this report. The baseline monitoring study has been carried out during the months December 2024 to February 2025 for various environmental components so as to assess the anticipated impacts of the cluster quarry projects on the environment and suitable mitigation measures for likely adverse impacts due to the proposed project is suggested individually for the respective proposed project under Chapter 10.

The project proponent ensures to obtain necessary clearances and quarrying will be carried out as per rules and regulations. The Mining Activity will be carried out in a phased manner as per the approved mining plan after obtaining EC, CTO from TNPCB, execution of lease deed and obtaining DGMS Permission and working will be carried out under the supervision of Competent Persons employed. Overall, the EIA report has predicted that the project will comply with all environment standards and legislation after commencement of the project and operational stage mitigation measures are implemented.

Mining operations has positive impact on environment and socio economy such as landscape improvement, water as by-product, economy development and better public services, providing and supply of Rough Stone as per market demand. Sustainable and modern mining leads us to see positive impact of mining operation and providing consistent employment for nearly 40 people directly in the proposed projects and indirectly around 70 people.

As discussed, it is safe to say that the proposed quarries are not likely to cause any significant impact to the ecology of the area, as adequate preventive measures will be adopted to keep the various pollutants within the permissible limits. Green belt development around the area will also be taken up as an effective pollution mitigate

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technique, as well as to serve as biological indicators for the pollutants released from the Tvl. SKT Mines Rough Stone and Gravel Quarry (Extent – 4.85.5 ha).

## 12. DISCLOSURE OF CONSULTANT

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

Name and address of the consultancy:

### GEO EXPLORATION AND MINING SOLUTIONS

No 17, Advaita Ashram Road,

Alagapuram, Salem – 636 004

Tamil Nadu, India

Email: info@geoexploration@gmail.com

Web: [www.gemssalem.com](http://www.gemssalem.com)

Phone: 0427 2431989.

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

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

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

### **DECLARATION BY EXPERTS CONTRIBUTING TO THE EIA/EMP**

This EIA/EMP for Tvl. SKT Mines Mines Rough Stone & Gravel Quarry over an Extent of 4.85.5 ha in Kaganam Village of Vembakkam Taluk, Tiruvannamalai District of Tamil Nadu is prepared as per the Generic Structure of EIA Guidelines manual. It is also certified that information furnished in the above EIA study are true and correct to the best of our knowledge.

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

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

Designation: **EIA Coordinator**

Date & Signature:

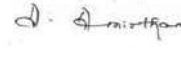


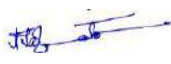
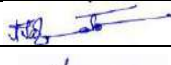
Period of Involvement: **August 2024 to till date**

**Associated Team Member with EIA Coordinator:**

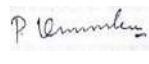
1. Mr.P. Viswanathan
2. Mr. M. Santhoshkumar
3. Mr. S. Ilavarasan

#### **FUNCTIONAL AREA EXPERTS ENGAGED IN THE PROJECT**

| Sl. No. | Functional Area | Involvement                                                                                                                                                                                                                                                           | Name of the Expert/s   | Signature                                                                             |
|---------|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|---------------------------------------------------------------------------------------|
| 1       | AP              | <ul style="list-style-type: none"> <li>Identification of different sources of air pollution due to the proposed mine activity</li> <li>Prediction of air pollution and propose mitigation measures / control measures</li> </ul>                                      | Mr. A. Jagannathan     |  |
| 2       | WP              | <ul style="list-style-type: none"> <li>Suggesting water treatment systems, drainage facilities</li> <li>Evaluating probable impacts of effluent/waste water discharges into the receiving environment/water bodies and suggesting control measures.</li> </ul>        | Dr. M. Ifthikhar Ahmed |  |
|         |                 |                                                                                                                                                                                                                                                                       | Mr. N. Senthilkumar    |  |
| 3       | HG              | <ul style="list-style-type: none"> <li>Interpretation of ground water table and predict impact and propose mitigation measures.</li> <li>Analysis and description of aquifer Characteristics</li> </ul>                                                               | Dr. P. Thangaraju      |  |
| 4       | GEO             | <ul style="list-style-type: none"> <li>Field Survey for assessing the regional and local geology of the area.</li> <li>Preparation of mineral and geological maps.</li> <li>Geology and Geo morphological analysis/description and Stratigraphy/Lithology.</li> </ul> | Dr. M. Ifthikhar Ahmed |  |
|         |                 |                                                                                                                                                                                                                                                                       | Dr. P. Thangaraju      |  |
| 5       | SE              | <ul style="list-style-type: none"> <li>Revision in secondary data as per Census of India, 2011.</li> <li>Impact Assessment &amp; Preventive Management Plan</li> <li>Corporate Environment Responsibility.</li> </ul>                                                 | Mrs. K. Anitha         |  |
| 6       | EB              | <ul style="list-style-type: none"> <li>Collection of Baseline data of Flora and Fauna.</li> <li>Identification of species labelled as Rare, Endangered and threatened as per IUCN list.</li> </ul>                                                                    | Mrs. Amirtham          |  |

