DRAFT ENVIRONMENTAL IMPACT ASSESSMENT

&

ENVIRONMENT MANAGEMENT PLAN

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

PALAPATTI ROUGH STONE QUARRIES

At

Palapatti Village, Vazappadi Taluk, Salem District, Tamil Nadu State.

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

IN CLUSTER OVER AN EXTENT OF 5.50.0 Ha

NAME OF PROPOSED PROJECT PROPONENTS FOR CONDUCTING PUBLIC HEARING

PROJECT PROPONENT	
Thiru.K.Venkatraman, Extent: 1.50.0 Ha S.F. No: 106 (Part-2), Palapatti Village, Vazappadi Taluk, Salem District ToR: Lr No. SEIAA-TN/F.No.9332/TOR-1244/2022 Dated: 30.08.2022	**Tmt.S.Sumathi,** Extent: 1.50.0 Ha S.F. No: 106 (Part-3), Palapatti Village, Vazappadi Taluk, Salem District ToR: Lr No. SEIAA-TN/F.No.9685/SEAC/TOR-1428/2022 Dated: 18.04.2023

Environmental Consultant

GEO EXPLORATION AND MINING SOLUTIONS
Old No. 260-B, New No. 17,
Advaitha Ashram Road, Alagapuram,
Salem – 636 004, Tamil Nadu, India
Accredited for sector 1 Category 'A' ,31 & 38 Category 'B'
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ENVIRONMENTAL LAB
KGS ENVIRO LABORATORY

No.16, F1, Bharathi Flats, Bharathiyar Street, Cholambedu Main Road,
Thirumullaivoyal, Chennai – 600 062

Baseline Monitoring Season – March 2022 to May 2022

JUNE 2024

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

PROPOSED QUARRIES				
CODE	**Name of the Owner**	**S.F. Nos**	**Extent**	**Status**
P1	**Thiru. S.Dhanapal,** S/o. Sengodan, No.438, Mahakaliyamman Kovil Street, dagapatti Post,, Salem District– 636 006	106 (Part-1)	1.00.0 ha	TOR Vide Lr No. SEIAA-TN/F.No.8121/SEAC/TOR-930/2020 Dated :16.04.2021
P2	**Thiru.K.Venkatraman,** S/o. Krishnan, No.74A/77A, Narayanan Pillai Street, Peramanur, Salem – 636 007.	106 (Part-2)	1.50.0 ha	TOR Vide Lr No. SEIAA-TN/F.No.9332/TOR-1244/2022 Dated :30.08.2022
P3	**Tmt.S.Sumathi,** W/o.Sathishkumar, No.3/43, Nadu Street, Singipuram, Vazhappadi, Salem – 636 115	106 (Part-3)	1.50.0 ha	TOR Vide Lr No. SEIAA-TN/F.No.9685/SEAC/TOR-1428/2022 Dated :18.04.2023
P4	**Thiru.A.Rajarajacholan,** S/o.Alagappan, No.3/22, Rajaveethi, Minnampalli Post, Vazhappadi, Salem – 636 106.	106 (Part-4)	1.50.0 ha	TOR Vide Lr No. SEIAA-TN/F.No.9333/TOR-1234/2022 Dated :30.08.2022
TOTAL			**5.50.0 ha**	
EXISTING QUARRIES				
NIL				
ABANDONED QUARRIES				
NIL				
Total Cluster Extent			**5.50.0 Ha**	

Note: -

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

TERMS OF REFERENCE (ToR) COMPLIANCE

P1 – Thiru. S.Dhanapal

"ToR issued vide Letter No. SEIAA-TN/F.No.8121/SEAC/TOR-930/2020 Dated: 16.04.2021"

	SPECIFIC CONDITIONS	
1	The proponent shall furnish the contour map of the water table detailing the number of wells located around the site and impacts on the wells due to mining activity.	Hydrogeological study was carried out detailing the number of wells located around the site and is discussed in Chapter 3, Page No.117.
2	The Project proponent shall re-plant all the trees with girth more than 20cm	Agreed and noted
3	The proponent shall conduct the hydro-geological study to evaluate the impact of proposed mining activity on the ground water table, agriculture activity and water bodies such as rivers, tanks, canals, ponds etc. Located nearby by the proposed mining area.	The hydro-geological study was conducted to evaluate the possible impact on the ground water table. No significant impacts are anticipated on the water bodies around the project area. Details are discussed under Chapter No. 3
4	The proponent shall furnish the details on number of groundwater pumping wells, open wells within the radius of 1Km along with the water levels in both monsoon and non-monsoon seasons. The proponent would also collect the data of water table from the PWD/TWAD in this area in both monsoon and non-monsoon seasons.	The number of wells located around the site is discussed in Chapter 3, Page No. 118.
5	The proponent shall conduct the cumulative impact study on the agriculture area due to mining crushers and other activities around the site area.	The cumulative impact study on the agriculture area due to mining crushers and other activities around the project site is discussed in Chapter 3, Page No. 103-107
6	The details of surrounding well and the cumulative impact on groundwater shall be part of EIA study.	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, Page No.117.
7	The Socio-Economic studies should be carried out within 10km buffer zone from the mines.	The Socio-Economic Studies were carried out for 10 km buffer zone from proposed project and discussed under Chapter 3, Page No. 157-176
8	A tree survey study shall be carried out (nos. name of the species, age) in the mining lease applied area and its management during mining activity.	Agreed and noted.
9	CER activities should be carried out taking in to consideration the requirement of the local habitants available within buffer zone as per Office Memorandum of MoEF & CC	Allocation for Corporate Environment Responsibility (CER) shall be made as per Government of India, MoEF & CC Office Memorandum F.No.22-65/2017-IA.III, Dated: 01.05.2018. As per para 6 (II) of the office memorandum, the quarry project being a green field project & Capital Investment is ≤ 100 crores, shall contribute 2% of Capital Investment towards CER as per directions of EAC/SEAC and the total CER amount is Rs Rs.90,000/-. The detailed CER Activities is discussed under Chapter No. 8, Page No. 215
10	A detailed mine closure plan for the proposed project shall be submitted.	Discussed under Chapter 2, Page No. 84 Mine Closure Plan is a part of Approved Mining Plan enclosed as Annexure Volume – 1.
11	A detailed report on the safety and health aspects of the workers and for the surrounding habitants during operation of mining for drilling and blasting shall be submitted	Standard Operating Procedures as per DGMS for Safety and Health aspects of the workers and for surrounding habitants during mining operations is to be followed. The details are discussed under Chapter No. 10, Page No. 221

12	The recommendation for the issue of Terms of Reference is subject to the final outcome of the Hon'ble NGT, Principal bench, New Delhi in O.A.No.186 of 2016 (M.A.No. 350/2016) and O.A.No.200/2016and O.A.No.580/2016(M.A.No.1182/2016)And O.A. No. 404/2016 (M.A.No758/2016, M.A.No 920/2016, M.A.No. 1122/2016, M.A.No.12/2017 & M.A.No. 843/2017) and O.A.No 405/2016 and O.A.No 520 of 2016 (M.A.No. 981/2016, M.A.No.982/2016 & M.A.No. 384/2017)	Agreed & Noted.
13	A detailed study of the lithology of the mining lease area shall be furnished.	Lithology of the project area is discussed in Chapter No:2 Page No.26
14	The project proponent shall furnish the details of the existing green belt area earmarked with GPS coordinates and list of trees are planted with copy of photos/documents along with the EIA report.	Agreed & Noted. Discussed under Chapter -3 Ecology environment details in flora and fauna, list of trees etc.,
ADDITIONAL CONDITIONS		
1	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.	Agreed and noted.

TERMS OF REFERENCE (ToR) COMPLIANCE

P2 – Thiru.K.Venkatraman,

"ToR issued vide Lr No. SEIAA-TN/F.No.9332/TOR-1244/2022 Dated :30.08.2022"

SPECIFIC CONDITIONS		
1	During the EIA appraisal, the proponent shall submit thc Revised Mining Plan approved by the competent authodty leaving the mandatory safety distance of not less than 7.5 m on all sides of the proposed mining lease area and indicating the revised quantity of production available from the proposed quarry.	Revised mining Plan is attached as Annexure VI
2	The proposed mine should be completely fenced and entry to general public may be ensured.	Not applicable as there are no existing quarry at proposed site
3	As the habitations are located at distance in the range of 250-300m, the PP shall provide conceptual design for carrying oui the NONEL initiation based coltrolled blasting operation involving muffle blasting in the proposed quarry such that the blast-induced ground vibralions are contrrolled within the permissiblc limits as stipulaled by the DGMS as well as no fly rock travel beyond 30m from the blast site.	There is no habitation within 500m radius from project site
4	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.	Depth of working is just 25m bgl. Slope stability plan for the proposed pit will be submitted along with final EIA report.
5	The PP shall furnish the affidavit stating that the blasting operationin the proposed quarry is carried out by the statutory competent person as per the MMR 1961 such as blaster, mining mate, mine foreman, II/lst Class mines manager appointed by the proponent	Affitavit attached as Annexure-IX

6	Ihe IllA Coordinators shall obtain and fumish rhe details of quarry/quaries operated by the proponent in the past, either in the same Iocation or elsewhere in the State with video and photographic evidences.	There is no quarry being operated by the project proponent.
7	The proponent should givc the details of trees to be cut for mitritrg operation and around 1000 trees have to be planted &ound the mining area before start of the quarrying.	Agrees to comply.
8	The PP shall fumish the affidavit stating that the blasting operation in rhe proposed quarry is carried out by the statutory competent person as per the MMR 196l such as blaster, mrning mate, mioe foreman, II/I Class mines manager appointed by the proponent.	Affidavit is attached as Annexure IX
9	The EIA Coordinators shall obtain and fumish the details of quarry/quarries operated by the proponenl in the past, either in the same location or elsewhere ln the State with video and photographic evidcnces.	There is no quarry being operated by the project proponent.
10	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 a) what was the period of the operation and stoppage of the earlier mines with last work permit issued by the AD/DD mines? b) Quantity of minerals mined out c) Highest production achieved in any one year d) Detail of approved depth of mining e) Actual depth of the mining achieved earlier f) Name of the person already mined in that leases area g) If EC and CTO already obtained' the copy of the same shall be submitted h) whether the mining was carried out as per the approved mine plan (or EC if issued) with stipulated benches.	➢ It is a Fresh Lease application.
11	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).	Map showing – Project area is superimposed on Satellite imagery is enclosed in Figure No. 2.7 Project area boundary coordinates superimposed on Toposheet – Figure No. 1.3, Surface Features around the project area covering 10km radius – Figure No. 2.8, Geology map of the project area covering 10km radius - Figure No. 2.11, Geomorphology Map of the Study Area covering 10 km radius – Figure No. 2.12,
12	The PP shall carry out Drone Video survey covering in cluster. Greenbelt, fencing etc.,	Noted & Agreed
13	The proponent shall furnish photgraphs of adequate fencing, green belt along the periphery including replantation of existing trees and safety distance between the adjacent quaries and water bodies nearby provided as per the approval mining plan.	Noted & Agreed
14	The Project Proponent shall provide the details of mineral reserves and mineable reserves planned production capacity, proposed working methodology with justificatioos the anticipated	Details are provided is section 2.6 ch.2

	impacts of the mining operations on the surrounding environment and the remedial measures for the same.	
15	The Project Propon€nt shall provid€ the Organization chart indicating the appointment of various statutory officials and other competenl persons to be appointed as per the provrsions of Mines Act 1952 and the MMR, 1961 for carrying out the quarrying operations scientifically and systematically in order to ensure safety and to protect the environment.	Details are provided is section 9.4
16	The project proponent shall conduct the hydro-geological study considering the contour map of the water table detailing the number of ground water pumping & open wells, and surface water bodies such as rivers, tanks, canals, ponds etc. within 1km (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 are this regard may be provided.	Depth of the water table in project area is 70m bgl. Whereas quarry operation is proposed up to depth of 25m bgl (18m Agl) thus mining will not disturb the ground waterlevel. Detailed study is given in section 3.3.4
17	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.	Details in Chapter No. 3.
18	The Proponent shall carry out the Cumulative impact study due to mining operations carried out in the quarry specifically with reference to the specific environment in terms of soil, health, biodiversity, air pollution, water pollution, climate change and flood control & health impacts. Accordingly, the Environment Management plan should be prepared keeping the concerned quarry and the surrounding habitations in the mind.	Detailes in Baseline environment discussed in chapter-3 and Chapter6 & 10- the Environment Management plan concerned quarry and the surrounding habitations in the mines.
19	Rain water harvesting management with recharging details along with water balance (both monsoon & non-monsoon) be submitted.	At the last stage of mining operation, almost complete area will be worked to restore the land to its optimum reclamation for future use as water reservoir.
20	Land use of the study area delineating forest area, agricultural land, grazing land, wildlife sanctuary, national park, migratory routes of fauna, water bodies, human settlements and other ecological features should be indicated. Land use plan of the mine lease area should be prepared to encompass pre operational, operational and post operational phases and submitted. Inpact, if any, of change of land use should be given.	Land use and land cover of the study area is discussed in Chapter No. 3. Land use plan of the project area showing pre-operational, operational and post-operational phases are discussed in Chapter No. 2, Table No 2.3.
21	Details of the land for storage of Overburden/Waste Dumps (or) Rejects outside the mine lease, such as extent of land area, distance from mine lease, its land use, R&R issues, if any, should be provided.	Not applicable
22	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	Not Applicable. Project area / Study area is not declared in 'Critically Polluted' Area and does not come under 'Aravalli Range.

	should be secured and furnished to the effect that the proposed mining activities could be considered.	
23	Description of water conservation measures proposed to be adopted itr the Project should be given. Details of rainwater harvesting proposed in the Project, if any, should be provided.	At the last stage of mining operation, alost complete area will be worked to restore the land to its optimum reclamation for future use as water reservoir.
24	Impact on local transport infrastructure due to the Project should be indicated.	Transport density details mentioned in Chapter -2
25	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.	Details of the trees in the buffer zone given in Chapter No.3 and 4
26	A detailed mine closure plan for the proposed project shall be included in EIA/EMP report which should be site-specific.	Detailed in chapter 2 mine closure plan for the proposed project
27	Public Hearing points raised and commitments of the Project Proponent on the same along with time bound Action Plan with budgetary provisions to implement the same should be provided and also incorporated in the final EIA /EMP Report of the Project and to be submitted to SEIAA/SEAC with regard to the Office Memomndum of MoEF& CC accordingly.	PH proceedings will be furnished in final EIA report.
28	The Public hearing advertisement shall be published in one major National daily and onemost circulated vernacular daily.	Noted and agreed
29	The PP shall produce/display the EIA report, Executive summary and other related information with respect to public hearing in Tamil Language also.	Executive summary in Tamil along with Draft EIA will be submitted as required to SPCB prior public hearing.
30	As a part of the study of flora and fauna around the vicinity of the proposed site, the EIA coordinator shall strive to educate the local students on the importance of preserving local flora and fauna by involving them in the study, wherever possible.	Details of flora and fauna in core a buffer zone detailed in Chapter 3
31	The purpose of green belt around the project is to capture the fugitive emissions, carbon sequestration and to attenuate the noise generated, in addition lo improving the aesthetics. A wide range of indigenous plant species should be planted as given in the appendix-l in consullation with thc DFO State Agticulture Universily Thc plant species with dense/moderate canopy of nalilc origin should be chosen Species of Small/medium/tall trees alternating with scrubs should be planted in a mixed manner.	Greenbelt plantation plan is provided. Approved mining plan including green belt development plan details in chapter 4.
32	Taller/one year old Saplings raised in appropriate size of bags; preferably eco-friendly bags should be planted in proper espacement as per the advice of local forest authorities / botanist / Horticulturist with regard to site specific choices. The proponent shall earmark the greenbelt area with GPS coordinates all along the boundary of the project site with at least 3 meters wide and in between blocks in an organized manner.	Noted and agreed
33	A Disaster management Plan shall be prepared and included in the EIA/EMP Report.	Disaster management Plan details in Chapter-7
34	A Risk Assessment and management Plan shall be prepared and included in the EIA/EMP Report.	A Risk Assessment and management Plan Chapter- 7
35	Occupational Health impacts of the Project should be anticipated and the proposed preventive measures spelt out in detail. Details of pre-placement medical examination and periodical	Occupational Health impacts chapter- 10

	medical examination schedules should be incorporated in the EMP. The project specific occupational health mitigation measures with required facilities proposed in the mining area may be detailed.	
36	Public health implications of the Project and related activities for the population in the impact zone should be systematically evaluated and the proposed lemedial measures should be detailed along with budgetary allocations.	It is explained in Chapter -3
37	The Socio-economic studies should be carried out within a 5 km buffer zone from the mining activity. Measures of socio-economic significance and influence to the local community proposed to be provided by the Project Proponent should be indicated. As far as possible, quantitative dimensions may be given with time frames for implementation.	Details are listed in Chapter:3.
38	Details of litigation pending against the project, if any, with direction /order passed by any Court of Law against the Project should be given.	No Litigation is pending
39	Benefits of the Project if the Project is implemented should be spelt out. The benefits of the Project shall clearly indicate environmental, social, economic, employment potential, etc.	Project benefits are detailed in chapter7 and 10
40	If any quarrying operations were carried out in the proposed quarrying site for which now the EC is sought, the Project Proponent shall furnish the detailed compliance to EC conditions given in the previous EC with the site photographs which shall duly be certified by MoEF&CC, Regional Office, Chennai (or) the concerned DEE/TNPCB.	It is Fresh Lease
41	The PP shall prepale thc EMP for the entire life of mine and also fumish the swom affrdavit stating to abide the EMP for the entire life of mine.	Noted
42	Concealing any factual information or submission of false/fabricated data and failure to comply with any of the conditions mentioned above may result in withdrawal of this Terms of Reference besides attracting penal provisions in the Environment (Protection) Act, 1986.	Noted and agreed

TERMS OF REFERENCE (ToR) COMPLIANCE

P3 – Tmt.S.Sumathi,

"ToR issued vide Lr No. SEIAA-TN/F.No.9685/SEAC/TOR-1428/2022 Dated :18.04.2023

SPECIFIC CONDITIONS		
1	The structures within the radius of (i) 100 m, (ii) 200 m, (iii) 300 m shall be enumerated with details such as dwelling houses with number ofoccupants' places of worship' industries, factories, sheds, etc.	Noted and agreed
2	The project proponent shall enumerate on the details of Trees, Age of trees & its yield details.	Noted and agreed
3	In the case of proposed lease exists in the hilly terrain, the Project Proponent (PP) shall prepare and submit an 'Action Plan' for carrying out the formation of the benches from top to downwards in the proposed quarry lease including the removal	Noted and agreed

	of boulder formed over the sloping face during the time of appraisal for obtaining the EC.	
4	The PP shall submit detailed mitigation measures particularly related to dust pollution with respect to the Iocation of the dwellings and Reserved Forest surrounding the proposed project based on the wind direction during the time ofappraisal for obtaining the EC.	Noted and agreed
5	The PP shall furnish the affidavit stating that the blasting operationin the proposed quarry is carried out by the statutory competent person as per the MMR 1961 such as blaster, mining mate, mine foreman, II/lst Class mines manager appointed by the proponent.	Noted and agreed
6	The PP shall present a conceptual design for carrying out only controlled blasting operation involving line drilling and muffle blasting in the proposed quarry such that the blast-induced ground vibrations are controlled as well as no fly rock travel beyond 30 m from the blast site.	Noted and agreed
7	The EIA Coordinators shall obtain and fumish the details of quarry/quarries operated by the proponent ill the past, either in the same location or else where in the State with video and photographic evidences.	Noted and agreed
8	If the proponent has already carried out the mining activity in the proposed mining lease area after 15.01.2016, then the proponent shall fumish the following details from AD/DD mines, a) What was the period of the operation and stoppage of the earlier mines with last work permit issued by the AD/DD mines? b) Quantity of minerals mined out. c) Highest production achieved in any one year d) Derail of approved depth of mining. e) Actual depth of the mining achieved earlier. t) Name ofthe person already mined in that leases area. g) If EC and CTO already obtained, the copy of the same shall be submitted. h) Whether the mining was carried out as per the approved mine plan (or EC if issued) with stipulated benches.	It is a fresh quarry
9	All corner coordinates of the mine lease area, superimposed on a high-resolution Imagery/Toposheet, 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 area).	Satellite imagery of the project area along with boundary coordinates is given in the Chapter No 1 Geomorphology of the area is given in Chapter No 2 Land use pattern of the project area is tabulated in the Chapter No.2. Land use pattern of the Study area is tabulated in the Chapter No.3

10	The PP shall carry out Drone video survey covering the cluster, Green belt, fencing etc	Drone video covering the cluster area clearly stating the extent of the operation will be submitted in the final EIA report
11	The PP shall furnish the revised manpower including the statutory & competent persons as required under the provisions ofthe MMR l96l for the prosed quarry' based on the volume of rock handled & area of excavation.	Noted and agreed
12	The proponent shall fumish photographs of adequate fencing, green belt along the periphery including replantation of existing trees & safety distance between the adjacent quarries & water bodies nearby provided as per the approved mining plan.	Noted and agreed
13	The Project proponent shall provide the details of mineral reserves and mineable reserves, planned production capacity, proposed working methodology justifications, with the anticipated impacts of the mining operations on the surrounding environment and the remedial measures for the same.	The details of mineral reserves and mineable reserves are explained in chapter-2 & 4.
14	The Project proponent shall provide the Organization chart indicating the appointment of various statutory officials and other competent persons to be appointed as per the provisions of Mines Act, 1952 and the MMR, 196l for carrying out the quarrying operations scientifically and systematically in order to ensure safety and to protect the environment.	Organization chart indicating Proposal for the appointment of Statutory officials is given in the Chapter No.7
15	The Project Proponent shall conduct the hydro-geological study considering the contour map of the water table detailing the number of ground water pumping & open wells, and surface water bodies such as rivers' tanks, canals, ponds etc. within l km (radius) along with the collected water level data for both monsoon and non-monsoon seasons from the PWD / TWAD so as to assess the impacts on the wells due to mining activity. Based on actual monitored data' it may clearly be shown whether working will intersect groundwater' Necessary data and documentation in this regard may be Provided.	The hydro-geological study is explained in chapter – 3.
16	The proponent shall furnish the baseline data for the environmental and ecological parameters with regard to surface water/ground water quantity' air quality' soil quality & flora/fauna including 8affic/vehicular movement study	Baseline data for the environmental and ecological parameters with regard to surface water/ground water quality, air quality, soil quality, & flora/fauna including traffic/vehicular movement study to assess the cumulative impact of the proposed project on the environment is prepared as a Draft EIA EMP and will be finalized after public consultation and will be submitted as Final EIA /EMP Report.
17	The Proponent shall carry out the Cumulative impact study due to mining operations carried out in the quarry specifically with reference to the specific environment in terms of soil, health, biodiversity, air pollution, water pollution, climate change and flood control & health impacts. Accordingly, the Environment Management plan should be prepared keeping	The Cumulative impact study due to mining operations is explained in chapter – 7

	the concerned quarry and the surrounding habitations in the mind.	
18	Rain water harvesting management with recharging details along with water balance (both monsoon & non-monsoon) be submitted.	Noted and agreed
19	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 pre operational, operational and post operational phases and submitted. Inpact, if any, of change of land use should be given.	Land use and land cover of the study area is discussed in Chapter No. 3. Land use plan of the project area showing pre-operational, operational and post-operational phases are discussed in Chapter No. 2, Table No 2.3.
20	Details of the land for storage of Overburden/Waste Dumps (or) Rejects outside the mine lease, such as extent of land area, distance from mine lease, its land use, R&R issues, if any, should be provided.	Not applicable
21	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.	Not Applicable. Project area / Study area is not declared in 'Critically Polluted' Area and does not come under 'Aravalli Range.
22	Description of water conservation measures proposed to be adopted itr the Project should be given. Details of rainwater harvesting proposed in the Project, if any, should be provided.	Mine Closure in Chapter -2
23	Impact on local transport infrastructure due to the Project should be indicated.	Transportation details mentioned in Chapter -2
24	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.	Details of the trees in the buffer zone given in Chapter No.3.
25	A detailed mine closure plan for the proposed project shall be included in EIA/EMP report which should be site-specific.	Mine closure plan is detailed in Chapter:4.
26	Public Hearing points raised and commitments of the Project Proponent on the same along with time bound Action Plan with budgetary provisions to implement the same should be provided and also incorporated in the final EIA,/EMP Report of the Project and to be submitted to SEIAA/SEAC with regard to the Office Memomndum of MoEF& CC accordingly.	Noted and agreed
27	The Public hearing advertisement shall be published in one major National daily and onemost circulated vernacular daily.	Noted and agreed
28	The PP shall produce/display the EIA report, Executive summary and other related information with respect to public hearing io Tamil Language also.	Noted and agreed
29	As a part of the study of flora and fauna around the vicinity of the proposed site, the EIA coordinator shall strive to educate	Noted and agreed

	the local students on the importance of preserving local flora and fauna by involving them in the study, wherever possible.	
30	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 in consultation with the DFO, State Agriculture University. The plant species with dense/moderate canopy of native origin should be chosen. Species of Small medium/tall trees altemating with shrubs should be planted io a mixed manner.	Species are proposed to plant in the safety barrier as mentioned in the ToR appendix. Proposed species are given in the Chapter No 4
31	Taller/one year old Saplings raised in appropriate size of bags; preferably eco-friendly bags should be planted in proper espacement 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.	It is a Fresh Lease. Around 900 trees are proposed to plant
32	A Disaster management Plan shall be prepared and included in the EIA/EMP Report.	Disaster management Plan details in Chapter-7
33	A Risk Assessment and management Plan shall be prepared and included in the EIA/EMP Report.	A Risk Assessment and management Plan Chapter- 7
34	Occupational Health impacts of the Project should be anticipated and the proposed preventive measures spelt out in detail. Details of pre-placement medical examination and periodical medical examination schedules should be incorporated in the EMP. The project specific occupational health mitigation measures with required facilities proposed in the mining area may be detailed.	Occupational Health impacts chapter- 10
35	Public health implications of the Project and related activities for the population in the impact zone should be systematically evaluated and the proposed lemedial measures should be detailed along with budgetary allocations.	It is explained in Chapter -3
36	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.	Details are listed in Chapter:3.
37	Details of litigation pending against the project, if any, with direction /order passed by any Court of Law against the Project should be given.	No Litigation is pending
38	Benefits of the Project if the Project is implemented should be spelt out. The benefits of the Project shall clearly indicate environmental, social, economic, employment potential, etc.	Noted and agreed
39	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	It is a Fresh Lease

	which shall duly be certified by MoEF&CC, Regional Office, Chennai (or) the concerned DEE/TNPCB.	
40	The PP shall prepare the EMP for the entire life of mine and also fumish the sworn affidavit stating to abide the EMP for the entire life of mine.	Noted and agreed
41	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 Reference besides attracting penal provisions in the Environment (Protection) Act, 1986.	Noted and agreed

TERMS OF REFERENCE (ToR) COMPLIANCE

P4 – Thiru.A.Rajarajacholan,

"ToR_issued_vide_Lr No. SEIAA-TN/F.No.9333/TOR-1234/2022 Dated :30.08.2022

SPECIFIC CONDITIONS		
1	The PP shall include the letter received fiom DFO concemed stating the proximity details of Reserve Forests, Protected Areas, Sanctuaries, Tiger reserve etc., upto a radius of 25 km from the proposed site.	Noted and agreed
2	In the casc of proposed lease in an existing (or old) quarry where the benches are not formed (or) panially formed as per the approved Mining Plan, lhe Project Proponent (PP) shall prepare and submit an 'Action Plan' for carrying out the realiSnmenl ofthe benchcs in the proposcd quarry lcase after it is approved by the conccmed Asst. Director of Geology and Mining du.ing lhe time ofappraisal for obtaining the EC.	Not applicable
3	The Proponcnt shall obtain Revised mining plan with benches and leaving adjaccnt safety distance on all the sides of the proposed mining area.	Revised mining Plan is attached
4	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 30m below ground level.	Depth of working is just 2m bgl.
5	The PP shall furnish the affidavit stating that the blasting operationin the proposed quarry is carried out by the statutory competent person as per the MMR 1961 such as blaster, mining mate, mine foreman, II/lst Class mines manager appointed by the proponent	Affidavit attached
6	Ihe EIA Coordinators shall obtain and fumish rhe details of quarry/quaries operated by the proponent in the past, either in the same Iocation or elsewhere itr the State with video and photographic evidences.	There is no quarry being operated by the project proponent.

7	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 a) what was the period of the operation and stoppage of the earlier mines with last work permit issued by the AD/DD mines? b) Quantity of minerals mined out c) Highest production achieved in any one year d) Detail of approved depth of mining e) Actual depth of the mining achieved earlier f) Name of the person already mined in that leases area g) If EC and CTO already obtained' the copy of the same shall be submitted h) whether the mining was carried out as per the approved mine plan (or EC if issued) with stipulated benches.	➢ It is a Fresh Lease application.
8	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).	Satellite imagery of the project area along with boundary coordinates is given in the Chapter No 1 Geomorphology of the area is given in Chapter No 2 Land use pattern of the project area is tabulated in the Chapter No.2. Land use pattern of the Study area is tabulated in the Chapter No.3
9	The PP shall carry out Drone Video survey covering in cluster. Greenbelt, fencing etc.,	Drone video covering the cluster area clearly stating the extent of the operation will be submitted in the final EIA report
10	The proponent shall furnish photgraphs of adequate fencing, green belt along the periphery including replantation of existing trees and safety distance between the adjacent quaries and water bodies nearby provided as per the approval mining plan.	Agreed, Photographs shall be provided after starting the work
11	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.	Details of Geological Resources and Proposed reserves are discussed under Chapter No. 2.
12	The Project Proponent shall provide the Organization chart indicating the appointment of various statutory officials and other competenl persons to be appointed as per the provrsions of Mines Act 1952 and the MMR, 1961 for carrying out the quarrying operations scientifically and systematically in order to ensure safety and to protect the environment.	Organization chart indicating Proposal for the appointment of Statutory officials is given in the Chapter No.7
13	The project proponent shall conduct the hydro-geological study considering the contour map of the water table detailing the number of ground water pumping & open wells, and surface water bodies such as rivers, tanks, canals, ponds etc. within 1km (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.	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.

	Necessary data and documentation are this regard may be provided.	
14	The proponent shall furnish the baseline data for the environmental and ecological parameters with regard to surface water/ground water quality, air quality, soil quality & Flora/fauna including traffic/vehicular movement study.	Baseline data for the environmental and ecological parameters with regard to surface water/ground water quality, air quality, soil quality, & flora/fauna including traffic/vehicular movement study to assess the cumulative impact of the proposed project on the environment is prepared as a Draft EIA EMP and will be finalized after public consultation and will be submitted as Final EIA /EMP Report.
15	The Proponent shall carry out the Cumulative impact study due to mining operations carried out in the quarry specifically with reference to the specific environment in terms of soil, health, biodiversity, air pollution, water pollution, climate change and flood control & health impacts. Accordingly, the Environment Management plan should be prepared keeping the concerned quarry and the surrounding habitations in the mind.	The Cumulative impact study due to mining operations is explained in chapter – 7
16	Rain water harvesting management with recharging details along with water balance (both monsoon & non-monsoon) be submitted.	At the last stage of mining operation, almost complete area will be worked to restoe the land to its optimum reclamation for future use as water reservoir
17	Issues relating to Mine Safety, including slope geometry in case of Cranite quarrying. blasting parameters etc. should be detailed.'lhe proposed safeguard measures in each case should also be provided.	Proposed quarry is for rough stone. Details of safety measures to be taken are given in section chap 2.
18	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 pre operational, operational and post operational phases and submitted. Inpact, if any, of change of land use should be given.	Land use and land cover of the study area is discussed in Chapter No. 3. Land use plan of the project area showing pre-operational, operational and post-operational phases are discussed in Chapter No. 2, Table No 2.3.
19	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.	Topsoil formation will be dumped in the West, East and Southern side of the 10.0 boundary barrier of the lease area.and it will be utilized for Plantation Purposes.
20	Since non-saleable waste /OB / intermediate r|aste etc. is huge in the granite quarry, the Proponent shall provide the derails pertaining to management of the above malerial with year wise ulilization and aveaage moving inventory be submitted.	Proposed project is Roughstone quarry
21	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.	Not Applicable. Project area / Study area is not declared in 'Critically Polluted' Area and does not come under 'Aravalli Range.
22	Description of water conservation measures proposed to be adopted itr the Project should be given. Details of rainwater harvesting proposed in the Project, if any, should be provided.	At the last stage of mining operation, almost complete area will be worked to restore the land to its optimum reclamation for future use as water reservoir. Mine Closure Plan in Chapter -2
23	Impact on local transport infrastructure due to the Project should be indicated.	Transportation details mentioned in Chapter -2

24	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.	Details of the trees in the buffer zone given in Chapter No.3.
25	A detailed mine closure plan for the proposed project shall be included in EIA/EMP report which should be site-specific.	Approved mining plan including mine closure plan is attached.
26	Public Hearing points raised and commitments of the Project Proponent on the same along with time bound Action Plan with budgetary provisions to implement the same should be provided and also incorporated in the final EIA,/EMP Report of the Project and to be submitted to SEIAA/SEAC with regard to the Office Memomndum of MoEF& CC accordingly.	Noted and agreed
27	The Public hearing advertisement shall be published in one major National daily and onemost circulated vernacular daily.	Noted and agreed
28	The PP shall produce/display the EIA report, Executive summary and other related information with respect to public hearing io Tamil Language also.	Noted and agreed
29	As a part of the study of flora and fauna around the vicinity of the proposed site, the EIA coordinator shall strive to educate the local students on the importance of preserving local flora and fauna by involving them in the study, wherever possible.	Noted and agreed
30	The purpose of green belt around the project is to capture the fugitive emissions, carbon sequestration and to attenuate the noise generated, in addition lo improving the aesthetics. A wide range of indigenous plant species should be planted as given in the appendix-l in consullation with thc DFO State Agticulture Universily Thc plant species with dense/moderate canopy of nalilc origin should be chosen Species of Small/medium/tall trees alternating with scrubs should be planted in a mixed manner.	Green belt plantation plan is provided in section and approved mining plan including green belt development plan is attached. And chapter 4
31	Taller/one year old Saplings raised in appropriate size of bags; preferably eco-friendly bags should be planted in proper espacement as per the advice of local forest authorities / botanist / Horticulturist with regard to site specific choices. The proponent shall earmark the greenbelt area with GPS coordinates all along the boundary of the project site with at least 3 meters wide and in between blocks in an organized manner.	Noted & agreed.
32	A Disaster management Plan shall be prepared and included in the EIA/EMP Report.	Disaster management Plan details in Chapter-7
33	A Risk Assessment and management Plan shall be prepared and included in the EIA/EMP Report.	A Risk Assessment and management Plan Chapter- 7
34	Occupational Health impacts of the Project should be anticipated and the proposed preventive measures spelt out in detail. Details of pre-placement medical examination and periodical medical examination schedules should be incorporated in the EMP. The project specific occupational health mitigation measures with required facilities proposed in the mining area may be detailed.	Occupational Health impacts chapter- 10
35	Public health implications of the Project and related activities for the population in the impact zone should be systematically evaluated and the	It is explained in Chapter -3

	proposed lemedial measures should be detailed along with budgetary allocations.	
36	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.	Details are listed in Chapter:3 and Chapt 4
37	Details of litigation pending against the project, if any, with direction /order passed by any Court of Law against the Project should be given.	No Litigation is pending
38	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.	Project benefits are detailed in chapter 7 and 8,10
39	If any quarrying operations were carried out in the proposed quarrying site for which now the EC is sought, the Project Proponent shall furnish the detailed compliance to EC conditions given in the previous EC with the site photographs which shall duly be certified by MoEF&CC, Regional Office, Chennai (or) the concerned DEE/TNPCB.	It is Fresh Lease
40	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 Reference besides attracting penal provisions in the Environment (Protection) Act, 1986.	Noted and agreed
ADDITIONAL CONDITIONS		
1	Restricting the ultimate depth of mining upto 46m (39m AGL & 7m BGL) and quantity of 277250 cu.m ofRough stone are permitted for mining over a period olfive years considering the environmental impacts due to the mining, safety precautionary measures of the working personnel and following the principlc oflhe sustainable mining.	Depth of mining plan as per approved mining plan
2	Cluster Management Committee, which must include all the proponents in the cluster as members including thc existing as well as proposed quarry.	Noted
3	The members must coordinate among themselves for thc effective implementation of EMP as committed including green belt development, Water sprinkling. tree plantation, blasting, etc,	Chapter 6 details of Methodology of Monitoring Mechanism
4	The List of members of thc committees formed shall be submitted to AD/Mines before the execution of mining lease and thc same shall be updated every year to the AD/ Mines.	Noted
5	Detailed Operational Plan must be submitted which must include the blasting frequency with respect to thc nearby quarry situated in the cluster, thc usage	Noted

	of haul roads by thc individual quarry in thc form of route map and network.	
6	The committee shall deliberate on risk management plan pertaining to the cluster in a holistic manncr especially during natural calamities like intense rain and thc mitigation measures considering the inundation of the cluster and evacuation plan.	Agreed
6	The committee shall deliberate on risk managemcnt plan pertaining to the cluster in a holistic manner especially during natural calamities likc intense rain and the mitigation measures considering lhe inundation ofthe clustcr and evacuation plan.	Agreed
7	The Cluster Management Committee shall form Environmental Policy to practice sustainable mining in a scientific and systematic manner in accordance with the law. The role played by thc committee in implementing thc environmental policy devised shall be given in detail.	Agreed
8	The committee shall furnish action plan regarding the restoration strategy with respect to thc individual quarry falling under the cluster in a holistic manner.	Approved mining plan including mine closure plan is attached.
9	The committee shall furnish the Emergency Management plan within the cluster.	Noted, Emergency Management plan is given in section7
10	The committee shall deliberate on the health of the workers/staff involved in the mining as well as the health of the public.	No Public Health Implications anticipated due to this project. Details of CER and CSR are discussed under Chapter 8.
11	Detailed study shall be carried out in regard to impact of mining around the proposed mine lease area covering the entire mine lease period as per precise area communication order issued from reputed research institutions on the fallowing a) Soil health & bio-diversity. b) Climate change leading to droughts, floods etc. c) Pollution leading to release of Greenhouse gases (GHG), rise in Temperature, & Livelihood of the local People. d) Possibilities of water contamination and impact on aquatic ecosystem health. e) Agriculture, Forestry & Traditional practices f) Bio-geochemical processes and its foot prints including environmental stress. g) Sediment geochemistry in the surface streams	Impact assessment is carried out on various environmental components and is provided in chapter 4

	h) Hydrothermal/Geothermal effect due to destruction in the environment.	
12	The committee shall furnish an action plan to achieve sustainable development goals with reference to water. sanitation & safety.	Mining activity shall be carried out sustainable and plan for EMP chapter 10.
13	The committcc shall furnish thc fire safety and evacuation plan in thc case of fire accidents.	Disaster management Plan details in Chapter-7
14	The measures taken to control Noise, Air, water. Dust Control and steps adopted to efficiently utilise the energy shall be furnished.	EMP details in chapter 10
15	Details of type of vegetations including no. of trees & shrubs within thc proposed mining area and. If so. transplantation of such vegetations all along thc boundary of the proposed mining area shall committed mentioned in EMP.	Chapter 3 details of Fauna and flora diversification and impacts of Environment (Chapter 4)
16	Impact on surrounding agricultural fields around the proposed mining Area.	There is no impact agriculture field. Chapter 3, Land environment details of Landuse/Landcover.
17	Erosion Control measures.	Slope stability will be studied and submitted along with final EIA report.
18	Impact on soil flora & vegetation around the project sitc.	Chapter 3 details of Fauna and flora diversification and impacts of Environment (Chapter 4)
19	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.	Impact assessment is carried out on various environmental components and is provided in chapter 4
20	The project proponent shall fumish VAO certificate with reference to 300m radius regard to approved habitations. schools. Archaeological sites. Structures, railway lines. roads. Water bodies such as streams. odai, vaari, canal, channel, river, lake pond, tank etc.	AD Letter 500m Cluster certificate.
21	As per the MoEF& CC office memorandum F.No.22-65/2017-IA.III dated: 30.09.2020 and 20.10.2020 the proponent shall address the concerns raised during the public consultation and all the activities proposed shall be part of the Environment Management plan.	To be furnished
22	The Environmental Impact Assessment shall study in detail the carbon emission and also suggest the measures to mitigate carbon emission including development of carbon sinks and temperature reduction including control of other emission and climate mitigation activities.	Noted

23	The Environmental Impact Assessment should study the biodiversity, the natural ecosystem the soil micro flora, fauna and so seed banks and suggest measures to maintain the natural Ecosystem.	Chapter 3, details of Ecology and Biodiversity
24	Action should specifically suggest for sustainable management of the area and restoration of ecosystem for flow of goods and services.	Agreed
25	The project proponent shall study impact on fish habitats and the rood web/ food chain in the water body and Reservoir.	Project will not impact any waterbody as there is no 2km radius of project site.
26	The terms of Reference should specifically study impact on soil health, soil erosion. the soil physical. chemical components and microbial components.	Yes, included chapter-3 soil and physical components.
27	The Environmental Impact assessment should study impact on forest, vegetation, endemic vulnerable and endangered indigenous flora and fauna.	There is no forest/wildlife within 10km radius, chapter 3 details of Ecology and Biodiversity, and 4 endemic vulnerable and endangered indigenous flora and fauna.
28	The Environmental Impact Assessment should study impact on standing trees and the existing trees should be numbered and action suggested for protection.	Chapter 3 details of Flora and Fauna
29	The Environmental Impact Assessment should study on wetlands, water bodies. Rivers streams. lakes and farmer sites.	Np wet land, water bodies, rivers streams, lakes and farmer sites will be affected due to this project.
30	The Environmcntal Impact Assessment should hold detailed study on EMP with budget for Green belt development and mine closure plan including disaster management plan.	Table 2.15: Water Requirement for The Project. And chapter 10, detailed study on EMP.
31	The Environmental impact Assessment should study impact on climatic change. Temperature rise, pollution and above soil & below soil carbon stock.	Yes, chapter 3 and 4 incorporated details of Climate parameters and soil chemical components.
32	The Environmental Impact Assessment should study impact on protected areas' Reserve Forests. National Parks, Corridors and Wildlife pathways, near project site.	There is no RF and wildlife nearby project site.
33	The project proponent shall study and furnish the impact of project on plantations in adjoing patta lands, Horticulture, Agriculture and livestock.	Green belt plantation plan is provided in section 2 and approved mining plan including green belt development plan is attached as Annexure-VI
34	The project proponent shall study and furnish the details on potential fragmentation impact of natural environment, by the activities.	Chapter 3 details of Ecology and Bio diversity.

35	The project proponent shall study and fumish the impact on aquatic plants and animals in water bodies and possible scars on the landscape, damages to nearby caves, heritage site and archaeological sites possible land form changes visual and aesthetic impacts.	There is no water body within 2km radius of the project site.
36	The project proponent shall study and furnish the possible pollution due to plastic and microplastic on the environment. the ecological risks and impacts of plastic & microplastics on aquatic environment and fresh water systems due to activities, contemplated during mining may be investigated and reported.	No such impacts are anticipated due to project
37	The project proponent shall detail study on impact of mining on Reserve forests free ranging wildlife.	There is no RF and wildlife due to proposed project.
38	Hydro-geological study considering the contour map of the water table detailing the number of' ground water pumping & open wells, and surface water bodies such as rivers' tanks, canals, ponds etc. within 1 km (radius) so as to assess the impacts on the nearby waterbodies due to mining activity. Based on actual monitored data. it may clearly be shown whether working will intersect groundwater. Necessary data and documentation in this regard may be provided, covering the entire mine lease period.	Chapter3, details of Water Environment with Ground water and surface water details etc. Maximum working depth 41m bgl. The ground water table is reported as 70m below surface ground level in nearby wells of this area. Now, the present quarry shall be proposed above the water table and hence, quarrying may not affect the ground water so mine working will not be intersecting the ground water table.
39	To fumish disaster management plan and disaster mitigation measures in regard to all aspects to avoid/reduce vulnerability to hazards & to cope with disaster/untoward accidents in &around the proposed mine lease area due 10 the proposed method or mining activity, & its related activities covering the entire mine lease period as per precise arca communication order issued.	Chaper 7, 7.3 disaster management plan furnished.
40	To furnish risk assessment and management plan including anticipated vulnerabilities during operational and post operational phases of Mining.	Chaper 7, 7.2 risk assessment and management plan furnished.
41	detailed Mine Closure plan covering the entire mine lease period as per precise area communication order issued.	Chapter2, detailed Mine Closure plan Closure Plan and Sections Approved mining plan including mine closure plan is attached.
42	Detailed Environment Management plan along with adaptation, mitigation & remedial strategies	Detailed Environment Management Plan for the project to mitigate the

	covering the entire mine lease period as per precise area communication order issued.	anticipated impacts described under Chapter 4 is discussed under Chapter 10.

STANDARD TERMS OF REFERENCE		
1.	Year-wise production details since 1994 should be given, clearly stating the highest production achieved in any one year prior to 1994. It may also be categorically informed whether there had been any increase in production after the EIA Notification 1994 came into force, w.r.t. the highest production achieved prior to 1994.	**Not applicable.** This is Not a violation category project. This proposal falls under B1 Category (Cluster Condition).
2.	A copy of the document in support of the fact that the Proponent is the rightful lessee of the mine should be given.	The applied land for quarrying is a Goverment Land. Document is enclosed along with Approved Mining Plan as Annexure Volume 1.
3.	All documents including approved mine plan, EIA and Public Hearing should be compatible with one another in terms of the mine lease area, production levels, waste generation and its management, mining technology etc. and should be in the name of the lessee.	**Noted & agreed.**
4.	All corner coordinates of the mine lease area, superimposed on a High-Resolution Imagery/ toposheet, topographic sheet, geomorphology and geology of the area should be provided. Such an Imagery of the proposed area should clearly show the land use and other ecological features of the study area (core and buffer zone).	**Map showing –** Project area is superimposed on Satellite imagery is enclosed in Figure No. 2.1 Page No. 23 Project area boundary coordinates superimposed on Toposheet – Figure No. 1.3, Page No. 14 Surface Features around the project area covering 10km radius – Figure No. 2.24, Page No. 46 Geology map of the project area covering 10km radius - Figure No. 2.27, Page No. 57 Geomorphology Map of the Study Area covering 10 km radius – Figure No. 2.28, Page No. 58
5.	Information should be provided in Survey of India Toposheet in 1:50,000 scale indicating geological map of the area, geomorphology of land forms of the area, existing minerals and mining history of the area, important water bodies, streams and rivers and soil characteristics.	**Map showing –** Geology map of the project area covering 10km radius - Figure No. 2.27, Page No. 57 Geomorphology Map of the Study Area covering 10 km radius – Figure No. 2.28, Page No. 58
6.	Details about the land proposed for mining activities should be given with information as to whether mining conforms to the land use policy of the State; land diversion for mining should have approval from State land use board or the concerned authority.	The applied area was inspected by the officers of Department of Geology along with revenue officials and found that the land is fit for quarrying under the policy of State Government.
7.	It should be clearly stated whether the proponent Company has a well laid down Environment Policy approved by its Board of Directors? If so, it may be spelt out in the EIA Report with description of the prescribed operating process/procedures to bring into focus any infringement/deviation/ violation of the environmental or forest norms/conditions? The hierarchical system or administrative order of the Company to deal with the environmental issues and for ensuring compliance with the EC conditions may also be given. The system of reporting of non-compliances / violations of environmental norms to the Board of Directors of the Company and/or shareholders or stakeholders at large, may also be detailed in the EIA Report.	The proponent has framed their Environmental Policy and the same is discussed in the Chapter No 10.1, Page No 239.

8.	Issues relating to Mine Safety, including subsidence study in case of underground mining and slope study in case of open cast mining, blasting study etc. should be detailed. The proposed safeguard measures in each case should also be provided.	It is an opencast quarrying operation proposed to operate in Mechanized method. The rough stone formation is a hard, compact and homogeneous body. The height and width of the bench will be maintained as 5m with 90^0 bench angles. Quarrying activities will be carried out under the supervision of Competent Persons like Mines Manager, Mines Foreman and Mining Mate. Necessary permissions will be obtained from DGMS after obtaining Environmental Clearance.
9.	The study area will comprise of 10 km zone around the mine lease from lease periphery and the data contained in the EIA such as waste generation etc., should be for the life of the mine / lease period.	**Noted & Agreed.** The study area considered for this study is 10 km radius and all data contained in the EIA report such as waste generation etc., is for the Life of the Mine / lease period.
10.	Land use of the study area delineating forest area, agricultural land, grazing land, wildlife sanctuary, national park, migratory routes of fauna, water bodies, human settlements and other ecological features should be indicated. Land use plan of the mine lease area should be prepared to encompass preoperational, operational and post operational phases and submitted. Impact, if any, of change of land use should be given.	Land use and land cover of the study area is discussed in Chapter No. 3, Page No. 102. 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, Page No 49.
11.	Details of the land for any Over Burden Dumps outside the mine lease, such as extent of land area, distance from mine lease, its land use, R&R issues, if any, should be given	**Not Applicable.** There is no waste anticipated during this quarry operation. The entire quarried out rough stone will be transported to the needy customers. No Dumps is proposed outside the lease area.
12.	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.	**Not Applicable.** There is no Forest Land involved in the proposed project area. The proposed project area is a Government land. Approved Mining Plan is enclosed as Annexure Volume 1.
13.	Status of forestry clearance for the broken-up area and virgin forestland involved in the Project including deposition of net present value (NPV) and compensatory afforestation (CA) should be indicated. A copy of the forestry clearance should also be furnished.	**Not Applicable.** The proposed project area does not involve any Forest Land.
14.	Implementation status of recognition of forest rights under the Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 should be indicated.	**Not Applicable.** The project doesn't attract Recognition of Forest Rights Act, 2006.
15.	The vegetation in the RF / PF areas in the study area, 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.	**Not Applicable.** There are No National Parks, Biosphere Reserves, Wildlife Corridors, and Tiger/Elephant Reserves within 10 km Radius from the periphery of the project area.

17.	Location of National Parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, Ramsar site Tiger/ Elephant Reserves/(existing as well as proposed), if any, within 10 KM of the mine lease should be clearly indicated, supported by a location map duly authenticated by Chief Wildlife Warden. Necessary clearance, as may be applicable to such projects due to proximity of the ecologically sensitive areas as mentioned above, should be obtained from the Standing Committee of National Board of Wildlife and copy furnished	**Not Applicable.** There are No National Parks, Biosphere Reserves, Wildlife Corridors, and Tiger/Elephant Reserves within 10 km Radius from the periphery of the project area.
18.	A detailed biological study of the study area [core zone and buffer zone (10 KM radius of the periphery of the mine lease)] shall be carried out. Details of flora and fauna, endangered, endemic and RET Species duly authenticated, separately for core and buffer zone should be furnished based on such primary field survey, clearly indicating the Schedule of the fauna present. In case of any scheduled-I fauna found in the study area, the necessary plan along with budgetary provisions for their conservation should be prepared in consultation with State Forest and Wildlife Department and details furnished. Necessary allocation of funds for implementing the same should be made as part of the project cost.	Detailed biological study of the study area [core zone and buffer zone (10 km radius of the periphery of the mine lease)] was carried out and discussed under Chapter No. 3, Page No. 145 – 156. There is no schedule I species of animals observed within study area as per Wildlife Protection Act 1972 as well as no species is in vulnerable, endangered or threatened category as per IUCN. There is no endangered red list species found in the study area.
19.	Proximity to Areas declared as 'Critically Polluted' or the Project areas likely to come under the 'Aravalli Range', (attracting court restrictions for mining operations), should also be indicated and where so required, clearance certifications from the prescribed Authorities, such as the SPCB or State Mining Department should be secured and furnished to the effect that the proposed mining activities could be considered.	**Not Applicable.** Project area / Study area is not declared in 'Critically Polluted' Area and does not come under 'Aravalli Range.
20.	Similarly, for coastal Projects, A CRZ map duly authenticated by one of the authorized agencies demarcating LTL. HTL, CRZ area, location of the mine lease w.r.t CRZ, coastal features such as mangroves, if any, should be furnished. (Note: The Mining Projects falling under CRZ would also need to obtain approval of the concerned Coastal Zone Management Authority).	**Not Applicable.** 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.	**Not Applicable.** There are no approved habitations within a radius of 300 meters. Therefore, R&R Plan / Compensation details for the Project Affected People (PAP) is not anticipated and Not Applicable for this project.
22.	One season (non-monsoon) [i.e. March-May (Summer Season); October-December (post monsoon season) ; December-February (winter	Baseline Data were collected for One Season (Summer Season) March – May 2022 as per CPCB Notification and MoEF & CC Guidelines. Details in Chapter No. 3, Page No. 100 – 167.

	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.	
23.	Air quality modelling should be carried out for prediction of impact of the project on the air quality of the area. It should also take into account the impact of movement of vehicles for transportation of mineral. The details of the model used and input parameters used for modelling should be provided. The air quality contours may be shown on a location map clearly indicating the location of the site, location of sensitive receptors, if any, and the habitation. The wind roses showing pre-dominant wind direction may also be indicated on the map.	Air Quality Modelling for prediction of incremental GLC's of pollutant was carried out using AERMOD view 9.6.1 Model. Details in Chapter No. 4, Page No. 172 – 178.
24.	The water requirement for the Project, its availability and source should be furnished. A detailed water balance should also be provided. Fresh water requirement for the Project should be indicated.	Total Water Requirement: 2.8 KLD Discussed under Chapter 2, Table No 2.15 and Page No 95.
25.	Necessary clearance from the Competent Authority for drawl of requisite quantity of water for the Project should be provided.	**Not Applicable.** Water for dust suppression, greenbelt development and domestic use will be sourced from accumulated rainwater/seepage water in mine pits and purchased from local water vendors through water tankers on daily requirement basis. Drinking water will be sourced from the approved water vendors.
26.	Description of water conservation measures proposed to be adopted in the Project should be given. Details of rainwater harvesting proposed in the Project, if any, should be provided.	Part of the working pit will be allowed to collect rain water during the spell of rain will be used for greenbelt development and dust suppression. The Mine Closure Plan is prepared for converting the excavated pit into rain water harvesting structure and serve as water reservoir for the project village during draught season.
27.	Impact of the Project on the water quality, both surface and groundwater, should be assessed and necessary safeguard measures, if any required, should be provided.	Impact Studies and Mitigation Measures of Water Environment including Surface Water and Ground Water are discussed in Chapter 4, Page No. 133.
28.	Based on actual monitored data, it may clearly be shown whether working will intersect groundwater. Necessary data and documentation in this regard may be provided. In case the working will intersect groundwater table, a detailed Hydro Geological Study should be undertaken and Report furnished. The Report inter-alia, shall include details of the aquifers present and impact of mining activities on these aquifers. Necessary permission from Central Ground Water Authority for working below ground water and for pumping of ground water should also be obtained and copy furnished.	**Not Applicable.** The ground water table inferred 63-68m below ground level. The ultimate depth of quarry is 41m bgl. This proposal of 41m below ground level will not intersect the ground water table, which is inferred from the hydro-geological carried out at the project site. Discussed under Chapter 3, Page No.112.

29.	Details of any stream, seasonal or otherwise, passing through the lease area and modification / diversion proposed, if any, and the impact of the same on the hydrology should be brought out.	**Not Applicable.** There is no stream, seasonal or other water bodies passing within the project area. Therefore, no modification/ diversion of water bodies is anticipated.
30.	Information on site elevation, working depth, groundwater table etc. Should be provided both in AMSL and Bgl. A schematic diagram may also be provided for the same.	Highest elevation of the project area is 448-400m AMSL. Ultimate depth of the mine is 41m BGL Water level of the area is 63-68m BGL
31.	A time bound Progressive Greenbelt Development Plan shall be prepared in a tabular form (indicating the linear and quantitative coverage, plant species and time frame) and submitted, keeping in mind, the same will have to be executed up front on commencement of the Project. Phase-wise plan of plantation and compensatory afforestation should be charted clearly indicating the area to be covered under plantation and the species to be planted. The details of plantation already done should be given. The plant species selected for green belt should have greater ecological value and should be of good utility value to the local population with emphasis on local and native species and the species which are tolerant to pollution.	Greenbelt Development Plan is discussed under Chapter 4, Page No.183 – 187.
32.	Impact on local transport infrastructure due to the Project should be indicated. Projected increase in truck traffic as a result of the Project in the present road network (including those outside the Project area) should be worked out, indicating whether it is capable of handling the incremental load. Arrangement for improving the infrastructure, if contemplated (including action to be taken by other agencies such as State Government) should be covered. Project Proponent shall conduct Impact of Transportation study as per Indian Road Congress Guidelines.	Traffic density survey was carried out to analyse the impact of Transportation in the study area as per IRC guidelines 1961 and it is inferred that there is no significant impact due to the proposed transportation from the project area. Details in Chapter 2, Page No.93 - 94.
33.	Details of the onsite shelter and facilities to be provided to the mine workers should be included in the EIA Report.	Infrastructure & other facilities will be provided to the Mine Workers after the grant of quarry lease and the same has been discussed in the Chapter No. 2 Page No.92 – 99.
34.	Conceptual post mining land use and Reclamation and Restoration of mined out areas (with plans and with adequate number of sections) should be given in the EIA report.	Discussed under Chapter 2, Page No. 83 – 90. Mine Closure Plan is a part of Approved Mining Plan enclosed as Annexure Volume – 1.
35.	Occupational Health impacts of the Project should be anticipated and the proposed preventive measures spelt out in detail. Details of pre-placement medical examination and periodical medical examination schedules should be incorporated in the EMP. The project specific occupational health mitigation measures with required facilities proposed in the mining area may be detailed.	Occupational Health Impacts of the project and preventive measures are detailed under Chapter 4, Page No.190.
36.	Public health implications of the Project and related activities for the population in the impact zone should be systematically evaluated and the proposed remedial measures should be detailed along with budgetary allocations.	No Public Health Implications anticipated due to this project. Details of CER and CSR are discussed under Chapter 8, Page No. 236.
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	No Negative Impact on Socio Economic Environment on the Study Area is anticipated and this project shall benefit the Socio-Economic Environment by ways of employment for 14 people directly and 10 people indirectly.

	dimensions may be given with time frames for implementation.	Details in Chapter 4, Page No. 189.
38.	Detailed environmental management plan (EMP) to mitigate the environmental impacts which, should inter-alia include the impacts of change of land use, loss of agricultural and grazing land, if any, occupational health impacts besides other impacts specific to the proposed Project.	Detailed Environment Management Plan for the project to mitigate the anticipated impacts described under Chapter 4 is discussed under Chapter 10, Page No. 239 – 247.
39.	Public Hearing points raised and commitment of the Project Proponent on the same along with time bound Action Plan with budgetary provisions to implement the same should be provided and also incorporated in the final EIA/EMP Report of the Project.	The outcome of public hearing will be updated in the final EIA/AMP report
40.	Details of litigation pending against the project, if any, with direction /order passed by any Court of Law against the Project should be given.	No litigation is pending in any court against this project.
41.	The cost of the Project (capital cost and recurring cost) as well as the cost towards implementation of EMP should be clearly spelt out.	Project Cost is Rs.44,71,000/- CER Cost is Rs.5,00,000 In order to implement the environmental protection measures, an amount of Rs.7.02 lakhs as capital cost and recurring cost as Rs.2.05 lakhs as recurring cost is proposed considering present market price considering present market scenario for the proposed project.
42.	A Disaster management Plan shall be prepared and included in the EIA/EMP Report.	Details in Chapter 7.3, Page No. 202 – 204.
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, Page No. 236 – 237.
44.	**Besides the above, the below mentioned general points are also to be followed: -**	
a)	Executive Summary of the EIA/EMP Report	Enclosed as separate booklet.
b)	All documents to be properly referenced with index and continuous page numbering.	All the documents are properly referenced with index and continuous page numbering.
c)	Where data are presented in the Report especially in Tables, the period in which the data were collected and the sources should be indicated.	List of Tables and source of the data collected are indicated.
d)	Project Proponent shall enclose all the analysis/testing reports of water, air, soil, noise etc. using the MoEF&CC/NABL accredited laboratories. All the original analysis/testing reports should be available during appraisal of the Project	Baseline monitoring reports are enclosed with This report in Chapter 3. Original Baseline monitoring reports will be submitted in the final EIA report during appraisal.
e)	Where the documents provided are in a language other than English, an English translation should be provided.	Not Applicable.
f)	The Questionnaire for environmental appraisal of mining projects as devised earlier by the Ministry shall also be filled and submitted.	Will be enclosed along with Final EIA EMP Report.
g)	While preparing the EIA report, the instructions for the Proponents and instructions for the Consultants issued by MoEF&CC vide O.M. No. J-11013/41/2006-IA.II(I) Dated: 4th August, 2009, which are available on the website of this Ministry, should be followed.	**Noted & Agreed.** Instructions issued by MoEF & CC O.M. No. J-11013/41/2006-IA.II (I) Dated: 4th August, 2009 are followed.
h)	Changes, if any made in the basic scope and project parameters (as submitted in Form-I and the PFR for securing the TOR) should be brought to the attention of MoEF&CC with reasons for such changes and permission should be sought, as the TOR may also have to be altered. Post Public Hearing changes in structure and content of the	**Noted & Agreed.**

	draft EIA/EMP (other than modifications arising out of the P.H. process) will entail conducting the PH again with the revised documentation	
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. 2.12 Page No. 34 Geological Plan – Figure No 2.29 Page No. 59 Working Plan – Figure No 2.29 Page No. 59 Closure Plan – Figure No.2.40 Page No. 70

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1. INTRODUCTION

1.0 PREAMBLE

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

Rough Stone is the major requirements for construction industry. This EIA report is prepared by considering Cumulative load of the proposed Palapatti Rough Stone Quarries, four proposed Quarries with total extent of Cluster of 5.50.0 ha at Palapatti Village, Valappady Taluk, Salem District and Tamil Nadu State, cluster area calculated as per MoEF & CC Notification S.O. 2269(E) Dated 1st July 2016.

This EIA Report is prepared in compliance with ToR obtained for the below proposals in Table 1.1 and the Baseline Monitoring study has been carried out during the period of March – May 2022

TABLE 1.1: ToR OBTAINED PROJECTS

Code.	Proponent Name	Extent (Ha)	Terms of Reference (ToR)
P1	Thiru. S.Dhanapal	1.00.0	Lr No. SEIAA-TN/F.No.8121/SEAC/TOR-930/2020 Dated :16.04.2021
P2	Thiru.K.Venkatraman	1.50.0	Lr No. SEIAA-TN/F.No.9332/TOR-1244/2022 Dated :30.08.2022
P3	Tmt.S.Sumathi	1.50.0	Lr No. SEIAA-TN/F.No.9685/SEAC/TOR-1428/2022 Dated :18.04.2023
P4	Thiru.A.Rajarajacholan	1.50.0	Lr No. SEIAA-TN/F.No.9333/TOR-1234/2022 Dated :30.08.2022

Source: ToR Letter's of the respective project proponents

1.1 PURPOSE OF THE REPORT

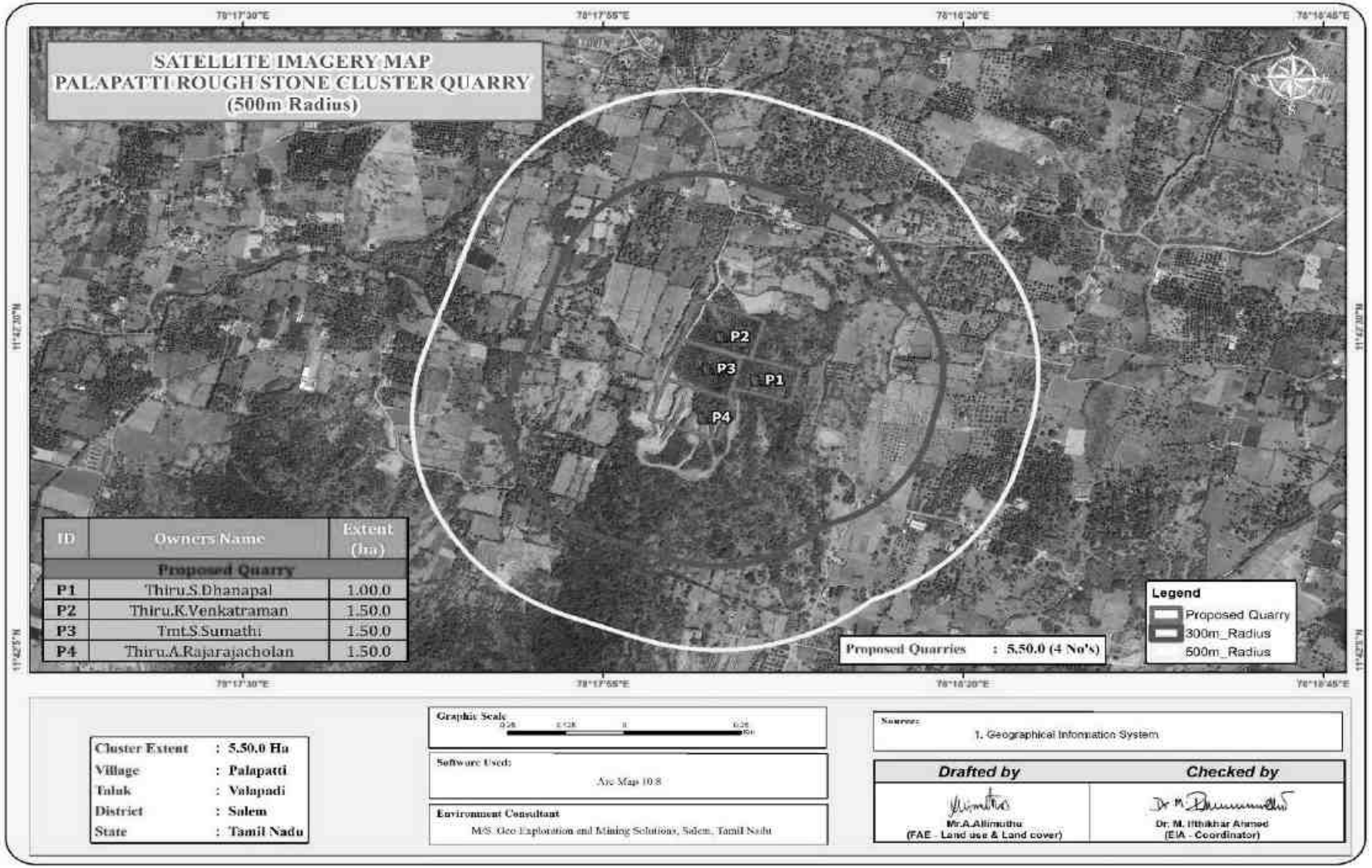
The Ministry of Environment and Forests, Govt. of India, through its EIA notification S.O. 1533(E) of 14thSeptember 2006 and its subsequent amendments as per Gazette Notification S.O. 3977 (E) of 14thAugust 2018, Mining Projects are classified under two categories i.e., A (> 100 Ha) and B (≤ 100 Ha),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

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

This 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"

FIGURE1.1: SATELLITE IMAGERY CLUSTER QUARRIES



1.2 IDENTIFICATION OF PROJECT AND PROJECT PROPONENT

1.2.1 Identification of Project

TABLE 1.1: PROJECT IDENTIFICATION

Name of the Project	Thiru. S.Dhanapal Rough Stone Quarry
S.F. No.	106 (Part-1)
Extent	1.00.0 ha
Land Type	Poramboke Land
Village Taluk and District	Palapatti Village, Valappady Taluk, Salem District

Name of the Project	Thiru.K.Venkatraman, Rough Stone Quarry
S.F. No.	106 (Part-I1)
Extent	1.50.0 ha
Land Type	Poramboke Land
Village Taluk and District	Palapatti Village, Valappady Taluk, Salem District

Name of the Project	Tmt.S.Sumathi, Rough Stone Quarry
S.F. No.	106 (Part-II1)
Extent	1.50.0 ha
Land Type	Poramboke Land
Village Taluk and District	Palapatti Village, Valappady Taluk, Salem District

Name of the Project	Thiru.A.Rajarajacholan, Rough Stone Quarry
S.F. No.	106 (Part-1V)
Extent	1.50.0 ha
Land Type	Poramboke Land
Village Taluk and District	Palapatti Village, Valappady Taluk, Salem District

Source: Approved Mining Plan

1.2.2 Identification of Project Proponent

TABLE 1.2: DETAILS OF PROJECT PROPONENT

Name of the Project Proponent	**Thiru. S.Dhanapal**
Communication Address	S/o. Sengodan, No.438, Mahakaliyamman Kovil Street, Dadagapatti Post, , Salem District– 636 006.
Mobile	+91 9865481777
Status	Proprietor
Name of the Project Proponent	**Thiru.K.Venkatraman**
Communication Address	S/o. Thiru.Krishnan No.74A/77A, Narayanan Pillai Street, Peramanur, Salem District– 636 007.
Mobile	-
Status	Proprietor
Name of the Project Proponent	**Tmt.S.Sumathi**
Communication Address	W/o.Sathishkumar, No.3/43, Nadu Street, Singipuram, Vazhappadi, Salem District– 636 115
Mobile	-
Status	Proprietor
Name of the Project Proponent	**Thiru.A.Rajarajacholan**
Communication Address	S/o. Alagappan, No.3/22, Rajaveethi, Minnampalli Post, Vazhappadi, Salem District– 636 106
Mobile	-

Status	Proprietor

Source: Approved Mining Plan

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 by deploying Heavy Earth Moving Machineries without deep hole drilling and blasting by Jack Hammer Drilling & Slurry Explosive during blasting by forming 5.0 m bench height and 5.0 m bench width. Excavator and tippers are proposed for Loading and transportation. Rock Breakers are proposed to be deployed to avoid secondary blasting.

TABLE 1.3: BRIEF DESCRIPTION OF THE APPLIED PROJECT "P1"

Name of the Quarry	Thiru. S.Dhanapal Rough Stone Quarry	
Toposheet No	58-I/06	
Latitude between	11°42'24.17"N to 11°42'27.73"N	
Longitude between	78°18'03.95"E to 78°18'08.71"E	
Highest Elevation	448-400 m AMSL	
Proposed Depth of Mining	41 m agl (1m Topsoil + 40m Rough Stone)	
Geological Resources	Rough Stone in m^3	Topsoil m^3
	4,38,620	10,112
Mineable Reserves	Rough Stone in m^3	Topsoil m^3
	1,51,795	6,372
Proposal for this Mining Plan Period	Rough Stone in m^3	Topsoil m^3
	83,425	6,372
Existing Pit Dimension	-	
Ultimate Pit Dimension	108m (L) x 59m (W) x 71m (D) (56m agl +15 bgl)	
Water Level in the surrounds area	63 – 68 m bgl	
Method of Mining	Opencast Mechanized Mining Method involving drilling and blasting	
Topography	The lease applied area is hilly terrain. The area has gentle slope with a gradient of 1 to 4 towards Eastern side. The altitude of the area is 448-400m (max) above mean sea level. The area is covered by 1m (avg) thickness of Topsoil Formation. Massive Charnockite is found after 1m (Topsoil Formation) which is clearly inferred from the nearby existing quarry pit.	
Machinery proposed	Jack Hammer	2 Nos
	Compressor	1 Nos
	Excavator with Bucket & Rock Breaker	1 Nos
	Tippers	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	14 Nos	
Total Project Cost	Project Cost	Rs.40,91,000/-
	Environment Monitoring Cost	Rs.3,80,000/-
	Total	Rs.44,71,000/-
CER Cost	Rs.5,00,000/-	
Nearby Water Bodies	Tank near Anuppur	4.25km NE
	Tank near Kuttathupatti	2.40km NE
	Tank near Achanguttaipatti	5.63km NW
	Tank near Valasaiyur	5.25km SW
	Tank near D. Perumapalayam	7.47km SW
	Tank near Pallapatty	6.88km SW
	Tank near Poovanur	5.37km NW
	Tank near Vellalagundam	6km SE
	Tank near Chinnakavundapuram	7km SW
	Tank near Sukkampatti	5.2km NW
	Tank Near Eripudur	1.8km SW
Greenbelt Development Plan	Proposed to plant 600 trees in the 7.5m safety distance and village road	

Proposed Water Requirement	2.8 KLD
Nearest Habitation	660m Southeast

Source: Approved Mining Plan

TABLE 1.4: BRIEF DESCRIPTION OF THE APPLIED PROJECT "P2"

Name of the Quarry	Thiru.K. Venkatraman Rough Stone Quarry	
Toposheet No	58-I/06	
S.f No & Extent	106 (P-IIq) and 1.50.0 Ha	
Land type	Government Poramboke Land	
Lease Period	10	
Proposed Period of Mining	5	
Latitude between	11°42'30.41"N to 11°42'28.96"N	
Longitude between	78°18'06.24"E to 78°18'00.47"E	
Highest Elevation	447 m AMSL	
Proposed Depth of Mining	43 m (1m Topsoil + 42m Rough Stone)	
Geological Resources	Rough Stone in m^3	Topsoil m^3
	7,80,604	15,000
Mineable Reserves	Rough Stone in m^3	Topsoil m^3
	3,39,516	11,700
Proposal for this Mining Plan Period	Rough Stone in m^3	Topsoil m^3
	3,02,716	11,700
Existing Pit Dimension	-	
Ultimate Pit Dimension	130.0m (L) x 90m (W) x 63m (D)	
Water Level in the surrounds area	70m bgl	
Method of Mining	Opencast Mechanized Mining Method involving drilling and blasting	
Topography	The lease applied for quarry lease is almost plain area sloping towards western covered with Roughstone which does not sustain any type of vegetation. The altitude of the area is 447m Amsl.	
Machinery proposed	Jack Hammer	5 Nos
	Hydraulic Excavator	1 Nos
	Tippers	2 Nos
Blasting Method	Controlled Blasting Method by shot hole drilling and small dia of 25mm slurry explosive are proposed to be used for shattering and heaving effect for removal and winning of Rough Stone. No deep hole drilling is proposed.	
Proposed Manpower Deployment	18 Nos	
Total Project Cost	Fixed Cost	Rs.40,90,000/-
	Operational cost	Rs. 30,00,000/-
	Environment Monitoring Cost	Rs.3,50,000/-
	Total	Rs.74,40,000/-
CER Cost @ 2% of Project Cost	Rs.5,00,000/-	
Nearby Water Bodies	Tank near Anuppur	4.34km NE
	Tank near Kuttathupatti	2.54km NE
	Tank near Achanguttaipatti	5.47km NW
	Tank near Valasaiyur	5.13km SW
	Tank near D. Perumapalayam	7.38km SW
	Tank near Pallapatty	6.73km SW
	Tank near Poovanur	5.24km NW
	Tank near Vellalagundam	6km SE
	Tank near Chinnakavundapuram	7km SW
	Tank near Sukkampatti	5.2km NW
	Tank Near Eripudur	1.8km SW
Greenbelt Development Plan	Proposed to plant 900trees in the7.5m safety distance and village road	
Proposed Water Requirement	1.8 KLD	
Nearest Habitation	500m Southeast	

TABLE 1.5: BRIEF DESCRIPTION OF THE APPLIED PROJECT "P3"

Name of the Quarry	Tmt.S. Sumathi Rough Stone Quarry
S.f No & Extent	106 (P-III) and 1.50.0 Ha
Land type	Government Poramboke Land
Lease Period	10

Proposed Period of Mining	5	
Toposheet No	58-I/06	
Latitude between	11°42'27.93"N to 11°42'25.89"N	
Longitude between	78°18'05.14"E to 78°17'59.38"E	
Highest Elevation	471 m AMSL	
Proposed Depth of Mining	58 m (1 m Topsoil + 57m Rough Stone)	
Geological Resources	Rough Stone in m^3	Topsoil m^3
	6,34,948	15,000
Mineable Reserves	Rough Stone in m^3	Topsoil m^3
	3,47,617	13,000
Proposal for this Mining Plan Period	Rough Stone in m^3	Topsoil m^3
	3,09,617	13,000
Existing Pit Dimension	-	
Ultimate Pit Dimension	130m (L) x 100m (W) x 63m (D)	
Water Level in the surrounds area	70 m bgl	
Method of Mining	Opencast Mechanized Mining Method involving drilling and blasting	
Topography	The area applied for quarry lease is almost plain area sloping towards western covered with roughstone doesnot sustain any type of Vegetation. The altitude of the area is 471m Amsl.	
Machinery proposed	Jack Hammer	7 Nos
	Hydraulic Excavator	1 Nos
	Tippers	4 Nos
Blasting Method	Controlled Blasting Method by shot hole drilling and small dia of 25mm slurry explosive are proposed to be used for shattering and heaving effect for removal and winning of Rough Stone. No deep hole drilling is proposed.	
Proposed Manpower Deployment	18 Nos	
Total Project Cost	Operational Cost	Rs.40,77,000/-
	Machinery Cost	Rs.30,00,000/-
	Environment Monitoring Cost	Rs.3,50,000/-
	Total	Rs.74,27,000/-
CER Cost	Rs.5,00,000/-	
Nearby Water Bodies	Tank near Anuppur	4.38km NE
	Tank near Kuttathupatti	2.58km NE
	Tank near Achanguttaipatti	5.50km NW
	Tank near Valasaiyur	5.11km SW
	Tank near D. Perumapalayam	7.36km SW
	Tank near Pallapatty	6.78km SW
	Tank near Poovanur	5.28km NW
	Tank near Vellalagundam	6km SE
	Tank near Chinnakavundapuram	7km SW
	Tank near Sukkampatti	5.2km NW
	Tank Near Eripudur	1.8km SW
Greenbelt Development Plan	Proposed to plant 900 trees in the7.5m safety distance and village road.	
Proposed Water Requirement	3.0 KLD	
Nearest Habitation	360m East	

TABLE 1.6: BRIEF DESCRIPTION OF THE APPLIED PROJECT "P4"

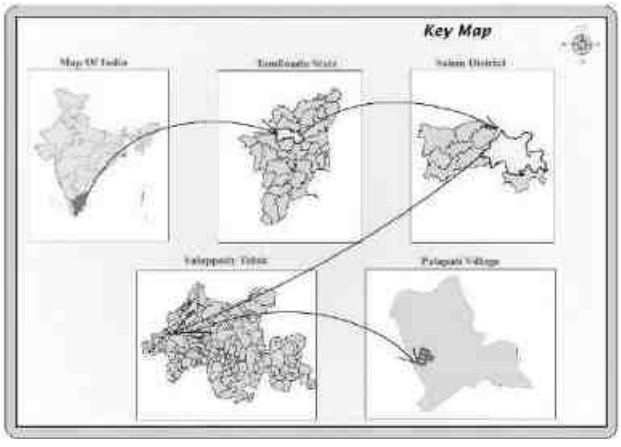
Name of the Quarry	Thiru.A. Rajarajacholan Rough Stone Quarry	
S.f No & Extent	106 (P-IV) and 1.50.0 Ha	
Land type	Government Poramboke Land	
Lease Period	10	
Proposed Period of Mining	5	
Toposheet No	58-I/06	
Latitude between	11°42'24.27"N to 11°42'22.83"N	
Longitude between	78°18'04.05"E to 78°17'58.28"E	
Highest Elevation	471 m AMSL	
Proposed Depth of Mining	51 m (1 m Topsoil + 50m Rough Stone)	
Geological Resources	Rough Stone in m^3	Topsoil m^3
	7,77,500	15,000
Mineable Reserves	Rough Stone in m^3	Topsoil m^3

	3,39,925	11,700
Proposal for this Mining Plan Period	Rough Stone in m^3	Topsoil m^3
	3,00,650	11,700
Existing Pit Dimension	-	
Ultimate Pit Dimension	Pit-I	130m (L) x 90m (W) x 66m (D)
Water Level depth in the surrounds area	70m	
Method of Mining	Opencast Mechanized Mining Method involving drilling and blasting	
Topography	The lease applied area is hilly terrain. The area has gentle sloping towards western side. The altitude of the area is 471m (max) above mean sea level. The area is covered by 1m (avg) thickness of Topsoil Formation. Massive Charnockite is found after 1m (Topsoil Formation) which is clearly inferred from the nearby existing quarry pit.	
Machinery proposed	Jack Hammer	5 Nos
	Hydraulic Excavator	1 Nos
	Tippers	2 Nos
Blasting Method	Controlled Blasting Method by shot hole drilling and small dia of 25mm slurry explosive are proposed to be used for shattering and heaving effect for removal and winning of Rough Stone. No deep hole drilling is proposed.	
Proposed Manpower Deployment	18 Nos	
Total Project Cost	Fixed asset Cost	Rs.40,90,000/-
	Operational cost	Rs.30,00,000/-
	Environment Monitoring Cost	Rs.3,50,000/-
	Total	Rs.74,40,000/-
CER Cost	Rs.5,00,000	
Nearby Water Bodies	Tank near Anuppur	4.42km NE
	Tank near Kuttathupatti	2.64km NE
	Tank near Achanguttaipatti	5.54km NW
	Tank near Valasaiyur	5.07km SW
	Tank near D. Perumapalayam	7.34km SW
	Tank near Pallapatty	6.70km SW
	Tank near Poovanur	5.31km NW
	Tank near Vellalagundam	6km SE
	Tank near Chinnakavundapuram	7km SW
	Tank near Sukkampatti	5.2km NW
	Tank Near Eripudur	1.8km SW
Greenbelt Development Plan	Proposed to plant 900 trees in the 7.5m safety distance and village road.	
Proposed Water Requirement	2.0 KLD	
Nearest Habitation	320m South	

1.3.2 Location of the Project

- The Lease Applied Area is located about 18 km North Easy of Salem taluk, 12 km North West of Valappady Town and 1 km Northwest side of Palapatti Village.

FIGURE1.2: KEY MAP SHOWING THE LOCATION OF THE CLUSTER SITE



Source: Survey of India Toposheet 58-I/06

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

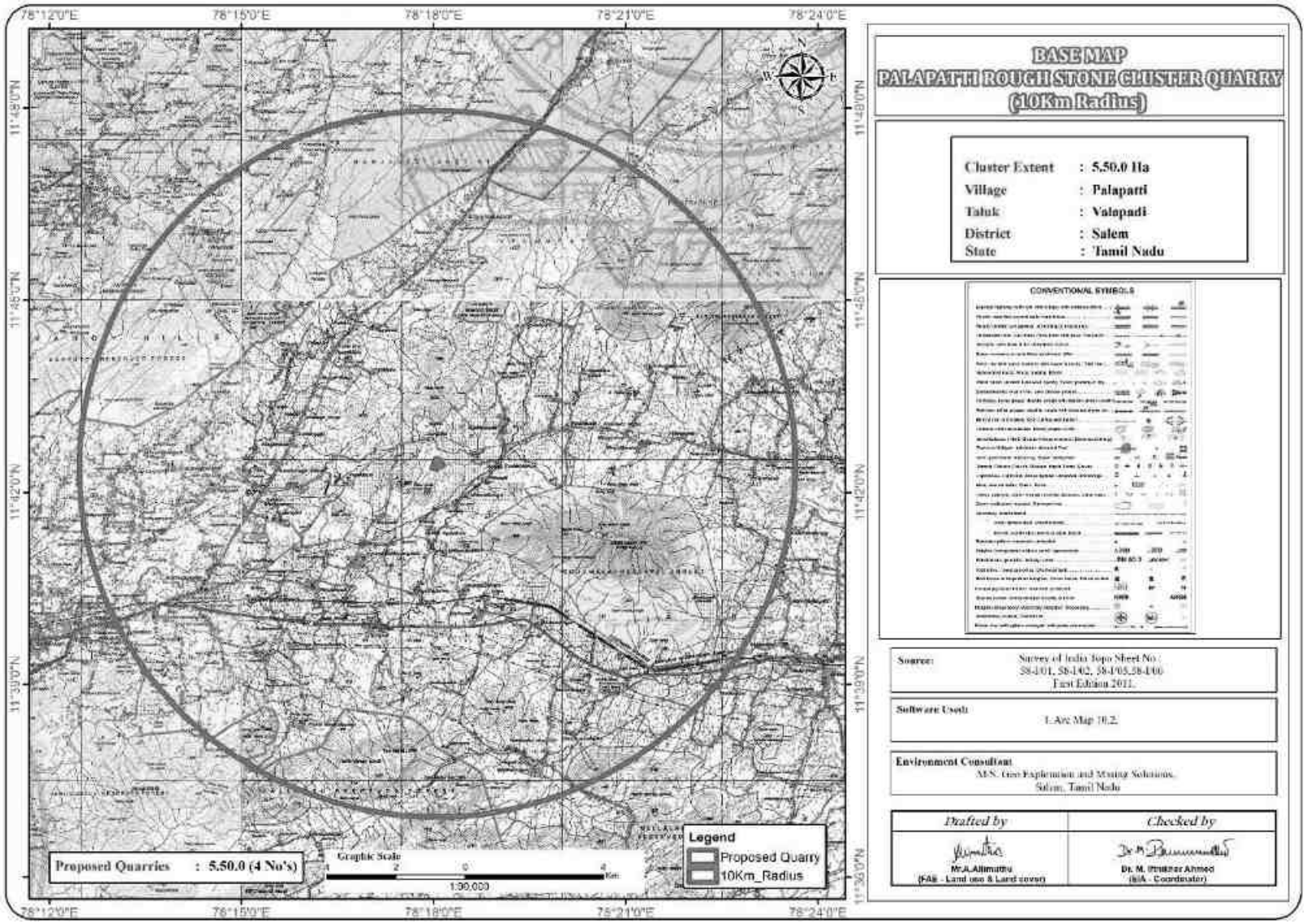
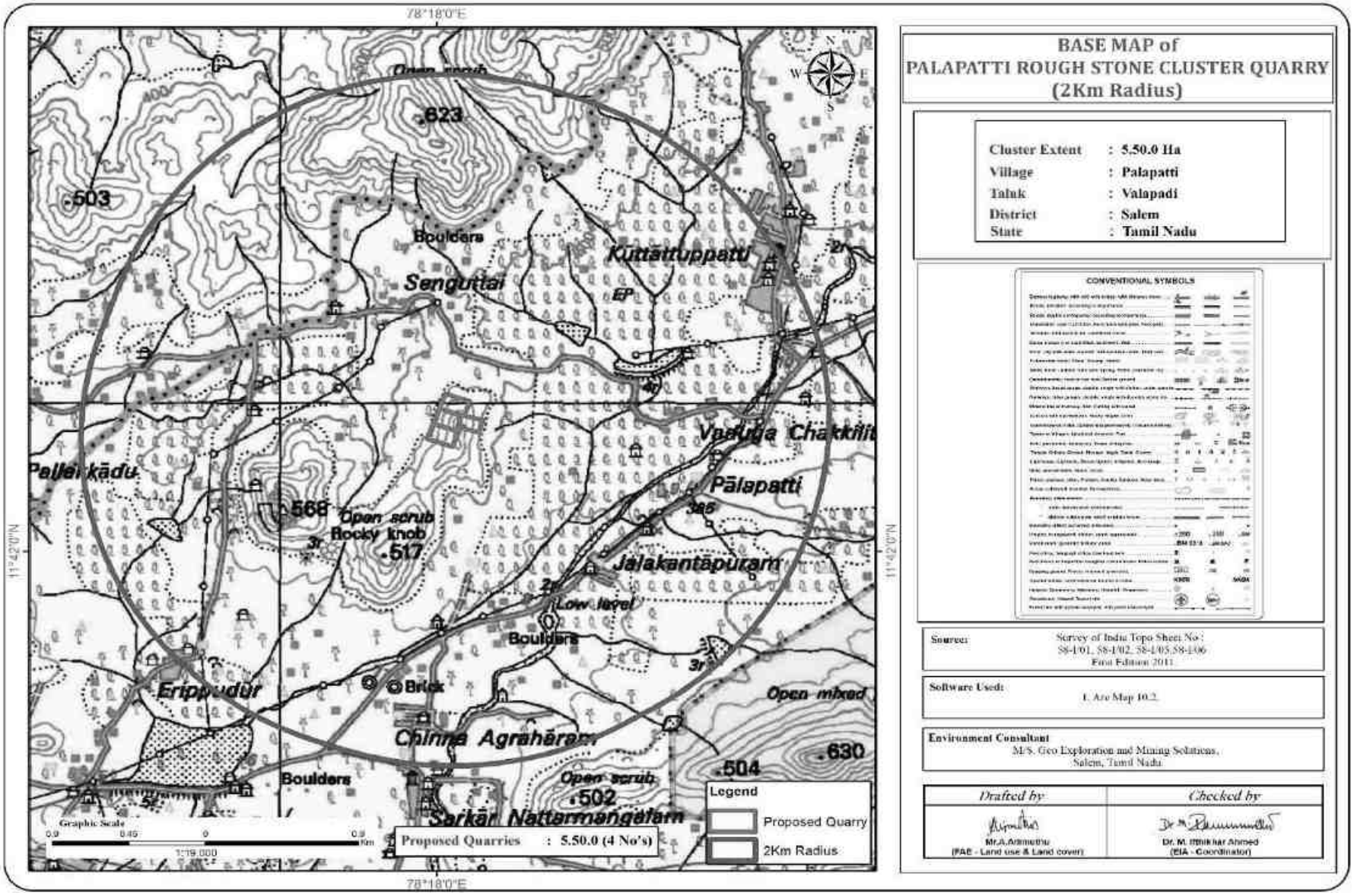


FIGURE 1.4: TOPOSHEET MAP OF THE STUDY AREA 2 KM RADIUS



1.4 ENVIRONMENTAL CLEARANCE

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

1. Screening
2. Scoping
3. Public Consultation &
4. Appraisal

SCREENING –P1

- The project proponent applied for Rough Stone Quarry Lease Dated: 05.02.2020
- Precise Area Communication Letter was issued by the District Collector, Salem Rc.No.185/2020 Mines-A, Dated: 14.07.2020
- The Mining Plan was prepared by Recognized Qualified Person and approved by Assistant Director, Geology and Mining, Salem District, vide R.C. No. 185/2020 Mines-A, Dated :21.10.2020
- The proposed project falls under "B1" Category as per Order Dated: 04.09.2018 & 13.09.2018 passed by Hon'ble National Green tribunal, New Delhi in O.A. No. 173 of 2018 & O.A. No, 186 of 2016 and MoEF & CC Office Memorandum F. No. L-11011/175/2018-IA-II (M) Dated: 12.12.2018
- Proponent applied for ToR for Environmental Clearance vide online Proposal No. SIA/TN/MIN/58994/2020 Date: 08.12.2020

SCOPING –P1

- The proposal was placed in 203rd SEAC meeting held on 23.02.2021 and the committee recommended for issue of ToR.
- The proposal was considered in 436th SEIAA meeting held on 30.03.2021 and issued ToR vide Letter No SEIAA-TN/F.No.8121/SEAC/ToR-930/2020 Dated 16.04.2021

SCREENING –P2

- The project proponent applied for Rough Stone Quarry Lease Dated: 06.02.2020
- Precise Area Communication Letter was issued by the District Collector, Salem Rc.No.186/2020 Mines-A, Dated: 28.05.2020
- The Mining Plan was prepared by Recognized Qualified Person and approved by Assistant Director, Geology and Mining, Salem District, vide R.C. No. 186/2020 Mines-A, Dated :19.06.2020
- The proposed project falls under "B1" Category as per Order Dated: 04.09.2018 & 13.09.2018 passed by Hon'ble National Green tribunal, New Delhi in O.A. No. 173 of 2018 & O.A. No, 186 of 2016 and MoEF & CC Office Memorandum F. No. L-11011/175/2018-IA-II (M) Dated: 12.12.2018
- Proponent applied for ToR for Environmental Clearance vide online Proposal No. SIA/TN/MIN/70643/2021 Date: 03.01.2022

SCOPING –P2

- The proposal was placed in 302rd SEAC meeting held on 17.08.2022 and the committee recommended for issue of ToR.
- The proposal was considered in 547h SEIAA meeting held on 30.08.2022 and issued ToR vide Lr No. SEIAA-TN/F.No.9332/TOR-1244/2022 Dated :30.08.2022.

SCREENING –P3

- The project proponent applied for Rough Stone Quarry Lease Dated: 06.02.2020
- Precise Area Communication Letter was issued by the District Collector, Salem Rc.No.187/2020 Mines-A, Dated: 30.05.2020
- The Mining Plan was prepared by Recognized Qualified Person and approved by Assistant Director, Geology and Mining, Salem District, vide R.C. No. 187/2020 Mines-A, Dated :26.06.2020
- The proposed project falls under "B1" Category as per Order Dated: 04.09.2018 & 13.09.2018 passed by Hon'ble National Green tribunal, New Delhi in O.A. No. 173 of 2018 & O.A. No, 186 of 2016 and MoEF & CC Office Memorandum F. No. L-11011/175/2018-IA-II (M) Dated: 12.12.2018
- Proponent applied for ToR for Environmental Clearance vide online Proposal No. SIA/TN/MIN/66919/2022 Date: 25.08.2021

SCOPING –P3

- The proposal was placed in 365[d] SEAC meeting held on 24.03.2023 and the committee recommended for issue of ToR.
- The proposal was considered in 612[th] SEIAA meeting held on 17.04.2023 & 18.04.2023 and issued ToR vide Lr No. SEIAA-TN/F.No.9685/SEAC/TOR-1428/2022 Dated :18.04.2023

SCREENING –P4

- The project proponent applied for Rough Stone Quarry Lease Dated: 06.02.2020
- Precise Area Communication Letter was issued by the District Collector, Salem Rc.No.188/2020 Mines-A, Dated: 30.05.2020
- The Mining Plan was prepared by Recognized Qualified Person and approved by Assistant Director, Geology and Mining, Salem District, vide R.C. No. 188/2020 Mines-A, Dated :19.06.2020
- The proposed project falls under "B1" Category as per Order Dated: 04.09.2018 & 13.09.2018 passed by Hon'ble National Green tribunal, New Delhi in O.A. No. 173 of 2018 & O.A. No, 186 of 2016 and MoEF & CC Office Memorandum F. No. L-11011/175/2018-IA-II (M) Dated: 12.12.2018
- Proponent applied for ToR for Environmental Clearance vide online Proposal No. SIA/TN/MIN/69164/2021 Date: 15.11.2021

SCOPING –P4

- The proposal was placed in 302[nd] SEAC meeting held on 17.08.2022 and the committee recommended for issue of ToR.
- The proposal was considered in 547[th] SEIAA meeting held on 30.08.2022 and issued ToR vide Lr No. SEIAA-TN/F.No.9333/TOR-1234/2022 Dated :30.08.2022

PUBLIC CONSULTATION –

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

APPRAISAL –

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

The report has been prepared using the following references:

- Guidance Manual of Environmental Impact Assessment for Mining of Minerals, Ministry of Environment and Forests, February, 2010
- EIA Notification, 14[th]September, 2006
- P1. Lr No. SEIAA-TN/F.No.8121/SEAC/TOR-930/2020 Dated :16.04.2021
- P2. Lr No. SEIAA-TN/F.No.9332/TOR-1244/2022 Dated :30.08.2022
- P3. Lr No. SEIAA-TN/F.No.9685/SEAC/TOR-1428/2022 Dated :18.04.2023
- P4. Lr No. SEIAA-TN/F.No.9333/TOR-1234/2022 Dated :30.08.2022
- Approved Mining Plan of the Proposed Project.

1.5 TERMS OF REFERENCE (ToR)

Compliance to ToR issued vide

P1. Lr No. SEIAA-TN/F.No.8121/SEAC/TOR-930/2020 Dated :16.04.2021
P2. Lr No. SEIAA-TN/F.No.9332/TOR-1244/2022 Dated :30.08.2022
P3. Lr No. SEIAA-TN/F.No.9685/SEAC/TOR-1428/2022 Dated :18.04.2023
P4. Lr No. SEIAA-TN/F.No.9333/TOR-1234/2022 Dated :30.08.2022

are detailed in Page No. I – IX.

1.6 POST ENVIRONMENT CLEARANCE MONITORING

The project 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 1st June and 1st December of each calendar year as per MoEF & CC Notification S.O. 5845 (E) Dated: 26.11.2018.

1.7 GENERIC STRUCTURE OF EIA DOCUMENT

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

1.8 THE SCOPE OF THE STUDY

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

TABLE 1.4: ENVIRONMENT ATTRIBUTES

Sl.No.	Attributes	Parameters	Source and Frequency
1	Ambient Air Quality	PM_{10}, $PM_{2.5}$, SO_2, NO_2	Continuous 24-hourly samples twice a week for three months at 8 locations (1 Core & 7 Buffer)
2	Meteorology	Wind speed and direction, temperature, relative humidity and rainfall	Near project site continuous for three months with hourly recording and from secondary sources of IMD station
3	Water quality	Physical, Chemical and Bacteriological parameters	Grab samples were collected at 6 locations – 5 ground water and 1 surface water samples; once during study period.
4	Ecology	Existing terrestrial and aquatic flora and fauna within 10 km radius circle.	Limited primary survey and secondary data was collected from the Forest department.
5	Noise levels	Noise levels in dB(A)	8 locations – data monitored once for 24 hours during EIA study
6	Soil Characteristics	Physical and Chemical Parameters	Once at 6 locations during study period
7	Land use	Existing land use for different categories	Based on Survey of India topographical sheet and satellite imagery and primary survey.
8	Socio-Economic Aspects	Socio-economic and demographic characteristics, worker characteristics	Based on primary survey and secondary sources data like census of India 2011.
9	Hydrology	Drainage pattern of the area, nature of streams, aquifer characteristics, recharge and discharge areas	Based on data collected from secondary sources as well as hydro-geology study report prepared.
10	Risk assessment and Disaster Management Plan	Identify areas where disaster can occur by fires and explosions and release of toxic substances	Based on the findings of Risk analysis done for the risk associated with mining.

Source: Onsite Monitoring Data/Sampling by KGS Laboratories

The data has been collected as per the requirement of the ToR issued by SEIAA – TN.