|    |     |                                                                                                                                                                                                                                                                          |                          |                                                                                     |
|----|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|-------------------------------------------------------------------------------------|
|    |     | <ul style="list-style-type: none"> <li>Impact of the project on flora and fauna.</li> <li>Suggesting species for greenbelt development.</li> </ul>                                                                                                                       | Mr. Alagappa Moses       |  |
| 7  | RH  | <ul style="list-style-type: none"> <li>Identification of hazards and hazardous substances</li> <li>Risks and consequences analysis</li> <li>Vulnerability assessment</li> <li>Preparation of Emergency Preparedness Plan</li> <li>Management plan for safety.</li> </ul> | Mr. N. Senthilkumar      |  |
|    |     |                                                                                                                                                                                                                                                                          | Mr. S. Pavel             |  |
|    |     |                                                                                                                                                                                                                                                                          | Mr. J. R. Vikram Krishna |  |
| 8  | LU  | <ul style="list-style-type: none"> <li>Construction of Land use Map</li> <li>Impact of project on surrounding land use</li> <li>Suggesting post closure sustainable land use and mitigative measures.</li> </ul>                                                         | Mr. A. Allimuthu         |  |
| 9  | NV  | <ul style="list-style-type: none"> <li>Identify impacts due to noise and vibrations</li> <li>Suggesting appropriate mitigation measures for EMP.</li> </ul>                                                                                                              | Mr. A. Jagannathan       |  |
| 10 | AQ  | <ul style="list-style-type: none"> <li>Identifying different source of emissions and propose predictions of incremental GLC using AERMOD.</li> <li>Recommending mitigations measures for EMP</li> </ul>                                                                  | Mr. N. Senthilkumar      |  |
| 11 | SC  | <ul style="list-style-type: none"> <li>Assessing the impact on soil environment and proposed mitigation measures for soil conservation</li> </ul>                                                                                                                        | Dr. M. Ifthikhar Ahmed   |  |
| 12 | SHW | <ul style="list-style-type: none"> <li>Identify source of generation of non-hazardous solid waste and hazardous waste.</li> <li>Suggesting measures for minimization of generation of waste and how it can be reused or recycled.</li> </ul>                             | Mr. A. Jagannathan       |  |
|    |     |                                                                                                                                                                                                                                                                          | Mr. J. R. Vikram Krishna |  |