1.8.1 Regulatory Compliance & Applicable Laws/Regulations

- Application for Quarrying Lease as per Tamil Nadu Minor Mineral Concession Rules, 1959
- Obtained Precise Area Communication Letter as per Tamil Nadu Minor Mineral Concession Rules, 1959 for Preparation of Mining Plan and obtaining Environmental Clearance
  - The Mining Plan has been approved under Rule 41 & 42 as amended of Tamil Nadu Minor Mineral Concession Rules, 1959 ToR ToR issued vide
    P1. Lr No. SEIAA-TN/F.No.8121/SEAC/TOR-930/2020 Dated :16.04.2021
    P2. Lr No. SEIAA-TN/F.No.9332/TOR-1244/2022 Dated :30.08.2022
    P3. Lr No. SEIAA-TN/F.No.9685/SEAC/TOR-1428/2022 Dated :18.04.2023
    P4. Lr No. SEIAA-TN/F.No.9333/TOR-1234/2022 Dated :30.08.2022

2. PROJECT DESCRIPTION

2.0 GENERAL

The Proposed Rough Stone Quarry requires Environmental Clearance. There are 4 proposed quarries forming a cluster; calculated as per MoEF & CC Notification S.O. 2269(E) Dated 1st July 2016 and the total extent of cluster is 5.50.0 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 proposed quarry.

The quarrying operation is proposed to be carried out by Opencast Mechanized Mining Method by deploying Heavy Earth Moving Machineries without deep hole drilling and blasting by Jack Hammer Drilling & Slurry Explosive during blasting by forming 5.0 m bench height and 5.0 m bench width. Excavators are proposed for Loading and tippers for transportation of Rough Stone & Gravel from pithead to the needy crushers. Rock Breakers are proposed to be deployed to avoid secondary blasting.

2.2 LOCATION OF THE PROJECT

- The Lease Applied Area is located about 18 km North East of Salem taluk, 12 km North West of Valappady Town and 1 km Northwest side of Palapatti Village.
- The project does not fall within 10 km radius of any Eco – sensitive zone, National Park, Tiger Reserve, Elephant Corridor and Biosphere Reserves.

TABLE 2.1: SITE CONNECTIVITY

Nearest Roadway	National Highway (NH-79) Salem- Ulundurpet - 4.5Km-South State Highway (179A) Salem-Harur-4Km-West
Nearest Village	Kootathupatti – 2 km – North East
Nearest Town	Ayothiapattinam – 8Km – SouthWest
Nearest Railway Station	Minnampalli – 4.25km – SouthWest
Nearest Airport	Salem – 27Km – NorthWest
Seaport	Chennai - 236 km – North East

Source: Survey of India Toposheet

TABLE 2.2: BOUNDARY CO-ORDINATES OF PROPOSED PROJECT "P1"

Boundary Pillar No.	Latitude	Longitude
1	11°42'25.26"N	78°18'03.95"E
2	11°42'27.73"N	78°18'04.63"E
3	11°42'26.64"N	78°18'08.71"E
4	11°42'24.17"N	78°18'08.03"E

Source: Approved Mining Plan

TABLE 2.3: BOUNDARY CO-ORDINATES OF PROPOSED PROJECT "P2"

Boundary Pillar No.	Latitude	Longitude
1	11°42'32.03"N	78°18'01.57"E
2	11°42'30.41"N	78°18'06.24"E
3	11°42'27.34"N	78°18'05.14"E
4	11°42'28.96"N	78°18'00.47"E

Source: Approved Mining Plan

TABLE 2.4: BOUNDARY CO-ORDINATES OF PROPOSED PROJECT "P3"

Boundary Pillar No.	Latitude	Longitude
1	11°42'28.96"N	78°18'00.48"E
2	11°42'27.34"N	78°18'05.14"E
3	11°42'24.27"N	78°18'04.05"E
4	11°42'25.89"N	78°17'59.38"E

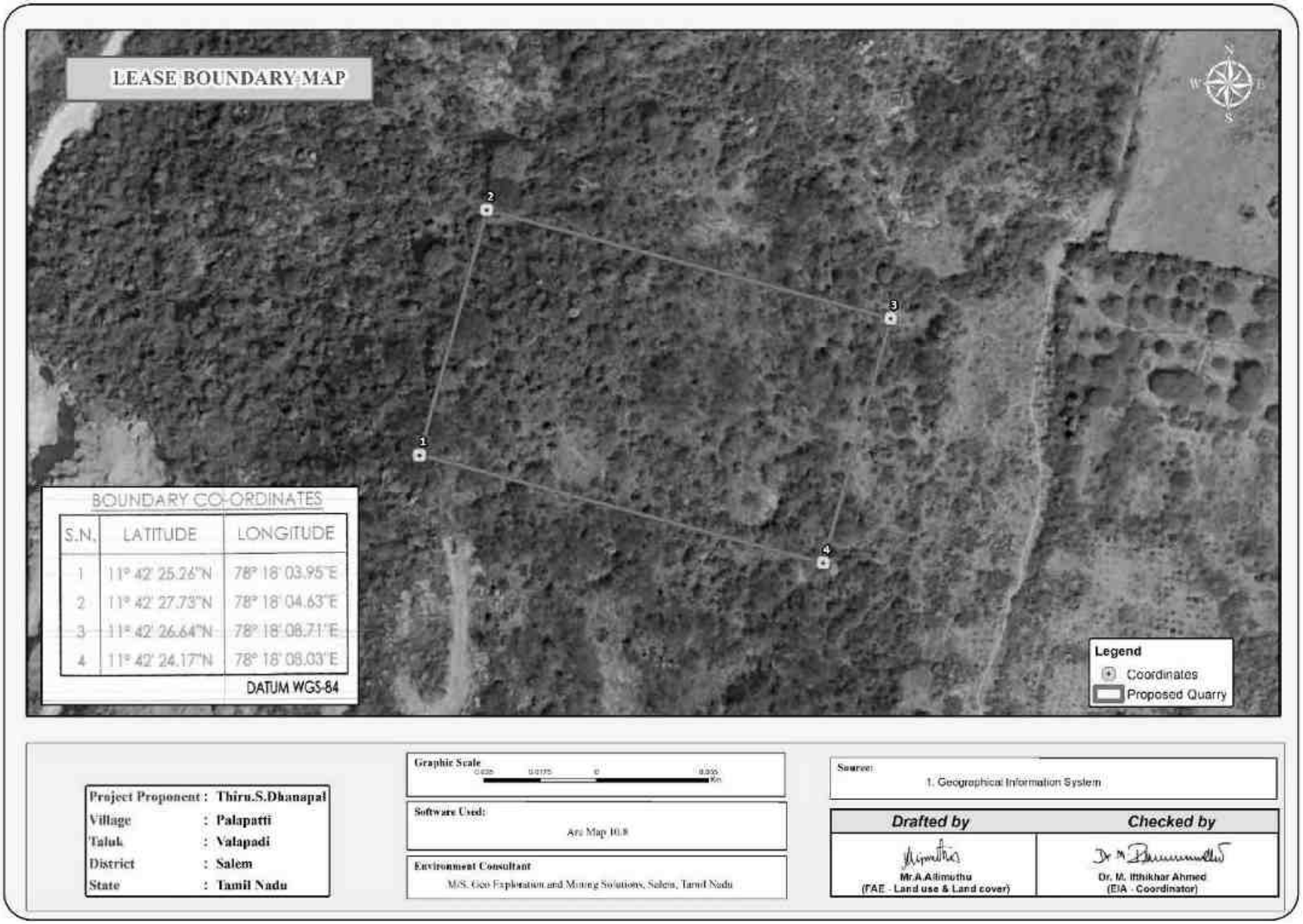
Source: Approved Mining Plan

TABLE 2.5: BOUNDARY CO-ORDINATES OF PROPOSED PROJECT "P4"

Boundary Pillar No.	Latitude	Longitude
1	11°42'25.89"N	78°17'59.38"E
2	11°42'24.27"N	78°18'04.05"E
3	11°42'21.20"N	78°18'02.95"E
4	11°42'22.83"N	78°17'58.28"E

Source: Approved Mining Plan

FIGURE 2.1: GOOGLE IMAGE OF THE PROJECT AREA "P1"



Source: Superimposed on Google Earth Imagery

FIGURE 2.2: GOOGLE IMAGE OF THE PROJECT AREA "P2"

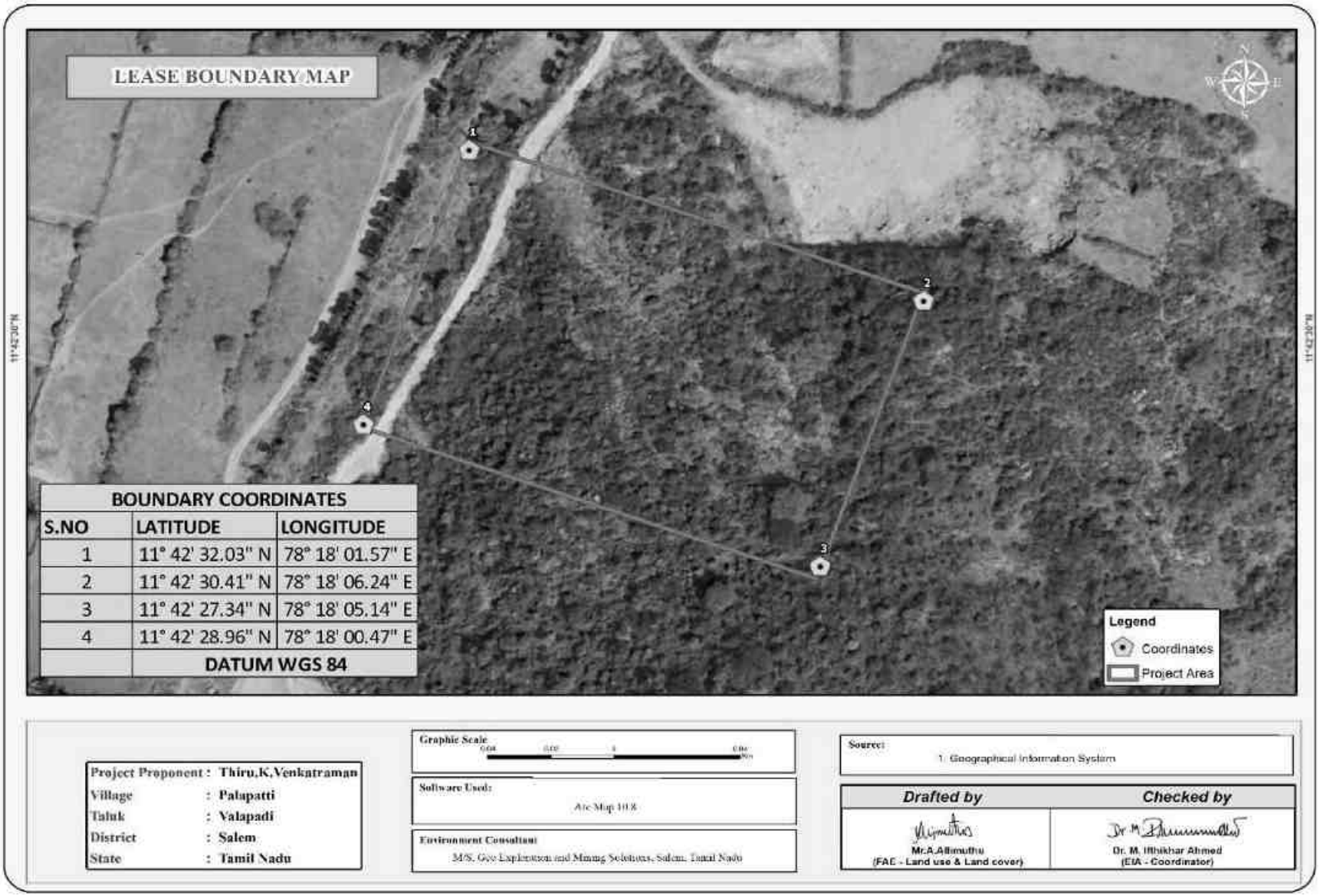


FIGURE 2.3: GOOGLE IMAGE OF THE PROJECT AREA "P3"

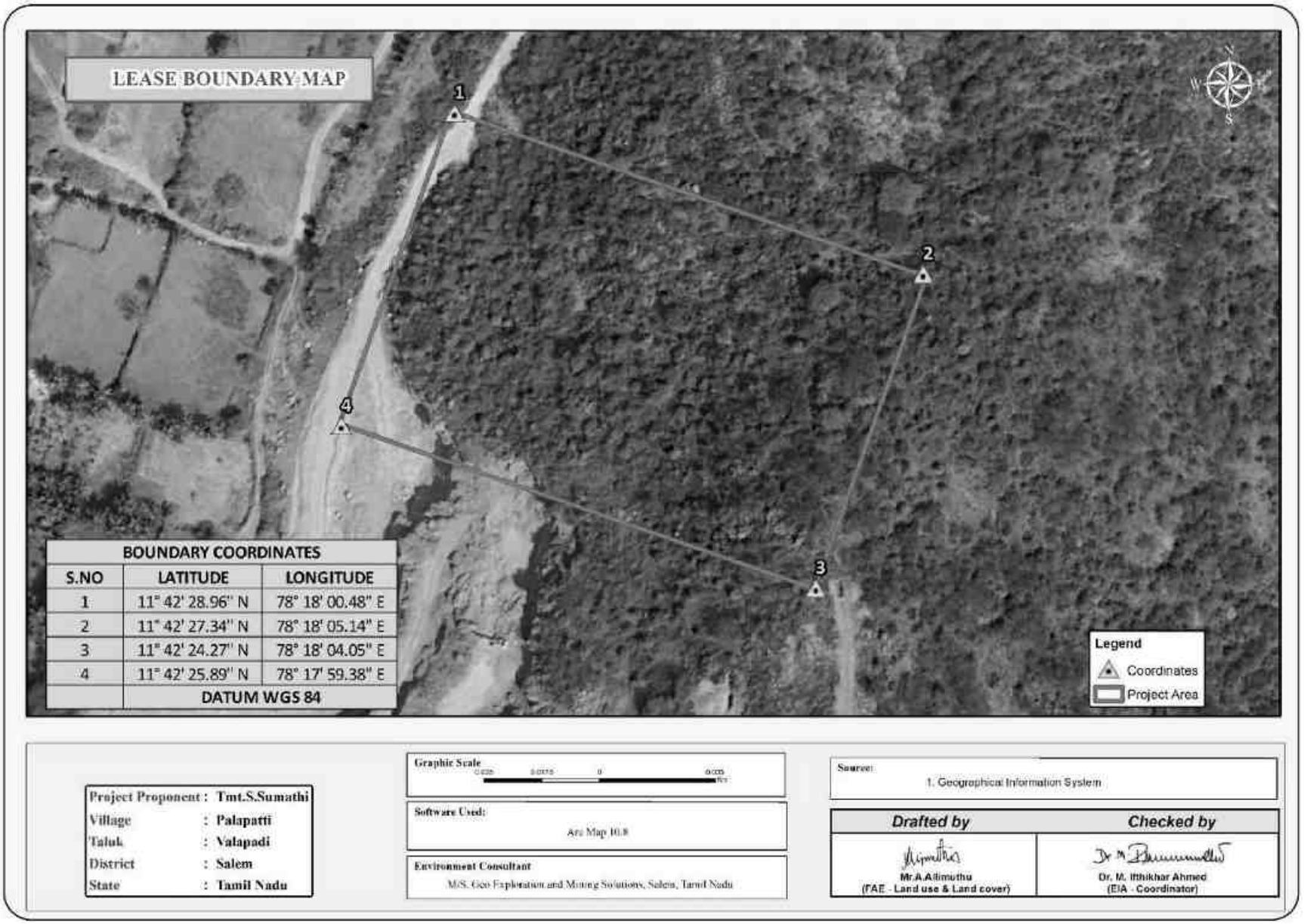


FIGURE 2.4: GOOGLE IMAGE OF THE PROJECT AREA "P4"

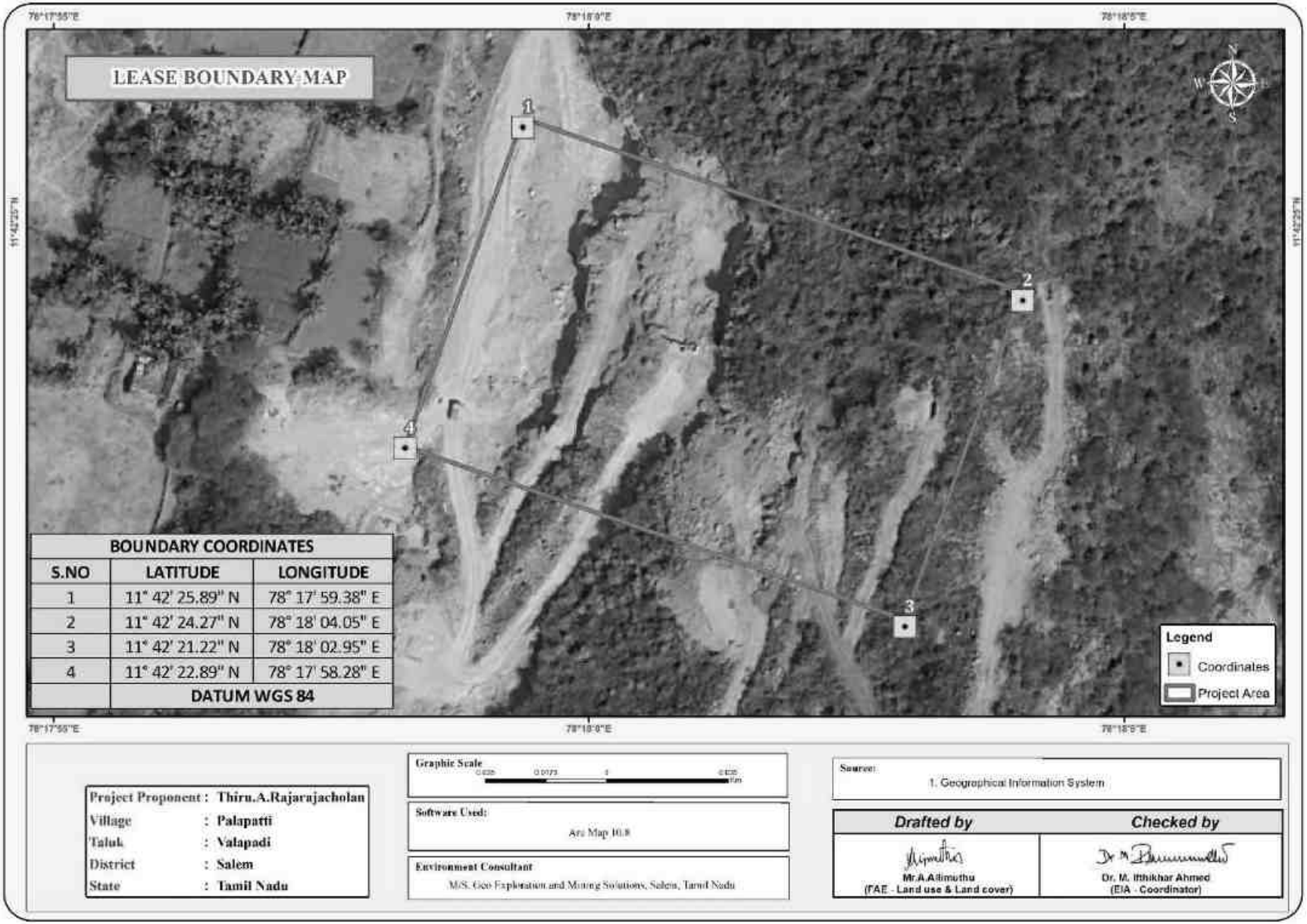
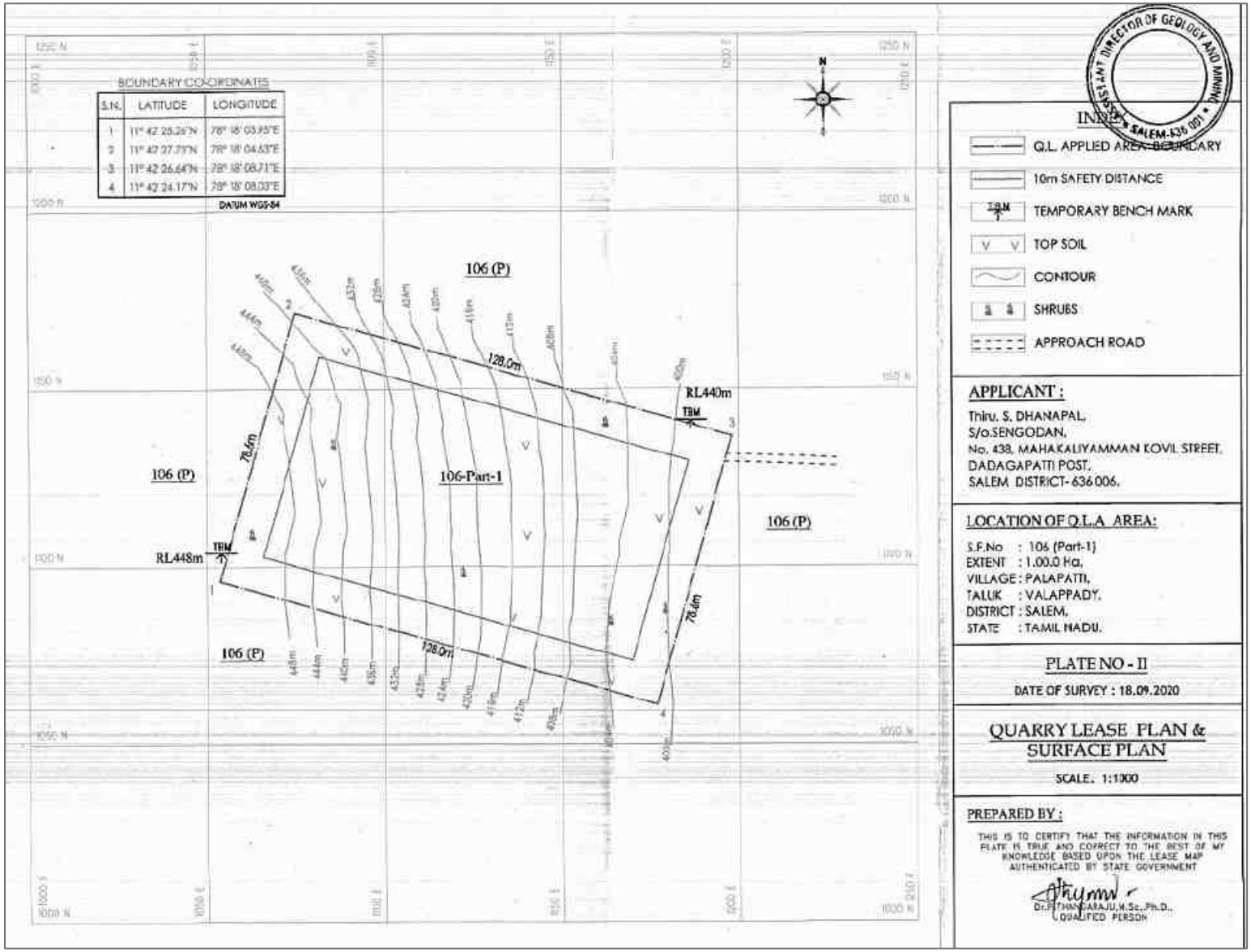


FIGURE 2.5: QUARRY LEASE PLAN / SURFACE PLAN "P1"



Source: Approved Mining Plan

FIGURE 2.6: QUARRY LEASE PLAN / SURFACE PLAN "P2"

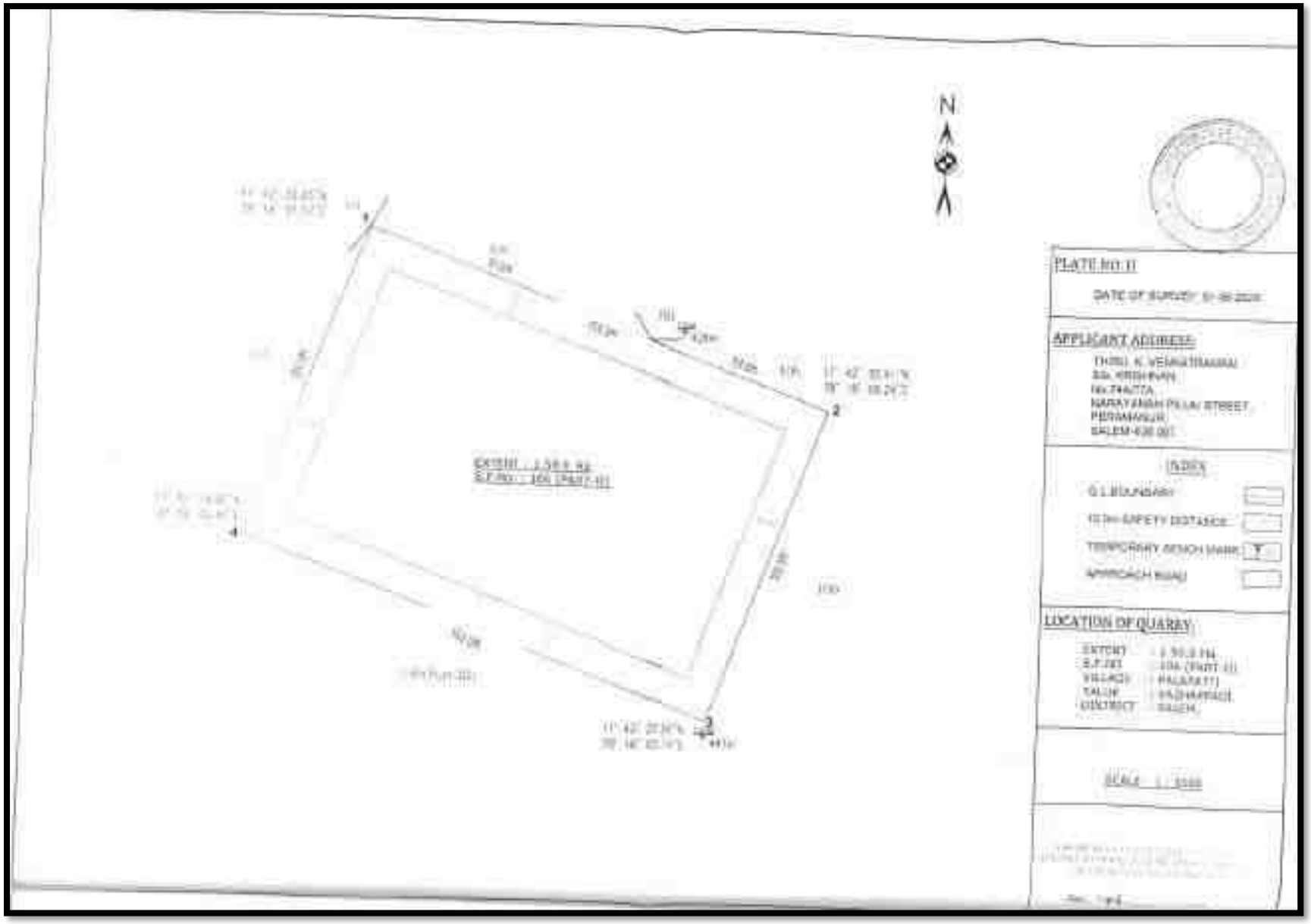


FIGURE 2.7: QUARRY LEASE PLAN / SURFACE PLAN "P3"

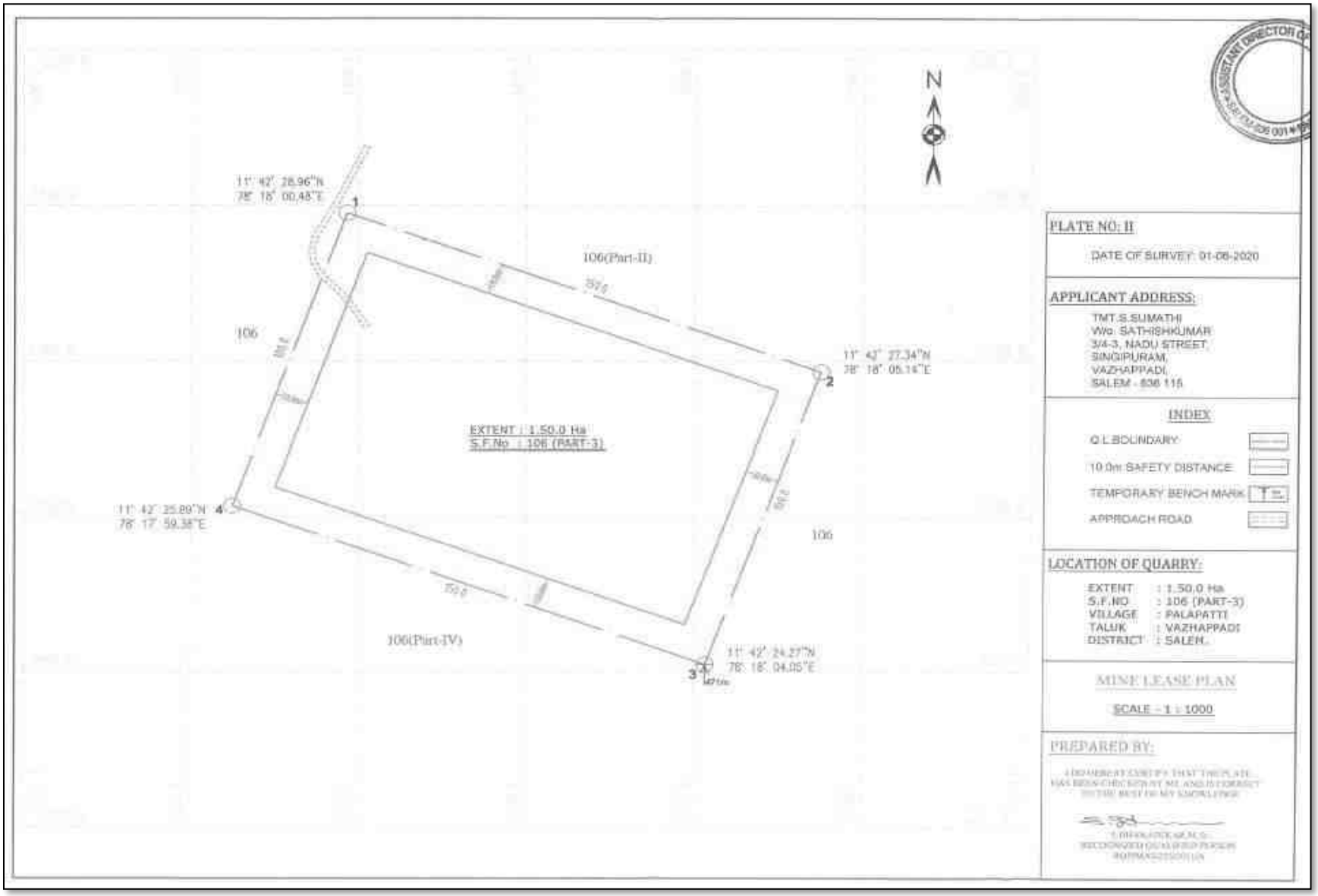


FIGURE 2.8: QUARRY LEASE PLAN / SURFACE PLAN "P4"

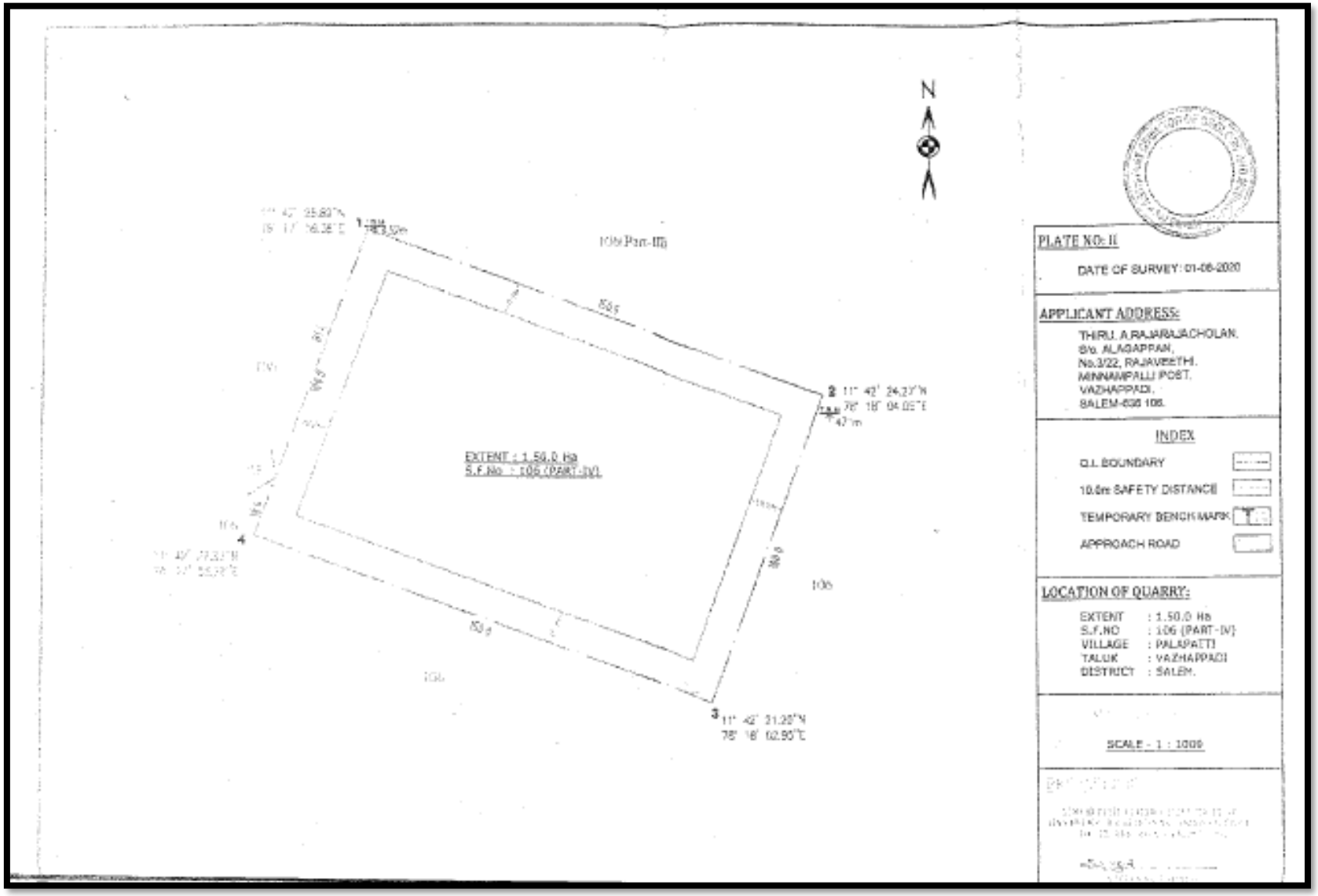


FIGURE 2.9: VILLAGE MAP SUPERIMPOSED ON GOOGLE EARTH IMAGE

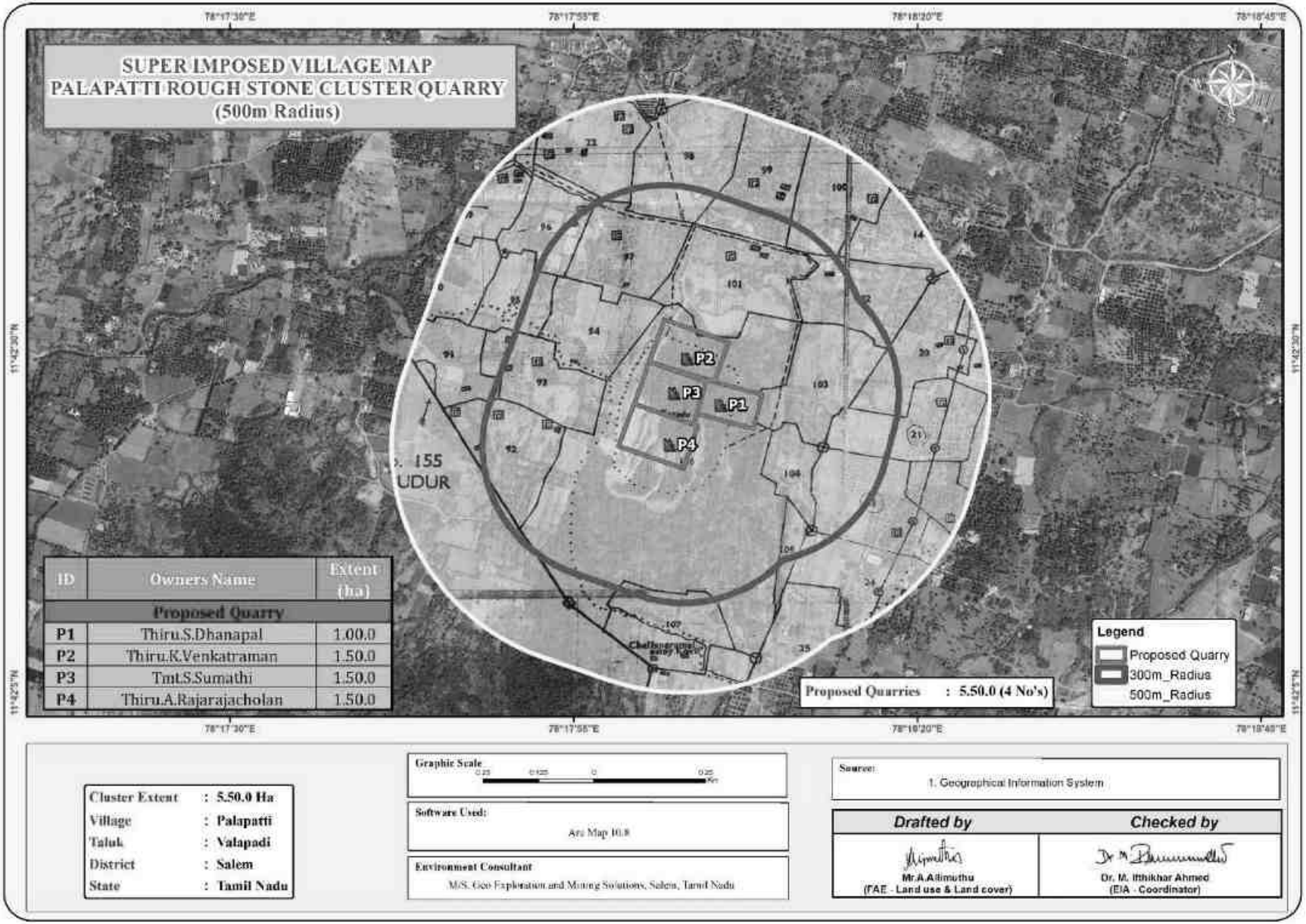


FIGURE 2.10: IMAGE SHOWING SURFACE FEATURES AROUND 10 KM RADIUS

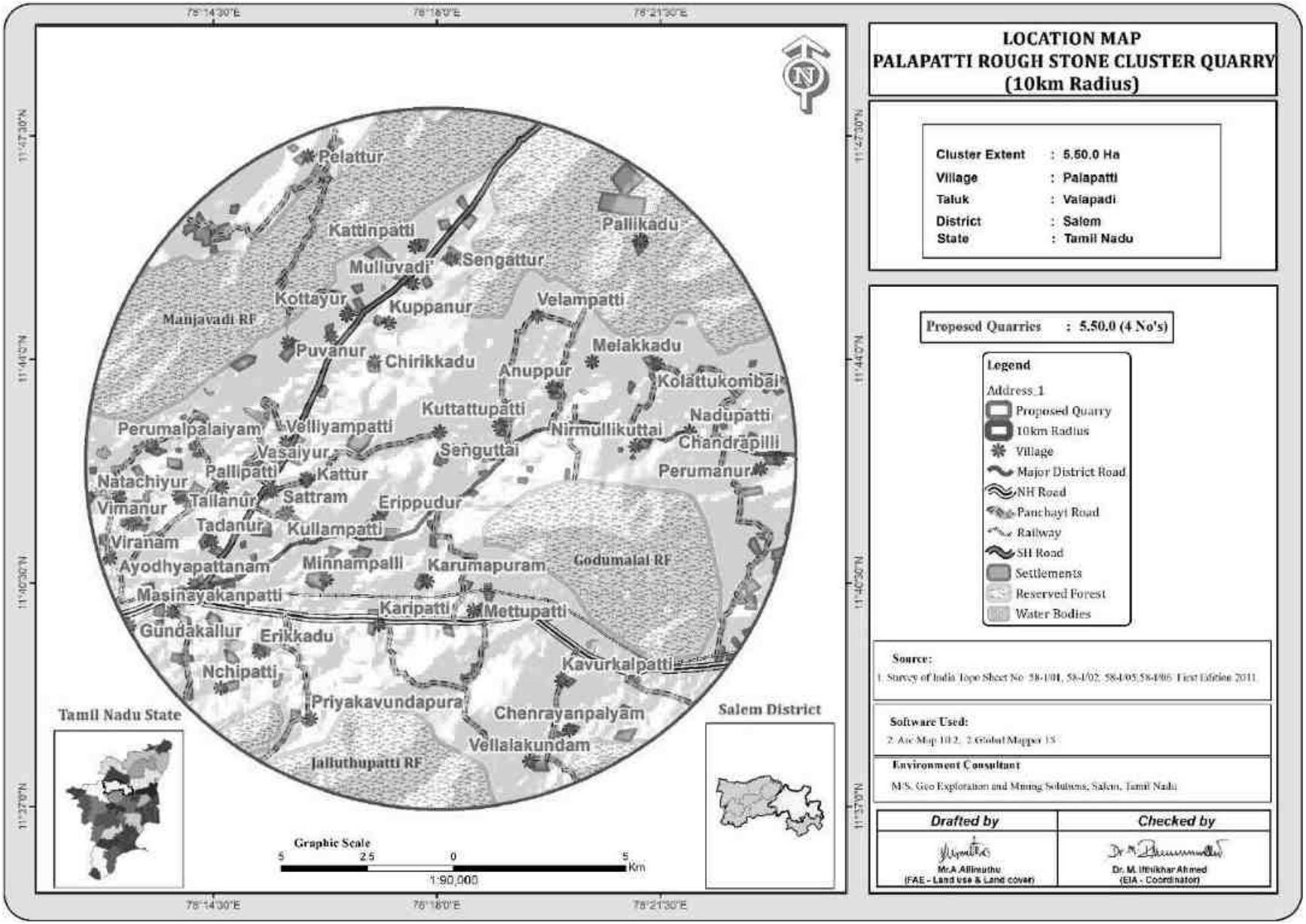


FIGURE 2.11: IMAGE SHOWING SURFACE FEATURES AROUND 5KM RADIUS

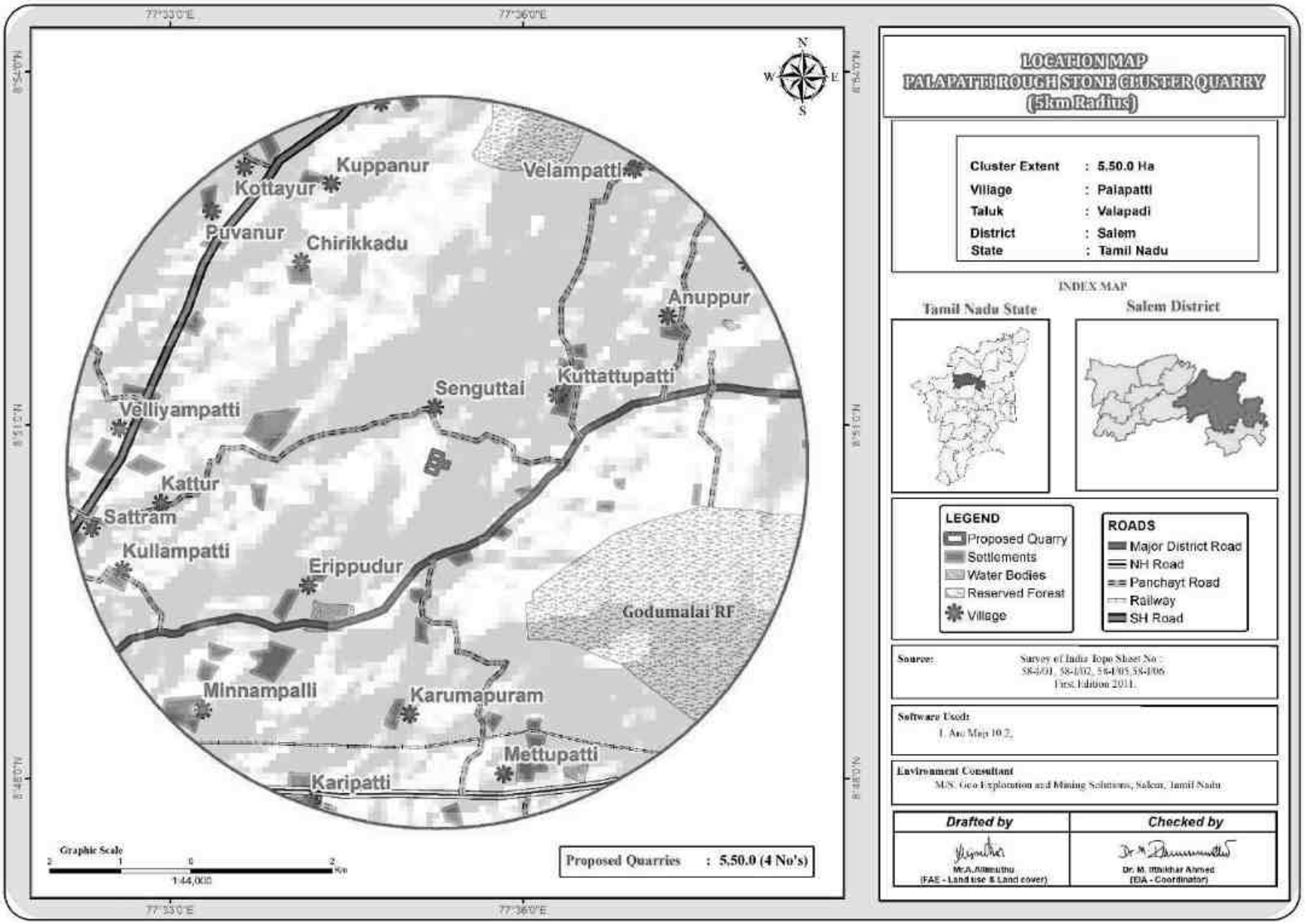
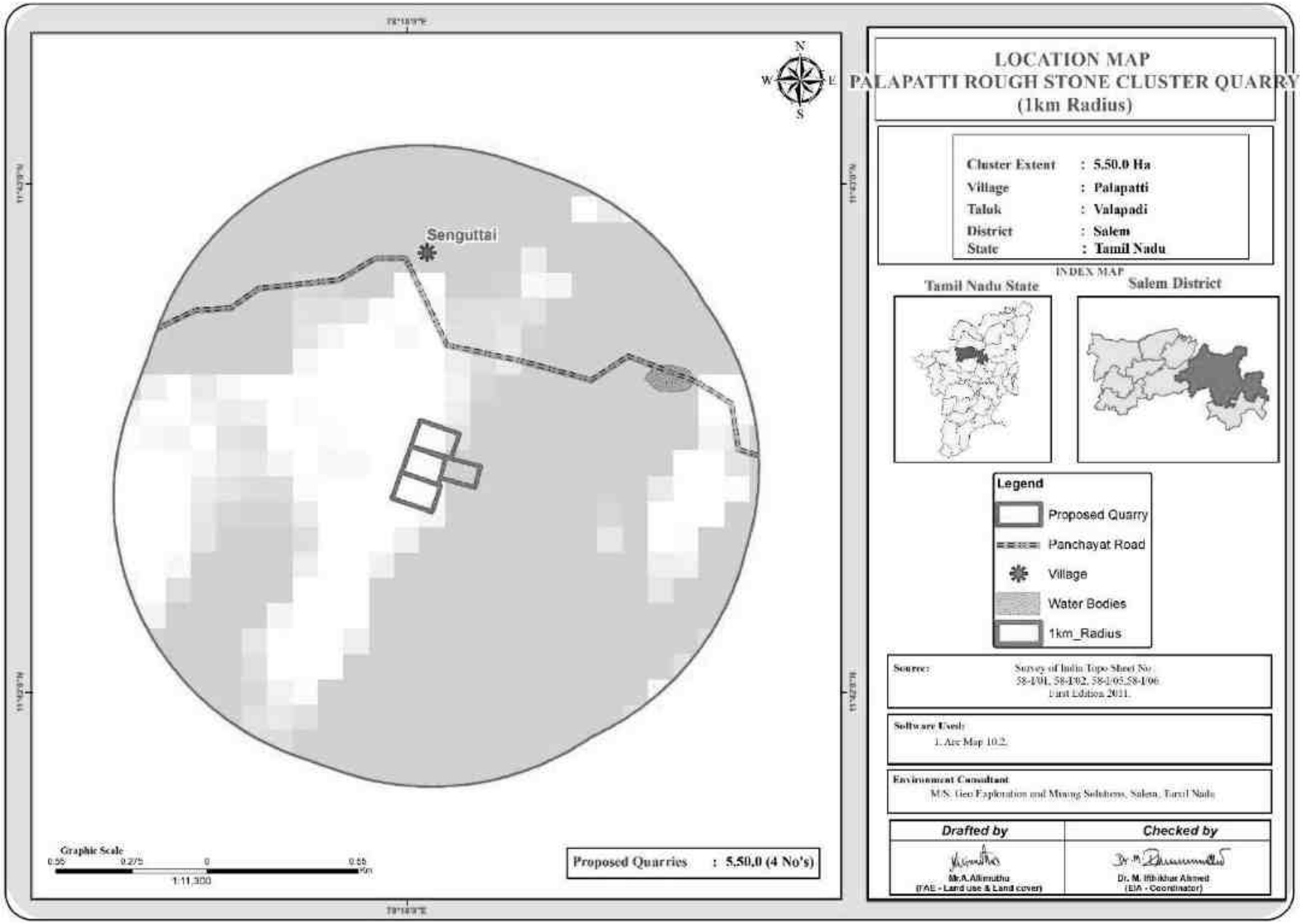


FIGURE 2.12: IMAGE SHOWING SURFACE FEATURES AROUND 1 KM RADIUS



2.2.1 Project Area

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

TABLE 2.6: LAND USE PATTERN OF THE LEASE APPLIED AREA "P1"

DESCRIPTION	PRESENT AREA IN (HA)	AREA AT THE END OF MINING PLAN (HA)
Area under Quarrying	Nil	0.63.0
Infrastructure	Nil	0.01.0
Road	Nil	0.02.0
Green Belt	Nil	0.20.0
Unutilized area	1.00.0	0.14.0
TOTAL	**1.00.0**	**1.00.0**

Source: Approved Mining Plan

TABLE 2.7: LAND USE PATTERN OF THE LEASE APPLIED AREA "P2"

DESCRIPTION	PRESENT AREA IN (HA)	AREA AT THE END OF MINING PLAN (HA)
Area under Quarrying	Nil	1.13.0
Infrastructure	Nil	0.01.0
Road	0.01.0	0.01.0
Green Belt	Nil	0.35.0
Unutilized area	1.49.0	Nil
TOTAL	**1.50.0**	**1.50.0**

Source: Approved Mining Plan

TABLE 2.8: LAND USE PATTERN OF THE LEASE APPLIED AREA "P3"

DESCRIPTION	PRESENT AREA IN (HA)	AREA AT THE END OF MINING PLAN (HA)
Area under Quarrying	Nil	1.28.0
Infrastructure	Nil	0.01.0
Road	0.01.0	0.01.0
Green Belt & Dump	Nil	0.20.0
Unutilized area	1.49.0	Nil
TOTAL	**1.50.0**	**1.50.0**

Source: Approved Mining Plan

TABLE 2.9: LAND USE PATTERN OF THE LEASE APPLIED AREA "P4"

DESCRIPTION	PRESENT AREA IN (HA)	AREA AT THE END OF MINING PLAN (HA)
Area under Quarrying	Nil	1.13.0
Infrastructure	Nil	0.01.0
Road	0.01.0	0.01.0
Green Belt	Nil	0.35.0
Unutilized area	1.49.0	Nil
TOTAL	**1.50.0**	**1.50.0**

Source: Approved Mining Plan

2.2.2 Size or Magnitude of Operation

TABLE 2.10: OPERATIONAL DETAILS OF LEASE APPLIED AREA "P1"

PARTICULARS	DETAILS	
	Rough Stone	**Topsoil**
Geological Resources in m^3	4,38,620	10,112
Mineable Reserves in m^3	1,51,795	6,372
Yearwise Production for five years in m^3	83,425	6,372
Mining Plan Period	5 Years	1 Years
Number of Working Days	300 Days	300 Days
Production per day in m^3	**56**	**21**
No of Lorry loads ($6m^3$ per load)	**9**	**4**
Total Depth of Mining	41 m bgl (1 m Topsoil + 40 m Rough Stone)	

Source: Approved Mining Plan

TABLE 2.11: OPERATIONAL DETAILS OF LEASE APPLIED AREA "P2"

PARTICULARS	DETAILS	
	Rough Stone	**Topsoil**
Geological Resources in m^3	7,80,604	15,000
Mineable Reserves in m^3	3,39,516	11,700
Yearwise Production for five years in m^3	3,02,716	11,700
Mining Plan Period	5 Years	1 Years
Number of Working Days	300 Days	300 Days
Production per day in m^3	**202**	**39**
No of Lorry loads ($6m^3$ per load)	**34**	**7**
Total Depth of Mining	43 m bgl (1 m Topsoil + 42 m Rough Stone)	

Source: Approved Mining Plan

TABLE 2.12: OPERATIONAL DETAILS OF LEASE APPLIED AREA "P3"

PARTICULARS	DETAILS	
	Rough Stone	**Topsoil**
Geological Resources in m^3	6,34,948	15,000
Mineable Reserves in m^3	3,47,617	13,000
Yearwise Production for five years in m^3	3,09,617	13,000
Mining Plan Period	5 Years	1 Years
Number of Working Days	300 Days	300 Days
Production per day in m^3	**206**	**43**
No of Lorry loads ($6m^3$ per load)	**34**	**7**
Total Depth of Mining	58 m bgl (1 m Topsoil + 57m Rough Stone)	

Source: Approved Mining Plan

TABLE 2.13: OPERATIONAL DETAILS OF LEASE APPLIED AREA "P4"

PARTICULARS	DETAILS	
	Rough Stone	**Topsoil**
Geological Resources in m^3	7,77,500	15,000
Mineable Reserves in m^3	3,39,925	11,700
Yearwise Production for five years in m^3	3,00,650	11,700
Mining Plan Period	5 Years	1 Years
Number of Working Days	300 Days	300 Days
Production per day in m^3	**200**	**39**
No of Lorry loads ($6m^3$ per load)	**33**	**7**
Total Depth of Mining	51 m bgl (1 m Topsoil + 50m Rough Stone)	

Source: Approved Mining Plan

2.3 GEOLOGY

2.3.1 Regional Geology

Crystalline rocks of Archaean to late Proterozoic age occupy over 80% of the area of the state of Tamilnadu, while the rest is covered by Phanerozoic sedimentary rocks mainly along the coastal belt and in a few inland River valleys. The hard rock terrain comprises predominantly of Charnockite and Khondalite groups and their migmatitic derivatives, supracrustal 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.

Stratigraphy of the area –

Age	Group	Lithology
Holocene to Recent	Alluvium Colluvium	Red Soil Coastal Sand Clay River Alluvium Laterite Red Teri Kankar Tuffaceous Kankar Shell LimeStone Calcareous Sandstone
Mio-Pliocence	Panamparai Sandstone	Hard, Compact, Calcareous Sandstone Shell Limestone
Precambrian	Crystalline Complex	Charnockite Mixed Composite Gneiss Peliticgneiss Calc-Granulite Quarzite

The geology of the area is characterised by contrasting lithological associations that are grouped under Sathyamangalam Group, Khondalite Group, Charnockite Group, Migmatite Complex, and Bhavani Gneissic Complex of Archaean/ Pre-Cambrain age, younger basic and acid intrusives are of Proterozoic age and kankar/ calcretes belonging to Quaternary age.

The Sathyamangalam Group of rocks comprises Quartzites ± Fuchsite ± Sillimanite, Talc-Tremolite, Actinolite schist, Amphibolite, Amphibolite, Gabbro and Pyroxenite. These litho units occur as thin bands, pods and lenses of various dimensions within Charnockites and Hornblende Biotite Gneisses. Quartzite bands is co-folded with Amphibolite and Pyroxenite. Talc-Tremolite-Actinolite schists occur as small oval to bean-shaped bodies in Hornblende Biotite Gneiss in the Southeast. Gabbros and Pyroxenites are distributed in the valley portion in the NorthEast and in Southern plains. A thin band of Amphibolite occurs in the North.

The Charnockite Group is represented by Charnockite and Banded Magnetite Quartzite. Charnockite, a greasy looking rock, is confined to the Northern part occupying the hills and the intervening valley. It is light to dark Grey in colour, medium to coarse to Pegmatoidal and consists of bluish Grey Quartz, Grey Feldspars, Pyroxenes (opx) ± Hornblende ± Biotite and opaques. It has a NNW-SSE trend with moderate to steep dips towards SSE or vertical in disposition. The rock is intruded by basic and ultrabasic rocks and basic dykes. Banded Magnetite Quartzite occurs as very thin bands within Charnockite.

The Khondalite Group is represented by Quartzite, Garnetiferous Sillimanite Gneiss and Calc Granulite. Quartzite occurs as thin bands associated with basic Granulites in a Gneissic country in the central part. Garnet Sillimanite Gneiss is restricted to the East where it forms persistent bands upto 50 m width occupying higher elevation of Perumal Malai. The rock is associated with Pyroxene Granulite and Garnetiferous Quartzofeldspathic Gneiss. Calc Granulite is confined to the NorthEast and shows typical ribbed weathering and contains Calcite, Plagioclase, Feldspar, Garnet and Diopside.

The Bhavani Gneissic Complex, comparable to the Peninsular Gneissic Complex, is roughly confined to the Southern half of the area. It is made up of Hornblende-Biotite and Biotite Gneisses exhibiting a distinct fissility. The Gneisses contain enclaves of the Sathyamangalam Supracrustals.

Source: https://salem.nic.in/salem-district-mineral-survey-report-new/

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 lease applied area exhibits hilly terrain. The area has gentle slope towards Eastern side. The altitude of the area is 400-480 m (max) above mean sea level. The area is covered by 1m (avg) thickness of Topsoil Formation. Massive Charnockite is found after 1 m (Topsoil Formation) which is clearly inferred from the nearby existing quarry pit.

Geologically, the entire district can be broadly classified into hard rock and sedimentary formations including tertiary formations.

a). Hard Rocks:

The Charnockite Group is represented by Charnockite and Banded Magnetite Quartzite.Charnockite, a greasy looking rock, is confined to the Northern part occupying the hills and the intervening valley. It is light to dark Grey in colour, medium to coarse to Pegmatoidal and consists of bluish Grey Quartz, Grey Feldspars, Pyroxenes (opx) ± Hornblende ± Biotite and opaques. It has a NNW-SSE trend with moderate to steep dips towards SSE or vertical in disposition. The rock is intruded by basic and ultrabasic rocks and basic dykes. Banded Magnetite Quartzite occurs as very thin bands within Charnockite.

b) Sedimentary (Alluvial formation):

The Quaternary Alluvium occurs all along the course of the Sarabhanga River in the central part.

2.3.3 Hydrogeology

Aquifer Systems:

The district is a part of Cauvery and Ponnaiar river basins and Sarabanga, Tirumanimuttar, Vasista and Suveda are the important watersheds/sub basins.

The district is underlain by both porous and fissured formations. The important aquifer systems in the district are constituted by unconsolidated & semiconsolidated formations and weathered and fractured crystalline rocks.

The porous formations in the district include sandstones and clays of Recent to subrecent and Tertiary age (Quaternary). The Recent formations comprising mainly sands, clays and gravels are confined to major drainage courses in the district. The maximum thickness of alluvium is 36.0 m bgl, whereas the average thickness is about 25.0 m. Ground water occurs under water table and confined conditions in these formations and is being developed by means of dug wells and filter points. The productive zones are encountered in the depth range of 20 to 36 m bgl. Alluvium, which forms a good aquifer system along the Cauvery, Ponnaiar, Sarabanga, Tirumanimuttar, Vasista and Suveda river bed which is one of the major sources of water supply to the villages

The water-bearing properties of crystalline formations which lack primary porosity depend on the extent of development of secondary intergranular porosity. The occurrence and movement of ground water in these rocks are under unconfined conditions in the joints & fissures and dependent on the nature and extent of pores and interconnection of fractures zones. The morpho-tectonic analysis of the crystalline tract indicates the presence of deep seated tensile and shear fractures particularly along the fold axes. These tension joints and fractures and shear fractures at deeper depth of 20 to 36 m have been acting as conduits for ground water movement.

Aquifer Parameters

The thickness of aquifer in this district is highly erratic and varies between 20 m to 36 m below ground level. The inter granular Porosity is essentially dependent on the intensity and degree of weathering and fracture development in the bed rock. As discussed earlier deep weathering has developed in Gneissic formations and moderate weathering in Charnockite formations. The range of aquifer parameters in hard rock and sedimentary formations are given below:

TABLE 2.14: RANGE OF AQUIFER PARAMETERS

Type of Aquifer	Unconfined to Semi confined conditions
Aquifer parameters	Hard rock
Well yield in lpm	45 - 545
Transmissivity (T)m2/day	10.2 – 542.8
Permeability (K)(m/day))	0.1 - 50
Depth of Water level	20m to 36m

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

FIGURE 2.13: REGIONAL GEOLOGY MAP

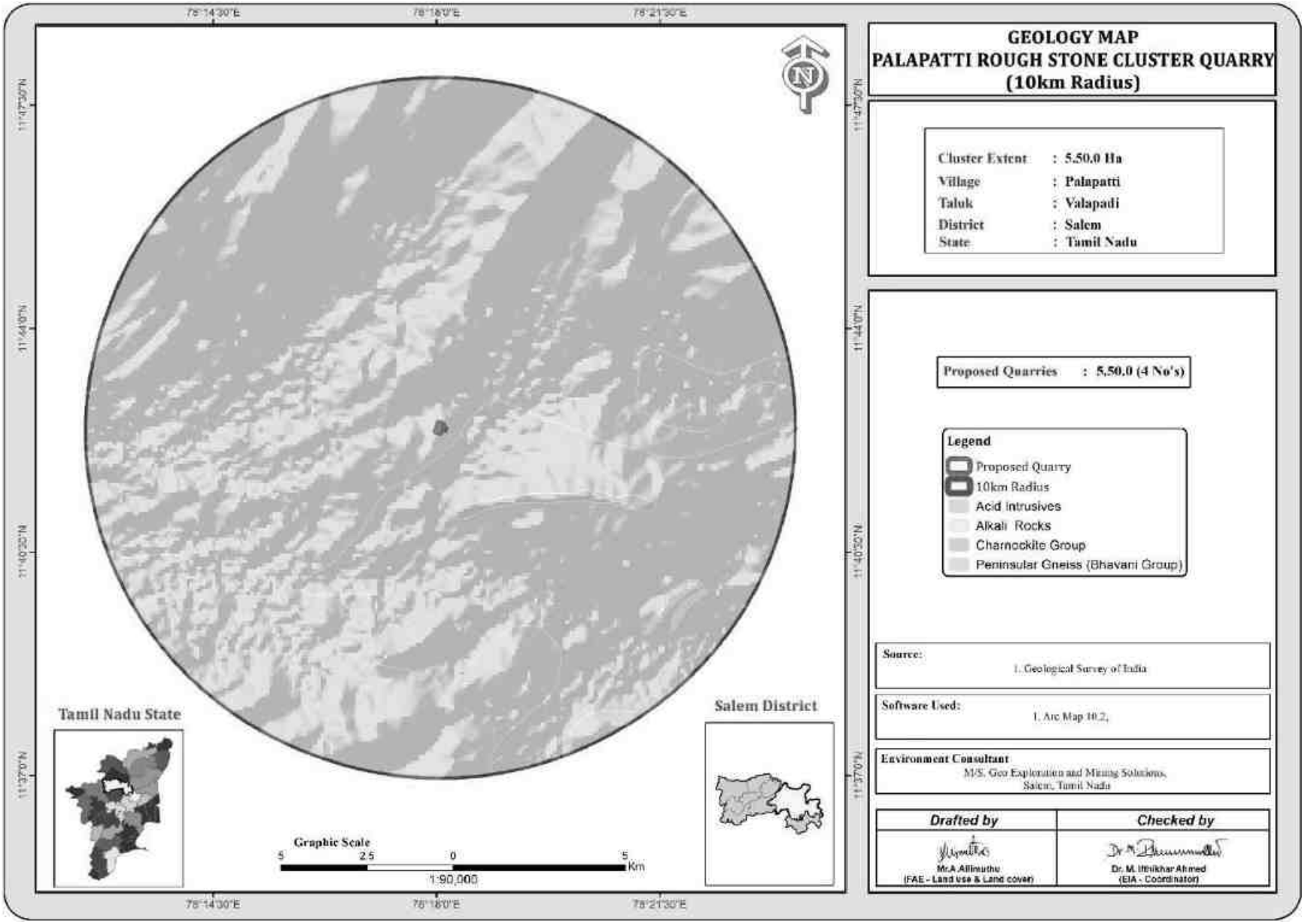


FIGURE 2.14: GEOMORPHOLOGY MAP

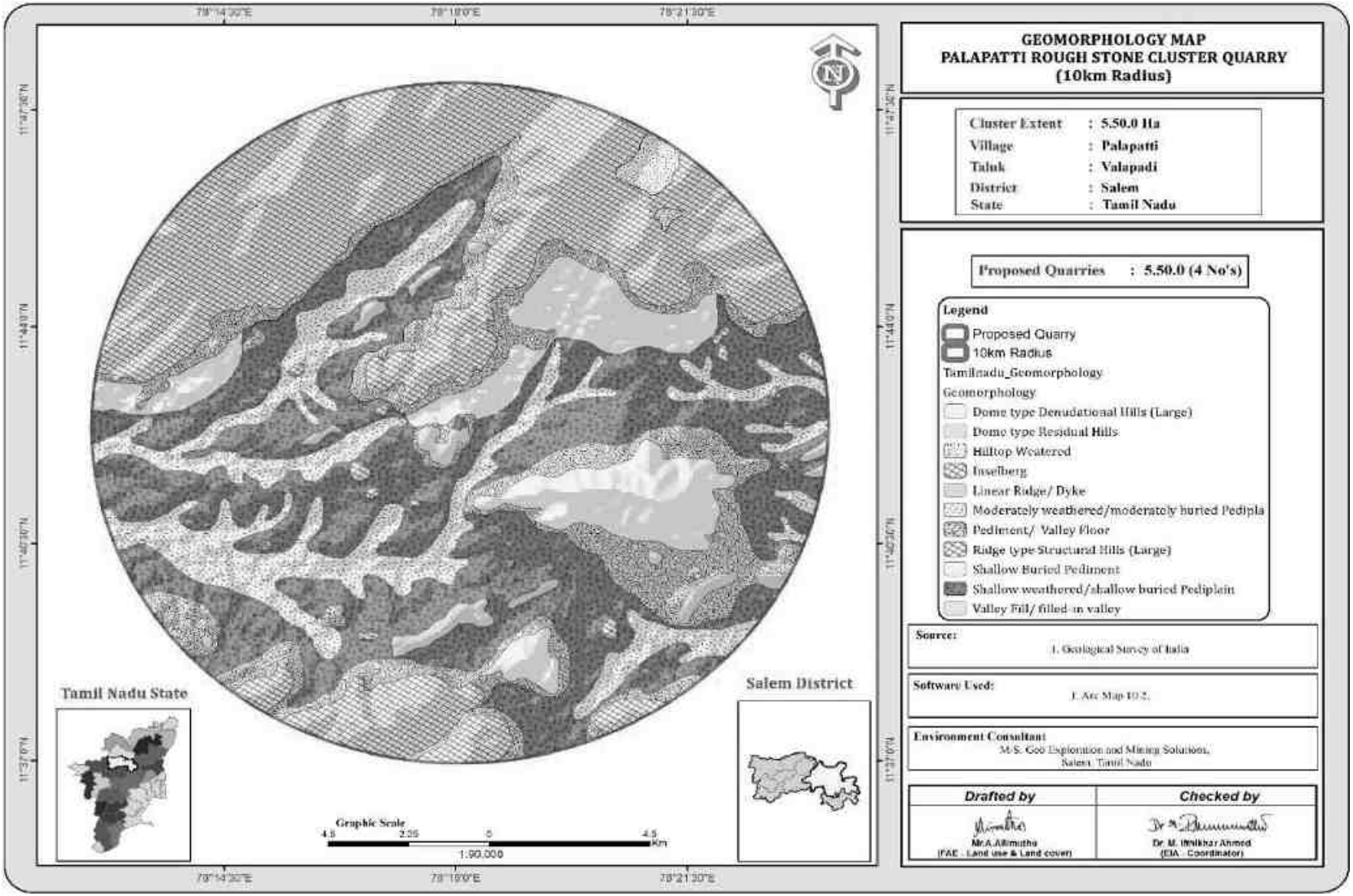
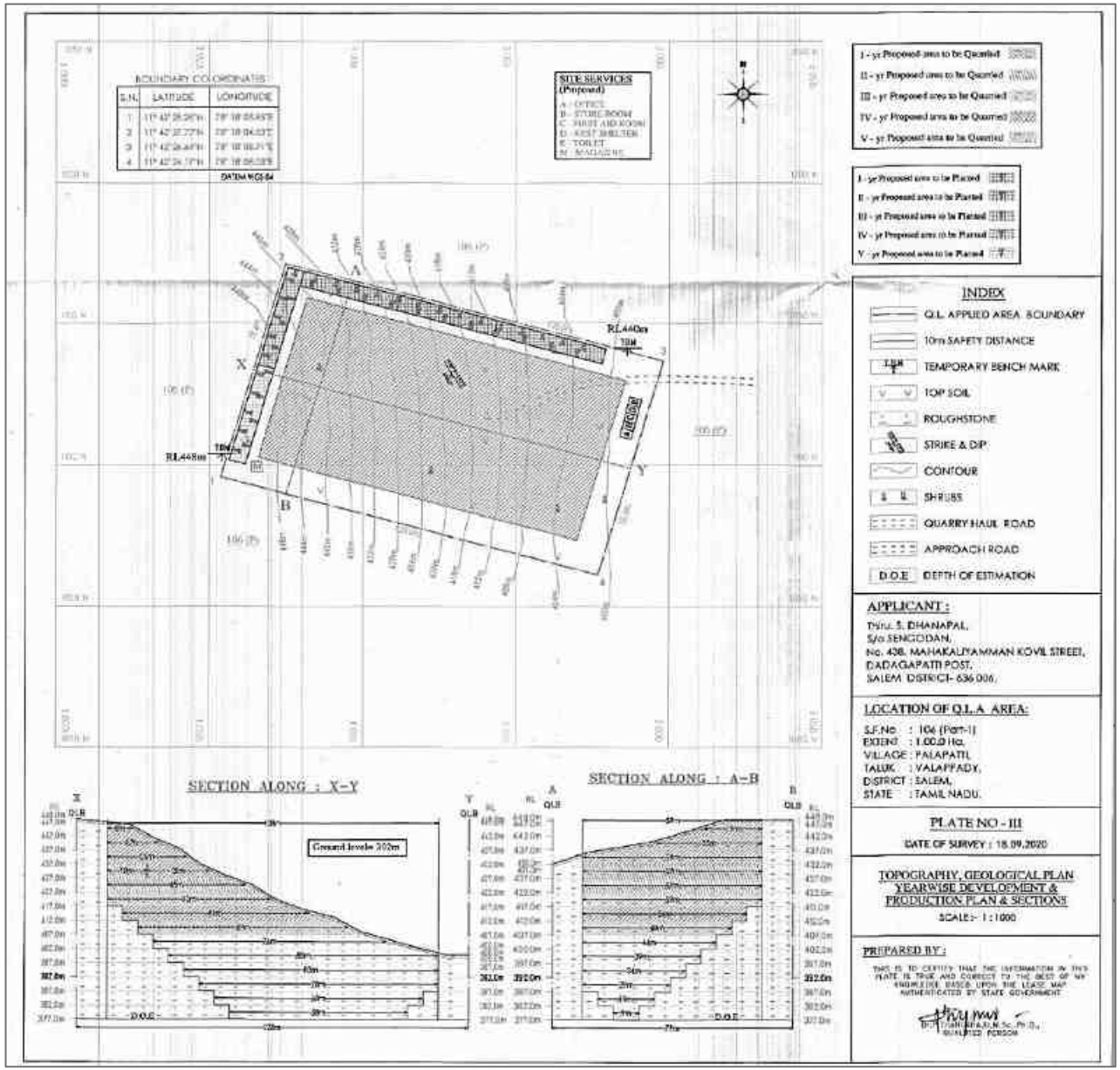


FIGURE 2.15: GEOLOGICAL, YEAR-WISE DEVELOPMENT PRODUCTION PLAN AND SECTIONS "P1"



Source: Approved Mining Plan

FIGURE 2.16: GEOLOGICAL, YEAR-WISE DEVELOPMENT PRODUCTION PLAN AND SECTIONS "P2"

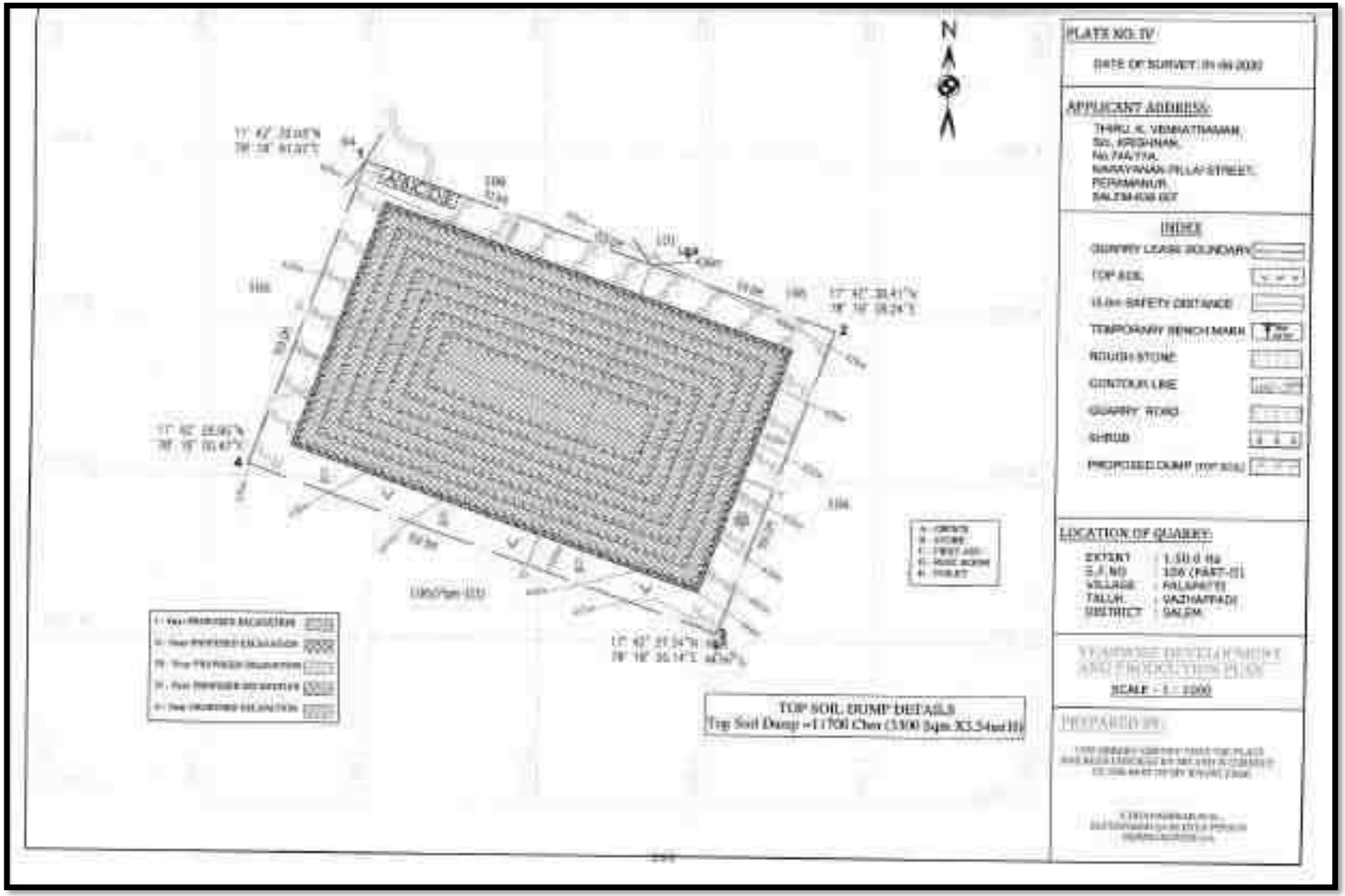


FIGURE 2.17: GEOLOGICAL, YEAR-WISE DEVELOPMENT PRODUCTION PLAN AND SECTIONS "P3"

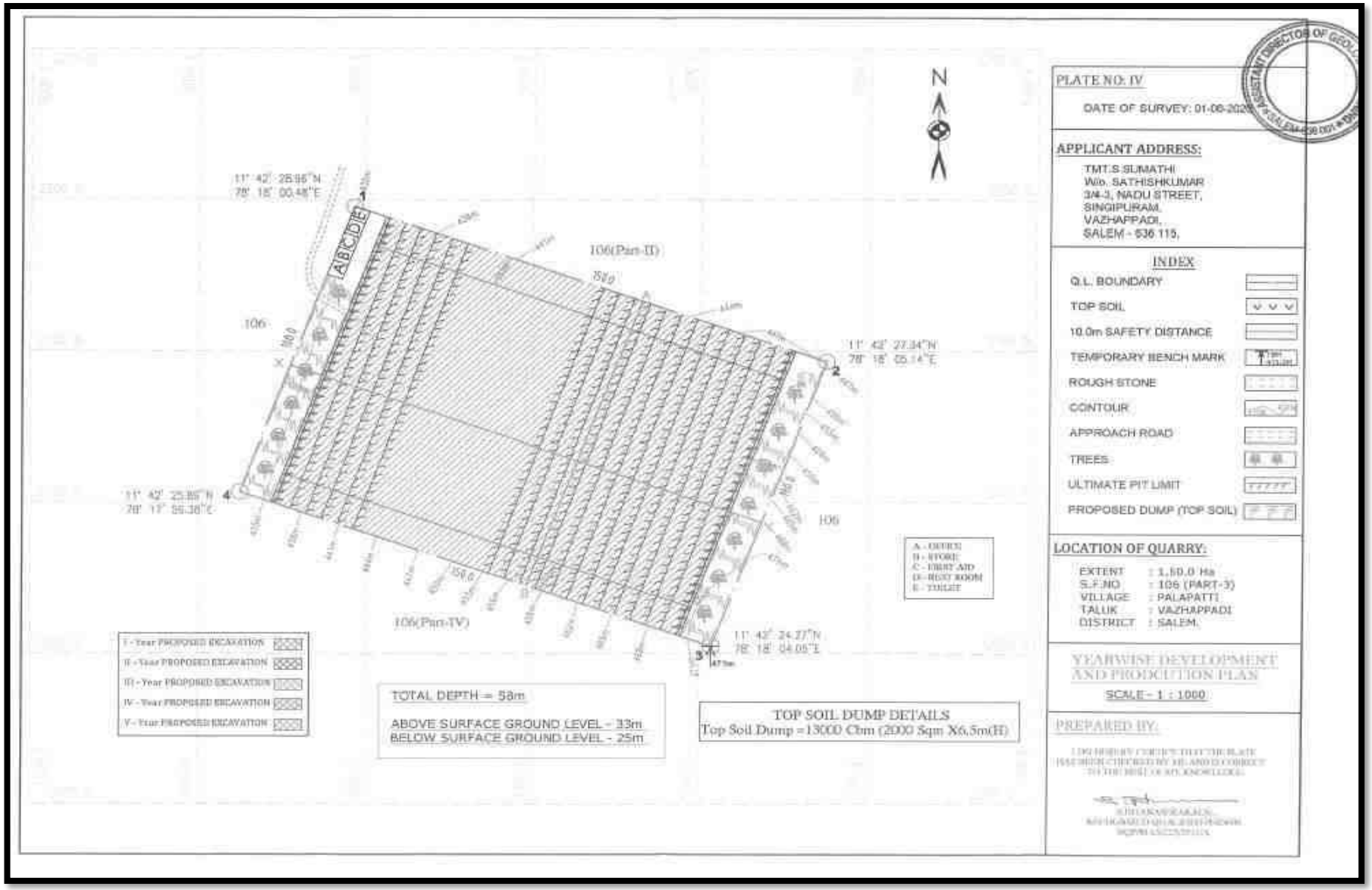


FIGURE 2.18: GEOLOGICAL, YEAR-WISE DEVELOPMENT PRODUCTION PLAN AND SECTIONS "P4"

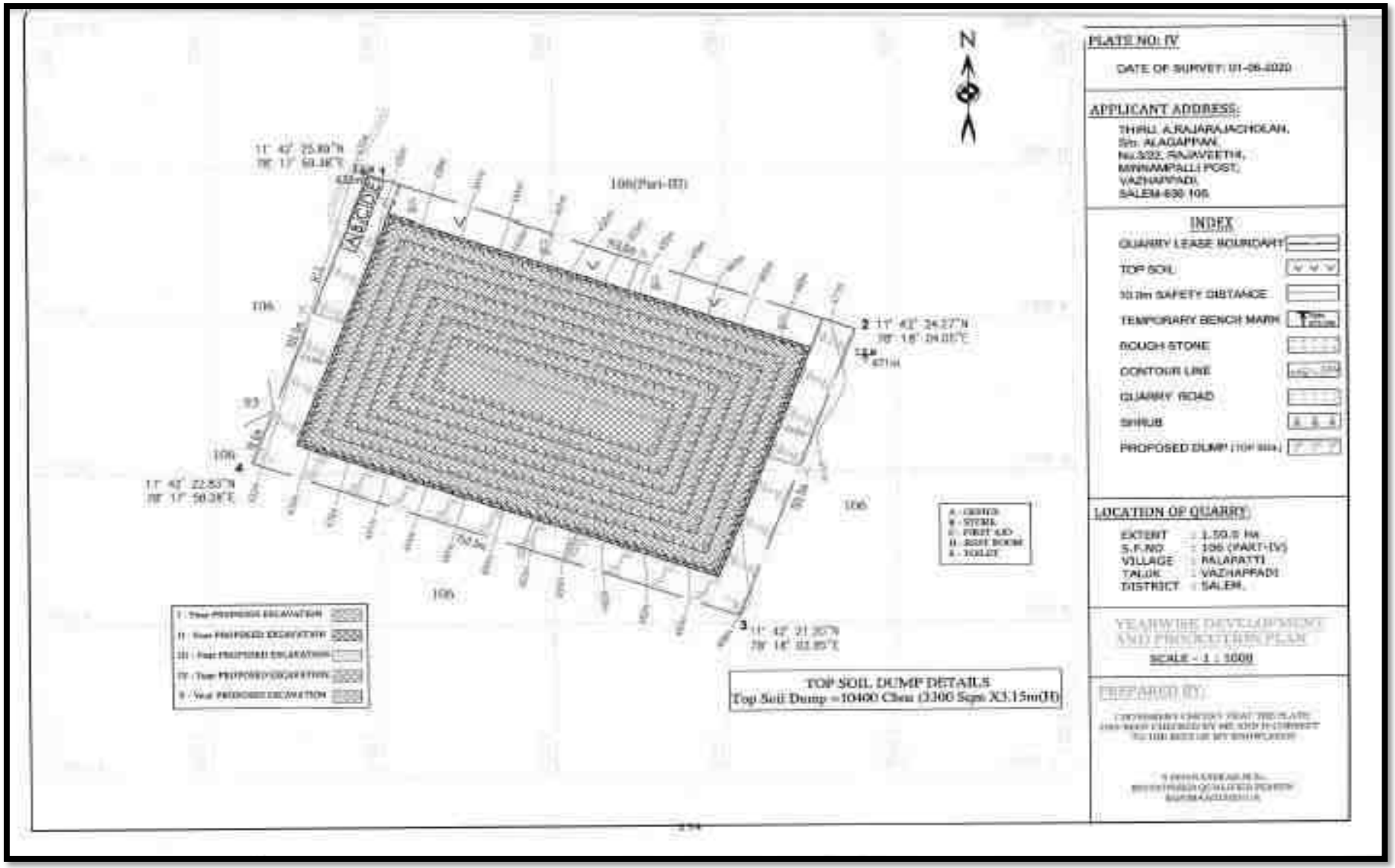
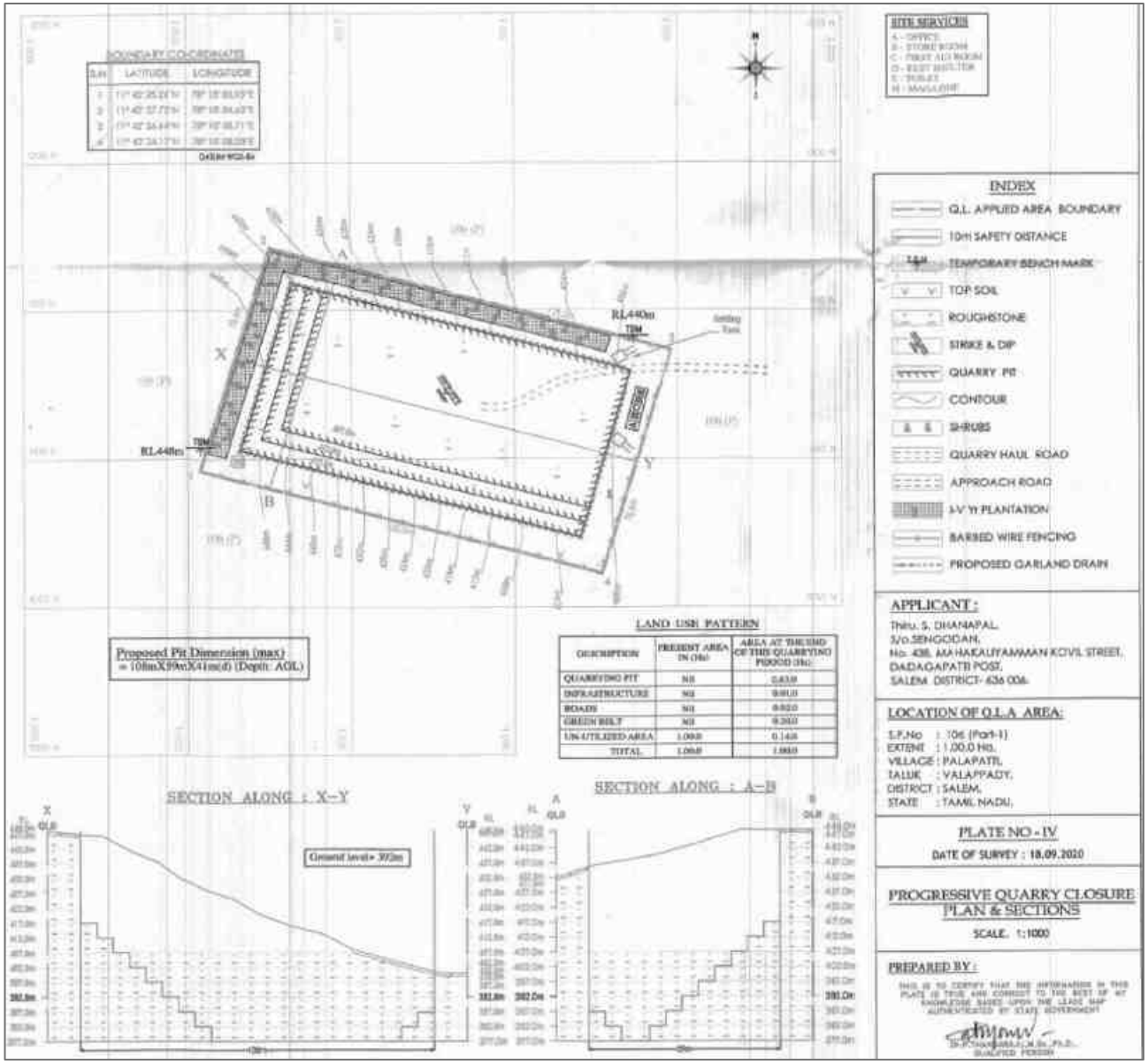


FIGURE 2.19: CLOSURE PLAN AND SECTIONS "P1"



Source: Approved Mining Plan

FIGURE 2.20: CLOSURE PLAN AND SECTIONS "P2"

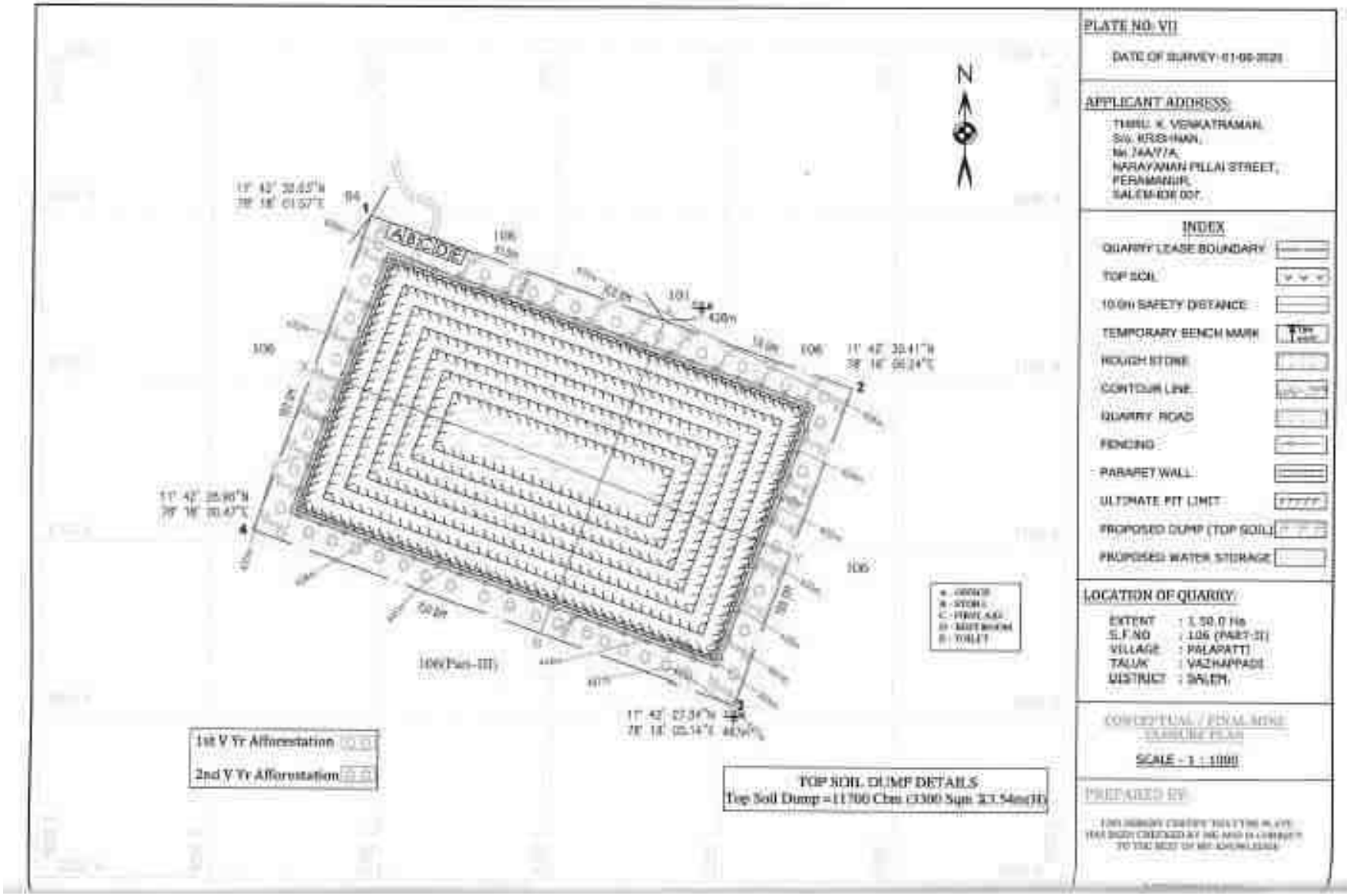


FIGURE 2.21: CLOSURE PLAN AND SECTIONS "P3"

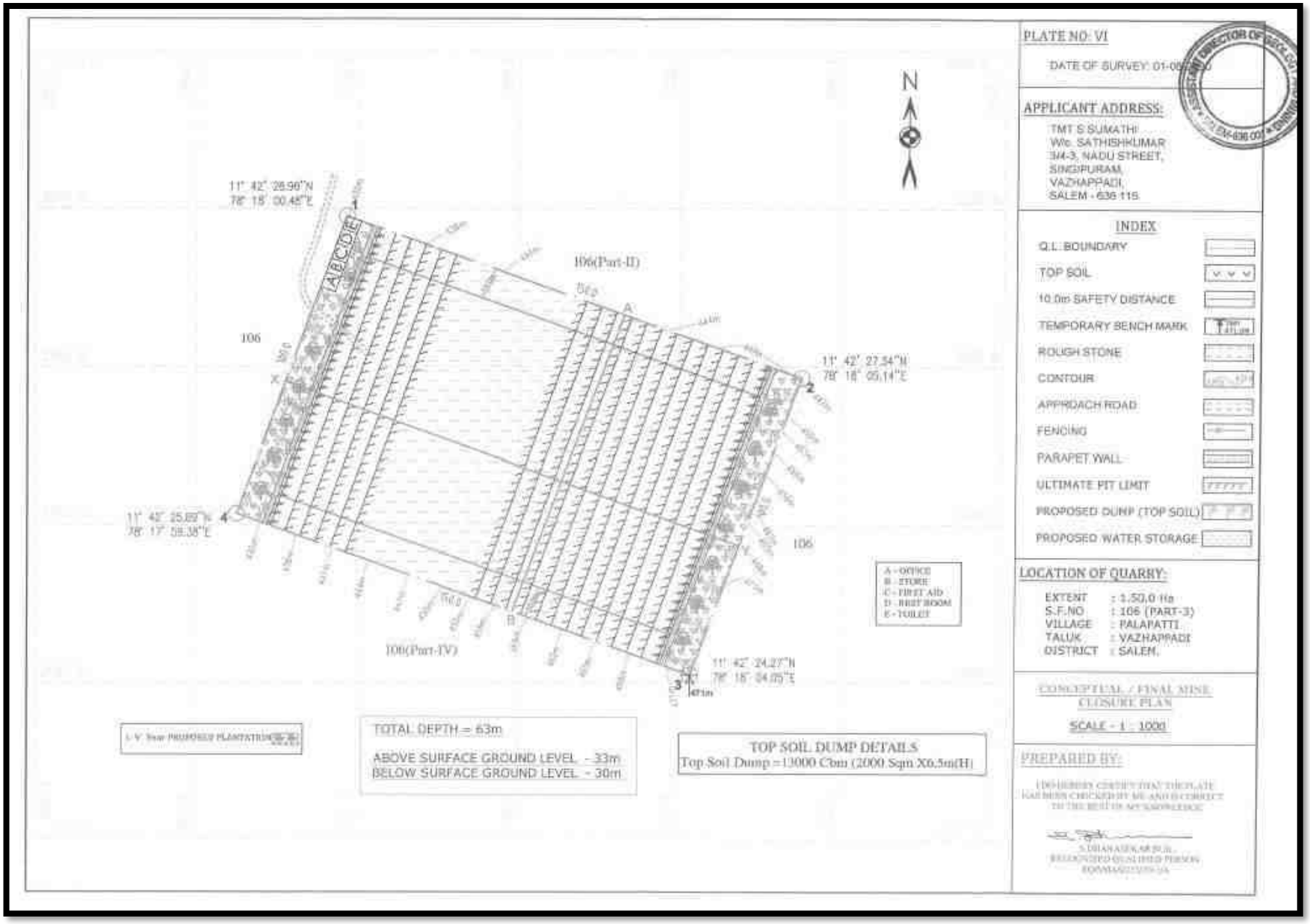
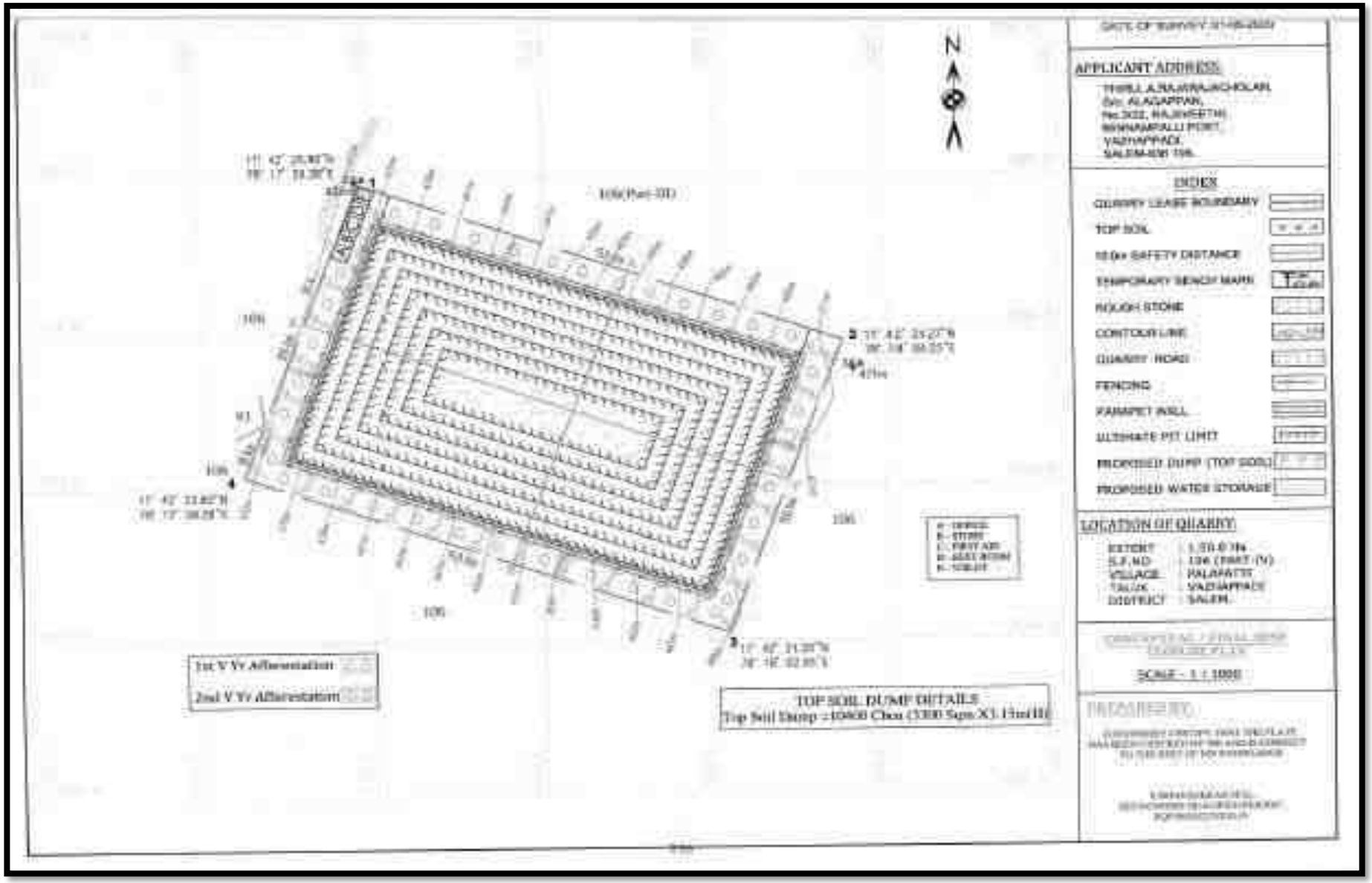


FIGURE 2.22: CLOSURE PLAN AND SECTIONS "P4"



2.4 RESOURCES AND RESERVES

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

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

TABLE 2.15: AVAILABLE GEOLOGICAL RESOURCES OF PROPOSED PROJECT "P1"

	Rough Stone	Topsoil
Geological Resource in m^3	4,38,620	10,112
Mineable Resource in m^3	1,51,795	6,372

Source: Approved Mining Plan

TABLE 2.15 -A: YEAR-WISE PRODUCTION PLAN "P1"

YEAR	ROUGH STONE (m^3)	TOPSOIL (m^3)
I	17,305	6,372
II	17,110	-
III	15,635	-
IV	16,470	-
V	16,905	-
TOTAL	**83,425**	**6,372**

Source: Approved Mining Plan

TABLE 2.16: AVAILABLE GEOLOGICAL RESOURCES OF PROPOSED PROJECT "P2"

	Rough Stone	Topsoil
Geological Resource in m^3	7,80,604	15,000
Mineable Resource in m^3	3,39,516	11,700

Source: Approved Mining Plan

TABLE 2.16 -A: YEAR-WISE PRODUCTION PLAN "P2"

YEAR	ROUGH STONE (m^3)	TOPSOIL (m^3)
I	91,416	11,700
II	51300	-
III	44200	-
IV	69,100	-
V	46,700	-
TOTAL	**3,02,716**	**11,700**

Source: Approved Mining Plan

TABLE 2.17: AVAILABLE GEOLOGICAL RESOURCES OF PROPOSED PROJECT "P3"

	Rough Stone	Topsoil
Geological Resource in m^3	6,34,948	15,000
Mineable Resource in m^3	3,47,617	13000

Source: Approved Mining Plan

TABLE 2.17 -A: YEAR-WISE PRODUCTION PLAN "P3"

YEAR	ROUGH STONE (m^3)	TOPSOIL (m^3)
I	128,617	13,000
II	49,000	-
III	44,000	-
IV	39,000	-

V	49,000	-
TOTAL	**3,09,617**	**13,000**

Source: Approved Mining Plan

TABLE 2.18: AVAILABLE GEOLOGICAL RESOURCES OF PROPOSED PROJECT "P4"

	Rough Stone	Topsoil
Geological Resource in m^3	777500	15000
Mineable Resource in m^3	339925	11700

Source: Approved Mining Plan

TABLE 2.18 -A: YEAR-WISE PRODUCTION PLAN "P4"

YEAR	ROUGH STONE (m^3)	TOPSOIL (m^3)
I	1,77,975	11,700
II	36,375	-
III	34,300	-
IV	28,600	-
V	23,400	-
TOTAL	**3,00,650**	**11,700**

Source: Approved Mining Plan

Disposal of Waste

There is no waste anticipated in this Rough Stone quarrying operation. The entire quarried out materials will be utilized (100%). Top layer of Topsoil formation will be removed and stored within the project premises and later will be used for Green-belt development.