**LIST OF TEAM MEMBERS ENGAGED IN THIS PROJECT**

| Sl.No. | Name              | Functional Area | Involvement                                                                                                                                                                                                                                                                                                                                                                                 | Signature                                                                             |
|--------|-------------------|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| 1      | Mr. S. Nagamani   | AP; GEO; AQ     | <ul style="list-style-type: none"> <li>Site Visit with FAE</li> <li>Provide inputs &amp; Assisting FAE with sources of Air Pollution, its impact and suggest control measures</li> <li>Provide inputs on Geological Aspects</li> <li>Analyse &amp; provide inputs and assist FAE with meteorological data, emission estimation, AERMOD modelling and suggesting control measures</li> </ul> |  |
| 2      | Mr. Viswathanan   | AP; WP; LU      | <ul style="list-style-type: none"> <li>Site Visit with FAE</li> <li>Provide inputs &amp; Assisting FAE with sources of Air Pollution, its impact and suggest control measures</li> <li>Assisting FAE on sources of water pollution, its impacts and suggest control measures</li> <li>Assisting FAE in preparation of land use maps</li> </ul>                                              |  |
| 3      | Mr. Santhoshkumar | GEO; SC         | <ul style="list-style-type: none"> <li>Site Visit with FAE</li> <li>Provide inputs on Geological Aspects</li> <li>Assist in Resources &amp; Reserve Calculation and preparation of Production Plan &amp; Conceptual Plan</li> <li>Provide inputs &amp; Assisting FAE with soil conservation methods and identifying impacts</li> </ul>                                                      |  |
| 4      | Mr. Umamahesvaran | GEO             | <ul style="list-style-type: none"> <li>Site Visit with FAE</li> <li>Provide inputs on Geological Aspects</li> </ul>                                                                                                                                                                                                                                                                         |  |



|    |                    |        |                                                                                                                                                                                                                                                            |                          |
|----|--------------------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
|    |                    |        | <ul style="list-style-type: none"> <li>Assist in Resources &amp; Reserve Calculation and preparation of Production Plan &amp; Conceptual Plan</li> </ul>                                                                                                   |                          |
| 5  | Mr. A. Allimuthu   | SE     | <ul style="list-style-type: none"> <li>Site Visit with FAE</li> <li>Assist FAE with collection of data's</li> <li>Provide inputs by analysing primary and secondary data</li> </ul>                                                                        | <i>A. Allimuthu</i>      |
| 6  | Mr. S. Ilavarasan  | LU; SC | <ul style="list-style-type: none"> <li>Site Visit with FAE</li> <li>Assisting FAE in preparation of land use maps</li> <li>Provide inputs &amp; Assisting FAE with soil conservation methods and identifying impacts</li> </ul>                            | <i>S. Ilavarasan</i>     |
| 7  | Mr. E. Vadivel     | HG     | <ul style="list-style-type: none"> <li>Site Visit with FAE</li> <li>Assist FAE &amp; provide inputs on aquifer characteristics, ground water level/table</li> <li>Assist with methods of ground water recharge and conduct pump test, flow rate</li> </ul> | <i>E. Vadivel</i>        |
| 8  | Mr. D. Dinesh      | NV     | <ul style="list-style-type: none"> <li>Site Visit with FAE</li> <li>Assist FAE and provide inputs on impacts due to proposed mine activity and suggest mitigation measures</li> <li>Assist FAE with prediction modelling</li> </ul>                        | <i>D. Dinesh</i>         |
| 9  | Mr. Panneer Selvam | EB     | <ul style="list-style-type: none"> <li>Site Visit with FAE</li> <li>Assist FAE with collection of baseline data</li> <li>Provide inputs and assist with labelling of Flora and Fauna</li> </ul>                                                            | <i>P. Panneer Selvam</i> |
| 10 | Mrs. Nathiya       | EB     | <ul style="list-style-type: none"> <li>Site Visit with FAE</li> <li>Assist FAE with collection of baseline data</li> <li>Provide inputs and assist with labelling of Flora and Fauna</li> </ul>                                                            | <i>T. Annappa</i>        |

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**DECLARATION BY THE HEAD OF THE ACCREDITED CONSULTANT ORGANIZATION**

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I, Dr. M. Ifthikhar Ahmed, Managing Partner, Geo Exploration and Mining Solutions, hereby, confirm that the above-mentioned Functional Area Experts and Team Members prepared the Cluster EIA/EMP for Tvl. SKT Mines Rough Stone & Gravel Quarry over an Extent of 4.85.5 ha in Kaganam Village of Vembakkam Taluk, Tiruvannamalai District of Tamil Nadu. It is also certified that information furnished in the EIA study are true and correct to the best of our knowledge.

Signature& Date:



Name:

**Dr. M. Ifthikhar Ahmed**

Designation:

**Managing Partner**

Name of the EIA Consultant Organization:

**M/s. Geo Exploration and Mining Solutions**

NABET Certificate No & Issue Date:

**NABET/EIA/2225/RA 0276 Dated: 20-2-2023**

Validity:

**Valid till 06.08.2025**