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 2.19: ULTIMATE PIT DIMENSION "P1"

Pit	Length (Max) (m)	Width (Max) (m)	Depth (Max)
I	108	59	71m

Source: Approved Mining Plan

TABLE 2.20: ULTIMATE PIT DIMENSION "P2"

Pit	Length (Max) (m)	Width (Max) (m)	Depth (Max)
I	130	90	63m

Source: Approved Mining Plan

TABLE 2.21: ULTIMATE PIT DIMENSION "P3"

Pit	Length (Max) (m)	Width (Max) (m)	Depth (Max)
I	130	100	63m

Source: Approved Mining Plan

TABLE 2.22: ULTIMATE PIT DIMENSION "P4"

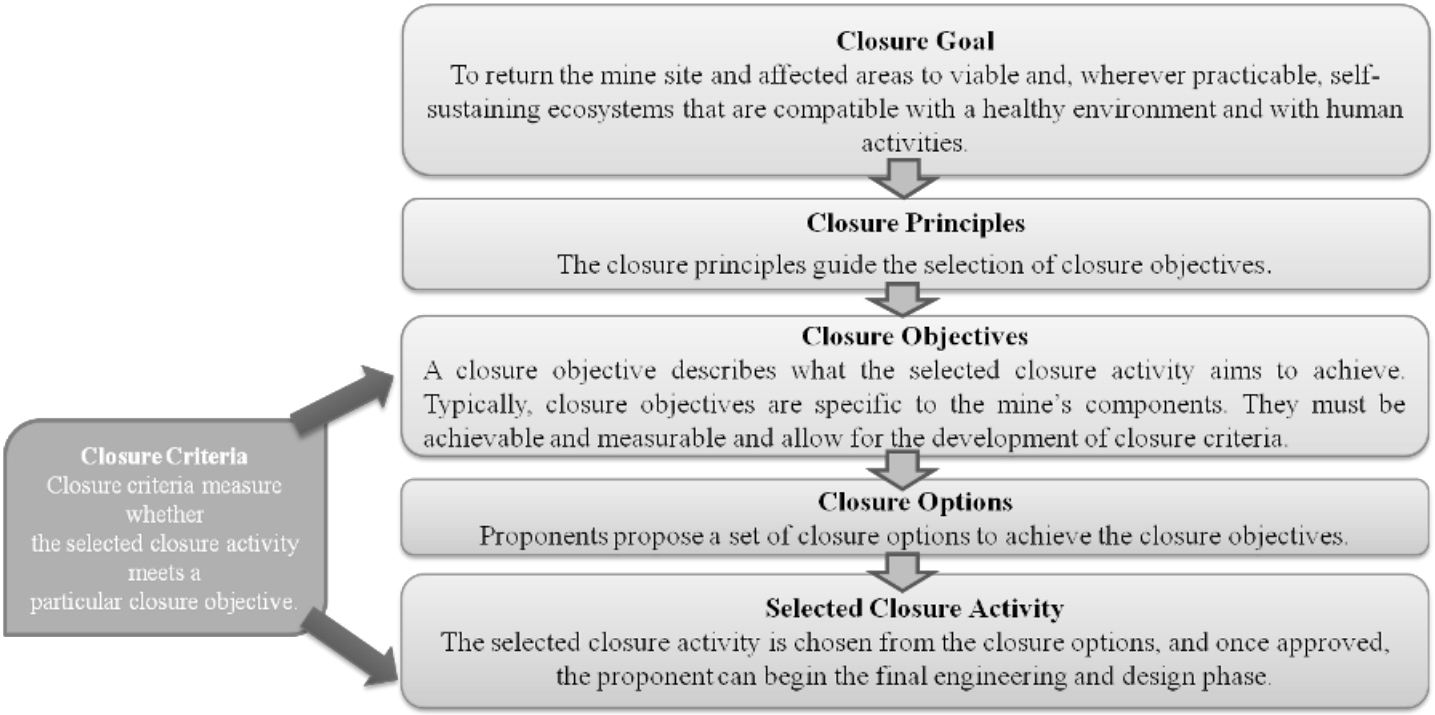
Pit	Length (Max) (m)	Width (Max) (m)	Depth (Max)
I	130	90	66m

Source: Approved Mining Plan

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

Closure Objectives –

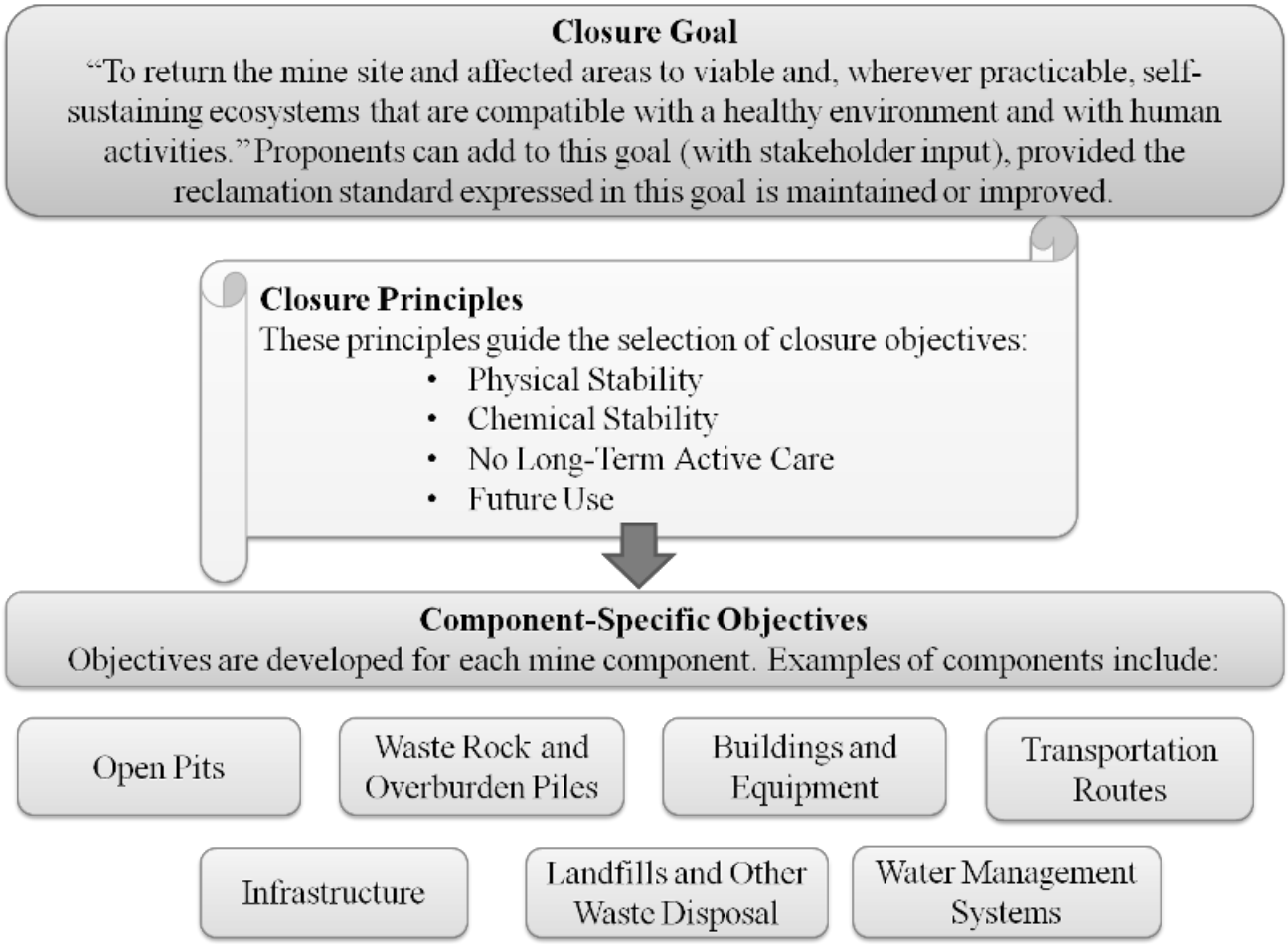
- Access to be limited, for the safety of humans and wildlife.
- The open pit mine workings and pit boundary are physically and geo-technically stable.
- Water quality in flooded pits is safe for humans, aquatic life, and wildlife.
- Discharge of contaminated drainage has been minimized and controlled.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



Closure Planning & Options Considerations in Mine Design –

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

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



Post-Closure Monitoring –

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

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

TABLE 2.23: MINE CLOSURE BUDGET –"P1-P4"

Proposal	Activity	Year & No of Trees	Cost	Total Cost
P1	Greenbelt development within the project area and nearby village roads	1st year 600 Nos of trees	Site clearance, preparation of land, digging of pits / trenches, soil amendments, transplantation of saplings @ 200 per plant and maintenance	Rs 1,20,000/-
P2		1st year 900 Nos of trees		Rs 1,80,000/-
P3		1st year 900 Nos of trees		Rs 1,80,000/-
P4		1st year 900 Nos of trees		Rs 1,80,000/-
P1-P4	Renovation of Wire Fencing (1300 meters)	1st year	@ 300 Rs per meter*4	Rs 15,60,000
P1-P4	Renovation of Garland Drain (1200 meters)	1st year	@ 300Rs per meter*4	Rs 14,40,000
Total no of Trees from the 4 Proposals		**3,300 Trees**	**Total Budget**	**Rs 36,60,000/-**

Source: Proposed by FAE's and EC

2.5 METHOD OF MINING

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

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

2.5.1 Drilling & Blasting Parameters

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

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

Type of Explosives to be used –

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

Storage of Explosives –

No proposal for storage of explosives within the project area, the project proponent has 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 2.27 PROPOSED MACHINERY DEPLOYMENT "P1"

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

Source: Approved Mining Plan

TABLE 2.28 PROPOSED MACHINERY DEPLOYMENT "P2"

S.NO.	TYPE	NOS	SIZE/CAPACITY	MOTIVE POWER
1	Jack hammers	5	1.2m to 2.0m	Compressed air
2	Hydraulic Excavator	1	300 HP	Diesel Drive
3	Tippers	2	20 Tonnes	Diesel Drive

Source: Approved Mining Plan

TABLE 2.29 PROPOSED MACHINERY DEPLOYMENT "P3"

S.NO.	TYPE	NOS	SIZE/CAPACITY	MOTIVE POWER
1	Jack hammers	7	1.2m to 2.0m	Compressed air
2	Hydraulic Excavator	1	300 HP	Diesel Drive
3	Tippers	4	20 Tonnes	Diesel Drive

Source: Approved Mining Plan

TABLE 2.30 PROPOSED MACHINERY DEPLOYMENT "P4"

S.NO.	TYPE	NOS	SIZE/CAPACITY	MOTIVE POWER
1	Jack hammers	5	1.2m to 2.0m	Compressed air
2	Hydraulic Excavator	1	300 HP	Diesel Drive
3	Tippers	2	20 Tonnes	Diesel Drive

Source: Approved Mining Plan

2.6 GENERAL FEATURES

2.6.1 Existing Infrastructures

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

2.6.2 Drainage Pattern

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

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

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

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

2.6.3 Traffic Density

The traffic survey conducted based on the transportation route of material, the Rough Stone is proposed to be transported mainly through (SH-18) Salem to Tirupattur Road and District Road Ayodhiyapattinam to Belur road on Western Side.

Traffic density measurements were performed at two locations

1. (SH-18) Salem to Tirupattur Road
2. Ayodhiyapattinam to Belur Major District road.

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

TABLE.2.31: TRAFFIC SURVEY LOCATIONS

Station Code	Road Name	Distance and Direction	Type of Road
TS1	(SH-18) Salem to Tirupattur Road	4.2Km NW	State Highways (Two Lane)
TS2	Ayodhiyapattinam to Belur Major District road	2.0 km-SW	Major District Road (Two Lane)

Source: On-site monitoring by GEMS FAE & TM

TABLE 2.32: EXISTING TRAFFIC VOLUME

Station code	HMV		LMV		2/3 Wheelers		Total PCU
	No	PCU	No	PCU	No	PCU	
TS1	215	645	103	103	312	156	904
TS2	203	609	98	98	296	148	885

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 2.33: ROUGH STONE HOURLY TRANSPORTATION REQUIREMENT

Transportation of Rough Stone & Gravel per day		
Capacity of trucks	No. of Trips per day Cumulatively	Volume in PCU
10 tonnes	9	9

Source: Data analysed from Approved Mining Plan

FIGURE.2.23: MINERAL TRANSPORTATION ROUTE MAP

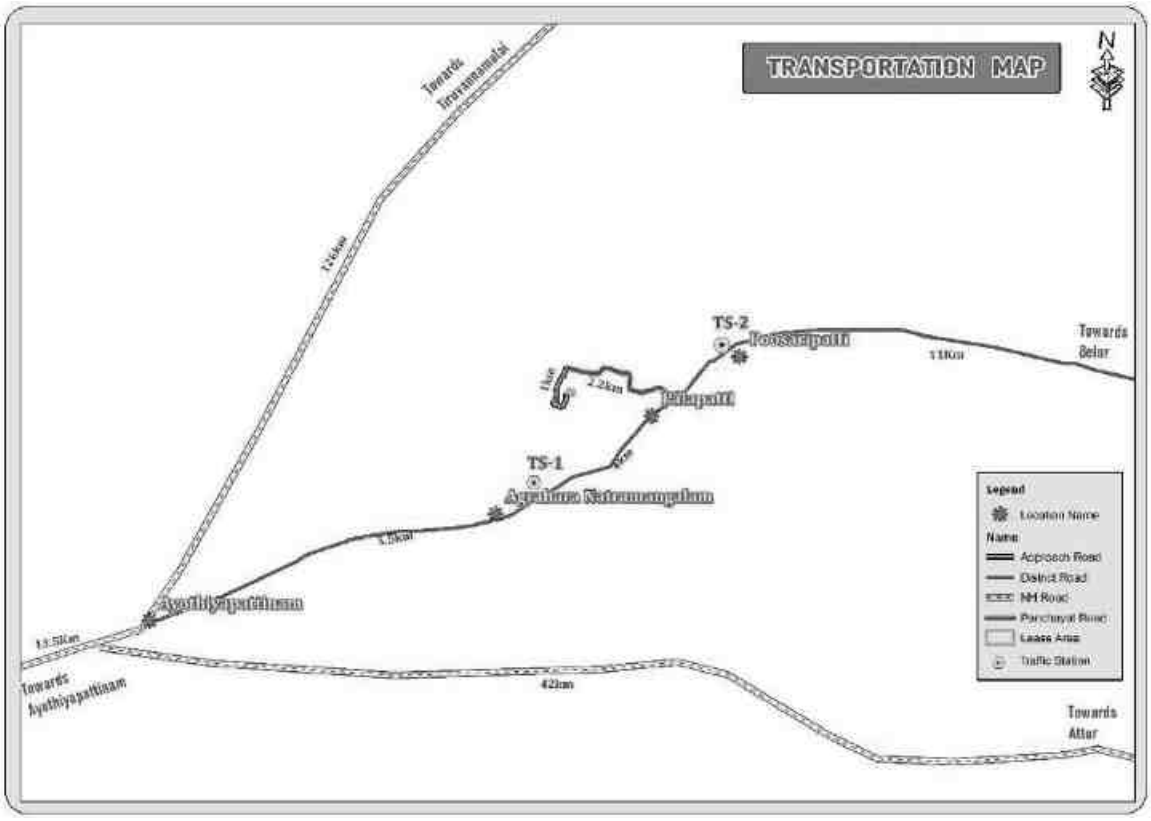


TABLE 2.34: SUMMARY OF TRAFFIC VOLUME

Route	Existing Traffic volume in PCU	Incremental traffic due to the project	Total traffic volume	Hourly Capacity in PCU as per IRC – 1960guidelines
(SH-18) Salem to Tirupattur Road	904	9	913	1200
Ayodhiyapattinam to Belur Major District road	885	9	884	1200

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

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

2.6.4 Mineral Beneficiation and Processing

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

2.7 PROJECT REQUIREMENT

2.7.1 Water Source & Requirement

Detail of water requirements in KLD as given below:

TABLE 2.35: WATER REQUIREMENT FOR THE PROJECT "P1"

*Purpose	Quantity	Source
Dust Suppression	1.5 KLD	Rainwater accumulated in Mine Pit/ Water Tanker
Green Belt development	0.7 KLD	Rainwater accumulated in Mine Pit/ Water Tanker
Domestic purpose	0.6 KLD	Water Tankers
Total	**2.8 KLD**	

Source: Prefeasibility Report

* Drinking water will be sourced from Approved Water Vendors

TABLE 2.36: WATER REQUIREMENT FOR THE PROJECT "P2"

*Purpose	Quantity	Source
Dust Suppression	0.80 KLD	Rainwater accumulated in Mine Pit/ Water Tanker
Green Belt development	0.50 KLD	Rainwater accumulated in Mine Pit/ Water Tanker
Domestic purpose	0.50 KLD	Water Tankers
Total	**1.8 KLD**	

Source: Prefeasibility Report

* Drinking water will be sourced from Approved Water Vendors

TABLE 2.37: WATER REQUIREMENT FOR THE PROJECT "P3"

*Purpose	Quantity	Source
Dust Suppression	1.0 KLD	Rainwater accumulated in Mine Pit/ Water Tanker
Green Belt development	1.5 KLD	Rainwater accumulated in Mine Pit/ Water Tanker
Domestic purpose	0.5 KLD	Water Tankers
Total	**3.0 KLD**	

Source: Prefeasibility Report

* Drinking water will be sourced from Approved Water Vendors

TABLE 2.38: WATER REQUIREMENT FOR THE PROJECT "P4"

*Purpose	Quantity	Source
Dust Suppression	1.00 KLD	Rainwater accumulated in Mine Pit/ Water Tanker
Green Belt development	0.50 KLD	Rainwater accumulated in Mine Pit/ Water Tanker
Domestic purpose	0.50 KLD	Water Tankers
Total	**2.0 KLD**	

Source: Prefeasibility Report * Drinking water will be sourced from Approved Water Vendors

2.7.2 Power and Other Infrastructure Requirement

This proposed project require power supply for the mining operations. The quarrying activity is proposed during day time only (General Shift 8 AM – 5 PM, Lunch Break 1 PM – 2 PM). Electricity for use in office and other internal infrastructure will be obtained from SEB by respective project proponent.

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

2.7.3 Fuel Requirement

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

Average diesel consumption is around = 500 Liters of HSD / day per proposed project.

2.7.4 Project Cost

TABLE 2.39: PROJECT COST P1-P4

Code	Proponent	Project Cost
P1	Thiru. S.Dhanapal	Rs. 44,71,000/-
P2	Thiru.K.Venkatraman,	Rs. 74,40,000/-
P3	Tmt. S.Sumathi	Rs. 74,27,000/-
P4	Thiru.A.Rajarajacholan	Rs. 74,40,000/-

Source: Approved Mining Plan &Prefeasibility Report

2.8 EMPLOYMENT REQUIREMENT:

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

TABLE 2.40: PROPOSED MANPOWER DEPLOYMENT "P1"

Mines Manager/Mines Foreman	1
Mate/Blaster	1
Excavator Operator and Driver	2
Jack hammer operator	4
Security	1
Unskilled Labourers	5
Total	**14**

Source: Approved Mining Plan

TABLE 2.41: PROPOSED MANPOWER DEPLOYMENT "P2"

Operator	2
Mechanic	1
Blaster Mat	1
Driver	2
Musdoor	5
Cleaners	3
Office Boy	1
Management & Supervisory staff	3
Total	**18**

Source: Approved Mining Plan

TABLE 2.42: PROPOSED MANPOWER DEPLOYMENT "P3"

Operator	2
Mechanic	1
Blaster Mat	1
Driver	2
Musdoor	5
Cleaners	3
Office Boy	1
Management & Supervisory staff	3
Total	**18**

Source: Approved Mining Plan

TABLE 2.43: PROPOSED MANPOWER DEPLOYMENT "P4"

Operator	2
Mechanic	1
Blaster Mat	1
Driver	2
Musdoor	5
Cleaners	3
Office Boy	1
Management & Supervisory staff	3
Total	**18**

Source: Approved Mining Plan

2.9 PROJECT IMPLEMENTATION SCHEDULE

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

TABLE 2.44: EXPECTED TIME SCHEDULE

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

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

3. DESCRIPTION OF ENVIRONMENT

3.0 GENERAL

This chapter presents a regional background to the baseline data at the very onset, which will help in better appreciation of micro-level field data, generated on several environmental and ecological attributes of the study area. The baseline status of the project environment is described section wise for better understanding of the broad-spectrum conditions. The baseline environment quality represents the background environmental scenario of various environmental components such as Land, Water, Air, Noise, Biological and Socio-economic status of the study area. Field monitoring studies to evaluate the base line status of the project site were carried out covering March, April & May 2022 with CPCB guidelines. Environmental data has been collected with reference to cluster quarries by KGS ENVIRO LABORATORY PVT LTD., ISO /IEC 17025:2017 Certified & MoEF Notified Laboratory, for the below attributes –

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

Study Area

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

Study Period

The baseline study was conducted during the summer season i.e., March – May 2022.

Study Methodology

- The project area was surveyed in detail with the help of Total Station and the boundary pillars were picked up with the help of GPS. The boundary coordinates were superimposed on the satellite imagery to understand the relief of the area, besides Land use pattern of the area was studied through the Bhuvan (ISRO)
- Soil samples were collected and analysed for relevant physio-chemical characteristics, exchangeable Cations, nutrients & micro nutrients etc., in order to assess the impact due to mining activities and to recommend saplings for Greenbelt development
- Ground water samples were collected during the study period from the existing bore wells, while surface water was collected from ponds in the buffer zone. The samples were analysed for parameters necessary to determine water quality (based on IS: 10500:2012 criteria) and those which are relevant from the point of view of environmental impact of the proposed mines
- An onsite meteorological station was setup in cluster area, to collect data about wind speed, wind direction, temperature, relative humidity, rainfall and general weather conditions were recorded throughout the study period
- In order to assess the Ambient Air Quality (AAQ), samples of ambient air were collected by installation of Respiratory Dust Samplers (RDS) for Fugitive dust, PM_{10} and SO_2, NO_X with gaseous attachments & Fine Dust Samplers (FDS) for $PM_{2.5}$ and other parameters as per NAAQ norms and analysed for primary air pollutants to work out the existing status of air quality.
- The Noise level measurements were also made at various locations in different intervals of time with the help of sound level meter to establish the baseline noise levels in the impact zone.

- Baseline biological studies were carried out to assess the ecology of the study area to study the existing flora and fauna pattern of the area.
- Socio-Economic survey was conducted at village and household level in the study area to understand the present socio-economic conditions and assess the extent of impact due to the proposed mining project.

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

TABLE 3.1: MONITORING ATTRIBUTES AND FREQUENCY OF MONITORING

Attribute	Parameters	Frequency of Monitoring	No. of Locations	Protocol
Land-use Land cover	Land-use Pattern within 10 km radius of the study area	Data from census handbook 2011 and from the satellite imagery	Study Area	Satellite Imagery Primary Survey
*Soil	Physio-Chemical Characteristics	Once during the study period	6 (1 core & 5 buffer zone)	IS 2720 Agriculture Handbook - Indian Council of Agriculture Research, New Delhi
*Water Quality	Physical, Chemical and Bacteriological Parameters	Once during the study period	6 (1 surface water & 5 ground water)	IS 10500& CPCB Standards
Meteorology	Wind Speed Wind Direction Temperature Cloud cover Dry bulb temperature Rainfall	1 Hourly Continuous Mechanical/Automatic Weather Station	1	Site specific primary data& Secondary Data from IMD Station
*Ambient Air Quality	PM_{10} $PM_{2.5}$ SO_2 NO_X Fugitive Dust	24 hourly twice a week (March – May 2022)	8 (1 core & 7 buffer)	IS 5182 Part 1-23 National Ambient Air Quality Standards, CPCB
*Noise Levels	Ambient Noise	Hourly observation for 24 Hours per location	8 (1 core & 7 buffer zone)	IS 9989 As per CPCB Guidelines
Ecology	Existing Flora and Fauna	Through field visit during the study period	Study Area	Primary Survey by Quadrate & Transect Study Secondary Data – Forest Working Plan
Socio Economic Aspects	Socio–Economic Characteristics, Population Statistics and Existing Infrastructure in the study area	Site Visit & Census Handbook, 2011	Study Area	Primary Survey, census handbook & need based assessments.

Source: On-site monitoring/sampling by KGS Laboratories 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

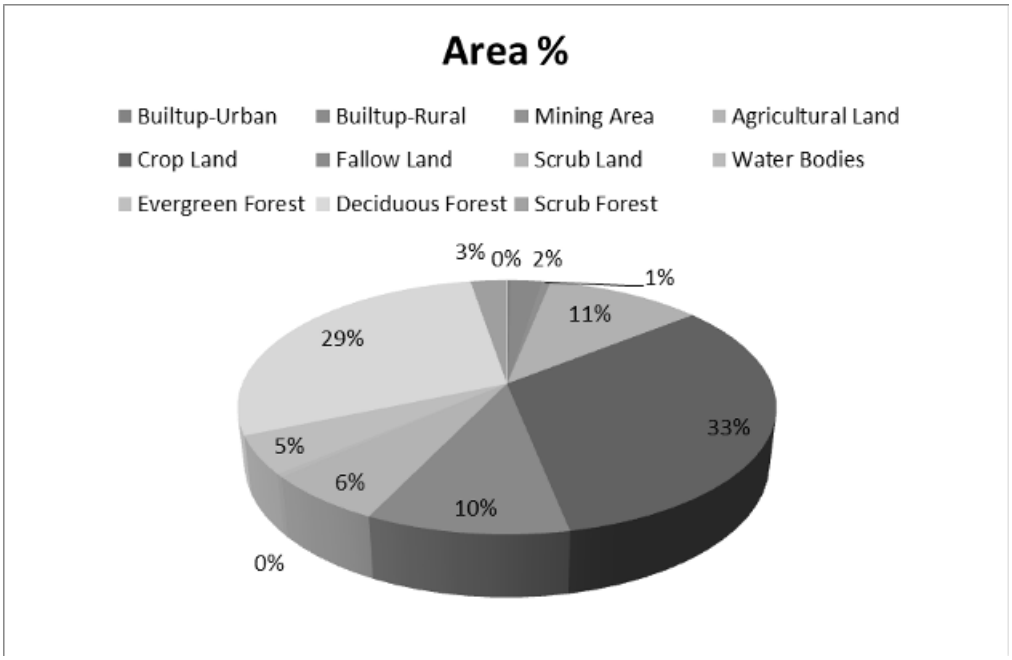
A visual interpretation technique has been adopted for land use classification based on the keys suggested in the chapter – V of the guidelines issued by NNRMS Bangalore & Level III classification with 1:50,000 scale for the preparation of land use mapping. Land use pattern of the area was studied through 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_%
BUILT UP			
1	Builtup-Urban	78.9276	0.236
2	Builtup-Rural	747.101	2.239
3	Mining Area	212.708	0.637
AGRICULTURAL LAND			
4	Agricultural Land	3728.83	11.17
5	Crop Land	10872.8	32.58
6	Fallow Land	3424.71	10.26
BARREN/WASTE LANDS			
7	Scrub Land	2060.26	6.175
WATER BODIES			
8	Water Bodies	143.249	0.429
FOREST			
9	Evergreen Forest	1608.65	4.821
10	Deciduous Forest	9615.31	28.81
11	Scrub Forest	871.415	2.611
	Total	**33363.9606**	**100.00**

Source: Survey of India Toposheet and Landsat Satellite Imagery

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



Source: Table 3.2

FIGURE 3.2: LAND USE LAND COVER MAP 10KM RADIUS

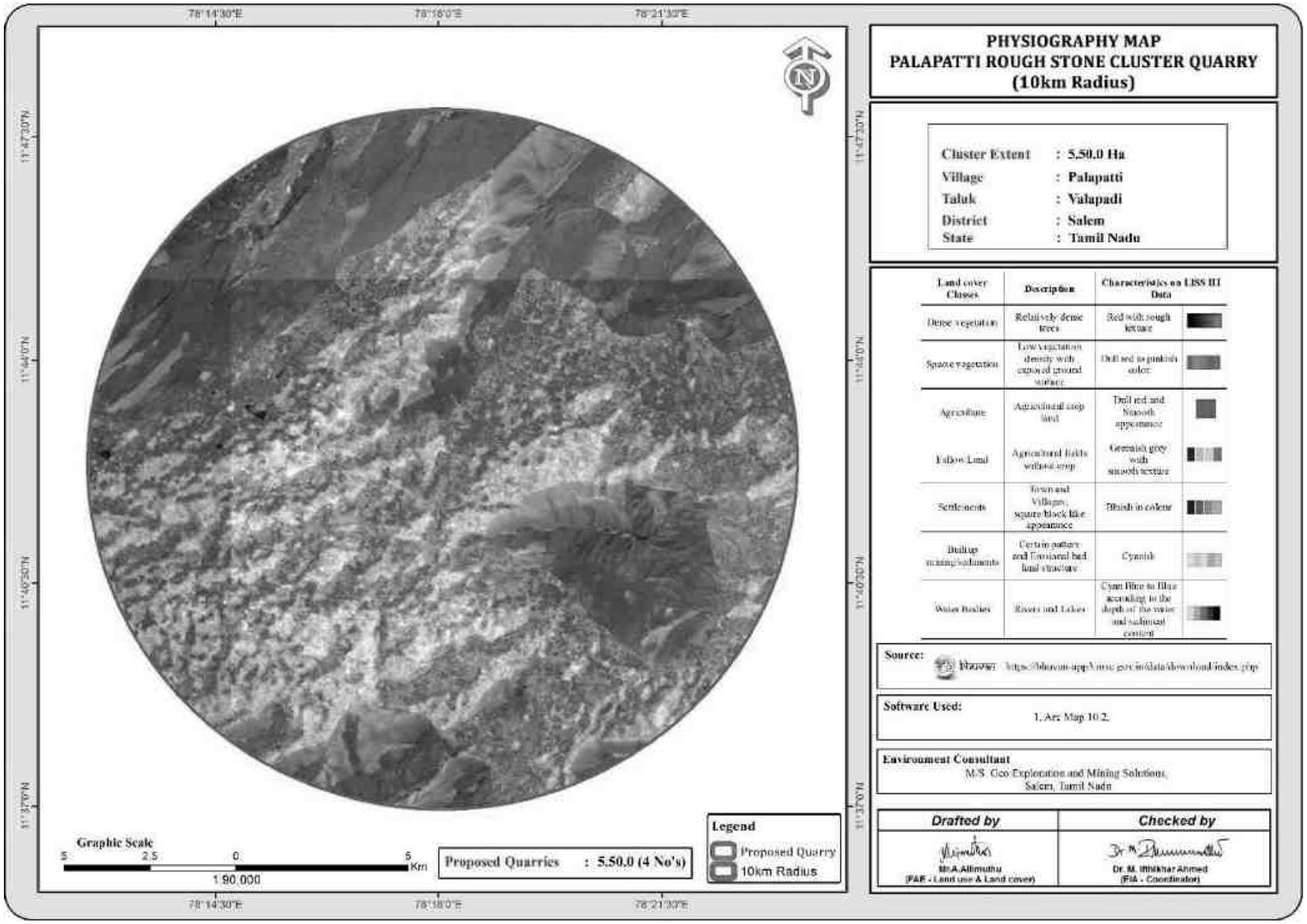
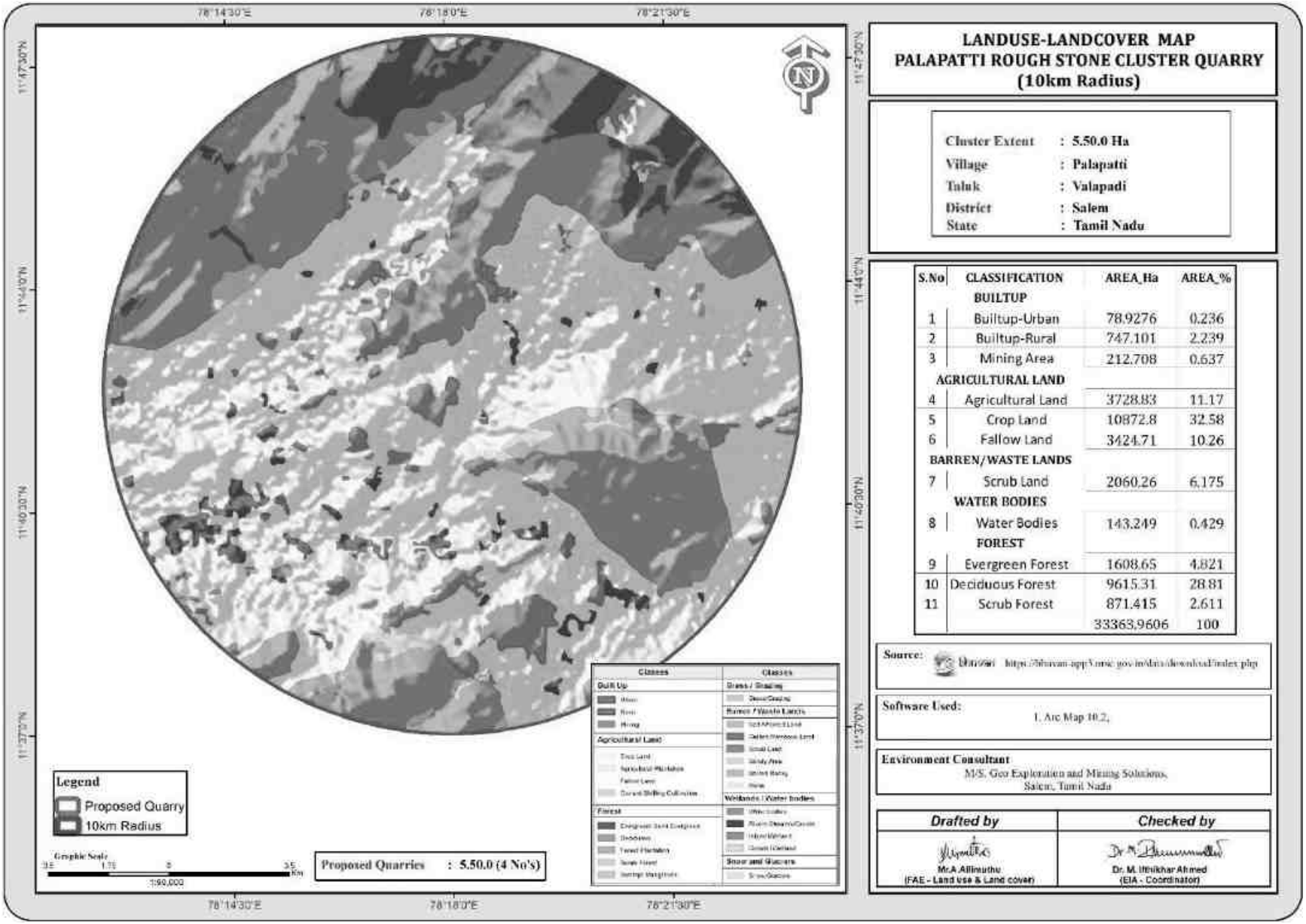


FIGURE 3.3: LAND USE LAND COVER MAP 10KM RADIUS



From the above table, pie diagram and land use map it is inferred that the majority of the land in the study area is Agriculture land (includes crop and fallow land) 54.01% followed by Forest land 36.24%, Scrub land 6.17%, Built up area 2.74%, Mining land 0.63% and Water bodies 0.43%

The total mining area within the study area is 212.70 ha i.e., 0.637%. The cluster area of 5.50 ha contributes about 2.58% 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 Lease Applied area is hilly terrain, the gradient is gentle (1 to 4) towards Eastern Side and altitude of the area is 448-400 AMSL. The area is covered with Topsoil formation of 1m thickness; Massive Charnockite formation is found after 1m Topsoil formation which is clearly inferred from the existing quarry pits nearby.

3.1.3 Drainage Pattern of the Area

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

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

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

3.1.4 Seismic Sensitivity

The proposed project site falls in the seismic Zone II, low damage risk zone as per BMTPC, Vulnerability Atlas of Seismic zone of India IS: 1893 – 2002. The project area falls in the hard rock terrain on the peninsular shield of south India which is highly stable.
(Source: https://moes.gov.in/writereaddata/files/LS_EN_20032020_385.pdf)

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.

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	None	Nil within 10km Radius
2	Reserve Forest	Velampatty R.F	4.12Km- NE
		Godumalai R.F	2.5Km- SE
		Kapputhi R.F	6.70 Km - NW
		Kurichi R.F	8.24km - NE
3	Lakes/Reservoir/ Dams/Stream/Rivers	None	Nil within 10km Radius
4	Tiger Reserve/ Elephant Reserve/ Biosphere Reserve	None	Nil within 10KM Radius
5	Critically Polluted Areas	None	Nil within 10km Radius
6	Mangroves	None	Nil within 10km Radius
7	Mountains/Hills	None	Nil within 10km Radius
8	Notified Archaeological Sites	None	Nil within 10km Radius
9	Industries/ Thermal Power Plants	None	Nil within 10km Radius
10	Defence Installation	None	Nil within 10km Radius

Source: Survey of India Toposheet

TABLE 3.4: NEARBY WATER BODIES FROM THE PROPOSED PROJECT SITE

Sl.No	NAME	DISTANCE & DIRECTION
1	Tank near Anuppur	4.25km NE
2	Tank near Kuttathupatti	2.40km NE
3	Tank near Achanguttaipatti	5.63km NW
4	Tank near Valasaiyur	5.25km SW
5	Tank near D. Perumapalayam	7.47km SW
6	Tank near Pallapatty	6.88km SW
7	Tank near Poovanur	5.37km NW
8	Tank near Vellalagundam	6km SE
9	Tank near Chinnakavundapuram	7km SW
10	Tank near Sukkampatti	5.2km NW
11	Tank Near Eripudur	1.8km SW

Source: Village Cadastral Map and Field Survey

3.1.6 Soil Environment

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

The objective of the soil sampling is –

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

TABLE 3.5: SOIL SAMPLING LOCATIONS

S. No	Location Code	Monitoring Locations	Distance & Direction	Coordinates
1	S-1	Core Zone	-	11°42’27.01”N 78°18’6.70”E
2	S-2	Senguttai	250m NW	11°42’49.65”N 78°17’54.26”E

3	S-3	Nirmulikuttai	5km NE	11°42’46.70”N 78°21’8.84”E
4	S-4	Karumapuram	3.5km South	11°40’25.17”N 78°17’38.73”E
5	S-5	Paruthikadu	3.5km NW	11°43’58.31”N 78°16’26.79”E
6	S-6	Sukkampatti	3.5km West	11°42’39.62”N 78°15’52.30"E

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

Methodology

For studying soil quality, sampling locations were selected to assess the existing soil conditions in and around the project site representing various land use conditions. The samples were collected by auger boring into the soil up to 90-cm depth. Six (6) locations were selected for soil sampling on the basis of soil types, vegetative cover, industrial & residential activities including infrastructure facilities, which would accord an overall idea of the soil characteristics. The samples were analysed for physical and chemical characteristics. The samples were sent to laboratory for analysis. The samples were filled in Polythene bags, coded and sent to laboratory for analysis and the details of methodology in respect are given in below Table 3.5.

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 KGS Laboratories in association with GEMS

Soil Testing Result –

The samples were analysed as per the standard methods prescribed in “Soil Chemical Analysis (M.L. Jackson, 1967) & Department of Agriculture, Cooperation & Farmers Welfare, Ministry of Agriculture & Farmers Welfare, Government of India”. The important properties analysed for soil are bulk density, porosity, infiltration rate, pH and Organic matter, kjeldahi Nitrogen, Phosphorous and Potassium. The standard classifications of soil and physico-chemical characteristics of the soils are presented below in Table 3.6 & test results in Table 3.7.

FIGURE 3.4: SOIL SAMPLING LOCATIONS AROUND 10 KM RADIUS

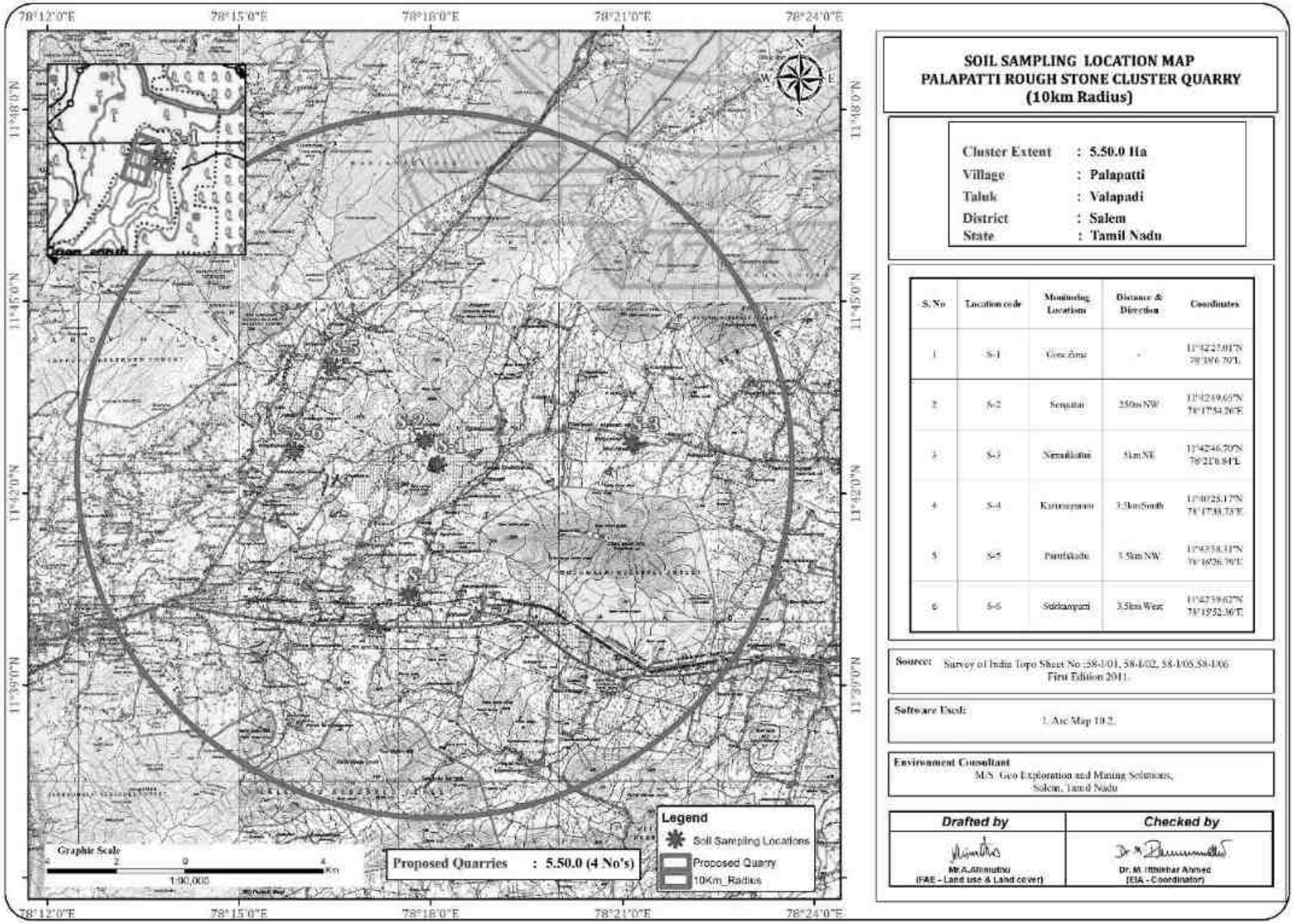


FIGURE 3.5: SOIL MAP

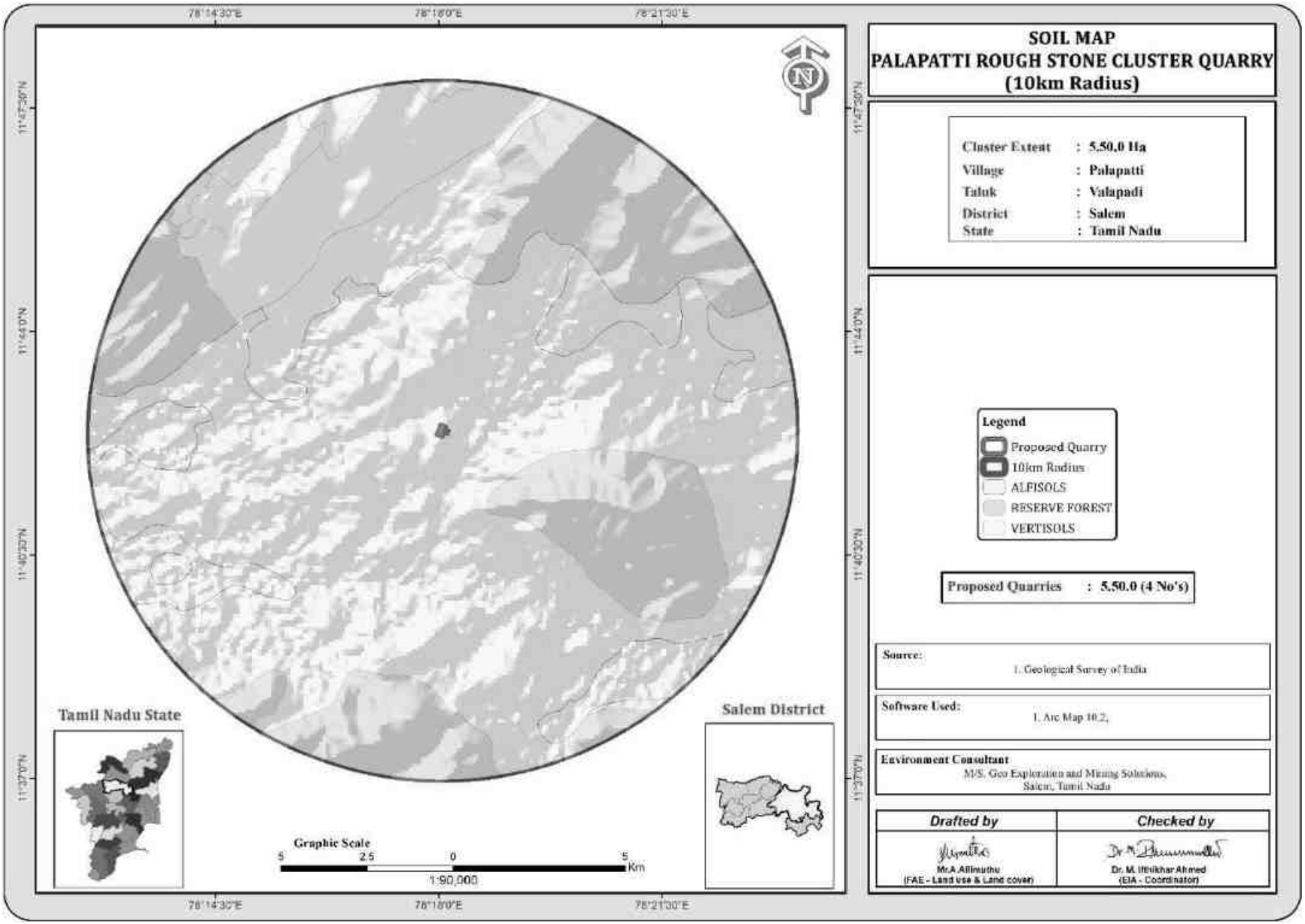


TABLE 3.7: SOIL QUALITY OF THE STUDY AREA

Parameter		S-1 (Core Zone)	S-2 (Senguttai)	S-3 (Nirmulikuttai)	S-4 (Karumapuram)	S-5 (Paruthikadu)	S-6 (Sukkampatti)
1.	Colour	Brown	Brown	Brown	Brown	Brown	Brown
2.	pHat27°C	8.29	7.29	7.65	8.36	7.39	7.98
3.	ElectricalConductivityat25°C	486	368	510	597	740	359
4.	Water Activity	Medium	Medium	Medium	Medium	Medium	Medium
5.	Texture	Sandy Loam	Clay	Clay	Sandy Clay Loam	Sandy Loam	Sandy Clay Loam
6.	Sand	76.3	43.8	36.8	53.9	64.9	65.3
7.	Slit	6.9	14.3	10.8	25.2	26.8	9.3
8.	Clay	16.8	41.9	52.4	20.9	8.3	25.4
9.	Water Holding Capacity	31.6	45.8	44.2	36.2	32.9	33.8
10.	Bulk Density	0.68	1.25	1.21	0.92	0.75	1.27
11.	Porosity	22.4	36.1	34.8	28.6	24.2	31.9
12.	Exchangeable Calcium(asCa)	142	179	184	168	145	137
13.	Exchangeable Magnesium(asMg)	23	38	38.5	38.2	25.7	31.5
14.	Exchangeable Manganese(asMn)	24.3	41.3	38.6	30.4	25.1	32.6
15.	Exchangeable Zinc as Zn	0.44	1.32	1.28	0.87	0.62	0.39
16.	Available Boron (as B)	0.53	0.83	0.95	0.62	0.49	0.32
17.	Soluble Chloride(as Cl)	129	183	175	157	131	129
18.	Soluble Sulphate(as S04)	119	165	158	132	124	124
19.	Available Potassium(as K)	30.5	55.2	59.3	39.9	34.7	44.4
20.	Sodium Absorption Ratio	1.24	1.32	1.24	1.46	1.33	1.56
21.	Available Phosphorous (as P)	0.68	1.35	1.21	0.76	0.52	31.6
22.	Available Nitrogen(as N)	128	172	186	142	135	132
23.	Cadmium (as Cd)	BDL(DL:0.003)	BDL (DL:0.003)	BDL (DL:0.003)	BDL (DL:0.003)	BDL (DL:0.003)	BDL (DL:0.003)
24.	Chromium (as Cr)	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)
25.	Copper(asCu)	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)
26.	Lead (as Pb)	0.62	1.31	1.26	0.71	0.56	0.38
27.	Total Iron	1.29	2.21	2.15	1.57	1.34	1.53
28.	Organic Matter	1.53	2.71	2.59	1.91	1.63	1.48
29.	Organic Carbon	0.89	1.57	1.50	1.11	0.95	0.86
30.	CEC	31.5	45.2	47.6	39.2	30.7	33.6

Source: Sampling Results by KGS Laboratories

Interpretation & Conclusion

Physical Characteristics –

The physical properties of the soil samples were examined for texture, bulk density, porosity and water holding capacity. The soil texture found in the study area is Clay to Sandy Loam Soil and Bulk Density of Soils in the study area varied between 0.68 – 1.27 g/cc. The Water Holding Capacity 31.6-45.8% and Porosity of the soil samples is found to be medium i.e. ranging from 22.4 – 36.1 %.

Chemical Characteristics –

- The nature of soil is slightly alkaline to strongly alkaline with pH range 7.29 to 8.36
- The available Nitrogen content range between 128 to 186 kg/ha
- The available Phosphorus content range between 0.52 to 31.6 kg/ha
- The available Potassium range between 30.5 to 59.3 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:

Salem district is drained by tributaries of Cauvery and Vellar rivers. Cauvery River, which is perennial in nature, flows along the Western and Southern boundaries of the district. Sarabanga and Tirumanimuttar are important tributaries of Cauvery River and originate in the Shevroy hills. The Swetha and Vasishta rivers are tributaries of Vellar River. The Swetha River originates in the Kollimalai and flows Eastwards and joins the Vellar River. The Vasishta River originates in the chitteri hills and flows southwards and joins the Vellar River. In general, the district is characterized by dentritic drainage.

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.

Ground water is occurring in pheratic conditions in weathered and fractured gneiss rock formation. 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 10 m and depth of dug wells range from 10.5 to 13.6 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

One (1) surface water and Five (5) ground water samples were collected from the study area and were analysed for physio-chemical, heavy metals and bacteriological parameters in order to assess the effect of mining and other activities on surface and ground water. The samples were analysed as per the procedures specified by CPCB, IS-10500:2012 and 'Standard methods for the Examination of Water and Wastewater' published by American Public Health Association (APHA). The water sampling locations are given in Table 3.9 and shown as Figure 3.6.

TABLE 3.8: WATER SAMPLING LOCATIONS

S.NO	CODE	LOCATIONS	DISTANCE & DIRECTION	COORDINATES
SURFACE WATER				
1	SW-1	Sukkampatti Tank	4.5km NW	11°43'5.23"N 78°15'12.84"E
GROUND WATER				
2	WW-1	Core Zone	-	11°42'36.40"N 78°18'4.88"E
3	WW-2	Nirmulikuttai	4.5km NE	11°42'44.22"N 78°21'3.20"E
4	WW-3	Senguttai	250m NW	11°42'46.53"N 78°17'59.52"E
5	BW-1	Core Zone	-	11°42'23.73"N 78°17'55.58"E
6	BW-2	Karumapuram	3.5km South	11°40'28.18"N 78°17'38.59"E

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

FIGURE 3.6: WATER SAMPLING LOCATIONS AROUND 10 KM RADIUS

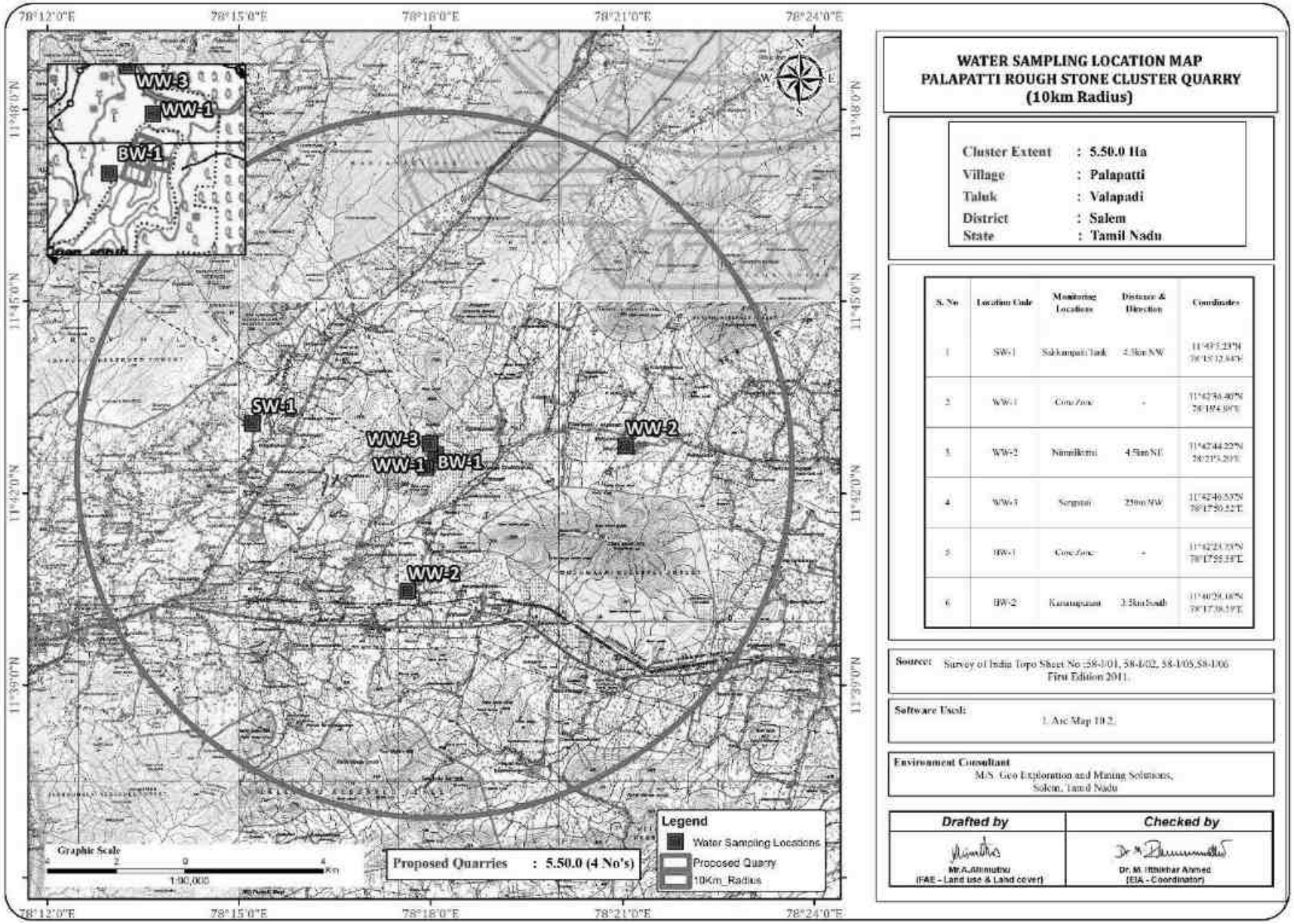


TABLE 3.9: GROUND WATER SAMPLING RESULTS

S.NO	Parameter	BW-1 (Core Zone)	BW-2 (Karumapuram)	WW-1 (Core Zone)	WW-2 (Nirmulikuttai)	WW-3 (Senguttai)
1.	Color	< 5	< 5	< 5	< 5	< 5
2.	Odour	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
3.	pH@ 25ºC	7.59	7.10	7.44	7.54	7.60
4.	Electrical Conductivity @ 25ºC	725	682	568	613	468
5.	Turbidity	< 1	< 1	< 1	< 1	< 1
6.	Total Dissolved Solids	428	402	335	362	276
7.	Total Hardness as $CaCO_3$	214	259	193	172	150
8.	Calcium as Ca	37.5	41.9	33.8	31.6	28.5
9.	Magnesium as Mg	29.2	37.6	26.4	22.8	19.2
10.	Total Alkalinity	164	177	135	142	138
11.	Chloride as Cl^-	90.1	85.3	72.7	75.8	65.5
12.	Sulphate as SO_4^-	29.2	28.3	25.7	26.7	23.4
13.	Iron as Fe	0.22	0.17	BDL(DL:0.1)	BDL(DL:0.1)	BDL(DL:0.1)
14.	Free Residual Chlorine	BDL(DL: 2.0)	BDL(DL: 2.0)	BDL(DL: 2.0)	BDL(DL: 2.0)	BDL(DL: 2.0)
15.	Fluoride as F	0.46	0.39	0.20	0.25	0.22
16.	Nitrates as NO_3	11.9	9.5	8.3	7.6	9.8
17.	Copper as Cu	BDL (DL:0.2)	BDL (DL:0.2)	BDL (DL:0.2)	BDL (DL:0.2)	BDL (DL:0.2)
18.	Manganese as Mn	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)
19.	Mercury as Hg	(BDL (DL: 0.0005)	(BDL (DL: 0.0005)	(BDL (DL: 0.0005)	(BDL (DL: 0.0005)	(BDL (DL: 0.0005)
20.	Cadmium as Cd	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)
21.	Selenium as Se	BDL (DL: 0.05)	BDL (DL: 0.05)	BDL (DL: 0.05)	BDL (DL: 0.05)	BDL (DL: 0.05)
22.	Aluminium as Al	BDL (DL: 0.03)	BDL (DL: 0.03)	BDL (DL: 0.03)	BDL (DL: 0.03)	BDL (DL: 0.03)
23.	Lead as Pb	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)
24.	Zinc as Zn	BDL (DL:0.02)	BDL (DL:0.02)	BDL (DL:0.02)	BDL (DL:0.02)	BDL (DL:0.02)
25.	Total Chromium	BDL (DL: 0.05)	BDL (DL: 0.05)	BDL (DL: 0.05)	BDL (DL: 0.05)	BDL (DL: 0.05)
26.	Boron as B	BDL (DL:0.1)	BDL (DL:0.1)	BDL (DL:0.1)	BDL (DL:0.1)	BDL (DL:0.1)
27.	Mineral Oil	BDL (DL:1.0)	BDL (DL:1.0)	BDL (DL:1.0)	BDL (DL:1.0)	BDL (DL:1.0)
28.	Phenolic Compunds as C_6H_5OH	Absent	Absent	Absent	Absent	Absent
29.	Anionic Detergents as	BDL (DL:0.1)	BDL (DL:0.1)	BDL (DL:0.1)	BDL (DL:0.1)	BDL (DL:0.1)
30.	Cynaide as CN	Absent	Absent	Absent	Absent	Absent
31.	Total Coliform	< 2	< 2	< 2	< 2	< 2
32.	E-Coli	< 2	< 2	< 2	< 2	< 2
33.	Barium as Ba	BDL (DL:0.5)	BDL (DL:0.5)	BDL (DL:0.5)	BDL (DL:0.5)	BDL (DL:0.5)
34.	Ammonia (as Total	BDL (DL:0.1)	BDL (DL:0.1)	BDL (DL:0.1)	BDL (DL:0.1)	BDL (DL:0.1)
35.	Sulphide as H_2S	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)
36.	Molybdenum as Mo	BDL (DL:0.5)	BDL (DL:0.5)	BDL (DL:0.5)	BDL (DL:0.5)	BDL (DL:0.5)
37.	Total Arsenic as As	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)
38.	Total Suspended Solids	BDL(DL:2)	BDL(DL:2)	BDL(DL:2)	BDL(DL:2)	BDL(DL:2)

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

TABLE 3.10: SURFACE WATER SAMPLING RESULTS

Sl. No.	Parameter	Unit	RESULT	CPCB Designated Best Use
			SW1	
1	Color	Hazen	10	300
2	Odour	-	Agreeable	Not specified
3	pH@ 25°C	-	7.40	6.5 – 8.5
4	Electrical Conductivity @ 25°C	µs/cm	539	
5	Turbidity	NTU	5.1	Not specified
6	Total Dissolved Solids	mg /l	318	1500
7	Total Hardness as $CaCO_3$	mg/l	197	Not specified
8	Calcium as Ca	mg/l	33.2	Not specified
9	Magnesium as Mg	mg/l	27.9	Not specified
10	Total Alkalinity as $CaCO_3$	mg/l	163	Not specified
11	Chloride as Cl^-	mg/l	69.5	600
12	Sulphate as SO_4^-	mg/l	24.1	400
13	Iron as Fe	mg/l	0.27	50
14	Free Residual Chlorine	mg/l	BDL (DL: 2.0)	400
15	Fluoride as F	mg/l	0.34	1.5
16	Nitrates as NO_3	mg/l	13.7	50
17	Copper as Cu	mg/l	BDL (DL:0.2)	1.5
18	Manganese as Mn	mg/l	BDL (DL:0.05)	Not specified
19	Mercury as Hg	mg/l	(BDL (DL: 0.0005)	Not specified
20	Cadmium as Cd	mg/l	BDL (DL:0.01)	0.01
21	Selenium as Se	mg/l	BDL (DL: 0.05)	Not specified
22	Aluminium as Al	mg/l	BDL (DL: 0.03)	Not specified
23	Lead as Pb	mg/l	BDL (DL:0.01)	0.1
24	Zinc as Zn	mg/l	BDL (DL:0.02)	15
25	Total Chromium	mg/l	BDL (DL: 0.05)	0.05
26	Boron as B	mg/l	BDL (DL:0.1)	Not specified
27	Mineral Oil	mg/l	BDL (DL:1.0)	Not specified
28	Phenolic Compounds as C_6H_5OH	mg/l	Absent	0.005
29	Anionic Detergents as MBAS	mg/l	BDL (DL:0.1)	Not specified
30	Cyanide as CN	mg/l	Absent	0.05
31	Biological Oxygen Demand, 3 days @ 27°C		6.2	3
32	Chemical Oxygen Demand		24	Not specified
33	Dissolved Oxygen		7.5	4
34	Total Coliform	MPN/ 100ml	100	5000
35	E-Coli		20	Not specified
36	Barium as Ba	mg/l	BDL (DL:0.5)	300
37	Ammonia (as Total Ammonia-N)	mg/l	BDL (DL:0.1)	Not specified
38	Sulphide as H_2S	mg/l	BDL (DL:0.05)	Not specified
39	Molybdenum as Mo	mg/l	BDL (DL:0.5)	Not specified
40	Total Arsenic as As	mg/l	BDL (DL:0.01)	0.2
41	Total Suspended Solids	mg/l	5.7	-

3.2.4 Interpretation& Conclusion

Surface Water

Ph:

The pH is 7.40 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 is 318 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 69.5 mg/l. Nitrates is around 13.7 mg/l, while sulphates content is 25 mg/l.

Ground Water

The pH of the water samples collected ranged from 7.10 to 7.60 and within the acceptable limit of 6.5 to 8.5. pH, Sulphates and Chlorides of water samples from all the sources are within the limits as per the Standard. On Turbidity, the water samples meet the requirement. The Total Dissolved Solids were found in the range of 276 to 428 mg/l in all samples. The Total hardness varied between 150 to 259 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 63-68m. The maximum depth of this proposed project is 41 to 66m BGL. Hence there is no possibilities of water table intersection during the entire mine life period besides it is also inferred topographically that there are no major water bodies intersecting the project area. There is no necessity of stream, channel diversion due to this proposed project.

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

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

Station Code	Water Level in Meters bgl				Latitude	Longitude
	March 2022	April 2022	May 2022	Average		
OW1	11.5	13	13.5	13	11° 42' 26.2468" N	78° 18' 16.3522" E
OW2	11.6	13.1	13.6	13.1	11° 42' 34.6913" N	78° 18' 16.3522" E
OW3	10.9	12.4	12.9	12.4	11° 42' 34.8441" N	78° 18' 16.3522" E
OW5	10.8	12.3	12.8	12.3	11° 42' 40.6637" N	78° 18' 16.3522" E
OW4	10.6	12.1	12.6	12.1	11° 42' 41.6087" N	78° 18' 16.3522" E
OW6	11.2	12.7	13.2	12.7	11° 42' 46.5451" N	78° 18' 16.3522" E
OW7	11.4	12.9	13.4	12.9	11° 42' 33.2378" N	78° 18' 16.3522" E
OW8	10.7	12.2	12.7	12.2	11° 42' 17.5109" N	78° 18' 16.3522" E
OW-9	10.5	12	12.5	12	11° 41' 59.9563" N	78° 18' 16.3522" E
OW-10	11.3	12.8	13.3	12.8	11° 41' 51.6227" N	78° 18' 16.3522" E

Source: Onsite monitoring data

TABLE 3.12: SUMMER SEASON WATER LEVEL OF BOREWELLS 1 KM RADIUS

Station Code	Water Level in Meters bgl				Latitude	Longitude
	March 2022	April 2022	May 2022	Average		
BW1	65.6	67.1	68	67.1	11° 42' 35.2348" N	78° 18' 14.1200" E
BW2	65.8	67.3	68.2	67.3	11° 42' 06.3061" N	78° 18' 14.1200" E
BW3	70.5	72	72.9	72	11° 42' 13.0658" N	78° 18' 14.1200" E
BW4	65.9	67.4	68.3	67.4	11° 41' 58.7225" N	78° 18' 14.1200" E
BW5	68.5	70	70.9	70	11° 42' 36.7145" N	78° 18' 14.1200" E
BW6	67.5	69	69.9	69	11° 42' 41.5762" N	78° 18' 14.1200" E
BW7	66.8	68.3	69.2	68.3	11° 42' 50.8532" N	78° 18' 14.1200" E
BW8	69.5	71	71.9	71	11° 42' 27.9074" N	78° 18' 14.1200" E
BW9	65.5	67	67.9	67	11° 42' 33.7557" N	78° 18' 14.1200" E

Source: Onsite monitoring data

FIGURE 3.7: OPEN WELL CONTOUR MAP – MARCH 2022

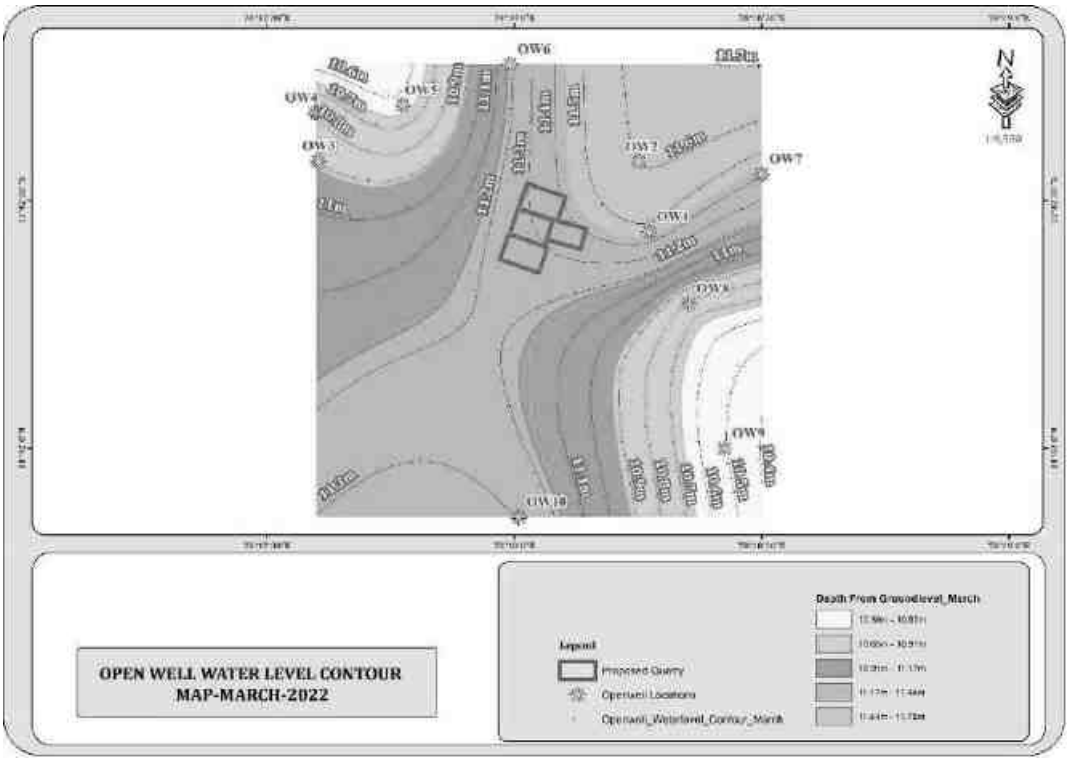


FIGURE 3.8: OPEN WELL CONTOUR MAP – APRIL 2022

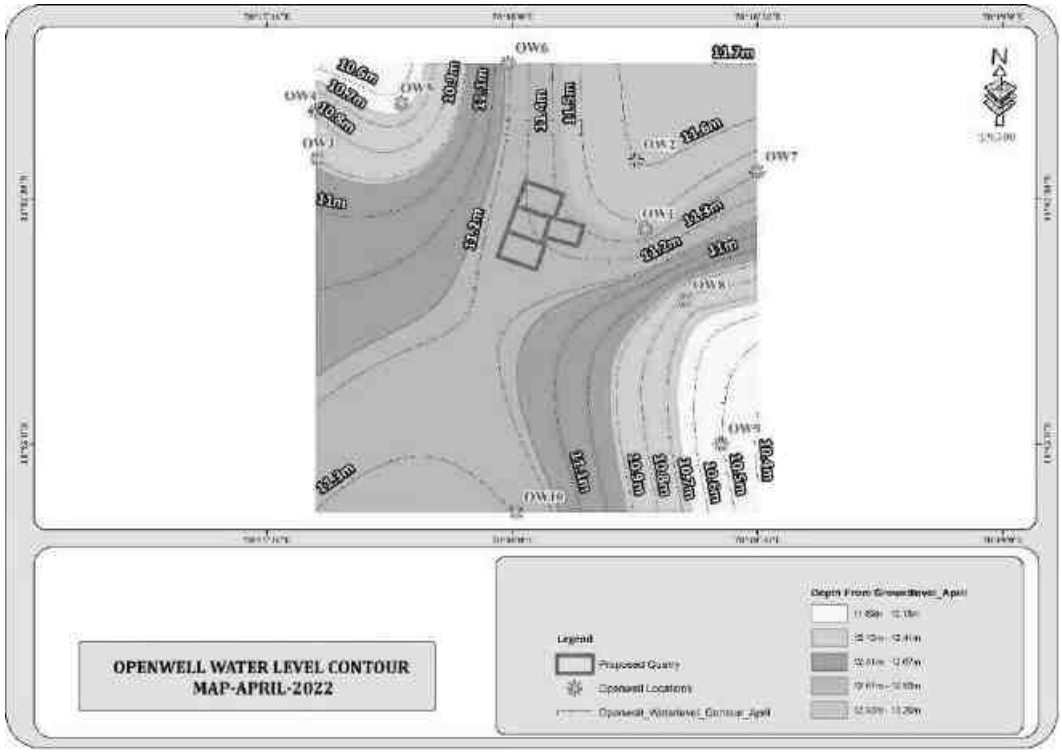


FIGURE 3.9: OPEN WELL CONTOUR MAP – MAY 2022

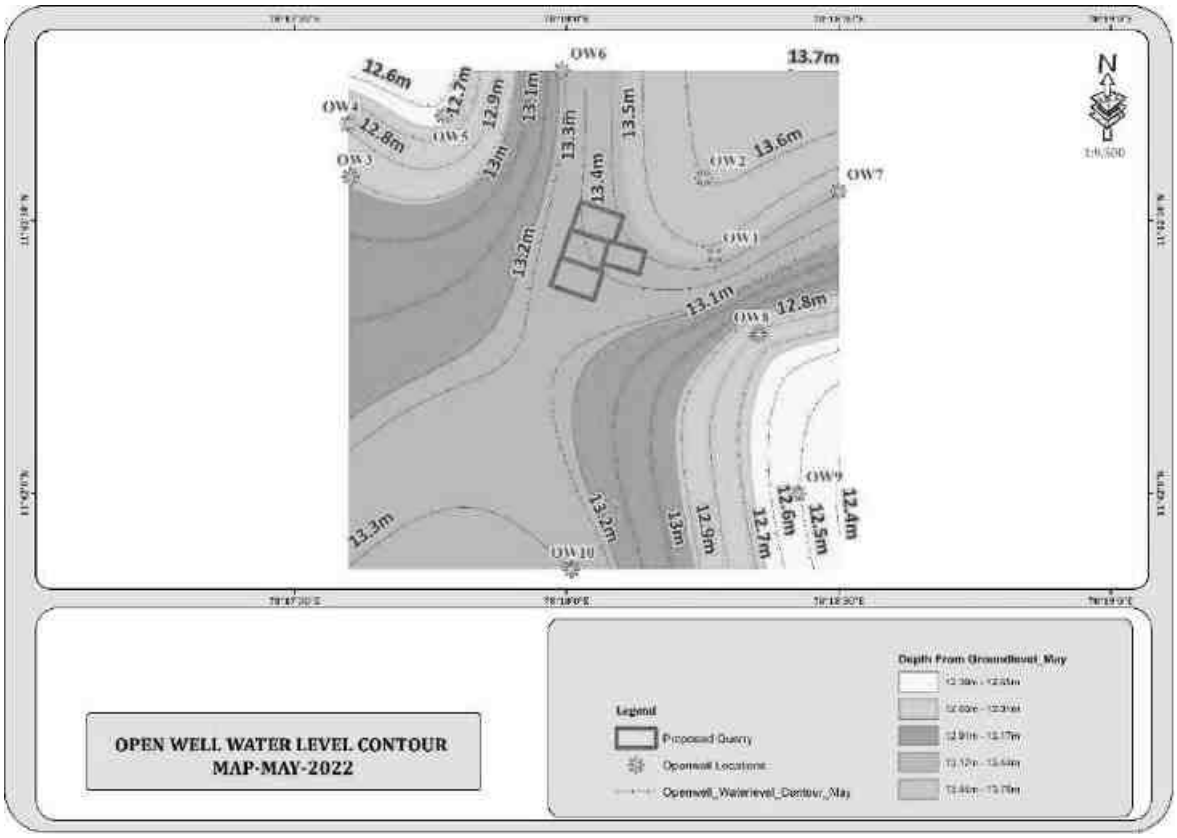


FIGURE 3.10: BORE WELL CONTOUR MAP – MARCH 2022

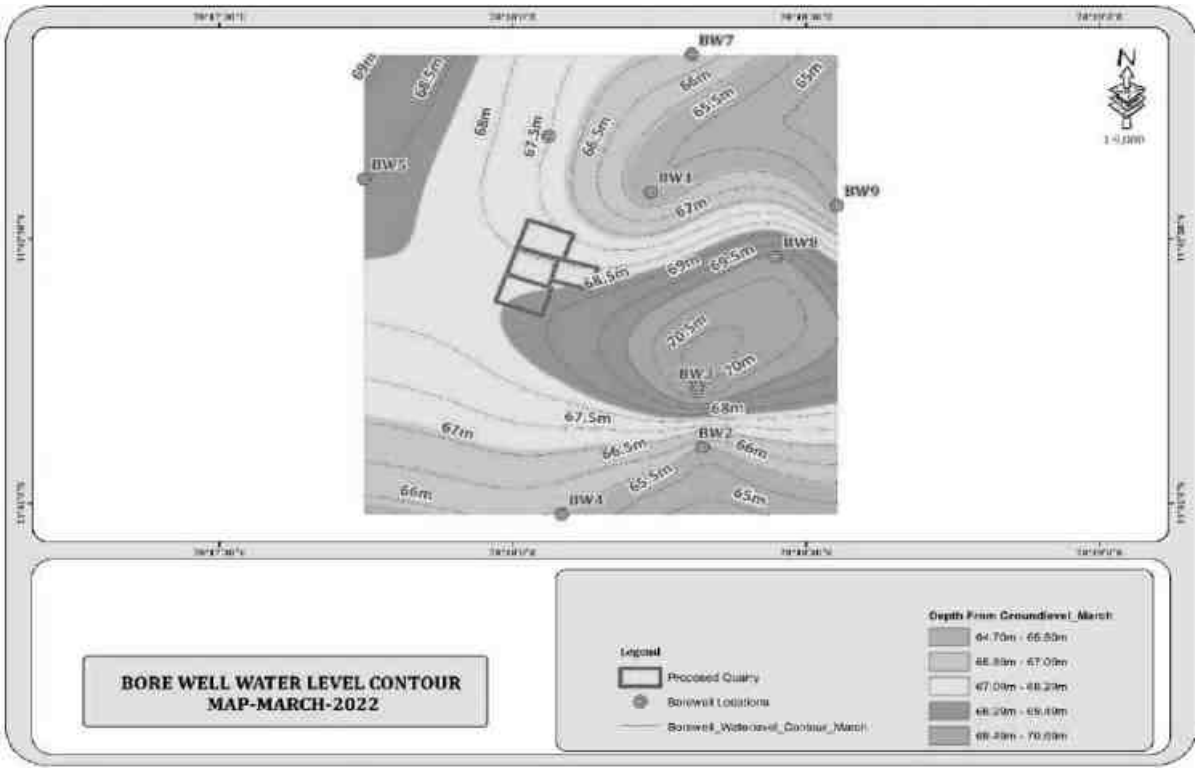


FIGURE 3.11: BORE WELL CONTOUR MAP – APRIL 2022

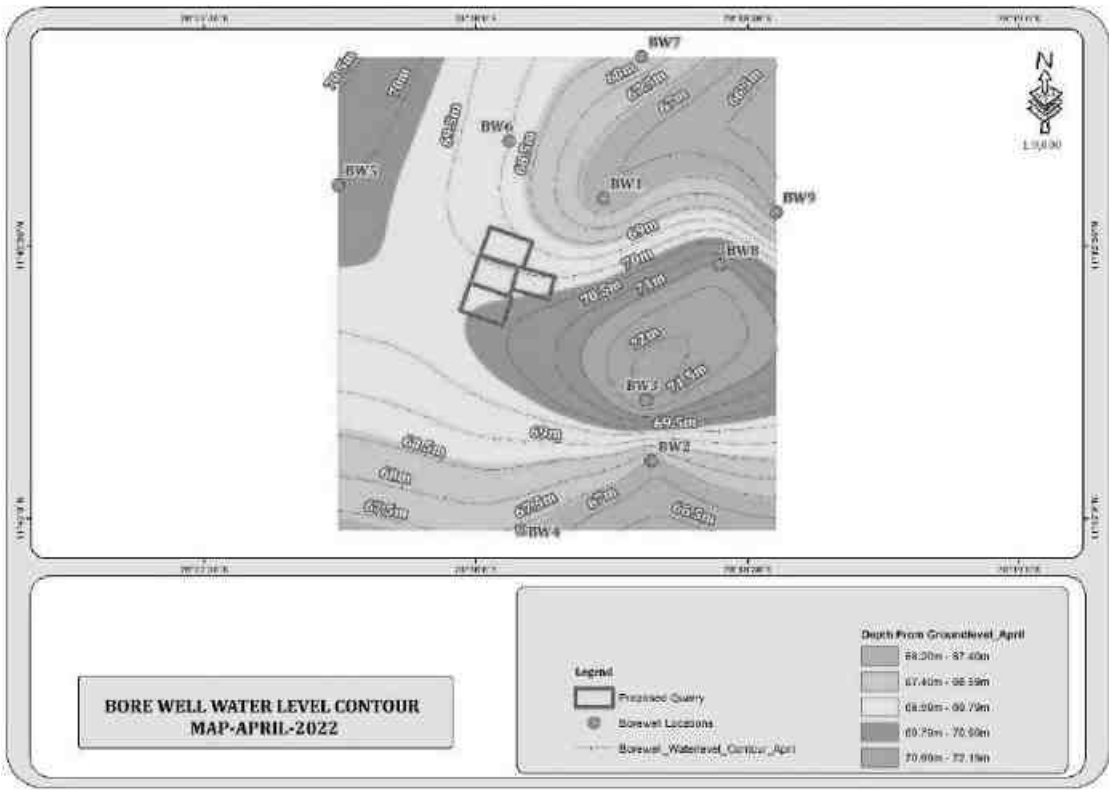


FIGURE 3.12: BORE WELL CONTOUR MAP – MAY 2022

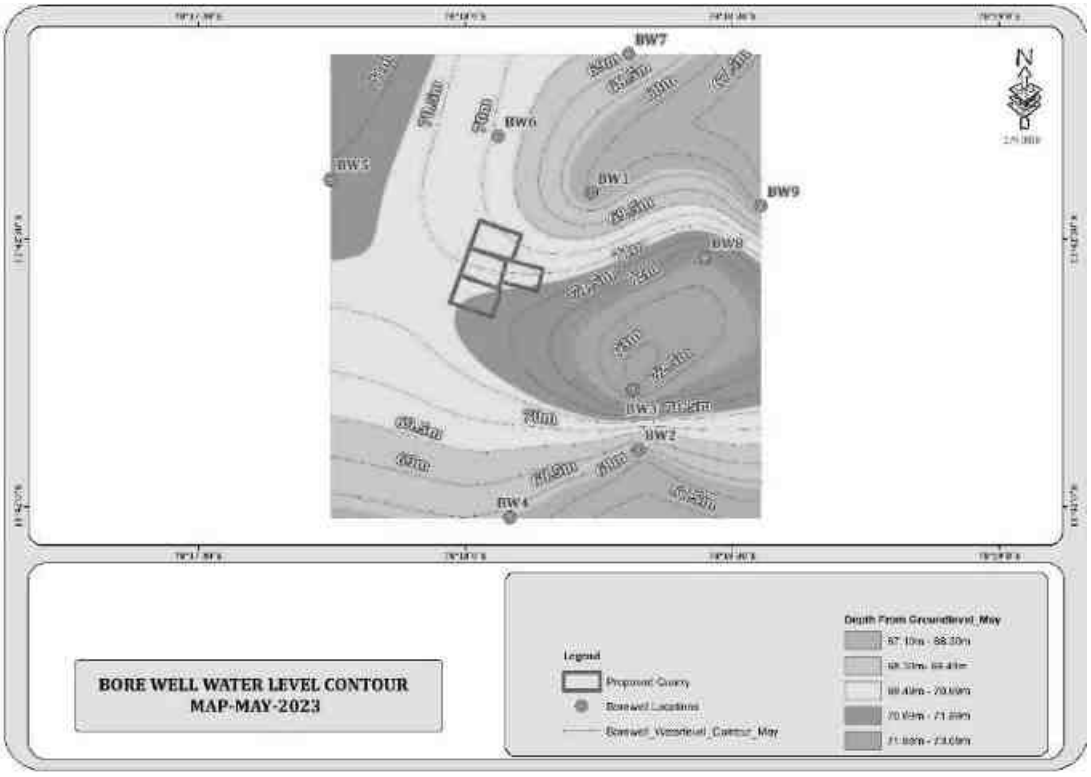


FIGURE 3.13: DRAINAGE MAP AROUND 10 KM RADIUS FROM PROJECT SITE

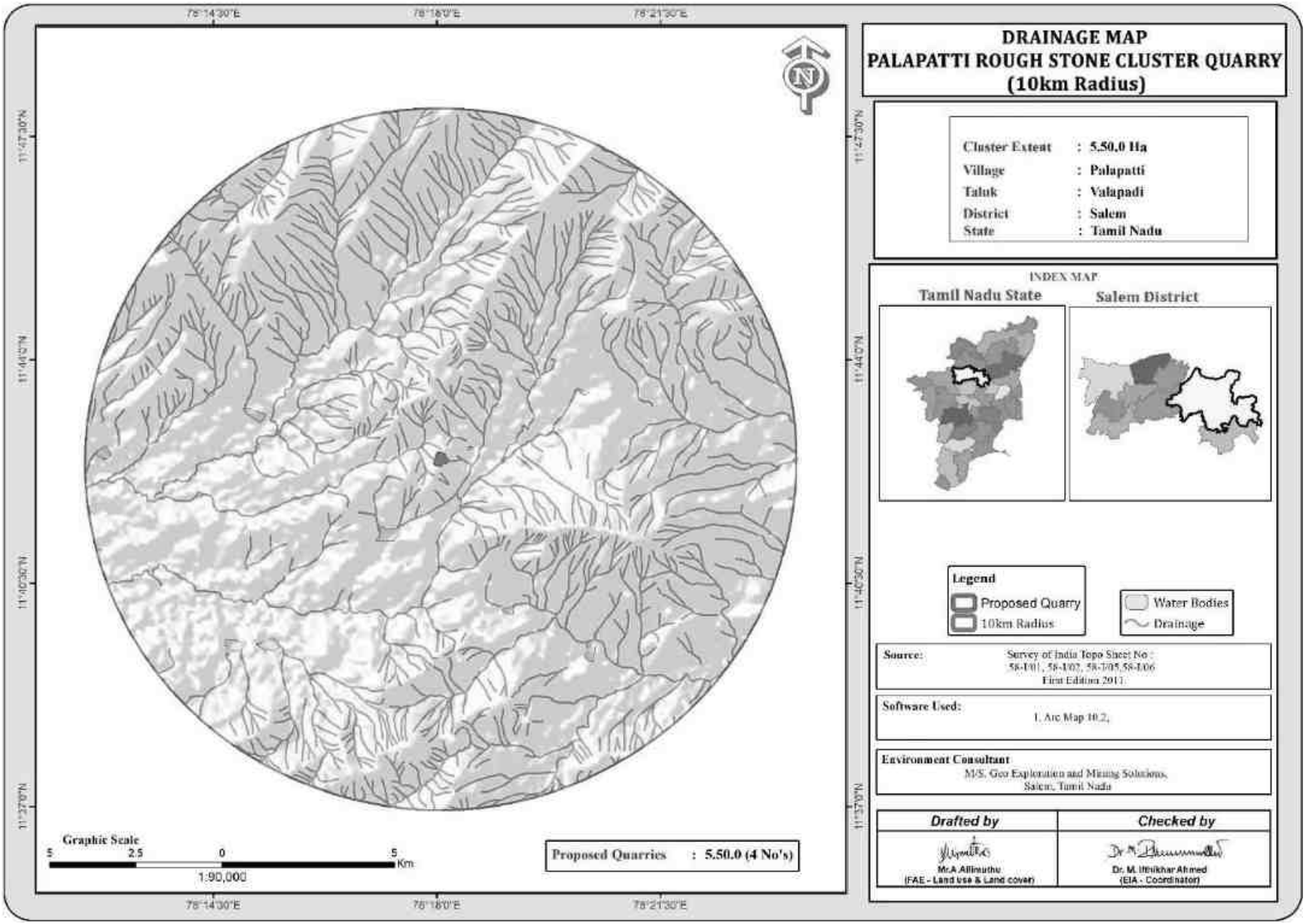
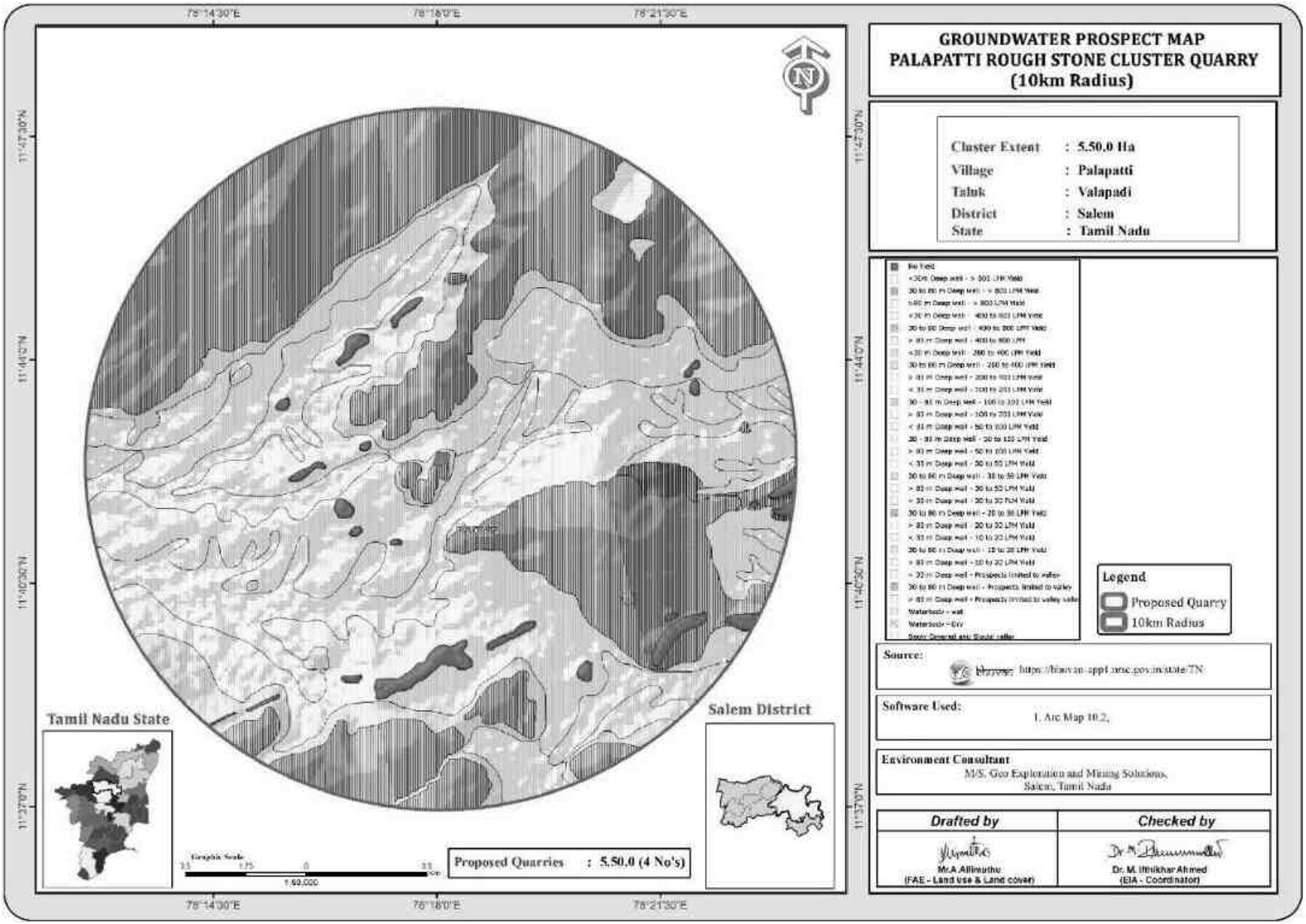


FIGURE 3.14: GROUND WATER PROSPECT MAP



3.2.5.1 Methodology and Data Acquisition

Electric Resistivity Method is well established for delineating lateral as well vertical discontinuities in the resistive structure of the Earth's subsurface. The present study makes use of vertical electric sounding (VES) to delineate the Vertical Resistivity structure at depth. Schlumberger electrode set up was employed for making sounding measurements. Since it is least influenced by lateral in homogeneities and is capable of providing higher depth of investigation. This is four electrodes collinear set up where in the outer electrodes send current into the ground and the inner electrodes measure the potential difference.

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

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

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

$$\rho_r = F\rho_w = a\,Ø^m\rho_w$$

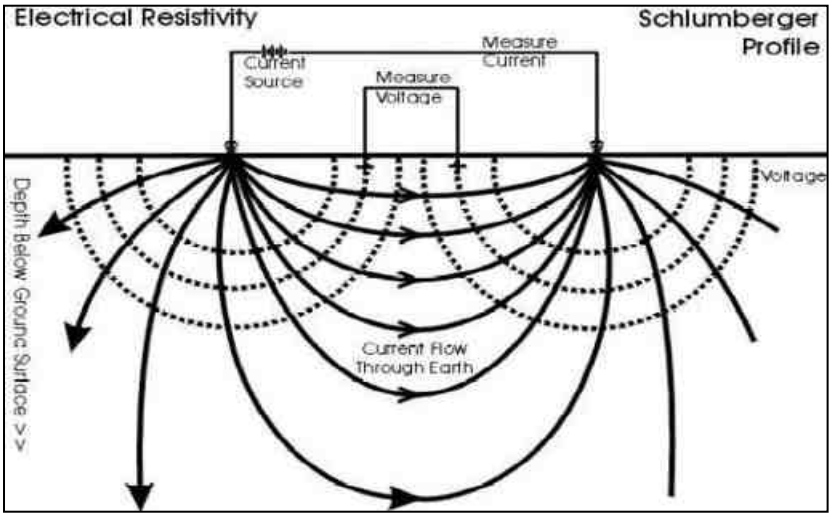
ρr = Resistivity of Rocks
ρw = Resistivity of water in pores of rock
F = Formation Factor
Ø = Fractional pore volume
A = Constants with values ranging from 0.5 to 2.5

3.2.5.2 Survey Layout

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

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

RESISTIVITY SURVEY PROFILE



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

3.2.5.3 Data Presentation

It was inferred that the low resistance encountered at the depth between 63-68m. The maximum depth of this proposed project is 25m BGL. Hence there is no possibilities of water table intersection during the entire mine life period besides it is also inferred topographically that there are no major water bodies intersecting the project area.

3.2.5.4 Geophysical Data Interpretation

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

3.3 AIR ENVIRONMENT

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

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

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

3.3.1 Meteorology & Climate

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

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

Climate –

- The Salem lies on 278 m above sea level. It has a Tropical climate.
- The average annual temperature is 32.6 C | 90.6°F.
- The annual rainfall here is around 770 mm | 30.3 inch.
- The driest month is January with 9mm |0.3 inch of rainfall.
- The greatest amount of precipitation occurs in October, with an average of 180mm | 7.0 inch.
- The warmest month of the year is April, with an average temperature of 37.3°C | 99.14°F. The lowest average temperatures in the year occur in December, when it is around 28.4°C | 83.1 °F.
- The difference in precipitation between the driest month and the wettest month is 197 mm |The variation in annual temperatures throughout the year is 9.5°C | 49.1 °F.

Source; https://www.weather-atlas.com/en/india/salem-climate#temperature

Rainfall –

TABLE 3.13: RAINFALL DATA

Actual Rainfall in mm						Normal Rainfall in mm
2013	2014	2015	2016	2017	2018	
830.80	857.70	1135.50	577.5	1006.5	712.9	997.9

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

TABLE 3.14: METEOROLOGICAL DATA RECORDED AT SITE

S.No	Parameters		Mar-2022	April– 2022	May- 2022
1	Temperature (^{0}C)	Max	31.4	33.4	33.5
		Min	27.6	28.8	28.1
		Avg.	29.5	31.1	30.8
2	Relative Humidity (%)	Avg.	64.4	61.3	62.9
3	Wind Speed (m/s)	Max	4.723	3.681	6.944
		Min	1.458	1.250	1.458
		Avg.	3.090	2.465	4.201
4	Cloud Cover (OKTAS)		0-8	0-8	0-8
5	Wind direction		ENE,E	ENE,E	E,ENE

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

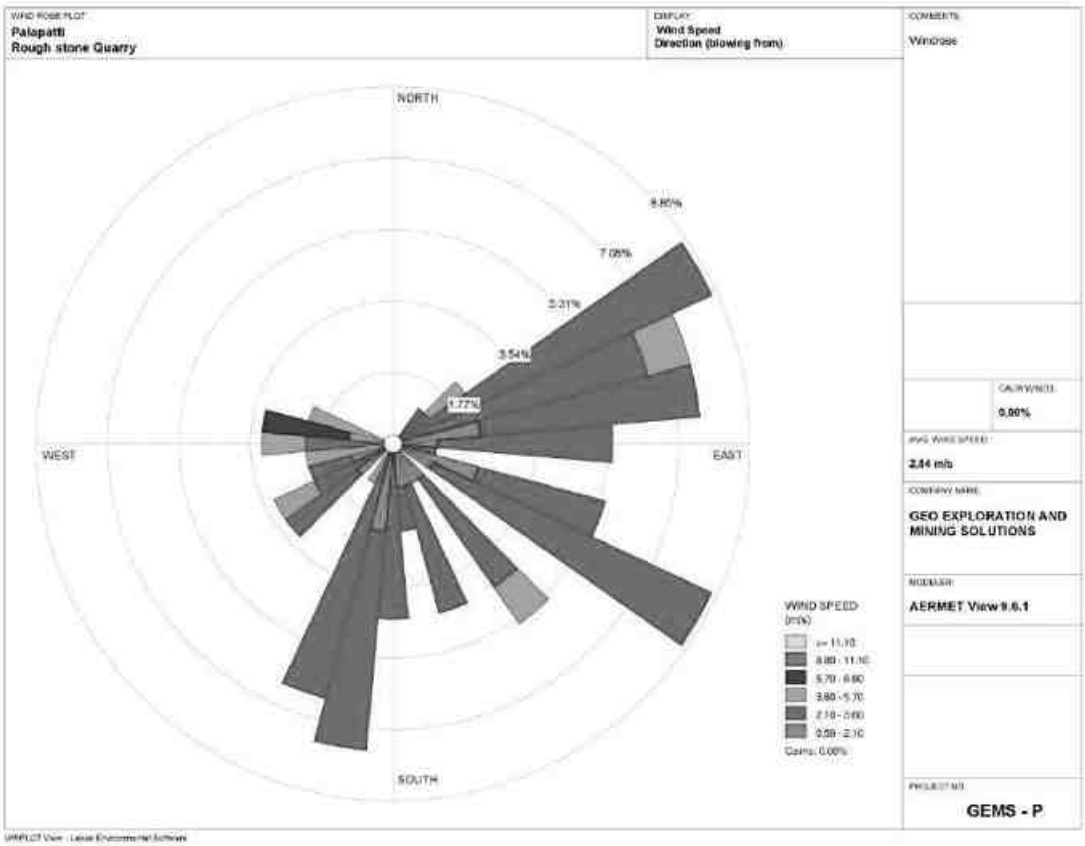
Correlation between Secondary and Primary Data

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

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

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

FIGURE 3.15: WINDROSE DIAGRAM



Source: Wind Rose plot view, Lake Environmental Software

In the abstract of collected data wind rose were drawn on presented in figure No.3.11 during the monitoring period in the study area

- Predominant winds were from NE-SW
- Wind velocity readings were recorded between 1.250 to 6.994 m/s
- Calm conditions prevail of about 0.00 % of the monitoring period
- Temperature readings ranging from 27.6 to 33.5 °C
- Relative humidity ranging from 61.3 to 64.4 %
- The monitoring was carried out continuously for three months

3.3.2 Methodology and Objective

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

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

3.3.3 Sampling and Analytical Techniques

TABLE 3.15: METHODOLOGY AND INSTRUMENT USED FOR AAQ MONITORING

Parameter	Method	Instrument
$PM_{2.5}$	Gravimetric Method Beta attenuation Method	Fine Particulate Sampler Make – Thermo Environmental Instruments – TEI 121
PM_{10}	Gravimetric Method Beta attenuation Method	Respirable Dust Sampler Make –Thermo Environmental Instruments – TEI 108
SO_2	IS-5182 Part II (Improved West & Gaeke method)	Respirable Dust Sampler with gaseous attachment
NO_x	IS-5182 Part II (Jacob & Hochheiser modifiedmethod)	Respirable Dust Sampler with gaseous attachment
Free Silica	NIOSH – 7601	Visible Spectrophotometry

Source: Sampling Methodology followed by KGS Laboratories & CPCB Notification

TABLE 3.16: NATIONAL AMBIENT AIR QUALITY STANDARDS

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

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

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

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

3.3.4 Frequency & Parameters for Sampling

Ambient air quality monitoring has been carried out with a frequency of two samples per week at eight (8) locations, adopting a continuous 24 hourly (3 shift of 8-hour) schedule for the period March to May, 2022. The baseline data of ambient air has been generated for PM_{10}, $PM_{2.5}$, Sulphur Dioxide (SO_2) & Nitrogen Dioxide (NO_2) Monitoring has been carried out as per the CPCB, MoEF guidelines and notifications.

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

3.3.5 Ambient Air Quality Monitoring Stations

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

TABLE 3.17: AMBIENT AIR QUALITY (AAQ) MONITORING LOCATIONS

S. No	Location Code	Monitoring Locations	Distance & Direction	Coordinates
1	AAQ-1	Core Zone	-	11°42'26.96"N 78°18'4.97"E
2	AAQ-2	Senguttai	250m NW	11°42'49.80"N 78°17'55.05"E
3	AAQ-3	Eripudur	1.5km SW	11°41'37.08"N 78°17'14.99"E
4	AAQ-4	Paruthikadu	3.5km NW	11°43'58.45"N 78°16'27.40"E
5	AAQ-5	Nirmulikuttai	5km NE	11°42'47.09"N 78°21'9.55"E
6	AAQ-6	M.Perumalpaalayam	3.5km SE	11°40'28.42"N 78°18'50.96"E
7	AAQ-7	Karumapuram	3.5km South	11°40'24.81"N 78°17'37.91"E
8	AAQ-8	Sukkampatti	3.5km West	11°42'39.64"N 78°15'51.24"E

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

FIGURE 3.16: AMBIENT AIR QUALITY LOCATIONS AROUND 10 KM RADIUS

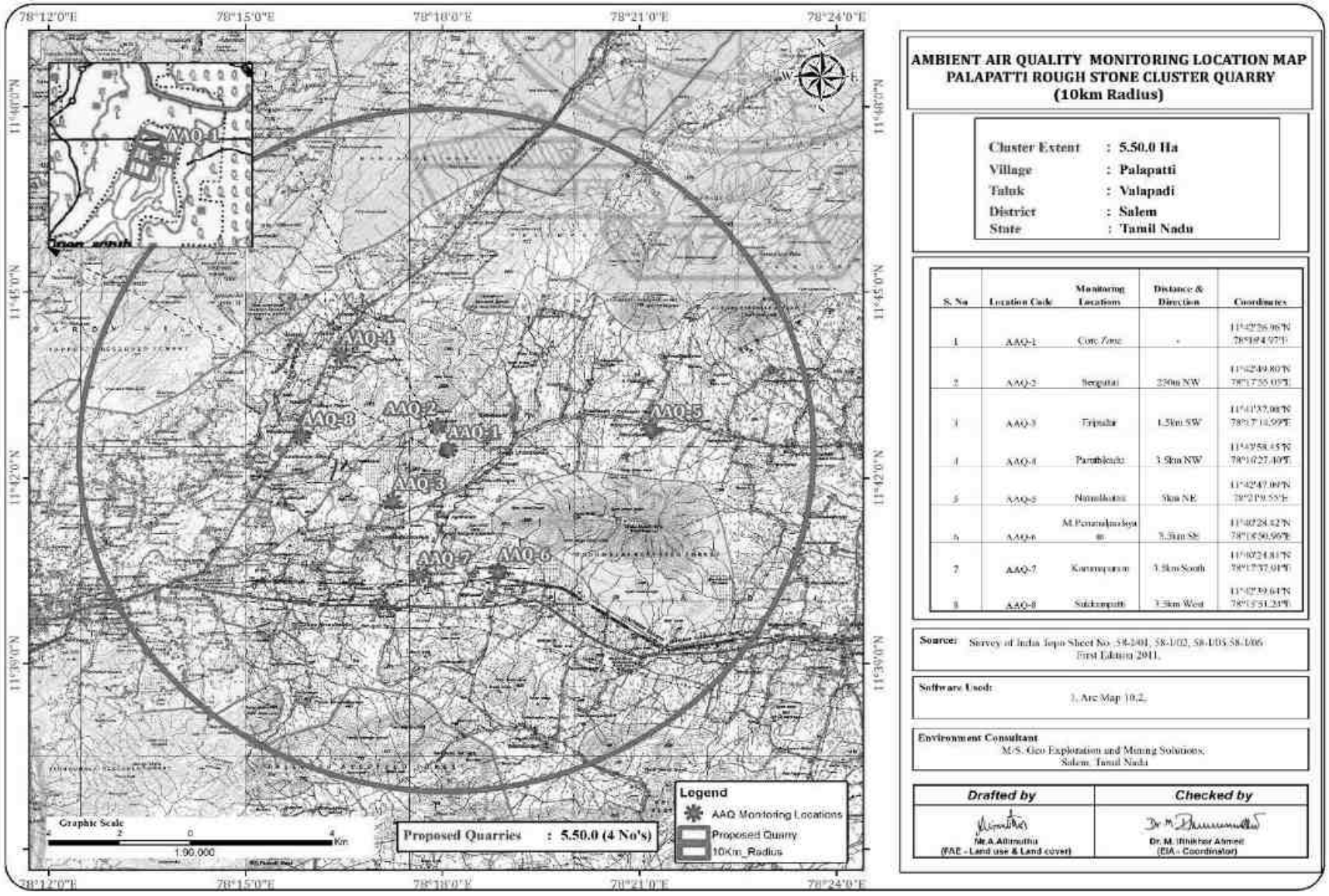


TABLE 3.18 AMBIENT AIR QUALITY DATA LOCATION AAQ1-:

Period: March 2022 – May 2022 Location: AAQ1- Project Area (Core Zone) Sampling Time: 24-hourly

Monitoring		Particulates, µg/m³			Gaseous Pollutants, µg/m³					Other Pollutants (Particulate Phase) , µg/m³				
Date	Period, hrs.	SPM	$PM_{2.5}$	PM_{10}	SO_2	NO_2	NH_3	O_3 (8-hly Avg.)	CO (8-hly Avg.)	Pb, µg/m³	As, ng/m³	Ni, ng/m³	C_6H_6, ng/m³	BaP, ng/m³
NAAQ Norms*		(24 hrs)	60(24 hrs.)	100 (24 hrs.)	80 (24 hrs.)	80 (24 hrs.)	400 (24 hrs.)	100 (8 hrs.)	2.0 (8hrs.)	1.0 (24 hrs.)	6.0 (annual)	20 (annual)	5.0 (annual)	1.0 (annual)
02.03.2022	07.00-07.00	62.7	26.3	42.4	10.3	25.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
03.03.2022	07.15-07.15	63.8	24.2	44.7	8.4	26.9	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
09.03.2022	07.00-07.00	61.4	23.5	43.3	7.2	28.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
10.03.2022	07.15-07.15	62.5	22.8	42.8	7.6	26.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
16.03.2022	07.00-07.00	66.3	23.5	41.9	9.4	25.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
17.03.2022	07.15-07.15	64.7	21.9	42.7	8.3	25.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
23.03.2022	07.00-07.00	63.9	23.5	41.5	7.6	26.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
24.03.2022	07.15-07.15	62.5	22.4	42.6	8.5	26.9	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
30.03.2022	07.00-07.00	65.8	23.6	42.7	7.1	28.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
31.03.2022	07.15-07.15	61.3	22.5	41.5	6.4	26.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
06.04.2022	07.00-07.00	62.8	21.7	43.6	9.3	25.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
07.04.2022	07.15-07.15	63.6	24.3	42.5	10.5	25.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
13.04.2022	07.00-07.00	62.7	23.8	44.2	6.3	25.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
14.04.2022	07.15-07.15	64.9	23.9	41.6	8.4	26.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
20.04.2022	07.00-07.00	63.3	25.4	43.3	8.5	26.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
21.04.2022	07.15-07.15	65.8	23.3	44.7	6.3	25.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
27.04.2022	07.00-07.00	64.7	22.7	41.9	9.6	24.9	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
28.04.2022	07.15-07.15	64.2	21.3	43.8	8.7	26.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
04.05.2022	07.00-07.00	63.9	22.6	42.2	5.2	28.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
05.05.2022	07.15-07.15	62.8	24.7	41.6	5.9	26.9	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
11.05.2022	07.00-07.00	62.5	23.3	43.7	7.3	27.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
12.05.2022	07.15-07.15	63.3	25.9	41.2	9.5	26.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
18.05.2022	07.00-07.00	64.9	24.7	43.5	8.5	27.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
19.05.2022	07.15-07.15	63.4	22.4	42.8	7.8	26.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
25.05.2022	07.00-07.00	62.7	22.7	44.3	7.2	25.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
26.05.2022	07.15-07.15	62.8	22.1	42.5	7.5	25.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0

TABLE 3.19 AMBIENT AIR QUALITY DATA LOCATIO NAAQ2-:

Period: March 2022 – May 2022 Location: AAQ2- Senguttai (NW) Sampling Time: 24-hourly

Monitoring		Particulates, µg/m³			Gaseous Pollutants, µg/m³					Other Pollutants (Particulate Phase) , µg/m³				
Date	Period, hrs.	SPM	PM2.5	PM10	SO_2	NO_2	NH_3	O_3 (8-hly Avg.)	CO (8-hly Avg.)	Pb, µg/m³	As, ng/m³	Ni, ng/m³	C_6H_6, ng/m³	BaP, ng/m³
NAAQ Norms*		(24 hrs)	60(24 hrs.)	100 (24 hrs.)	80 (24 hrs.)	80 (24 hrs.)	400 (24 hrs.)	100 (8 hrs.)	2.0 (8hrs.)	1.0 (24 hrs.)	6.0 (annual)	20 (annual)	5.0 (annual)	1.0 (annual)
02.03.2022	07.15-07.15	61.7	24.3	41.7	7.3	26.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
03.03.2022	07.30-07:30	63.9	21.6	43.2	8.2	24.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
09.03.2022	07.15-07.15	65.2	22.3	44.7	6.5	23.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
10.03.2022	07.30-07:30	63.3	24.7	41.9	7.8	25.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
16.03.2022	07.15-07.15	64.4	22.9	43.3	8.3	24.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
17.03.2022	07.30-07:30	62.8	23.4	42.7	5.9	25.9	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
23.03.2022	07.15-07.15	63.3	21.9	41.6	6.4	26.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
24.03.2022	07.30-07:30	62.7	22.5	44.2	7.9	24.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
30.03.2022	07.15-07.15	62.8	24.4	43.3	8.3	24.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
31.03.2022	07.30-07:30	62.9	23.9	42.7	7.1	23.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
06.04.2022	07.15-07.15	62.5	22.2	41.9	8.2	25.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
07.04.2022	07.30-07:30	63.3	23.5	42.6	8.9	25.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
13.04.2022	07.15-07.15	62.8	21.7	43.8	7.4	26.9	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
14.04.2022	07.15-07.15	61.5	23.6	43.5	7.3	24.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
20.04.2022	07.00-07.00	62.7	23.5	41.6	9.6	25.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
21.04.2022	07.15-07.15	63.6	24.9	43.3	8.5	26.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
27.04.2022	07.00-07.00	62.8	23.5	42.7	5.9	25.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
28.04.2022	07.15-07.15	62.5	24.8	43.3	5.6	25.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
04.05.2022	07.00-07.00	63.9	23.6	44.6	6.3	24.9	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
05.05.2022	07.15-07.15	64.5	24.7	42.4	8.7	23.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
11.05.2022	07.00-07.00	63.8	23.3	44.9	5.5	25.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
12.05.2022	07.15-07.15	62.7	25.8	41.6	7.2	24.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
18.05.2022	07.00-07.00	62.3	24.3	43.2	6.3	25.9	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
19.05.2022	07.15-07.15	62.9	23.9	44.7	7.9	23.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
25.05.2022	07.00-07.00	64.5	22.3	42.2	8.2	24.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
26.05.2022	07.15-07.15	62.5	24.5	42.5	8.3	24.9	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0

TABLE 3.20 AMBIENT AIR QUALITY DATA LOCATION AAQ3-:

Period: March 2022 – May 2022 Location*:* AAQ3- Eripudur (SW) Sampling Time: 24-hourly

Monitoring		Particulates, µg/m³			Gaseous Pollutants, µg/m³					Other Pollutants (Particulate Phase) , µg/m³				
Date	Period, hrs.	SPM	PM2.5	PM10	SO_2	NO_2	NH_3	O_3 (8-hly Avg.)	CO (8-hly Avg.)	Pb, µg/m³	As, ng/m³	Ni, ng/m³	C_6H_6, ng/m³	BaP, ng/m³
NAAQ Norms*		(24 hrs.)	60 (24 hrs.)	100 (24 hrs.)	80 (24 hrs.)	80 (24 hrs.)	400 (24 hrs.)	100 (8 hrs.)	2.0 (8hrs.)	1.0 (24 hrs.)	6.0 (annual)	20 (annual)	5.0 (annual)	1.0 (annual)
02.03.2022	07.15-07.15	63.7	21.9	43.2	6.3	24.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
03.03.2022	07.30-07:30	61.8	22.7	42.5	5.9	23.9	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
09.03.2022	07.15-07.15	62.6	23.4	43.9	5.4	25.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
10.03.2022	07.30-07:30	63.4	22.9	41.5	7.8	23.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
16.03.2022	07.15-07.15	62.5	23.6	42.7	5.9	25.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
17.03.2022	07.30-07:30	63.9	22.3	43.3	5.8	25.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
23.03.2022	07.15-07.15	62.5	25.9	44.5	5.1	23.9	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
24.03.2022	07.30-07:30	63.3	24.4	42.7	7.3	25.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
30.03.2022	07.15-07.15	65.4	23.9	43.4	6.3	25.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
31.03.2022	07.30-07:30	61.8	25.7	42.9	5.8	26.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
06.04.2022	07.15-07.15	62.2	24.3	44.6	7.9	25.9	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
07.04.2022	07.30-07:30	63.9	23.9	42.5	6.3	26.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
13.04.2022	07.15-07.15	62.7	25.7	44.7	8.5	25.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
14.04.2022	07.15-07.15	62.5	24.4	43.3	5.9	26.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
20.04.2022	07.00-07.00	63.4	23.3	42.5	6.9	25.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
21.04.2022	07.15-07.15	62.8	25.7	41.8	8.7	26.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
27.04.2022	07.00-07.00	64.3	26.6	42.7	5.3	25.9	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
28.04.2022	07.15-07.15	64.1	25.8	42.5	6.9	25.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
04.05.2022	07.00-07.00	62.9	24.3	43.6	5.8	25.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
05.05.2022	07.15-07.15	63.7	25.7	42.5	6.3	25.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
11.05.2022	07.00-07.00	65.3	24.4	44.9	5.9	26.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
12.05.2022	07.15-07.15	64.8	23.9	44.1	7.4	24.9	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
18.05.2022	07.00-07.00	63.5	22.3	43.7	6.2	25.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
19.05.2022	07.15-07.15	62.5	22.7	43.5	5.6	24.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
25.05.2022	07.00-07.00	62.4	22.3	42.2	7.2	24.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
26.05.2022	07.15-07.15	62.8	23.5	42.9	6.9	23.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0

TABLE 3.21 AMBIENT AIR QUALITY DATA LOCATIO NAAQ4-:

Period: March 2022 – May 2022 Location: AAQ4 – Paruthikadu (NW) Sampling Time: 24-hourly

Monitoring		Particulates, µg/m³			Gaseous Pollutants, µg/m³					Other Pollutants (Particulate Phase) , µg/m³				
Date	Period, hrs.	SPM	PM2.5	PM10	SO_2	NO_2	NH_3	O_3 (8-hly Avg.)	CO (8-hly Avg.)	Pb, µg/m³	As, ng/m³	Ni, ng/m³	C_6H_6, ng/m³	BaP, ng/m³
NAAQ Norms*		(24 hrs.)	60(24 hrs.)	100 (24 hrs.)	80 (24 hrs.)	80 (24 hrs.)	400 (24 hrs.)	100 (8 hrs.)	2.0 (8hrs.)	1.0 (24 hrs.)	6.0 (annual)	20 (annual)	5.0 (annual)	1.0 (annual)
02.03.2022	07.00-07.00	62.8	25.5	42.9	8.9	25.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
03.03.2022	07.15-07:15	61.8	23.7	45.4	9.6	21.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
09.03.2022	07.00-07.00	63.5	24.4	43.3	9.1	23.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
10.03.2022	07.15-07:15	63.9	23.3	43.7	9.2	24.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
16.03.2022	07.00-07.00	62.7	25.7	42.4	8.6	23.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
17.03.2022	07.15-07:15	63.6	23.8	42.6	8.2	22.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
23.03.2022	07.00-07.00	64.7	25.5	45.1	8.3	21.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
24.03.2022	07.15-07:15	62.9	24.1	43.4	8.7	23.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
30.03.2022	07.00-07.00	63.5	23.9	43.8	8.6	23.9	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
31.03.2022	07.15-07:15	62.9	25.4	41.9	7.3	22.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
06.04.2022	07.00-07.00	62.8	23.7	43.6	7.5	20.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
07.04.2022	07.15-07:15	62.4	24.1	42.4	7.8	22.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
13.04.2022	07.00-07.00	63.5	23.5	42.5	7.6	21.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
14.04.2022	07.15-07.15	64.6	23.6	44.7	7.1	23.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
20.04.2022	07.00-07.00	62.8	25.5	43.4	7.8	23.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
21.04.2022	07.15-07.15	63.3	24.4	42.5	8.2	21.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
27.04.2022	07.00-07.00	63.9	23.9	41.9	8.1	24.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
28.04.2022	07.15-07.15	64.2	25.4	42.4	8.6	23.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
04.05.2022	07.00-07.00	63.6	21.5	43.6	8.1	22.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
05.05.2022	07.15-07.15	64.7	23.8	45.4	8.6	25.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
11.05.2022	07.00-07.00	64.8	22.5	46.6	7.6	23.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
12.05.2022	07.15-07.15	64.9	25.4	43.7	7.1	26.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
18.05.2022	07.00-07.00	62.4	23.9	42.8	7.6	25.9	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
19.05.2022	07.15-07.15	63.2	24.7	41.9	7.3	26.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
25.05.2022	07.00-07.00	63.8	23.5	42.5	7.6	24.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
26.05.2022	07.15-07.15	63.4	23.8	42.6	7.2	24.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0

TABLE 3.22 AMBIENT AIR QUALITY DATA LOCATIO NAAQ5-:

Period: March 2022 – May 2022 Location: AAQ5- Nirmulikuttai (NE) Sampling Time: 24-hourly

Monitoring		Particulates, µg/m³			Gaseous Pollutants, µg/m³					Other Pollutants (Particulate Phase) , µg/m³				
Date	Period, hrs.	SPM	PM2.5	PM10	SO_2	NO_2	NH_3	O_3 (8-hly Avg.)	CO (8-hly Avg.)	Pb, µg/m³	As, ng/m³	Ni, ng/m³	C_6H_6, ng/m³	BaP, ng/m³
NAAQ Norms*		(24 hrs.)	60(24 hrs.)	100 (24 hrs.)	80 (24 hrs.)	80 (24 hrs.)	400 (24 hrs.)	100 (8 hrs.)	2.0 (8hrs.)	1.0 (24 hrs.)	6.0 (annual)	20 (annual)	5.0 (annual)	1.0 (annual)
02.03.2022	07:30-07:30	63.7	21.9	43.2	6.3	21.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
03.03.2022	07:45-07:45	61.8	22.7	42.5	5.9	21.9	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
09.03.2022	07:30-07:30	62.6	23.4	43.9	5.4	21.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
10.03.2022	07:45-07:45	63.4	22.9	41.5	7.8	21.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
16.03.2022	07:30-07:30	62.5	23.6	42.7	5.9	22.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
17.03.2022	07:45-07:45	63.9	22.3	43.3	5.8	22.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
23.03.2022	07:30-07:30	62.5	25.9	44.5	5.1	22.9	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
24.03.2022	07:45-07:45	63.3	24.4	42.7	7.3	21.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
30.03.2022	07:30-07:30	65.4	23.9	43.4	6.3	22.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
31.03.2022	07:45-07:45	61.8	25.7	42.9	5.8	21.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
06.04.2022	07:30-07:30	62.2	24.3	44.6	7.9	22.9	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
07.04.2022	07:45-07:45	63.9	23.9	42.5	6.3	21.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
13.04.2022	07:30-07:30	62.7	25.7	44.7	8.5	21.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
14.04.2022	07.15-07.15	62.5	24.4	43.3	5.9	22.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
20.04.2022	07.00-07.00	63.4	23.3	42.5	6.9	22.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
21.04.2022	07.15-07.15	62.8	25.7	41.8	8.7	22.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
27.04.2022	07.00-07.00	64.3	26.6	42.7	5.3	22.9	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
28.04.2022	07.15-07.15	64.1	25.8	42.5	6.9	21.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
04.05.2022	07.00-07.00	62.9	24.3	43.6	5.8	22.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
05.05.2022	07.15-07.15	63.7	25.7	42.5	6.3	21.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
11.05.2022	07.00-07.00	65.3	24.4	44.9	5.9	23.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
12.05.2022	07.15-07.15	64.8	23.9	44.1	7.4	22.9	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
18.05.2022	07.00-07.00	63.5	22.3	43.7	6.2	22.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
19.05.2022	07.15-07.15	62.5	22.7	43.5	5.6	21.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
25.05.2022	07.00-07.00	62.4	22.3	42.2	7.2	21.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
26.05.2022	07.15-07.15	62.8	23.5	42.9	6.9	21.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0

TABLE 3.23 AMBIENT AIR QUALITY DATA LOCATIO NAAQ6-:

Period: March 2022 – May 2022 Location: AAQ6 – M.Perumalpaalayam (SE) Sampling Time: 24-hourly

Monitoring		Particulates, µg/m³			Gaseous Pollutants, µg/m³					Other Pollutants (Particulate Phase) , µg/m³				
Date	Period, hrs.	SP/m	PM2.5	PM10	SO_2	NO_2	NH_3	O_3 (8-hly Avg.)	CO (8-hly Avg.)	Pb, µg/m³	As, ng/m³	Ni, ng/m³	C_6H_6, ng/m³	BaP, ng/m³
NAAQ Norms*		(24 hrs.)	60(24 hrs.)	100 (24 hrs.)	80 (24 hrs.)	80 (24 hrs.)	400 (24 hrs.)	100 (8 hrs.)	2.0 (8hrs.)	1.0 (24 hrs.)	6.0 (annual)	20 (annual)	5.0 (annual)	1.0 (annual)
02.03.2022	08:00-08:00	69.3	18.2	38.6	6.5	20.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
03.03.2022	08:15-08:15	60.2	18.5	38.5	6.7	20.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
09.03.2022	08:00-08:00	60.3	18.9	39.2	6.4	20.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
10.03.2022	08:15-08:15	60.6	18.5	40.0	6.9	20.9	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
16.03.2022	08:00-08:00	60.1	18.8	40.6	6.8	21.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
17.03.2022	08:15-08:15	60.4	19.9	41.3	5.3	21.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
23.03.2022	08:00-08:00	60.7	19.5	40.9	5.4	21.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
24.03.2022	08:15-08:15	60.3	18.8	39.6	5.6	21.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
30.03.2022	08:00-08:00	61.3	18.2	39.9	4.2	21.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
31.03.2022	08:15-08:15	61.7	19.2	40.1	4.5	20.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
06.04.2022	08:00-08:00	67.6	19.0	40.2	4.1	20.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
07.04.2022	08:15-08:15	67.2	19.9	42.3	5.4	20.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
13.04.2022	08:00-08:00	67.3	18.7	42.5	5.5	21.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
14.04.2022	07.15-07.15	67.8	18.8	41.1	6.6	21.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
20.04.2022	07.00-07.00	66.5	18.2	40.5	7.4	21.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
21.04.2022	07.15-07.15	66.8	18.5	40.6	7.1	21.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
27.04.2022	07.00-07.00	66.9	18.1	41.9	8.6	19.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
28.04.2022	07.15-07.15	68.3	19.2	39.7	5.5	19.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
04.05.2022	07.00-07.00	68.9	19.2	38.6	5.7	21.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
05.05.2022	07.15-07.15	69.2	19.1	38.0	6.2	21.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
11.05.2022	07.00-07.00	60.2	19.2	40.5	6.3	21.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
12.05.2022	07.15-07.15	60.7	19.8	40.0	7.4	21.9	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
18.05.2022	07.00-07.00	60.3	18.5	39.6	6.8	21.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
19.05.2022	07.15-07.15	60.5	19.7	40.0	6.6	22.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
25.05.2022	07.00-07.00	69.3	19.6	40.5	6.9	22.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
26.05.2022	07.15-07.15	69.7	19.2	40.6	7.1	21.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0

TABLE 3.24 AMBIENT AIR QUALITY DATA LOCATIO NAAQ7-:

Period: March 2022 – May 2022 Location: AAQ7 – Karumapuram (S) Sampling Time: 24-hourly

Monitoring		Particulates, µg/m³			Gaseous Pollutants, µg/m³					Other Pollutants (Particulate Phase) , µg/m³				
Date	Period, hrs.	SPM	PM2.5	PM10	SO_2	NO_2	NH_3	O_3 (8-hly Avg.)	CO (8-hly Avg.)	Pb, µg/m³	As, ng/m³	Ni, ng/m³	C_6H_6, ng/m³	BaP, ng/m³
NAAQ Norms*		(24 hrs.)	60(24 hrs.)	100 (24 hrs.)	80 (24 hrs.)	80 (24 hrs.)	400 (24 hrs.)	100 (8 hrs.)	2.0 (8hrs.)	1.0 (24 hrs.)	6.0 (annual)	20 (annual)	5.0 (annual)	1.0 (annual)
02.03.2022	08:00-08:00	61.3	19.3	40.6	6.8	23.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
03.03.2022	08:15-08:15	61.6	18.6	40.5	6.7	21.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
09.03.2022	08:00-08:00	61.2	19.8	41.2	6.2	21.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
10.03.2022	08:15-08:15	60.8	20.6	41.8	6.8	21.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
16.03.2022	08:00-08:00	60.3	20.5	40.8	7.2	20.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
17.03.2022	08:15-08:15	60.7	20.3	40.3	7.8	20.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
23.03.2022	08:00-08:00	61.6	20.9	41.8	7.3	21.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
24.03.2022	08:15-08:15	61.9	21.5	42.7	7.1	20.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
30.03.2022	08:00-08:00	61.4	21.3	40.8	8.8	23.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
31.03.2022	08:15-08:15	64.3	20.5	41.3	8.2	23.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
06.04.2022	08:00-08:00	61.3	21.6	42.3	8.1	23.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
07.04.2022	08:15-08:15	62.3	20.1	41.8	7.2	22.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
13.04.2022	08:00-08:00	62.4	20.4	40.2	7.5	22.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
14.04.2022	07.15-07.15	62.2	20.2	41.0	8.1	23.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
20.04.2022	07.00-07.00	62.6	19.7	42.2	8.4	19.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
21.04.2022	07.15-07.15	64.3	19.6	40.9	7.6	20.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
27.04.2022	07.00-07.00	63.7	20.9	41.2	8.2	20.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
28.04.2022	07.15-07.15	60.2	21.7	40.8	7.5	20.9	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
04.05.2022	07.00-07.00	60.6	21.6	40.2	7.9	20.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
05.05.2022	07.15-07.15	60.7	22.8	42.9	7.4	20.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
11.05.2022	07.00-07.00	60.0	21.9	43.2	6.8	20.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
12.05.2022	07.15-07.15	61.2	22.7	41.2	7.9	20.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
18.05.2022	07.00-07.00	61.3	21.8	44.1	8.9	21.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
19.05.2022	07.15-07.15	61.7	21.1	42.7	8.4	21.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
25.05.2022	07.00-07.00	61.3	20.5	40.9	7.2	21.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
26.05.2022	07.15-07.15	61.5	21.0	42.6	7.8	21.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0

TABLE 3.25 AMBIENT AIR QUALITY DATA LOCATIO NAAQ8-:

Period: March 2022 – May 2022 Location: AAQ8 – Sukkampatti(W) Sampling Time: 24-hourly

Monitoring		Particulates, µg/m³			Gaseous Pollutants, µg/m³					Other Pollutants (Particulate Phase) , µg/m³				
Date	Period, hrs.	SPM	PM2.5	PM10	SO_2	NO_2	NH_3	O_3 (8-hly Avg.)	CO (8-hly Avg.)	Pb, µg/m³	As, ng/m³	Ni, ng/m³	C_6H_6, ng/m³	BaP, ng/m³
NAAQ Norms*		(24 hrs.)	60(24 hrs.)	100 (24 hrs.)	80 (24 hrs.)	80 (24 hrs.)	400 (24 hrs.)	100 (8 hrs.)	2.0 (8hrs.)	1.0 (24 hrs.)	6.0 (annual)	20 (annual)	5.0 (annual)	1.0 (annual)
02.03.2022	08:00-08:00	68.5	19.2	40.2	5.9	22.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
03.03.2022	08:15-08:15	68.6	20.3	40.5	5.7	22.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
09.03.2022	08:00-08:00	67.2	20.6	41.9	6.6	21.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
10.03.2022	08:15-08:15	67.3	21.6	40.7	6.4	21.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
16.03.2022	08:00-08:00	67.6	21.4	40.5	6.3	22.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
17.03.2022	08:15-08:15	67.5	21.5	41.6	7.5	21.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
23.03.2022	08:00-08:00	67.8	21.3	39.2	7.1	22.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
24.03.2022	08:15-08:15	67.3	21.3	40.3	5.5	22.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
30.03.2022	08:00-08:00	67.2	21.8	40.5	4.1	21.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
31.03.2022	08:15-08:15	67.9	18.6	40.3	5.4	23.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
06.04.2022	08:00-08:00	67.5	18.9	41.5	6.8	23.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
07.04.2022	08:15-08:15	67.8	18.6	39.6	4.9	23.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
13.04.2022	08:00-08:00	67.3	19.4	39.9	6.4	22.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
14.04.2022	07.15-07.15	67.9	19.2	37.7	6.9	22.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
20.04.2022	07.00-07.00	68.6	18.3	38.6	6.7	23.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
21.04.2022	07.15-07.15	69.2	18.3	40.3	6.8	24.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
27.04.2022	07.00-07.00	69.7	18.6	40.3	6.1	24.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
28.04.2022	07.15-07.15	69.5	18.2	40.8	6.4	24.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
04.05.2022	07.00-07.00	69.3	18.4	41.7	7.3	24.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
05.05.2022	07.15-07.15	69.4	20.3	40.6	7.3	23.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
11.05.2022	07.00-07.00	68.3	21.4	40.2	7.6	24.9	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
12.05.2022	07.15-07.15	68.7	21.6	40.3	7.1	23.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
18.05.2022	07.00-07.00	69.3	21.5	42.9	7.4	22.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
19.05.2022	07.15-07.15	69.5	21.3	40.7	7.2	22.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
25.05.2022	07.00-07.00	69.7	21.5	40.9	7.5	21.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
26.05.2022	07.15-07.15	67.3	21.9	41.5	7.8	23.9	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0

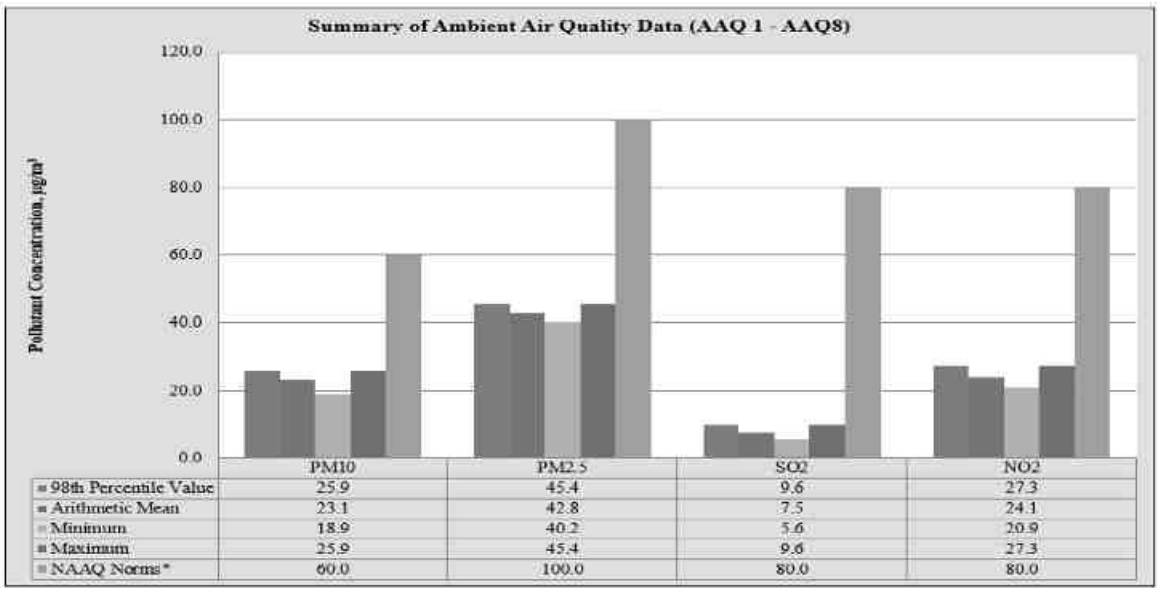
TABLE 3.26: SUMMARY OF AAQ – 1 to AAQ – 8

PM2.5	**AAQ1**	**AAQ2**	**AAQ3**	**AAQ4**	**AAQ5**	**AAQ6**	**AAQ7**	**AAQ8**
Arithmetic Mean	23.4	23.5	24.1	24.2	24.1	24.1	20.8	20.2
Minimum	21.3	21.6	21.9	21.5	21.9	18.1	18.6	18.2
Maximum	26.3	25.8	26.6	25.7	26.6	19.9	22.8	21.9
NAAQ Norms	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0
PM10	**AAQ1**	**AAQ2**	**AAQ3**	**AAQ4**	**AAQ5**	**AAQ6**	**AAQ7**	**AAQ8**
Arithmetic Mean	42.8	43.0	43.2	43.3	24.1	19.0	41.5	40.5
Minimum	41.2	41.6	41.5	41.9	41.5	38.0	40.2	37.7
Maximum	44.7	44.9	44.9	46.6	44.9	42.5	44.1	42.9
NAAQ Norms	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
SO2	**AAQ1**	**AAQ2**	**AAQ3**	**AAQ4**	**AAQ5**	**AAQ6**	**AAQ7**	**AAQ8**
Arithmetic Mean	8.0	7.4	6.5	8.1	6.5	6.2	7.6	6.6
Minimum	5.2	5.5	5.1	7.1	5.1	4.1	6.2	4.1
Maximum	10.5	9.6	8.7	9.6	8.7	8.6	8.9	7.8
NAAQ Norms	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0
NO2	**AAQ1**	**AAQ2**	**AAQ3**	**AAQ4**	**AAQ5**	**AAQ6**	**AAQ7**	**AAQ8**
Arithmetic Mean	26.4	25.1	25.3	23.5	22.1	21.2	21.4	23.0
Minimum	24.9	23.3	23.7	20.7	21.2	19.6	19.2	21.6
Maximum	28.7	26.9	26.8	26.4	23.4	22.7	23.6	24.9
NAAQ Norms	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0

TABLE 3.27: ABSTRACT OF AMBIENT AIR QUALITY DATA

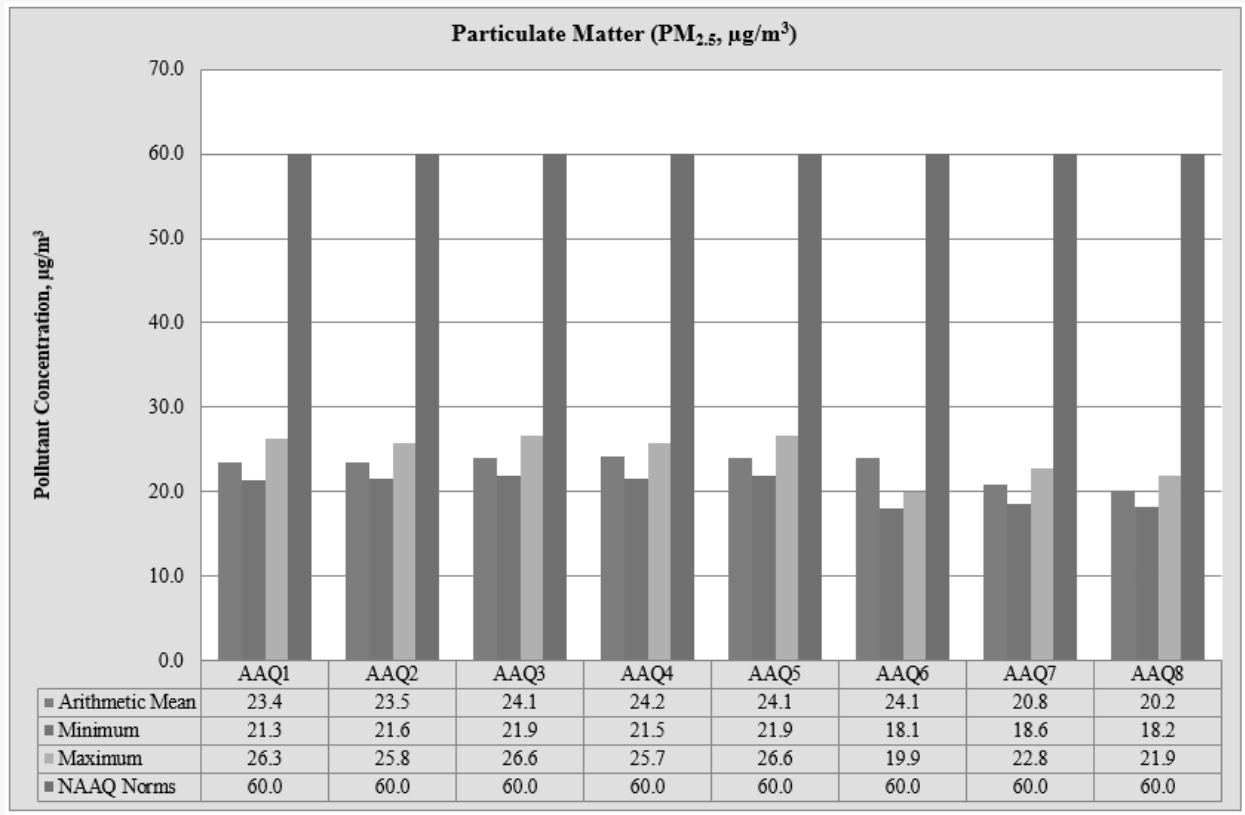
1	Parameter	PM2.5	PM10	SO_2	NO_2
2	No. of Observations	260	260	260	260
3	10th Percentile Value	18.9	40.2	5.6	20.9
4	20th Percentile Value	19.9	40.6	5.9	21.5
5	30th Percentile Value	21.3	41.5	6.3	21.8
6	40th Percentile Value	21.9	41.9	6.8	22.5
7	50th Percentile Value	22.7	42.5	7.1	23.5
8	60th Percentile Value	23.5	42.7	7.4	23.9
9	70th Percentile Value	23.9	43.2	7.8	24.8
10	80th Percentile Value	24.4	43.5	8.2	25.5
11	90th Percentile Value	25.5	44.3	8.6	26.3
12	95th Percentile Value	25.7	44.7	8.9	26.7
13	98th Percentile Value	25.9	45.4	9.6	27.3
14	Arithmetic Mean	23.1	42.8	7.5	24.1
15	Geometric Mean	22.9	42.7	7.4	24.0
16	Standard Deviation	2.4	1.7	1.3	2.2
17	Minimum	18.9	40.2	5.6	20.9
18	Maximum	25.9	45.4	9.6	27.3
19	**NAAQ Norms***	**100.0**	**60.0**	**80.0**	**80.0**
	% Values exceeding Norms*	0.0	0.0	0.0	0.0

FIGURE 3.17: BAR DIAGRAM OF SUMMARY OF AAQ 1 – AAQ 8



Source: Table 3.17 to 3.26

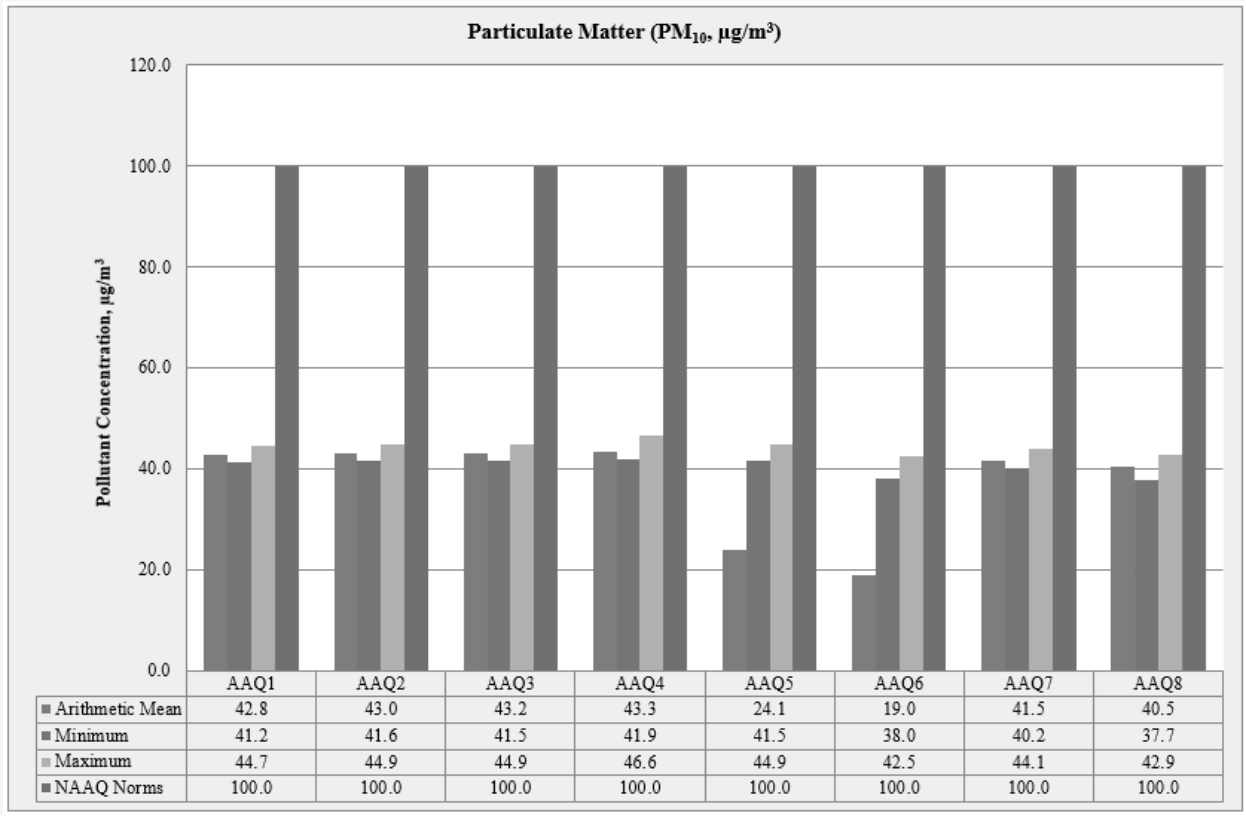
FIGURE 3.18: BAR DIAGRAM OF PARTICULATE MATTER $PM_{2.5}$



	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8
Arithmetic Mean	23.4	23.5	24.1	24.2	24.1	24.1	20.8	20.2
Minimum	21.3	21.6	21.9	21.5	21.9	18.1	18.6	18.2
Maximum	26.3	25.8	26.6	25.7	26.6	19.9	22.8	21.9
NAAQ Norms	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0

Source: Table 3.17 to 3.26

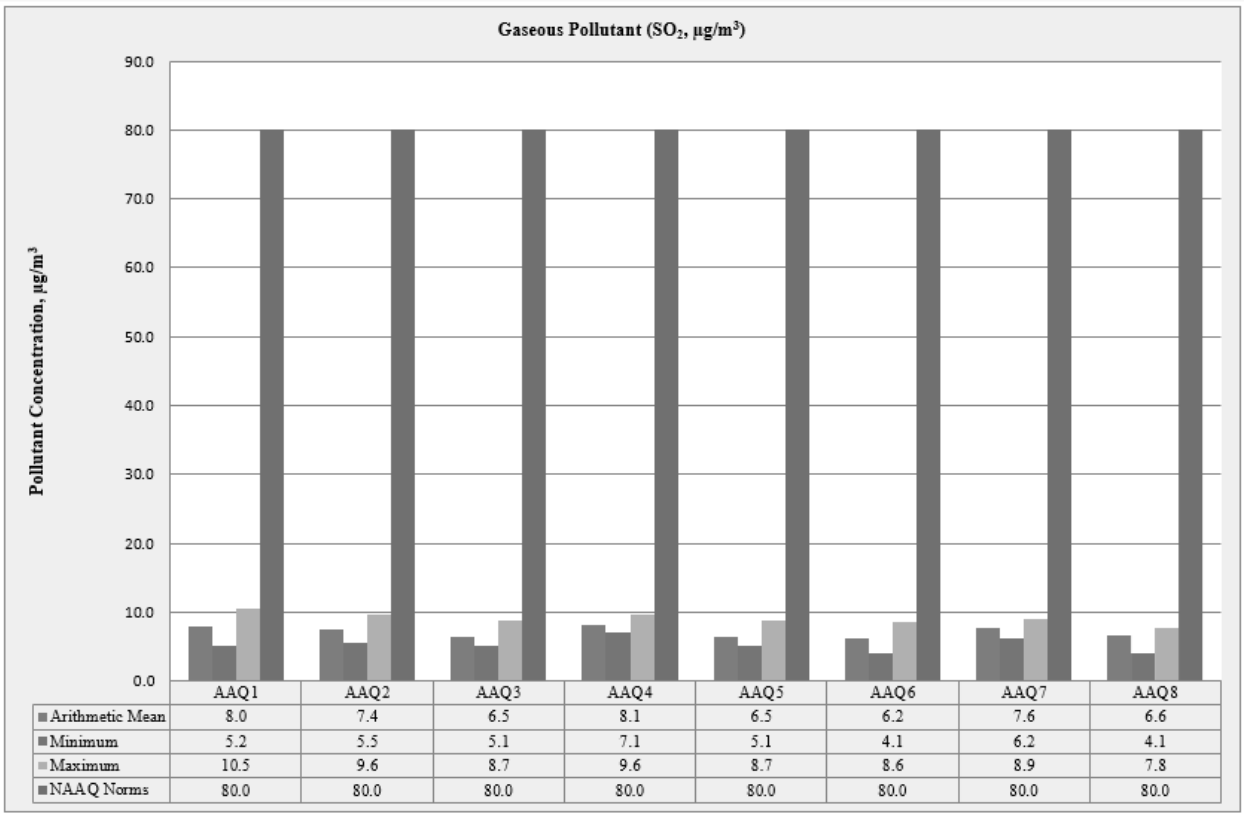
FIGURE 3.19: BAR DIAGRAM OF PARTICULATE MATTER PM_{10}



	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8
Arithmetic Mean	42.8	43.0	43.2	43.3	24.1	19.0	41.5	40.5
Minimum	41.2	41.6	41.5	41.9	41.5	38.0	40.2	37.7
Maximum	44.7	44.9	44.9	46.6	44.9	42.5	44.1	42.9
NAAQ Norms	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Table 3.17 to 3.26

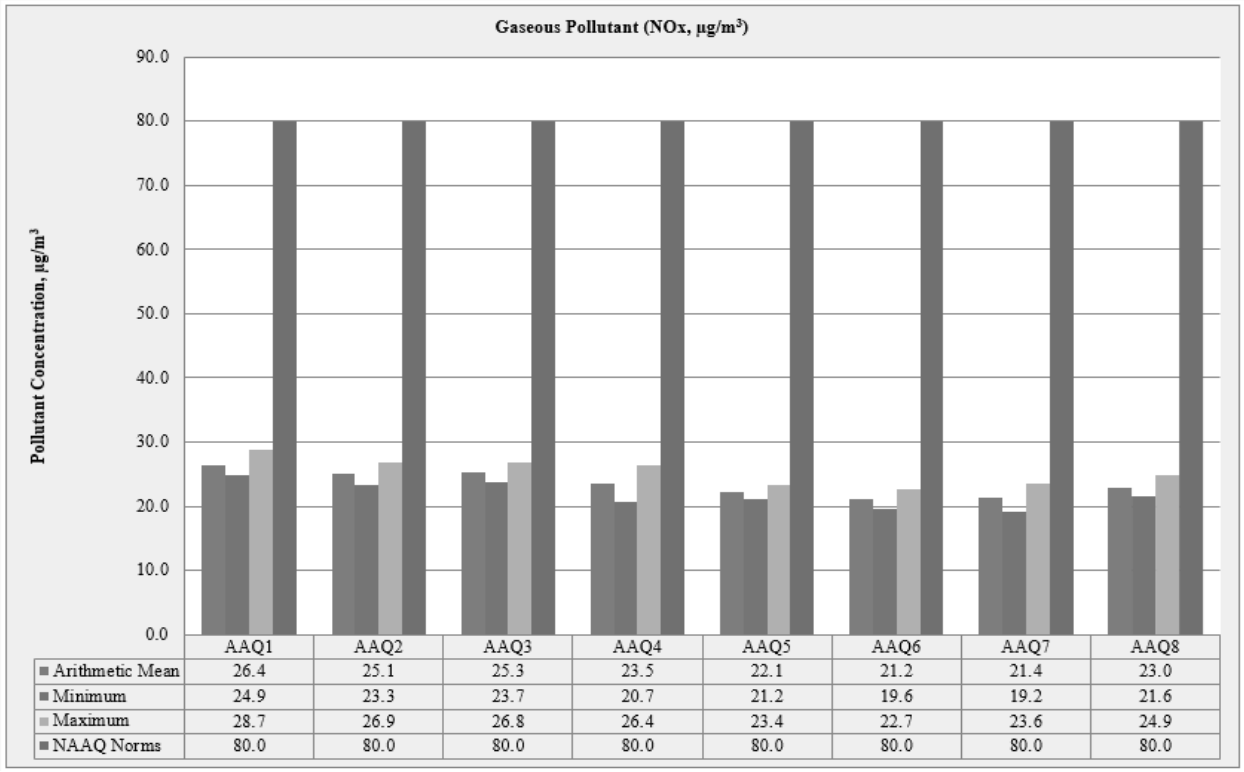
FIGURE 3.20: BAR DIAGRAM OF GASEOUS POLLUTANT SO_2



	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8
Arithmetic Mean	8.0	7.4	6.5	8.1	6.5	6.2	7.6	6.6
Minimum	5.2	5.5	5.1	7.1	5.1	4.1	6.2	4.1
Maximum	10.5	9.6	8.7	9.6	8.7	8.6	8.9	7.8
NAAQ Norms	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0

Source: Table 3.17 to 3.26

FIGURE 3.21: BAR DIAGRAM OF GASEOUS POLLUTANT NO_x



	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8
Arithmetic Mean	26.4	25.1	25.3	23.5	22.1	21.2	21.4	23.0
Minimum	24.9	23.3	23.7	20.7	21.2	19.6	19.2	21.6
Maximum	28.7	26.9	26.8	26.4	23.4	22.7	23.6	24.9
NAAQ Norms	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0

Source: Table 3.17 to 3.26

3.3.6 Interpretations & Conclusion

As per monitoring data, PM_{10} ranges from 37.7 µg/m^3 to 46.6 µg/m^3, $PM_{2.5}$ data ranges from 18.1 µg/m^3 to 26.6 µg/m^3, SO_2 ranges from 4.1 µg/m^3 to 10.5 µg/m^3 and NO_2 data ranges from 19.2 µg/m^3 to 28.7 µg/m^3. The concentration levels of the above criteria pollutants were observed to be well within the limits of NAAQS prescribed by CPCB.

3.3.7 FUGITIVE DUST EMISSION –

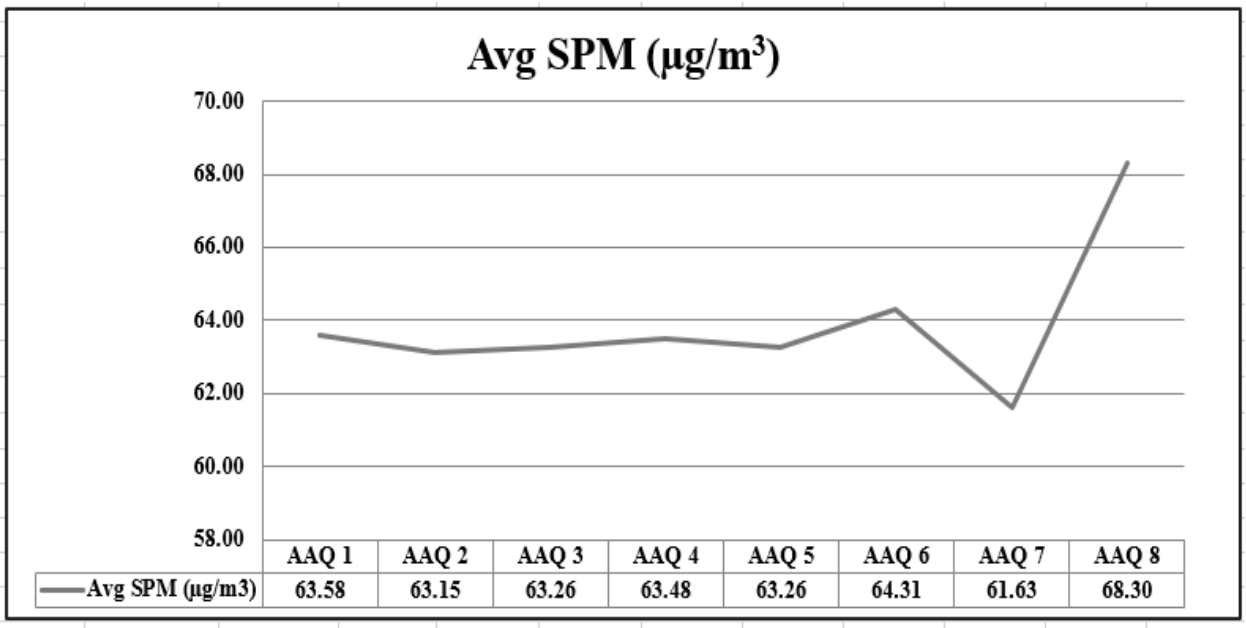
Fugitive dust was recorded at 8 AAQ monitoring stations for 26 days average during the study period.

TABLE 3.28: AVERAGE FUGITIVE DUST SAMPLE VALUES

AAQ Locations	Avg SPM (µg/m^3)
AAQ 1	63.58
AAQ 2	63.15
AAQ 3	63.26
AAQ 4	63.48
AAQ 5	63.26
AAQ 6	64.31
AAQ7	61.63
AAQ8	68.30

Source: Onsite monitoring/ sampling by KGS Laboratories

FIGURE 3.22: LINE DIAGRAM OF AVERAGE SPM VALUES



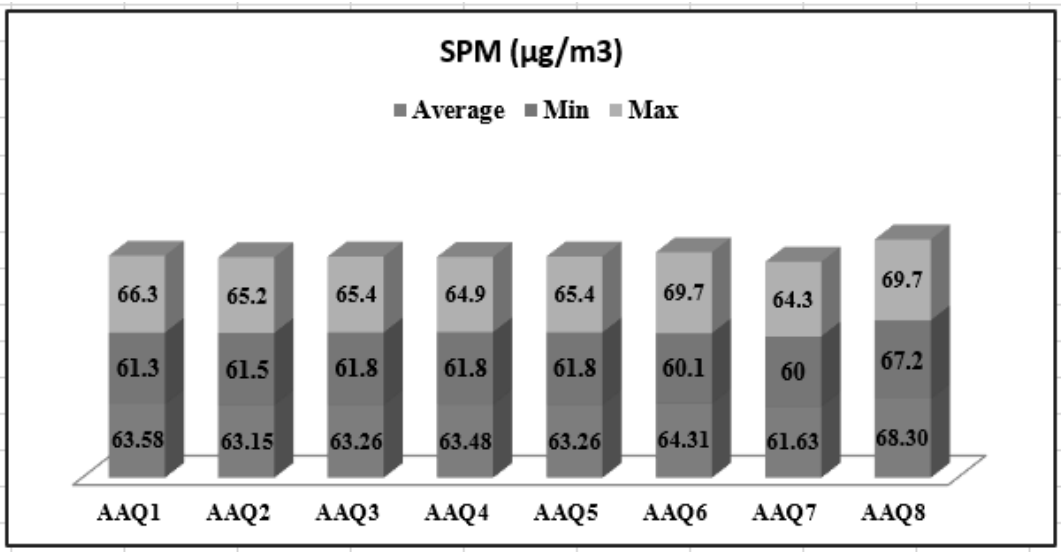
Source: Table 3.28

TABLE 3.29: FUGITIVE DUST SAMPLE VALUES IN µg/m³

SPM (µg/m³)	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8
Average	63.58	63.15	63.26	63.48	63.26	64.31	61.63	68.30
Min	61.3	61.5	61.8	61.8	61.8	60.1	60	67.2
Max	66.3	65.2	65.4	64.9	65.4	69.7	64.3	69.7

Source: Calculations from Lab Analysis Reports

FIGURE 3.23: BAR DIAGRAM OF SPM VALUES



Source: Table 3.29

3.4 NOISE ENVIRONMENT

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

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

3.4.1 Identification of Sampling Locations

In order to assess the ambient noise levels within the study area, noise monitoring was carried out at Eight (8) locations. The noise level monitoring locations were carried out by covering commercial, residential, rural areas within the radius of 10km. A noise monitoring methodology was chosen such that it best suited the purpose and objectives of the study.

TABLE 3.30: DETAILS OF SURFACE NOISE MONITORING LOCATIONS

S. No	Location Code	Monitoring Locations	Distance & Direction	Coordinates
1	N1	Core Zone	-	11°42'26.11"N 78°18'4.86"E
2	N2	Senguttai	250m NW	11°42'49.16"N 78°17'54.85"E
3	N3	Eripudur	1.5km SW	11°41'37.14"N 78°17'15.59"E
4	N4	Paruthikadu	3.5km NW	11°43'58.37"N 78°16'27.49"E
5	N5	Nirmulikuttai	5km NE	11°42'47.44"N 78°21'8.98"E
6	N6	M.Perumalpaalayam	3.5km SE	11°40'28.81"N 78°18'51.17"E
7	N7	Karumapuram	3.5km South	11°40'25.11"N 78°17'37.68"E
8	N8	Sukkampatti	3.5km West	11°42'40.22"N 78°15'51.51"E

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

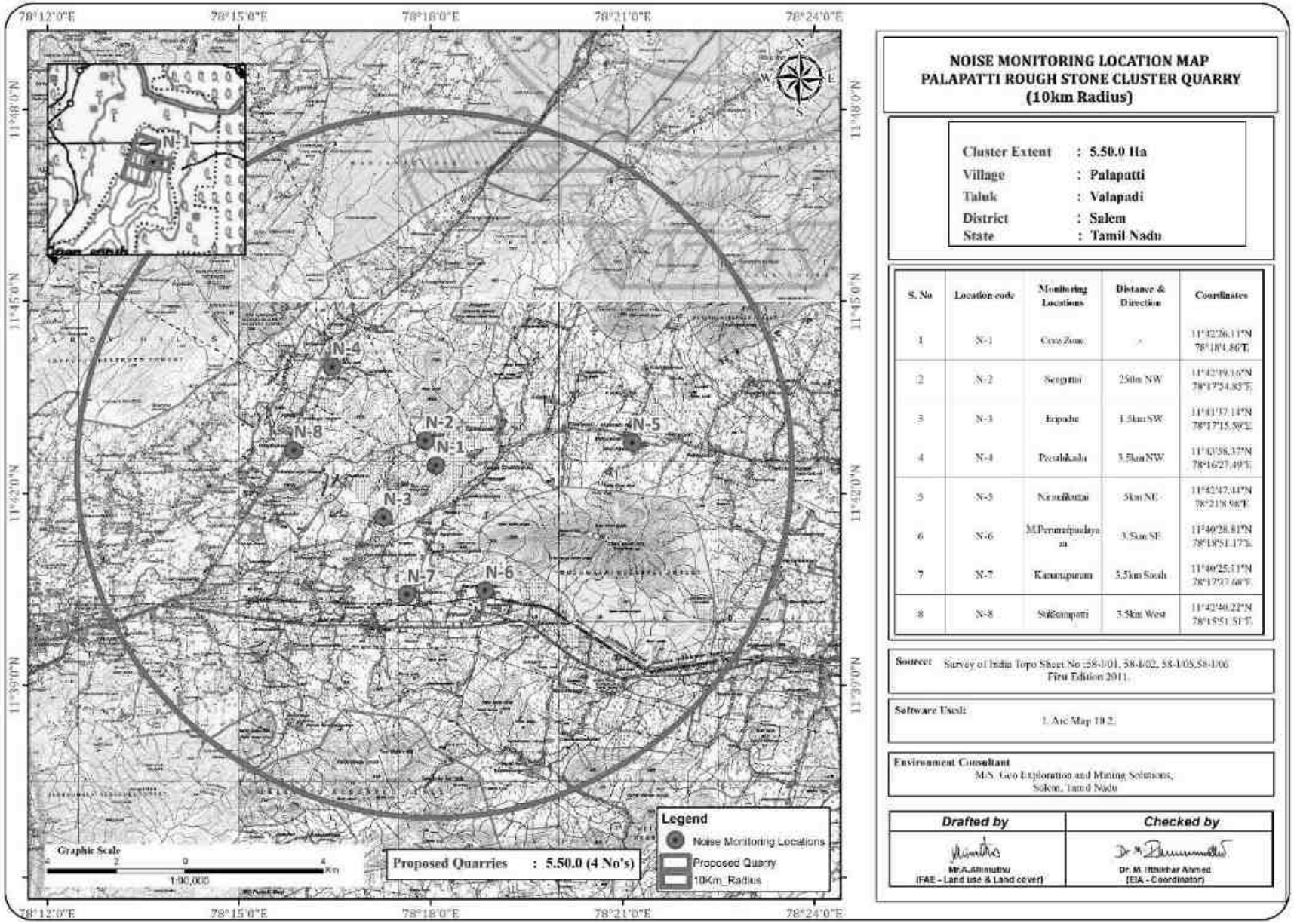
3.4.2 Method of Monitoring

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

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

$Leq = 10 \text{ Log } L / T\sum (10Ln/10)$
Where L = Sound pressure level at function of time dB (A)
T = Time interval of observation

FIGURE 3.24: NOISE MONITORING STATIONS AROUND 10 KM RADIUS



3.4.3 Analysis of Ambient Noise Level in the Study Area

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

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

Day time: 6:00 hours to 22.00 hours.

Night time: 22:00 hours to 6.00 hours.

TABLE 3.31: AMBIENT NOISE QUALITY RESULT

S. No	Locations	Noise level (dB (A) Leq)		Ambient Noise Standards
		Day Time	Night Time	
1	Core Zone	41.8	36.8	**Industrial Day Time- 75 dB (A) Night Time- 70 dB (A)**
2	Senguttai	42.8	35.9	**Residential Day Time– 55 dB (A) Night Time- 45 dB (A)**
3	Eripudur	42.3	36.4	
4	Paruthikadu	42.3	35.9	
5	Nirmulikuttai	42.5	36.6	
6	M.Perumalpaalayam	37.6	35.7	
7	Karumapuram	38.8	36.1	
8	Sukkampatti	38.6	35.2	

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

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

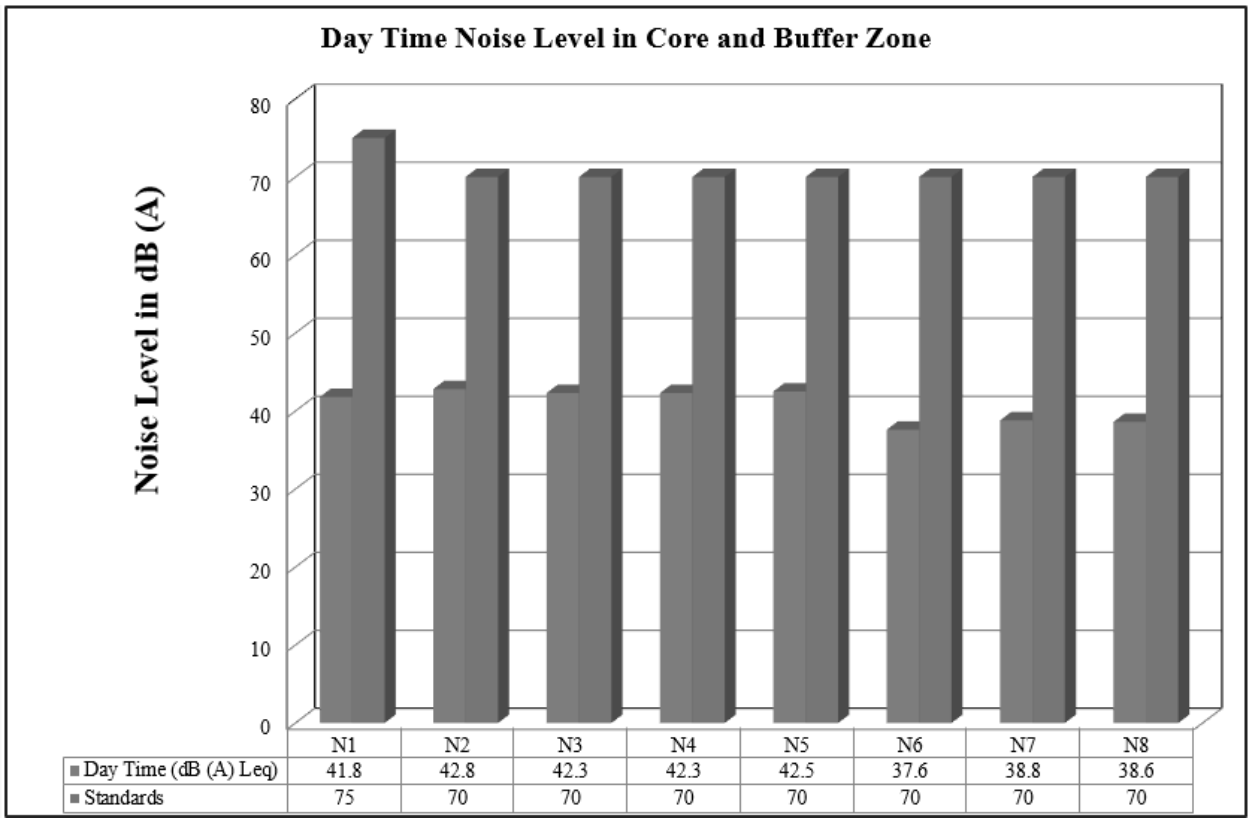
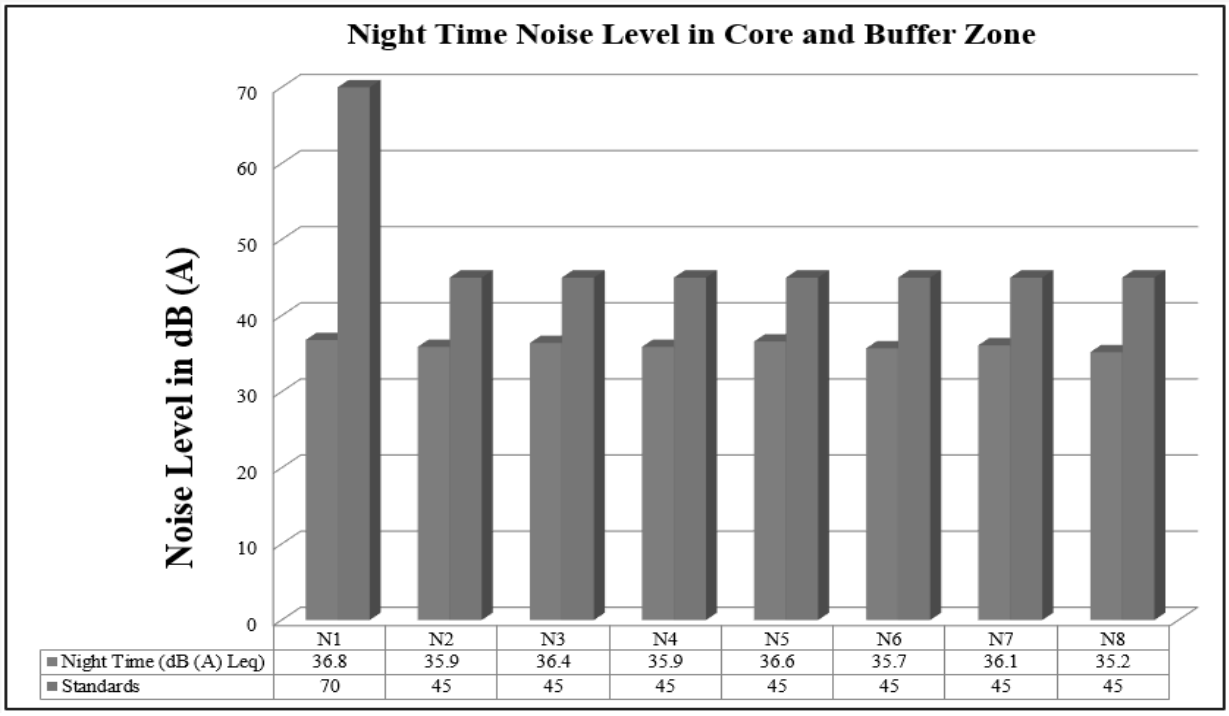


FIGURE 3.26: NIGHT TIME NOISE LEVELS IN CORE AND BUFFER ZONE



3.4.4 Interpretation & Conclusion:

Ambient noise levels were measured at 8 (Eight) locations around the proposed project area. Noise levels recorded in core zone during day time is 41.8 dB (A) Leq and during night time is 36.8 dB (A) Leq. Noise levels recorded in buffer zone during day time were from 38.6 to 42.8 dB (A) Leq and during night time were from 35.2 to 36.6 dB (A) Leq.

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

3.5 ECOLOGICAL ENVIRONMENT

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

3.5.1 Scope of Work

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

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

3.5.2 Objectives of Biological Studies

The present study was undertaken with the following objectives:

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

3.5.3 Methodology of Sampling

The present study was carried out in given steps

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

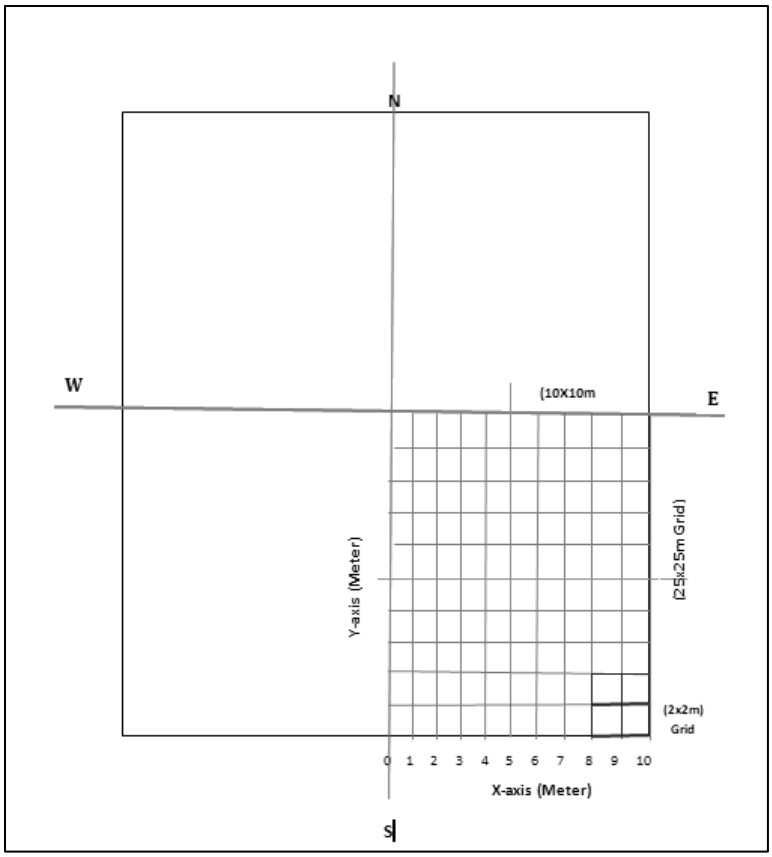
Site selection criteria: The core study area is located at Village: Palapatti, Taluk: Valappady, District: Salem, Tamil Nadu. The buffer study area comprises of 10 km radius from all the proposed rough stone quarry area.

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

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

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

FIGURE 3.27: A SCHEMATIC DIAGRAM FOR FLORAL RANDOM SAMPLING



Phyto-sociological Survey method

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

Quadrats method

Quadrats of 25 × 25-m were laid down randomly within core and 5-km buffer area; each quadrat was laid to assess the trees (>5 cm GBH) and one, 10 × 10-m sub-quadrat nested within the quadrat for shrubs. The quadrats were laid randomly to cover the area to maximize the sampling efforts and minimize the species homogeneity, such as small stream area, trees in agricultural bunds, tank bunds, farm forestry plantations, wildlife areas, natural forest area, avenue plantations, house backyards, etc. In each quadrat individuals belonging to tree (25 × 25-m) and shrub (10 × 10-m) were recorded separately and have been identified on the field. quadrates sampling methods is given in Fig no.3.26.

FLORA IN CORE ZONE

Taxonomically a total of 23 species belonging to 19 families have been recorded from the core mining lease area. Based on habitat classification of the enumerated plants the majority of species were Trees 6 (26%) followed by Shrubs 6 (26%), Herbs 8 (35%) and Climber 3 (13%). Details of flora with the scientific name were mentioned in Table No. 3.32. The result of core zone of flora studies shows that Fabaceae and Amaranthaceae, Lamiaceae are the main dominating species in the study area it mentioned in Table No.3.32 and the details of diversity of flora family's pattern are given in Fig No.3.27. No species found as threatened category (Table No. 3.32).

FLORA IN BUFFER ZONE

Similar type of environment also in buffer area but with more flora diversity compare than core zone area because of nearby forest covers and agriculture land was found to dominate mostly in Northwest and Southwest directions. It contains a total of 98 species belonging to 43 families have been recorded from the buffer zone. The floral (98) varieties among them forty Trees 40 (40%) Seventeen Herbs 17 (19%) and Seventeen Shrubs 17 (19%) and Climbers seven 7 (8%), Eight Creepers 8 (9%), Three Grasses 3 (4%), One Cactus 1 (1%) were identified. The result of buffer zone of flora studies shows that Fabaceae, Poaceae and Euphorbiaceae are the main dominating species in the study area it mentioned in Table No.3.33

There are few reserves forest located nearby study. Small Gudamalai R.F is located about 2.5km on the south east side and followed by Kurichi R.F cover about 1.5km on the North side, Kapputhi F.R. covers is located about 7.5km on the Northwest side. There is no Rare, Endangered and Threatened Flora species in mining area and their surrounding area. Details of flora with the scientific name were mentioned in Table No.3.33. The diversity of flora families is given in Fig No.3.28.

TABLE 3.32: FLORA IN CORE ZONE

SI. No	English Name	Vernacular Name	Scientific Name	Family Name
TREES				
1	Acacia Nilotica	Karuvelam maram	*Vachellia nilotica*	Fabaceae
2	Mesquite	Velikathan maram	*Prosopis juliflora*	Fabaceae
3	Noni	Nuna maram	*Morinda citrifolia*	Rubiaceae
4	Millettia pinnata	Pongam oiltree	*Pongamia pinnata*	Fabaceae
5	Neem	Vembu	*Azadirachta indica*	Meliaceae
6	Asian Palmyra palm	Panai maram	*Borassus flabellifer*	Arecaceae
SHRUBS				
7	Touch-me-not	Thottalchinungi	*Mimosa pudica*	Mimosaceae
8	Milk Weed	Erukku	*Calotropis gigantea*	Apocynaceae
9	Wild sage	Unichedi	*Lantana camara*	Verbenaceae
10	Indian mallow	Thuththi	*Abutilon indicum*	Malvaceae
11	Ackal jujube	Soorai	*Ziziphus oenoplia*	Rhamnaceae
12	Large calotrops	Yanainerunjil	*Pedalium murex*	Pedaliaceae
HERBS				
13	Common leucas	Thumbai	*Leucas aspera*	Lamiaceae
14	Basil	Karunthulasi	*Ocimum basilicum*	Lamiaceae
15	Yellow-fruit Nightshade	Kantang kathrikai	*Solanum virginianum*	Solanaceae
16	Devil‘s thorn	Nerunji	*Tribulus terrestris*	Zygophyllales
17	Common nut sedge	Korai	*Cyperus rotundus*	Cyperaceae
18	Indian doab	Arugampul	*Cynodon dactylon*	Poaceae
19	Prickly chaff flower	Nayuruv	*Achyranthes aspera*	Amaranthaceae
20	Mountain knotgrass	Poolai poondu	*Aerva lanata*	Amaranthaceae
CLIMBER				
21	Stemmed vine	Perandai	*Cissus quadrangularis*	Vitaceae
22	Wild bitter	Pavarkai	*Momordica charantia*	Cucurbitaceae
23	Ivy gourd	Kovai	*Coccinia grandis*	Cucurbitaceae

TABLE 3.33: FLORA IN BUFFER ZONE

SI.No	English Name	Vernacular Name	Scientific Name	Family Name	Resource use type *(E,M,EM)
			TREES		
1	Neem or Indian lilac	Vembu	*Azadirachta indica*	Meliaceae	M
2	Asian Palmyra palm	Panai maram	*Borassus flabellifer*	Arecaceae	E
3	Millettia pinnata	Pongam oiltree	*Pongamia pinnata*	Fabaceae	E
4	Jack fruit	Palamaram	*Artocarpus heterophyllus*	Moraceae	E
5	Coconut	Thennai maram	*Cocos nucifera*	Arecaceae	EM
6	Noni	Nuna maram	*Morinda citrifolia*	Rubiaceae	M
7	Lemon	Ezhumuchaipalam	*Citrus lemon*	Rutaceae	EM
8	Madras Thorn	Kuduka puli	*Pithecellobium dulce*	Mimosaceae	EM
9	Mango	Manga	*Mangifera indica*	Anacardiaceae	E
10	Banyan tree	Alamaram	*Ficus benghalensis*	Moraceae	E
11	Tamarind	Puliyamaram	*Tamarindus indica*	Legumes	EM
12	Creamy Peacock Flower	Vadanarayani	*Delonix elata*	Fabaceae	M
13	Beauty leaf	Punnai	*Calophyllu inophyllum*	Calophyllaceae	M
14	Castor oil plant	Amanakku	*Ricinus communis*	Euphorbiaceae	M
15	Acacia Nilotica	Karuvelam maram	*Vachellia nilotica*	Fabaceae	M
16	Eucalyptus	Eucalyptus	*Eucalyptus globules*	Myrtaceae	EM
17	Chebulic myrobalan	Kadukkai	*Terminalia chebula*	Combretaceae	M
18	Bitter Albizia	Arappu	*Albizia amara*	Fabaceae	M
19	Banana tree	Vazhaimaram	*Musa*	Musaceae	EM
20	Manilkara zapota	Sapota	*Manilkara zapota*	Sapotaceae	E
21	Giant thorny bamboo	Perumungil	*Bambusa bambos*	Poaceae	M
22	Black plum	Navalmaram	*Sygygium cumini*	Myrtaceae	EM
23	Indian fig tree	Athi	*Ficus recemosa*	Moraceae	EM
24	Gum arabic tree	Karuvelam	*Acacia nilotica*	Mimosaceae	NE
25	Gooseberry	Arai nelli	*Phyllanthus acidus*	Euphorbiaceae	EM
26	Teak	Thekku	*Tectona grandis*	Verbenaceae	E
27	Indian gooseberry	Nelli	*Emblica officinalis*	Phyllanthaceae	EM
28	Rosewood trees	Eeti	*Dalbergia latifolia*	Fabaceae	E
29	Sesban	Chitthakathi	*Sesbania sesban*	Fabaceae	M
30	Henna	Marudaani	*Lawsonia inermis*	Lythraceae	EM
31	Five leaf chastera	Nochi	*Vitex negundo*	Lamiaceae	M
32	Papaya	Pappali maram	*Carica papaya L*	Caricaceae	EM
33	Peepal	Arasanmaram	*Ficus religiosa*	Moraceae	M
34	Indian bael	Vilvam	*Aegle marmelos*	Rutaceae	EM

35	Chinese chaste tree	Nochi	*Vitex negundo*	Verbenaceae	E
36	Peepal	Arasanmaram	*Ficus religiosa*	Moraceae	M
37	Indian fir tree	Nettilinkam	*Polylathia longifolia*	Annonaceae	E
38	Guava	Koyya	*Psidium guajava*	Myrtaceae	EM
39	Custard apple	Seethapazham	*Annona reticulata*	Annonaceae	E
40	Curry tree	Velipparuthi	*Murraya koenigii*	Asclepiadaceae	EM
SHRUBS					
41	Avaram	Avarai	*Senna auriculata*	Fabaceae	M
42	Ceylon Date Palm	Icham	*Phoenix pusilla*	Arecaceae	EM
43	Rosy Periwinkle	Nithyakalyani	*Cathranthus roseus*	Apocynaceae	M
44	Wild Caper Bush.	Karindu	*Capparis sepiaria*	Capparaceae	M
45	Thorn apple	Oomathai	*Datura stramonium*	Solanaceae	E
46	Ackal jujube	Soorai	*Ziziphus oenoplia*	Rhamnaceae	EM
47	Flame of the Woods	Idlipoo	*Xoracoc cinea*	Rubiaceae	M
48	Puriging nut	Kattamanakku	*Jatropha curcas*	Euphorbiaceae	EM
49	Columnar Cactus	Sappathikalli	*Cereus pterogonus*	Cactaceae	M
50	Night shade plan	Sundaika	*Solanum torvum*	Solanaceae	EM
51	Indian mallow	Thuthi	*Abutilon indicum*	Meliaceae	M
52	Indian Oleander	Arali	*Nerium indicum*	Apocynaceae	M
53	Triangular spruge	Chaturakalli	*Euphorbia antiquorum*	Euphorbiaceae	NE
54	Shoe flower	Chemparuthi	*Hibiscu rosa-sinensis*	Malvaceae	EM
55	Rosary pea	Kundumani	*Abrus precatorius*	Fabaceae	M
56	Datura metel	Uumaththai	*Datura metel*	Solanaceae	NE
57	Milk Weed	Erukku	*Calotropis gigantea*	Apocynaceae	M
58	Touch-me-not	Thottalchinungi	*Mimosa pudica*	Mimosaceae	M
HERBS					
59	Prickly chaff flower	Nayuruv	*Achyranthes aspera*	Amaranthaceae	M
60	Tridax daisy	Veetukaayapoondu	*Tridax procumbens*	Asteraceae	M
61	Hibiscus hispidissimus	Kaattu piral	*Hibiscus hispidissimus*	Malvaceae	M
62	Indian Copperleaf	Kuppaimeni	*Acalypha indica*	Euphorbiaceae	M
63	Cleome viscosa	Nai kadugu	*Celome viscosa*	Capparidaceae	M
64	False daisy	Karisilanganni	*Eclipta prostata*	Asteraceae	EM
65	Punarnava	Mukkirattai	*Boerhaavia diffusa*	Nyctaginaceae	EM
66	Common nut sedge	Korai	*Cyperus rotundus*	Cyperaceae	NE
67	Node Flower	Kumattikkirai	*Allmania nodiflora*	Amaranthaceae	M
68	Poor land flatsedg	Kunnakora	*Cyperus compressus*	Cyperaceae	NE
69	Gale of the wind	Keelaneeli	*Phyllanthus niruri*	Phyllanthaceae	EM
70	Benghal dayflower	Kanamvazha	*Commelina benghalensis*	Commelinaceae	M

71	Common leucas	Thumbai	*Leucas aspera*	Lamiaceae	M
72	Carrot grass	Parttiniyam	*Parthenium hysterophorus*	Asteraceae	NE
73	Creeping wood sorrel	Pulliyari	*Oxalis corniculata*	Oxalidaceae	M
74	Black Mustard Seed	Kaduku	*Brassica juncea*	Brassaceae	EM
75	Red Hogweed	Mukurattai	*Boerhavia diffusa*	Nyctaginaceae	M
76	Holy basil	Thulasi	*Ocimum tenuiflorum*	Lamiaceae	M
77	Digeria muricata	Thoiya keerai	*Digeria muricata*	Amarantheceae	EM
78	Indian doab	Arugampul	*Cynodon dactylon*	Poaceae	E
79	European black nightshade	Manathakkali	*Solanumnigrum*	Solanaceae	EM
CLIMBER					
80	Ivy gourd	Kovai	*Coccinia grandis*	Cucurbitaceae	M
81	Stemmed vine	Perandai	*Cissus quadrangularis*	Vitaceae	M
82	Balloon vine	Mudakkotan	*Cardiospermum helicacabum*	Sapindaceae	M
83	Butterfly pea	Karkakartum	*Clitoria ternatea*	Fabaceae	M
84	Wild bitter	Pavarkai	*Momordica charantia*	Cucurbitaceae	EM
85	Purple fruited pea eggplant	Thuthuvelai	*Solanum trilobatum*	Solanaceae	EM
86	Indian sarsparilla	Nannari	*Hemidesmus indicus*	Asclepiadaceae	M
87	Pointed gourd	Kovakkai	*Trichosanthes dioica*	Cucurbitaceae	EM
88	Butterfly-pea	Sangupoo	*Clitoriaternatia*	Fabaceae	M
89	Bottle Guard	Sorakkai	*Lagenaria siceraria*	Cucurbitaceae	EM
CREEPER					
90	Water spinach	Vallikeerai	*Ipomoea aquatica*	Convolvulaceae	EM
91	Grona triflora	Siru puladi	*Desmodium triflorum*	Fabaceae	EM
92	Ground Spurge	Sithrapaalavi	*Euphorbia prostrata*	Euphorbiaceae	EM
93	Nut grass	Korai	*Cyperus rotandus*	Poaceae	M
94	Creeping-oxeye	Malai mookuthi poondu	*Wedelia trilobata*	Asteraceae	M
GRASS					
95	Jungle rice	Kuthirai vaal Kattu arusi	*Echinochloa colona*	Poaceae	NE
96	Eragrostis	Pullu	*Eragrostis ferruginea*	Poaceae	E
97	Windmill grass	Chevvarakupul	*Chloris barbata*	Amaranthaceae	NE
CACTUS					
98	Prickly pear	Nagathali	*Opuntia dillenii*	Cactaceae	M

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

AQUATIC VEGETATION

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

TABLE 3.34: AQUATIC VEGETATION

Sl.No	Scientific name	Common Name	Vernacular Name (Tamil)	IUCN Red List of Threatened Species
1	*Eichornia crassipe*	Water hyacinth	Agayatamarai	NA
2	*Aponogetonnatans*	Floating lace plant	Kottikizhnagu	NA
3	*Nymphaea nouchali*	Blue water lily	Nellambal	LC
4	*Carex cruciata*	Cross Grass	Koraipullu	NA
5	*Cynodon dactylon*	Scutch grass	Arugampul	LC
6	*Cyperus exaltatus*	Tall Flat Sedge	Koraikizhangu	LC
7	*Nymphaea nauchali*	Blue lotus	Alli	LC

*LC- Least Concern, NA-Not yet assessed

FAUNA

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

FAUNA METHODOLOGY

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

Survey and Monitoring of Mammals

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

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

Survey and Monitoring of Birds

Birds are sampled by using point count methods, and opportunistic bird sightings. By this bird vocal sounds and photographs, the species were identified in consultation with village local people. Point count: in this method, the observer will stand in a randomly chosen point and birds seen or heard in 50m radius are recorded for 5-min. this observation is repeated in another point at least 30m from the first point. We have enumerated 20 point – counts in each quartile, which constitute a total of 80 points-count (20 x 4) within 10 km radius area.

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

Survey and Monitoring of reptiles

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

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

FAUNA IN CORE ZONE

A total of 24 varieties of species observed in the Core zone of Palapatti Village Rough stone quarry (Table No.3.3) among them numbers of Insects 8 (33%), Reptiles 5 (21%), Mammals 3 (13%) and Avian 8 (33%). A total of 24 species belonging to 18 families have been recorded from the core mining lease area. None of these species are threatened or endemic in the study area and surroundings. There is no Schedule I species and seven species are under schedule IV according to Indian wild life Act 1972. A total eight 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 core zone with the scientific name were mentioned in Table No. 3.35.

TABLE 3.35: FAUNA IN CORE ZONE

S. No	Common name/English name	Family name	Scientific name	Schedule list wildlife Protection act 1972	IUCN Red List data
INSECTS					
1	Striped tiger	Nymphalidae	*Danaus plexippus*	Schedule IV	LC
2	Milkweed butterfly	Nymphalidae	*Danaus plexippus*	NE	LC
3	Red-veined darter	Libellulidae	*Sympetrum fonscolombii*	NE	LC
4	Common grass yellow	Pieridae	*Euremahecabe*	Schedule IV	LC
5	Termite	Blattodea	*Hamitermes silvestri*	NE	LC
6	Grasshopper	Acrididae	*Hieroglyphus sp*	NL	LC
7	Plain Tiger	Nymphalidae	*Dananuschrysippus*	NL	NE
8	Ant	Formicidae	*Camponotus Vicinus*	NL	NL
REPTILES					
9	Garden lizard	Agamidae	*Calotes versicolor*	NE	NE
10	Common house gecko	Gekkonidae	*Hemidactylus frenatus*	NE	NE
11	Rat snake	Colubridae	*Ptyas mucosa*	Sch II (Part II)	LC
12	Fan-Throated Lizard	Agamidae	*Sitanaponticeriana*	NL	LC
13	Common vine snake	Colubridae	*Ahaetulla nasuta*	Schedule IV	NE

1MAMMALS					
14	Indian Field Mouse	Muridae	*Mus booduga*	Schedule IV	LC
15	Goat	Bividae	*Capra aegagrus hircus*	NL	NL
16	Common Mongoose	Herpestidae	*Herpestesewardsii*	Schedule II (Part I)	LC
AVIAN					
17	Common myna	Sturnidae	*Acridotheres tristis*	NE	LC
18	Cattle egret	Ardeidae	*Bubulcus ibis*	NE	LC
19	House crow	Corvidae	*Corvus splendens*	NE	LC
20	Common cuckoo	Cucalidae	*Cuculus canorus*	NE	LC
21	Koel	Cucalidae	*Eudynamys scolopaceus*	Schedule IV	LC
22	Crow Pheasant	Cucalidae	*Centropus sinensis*	Schedule IV	LC
23	Indian pond heron	Ardeidae	*Ardeola grayii*	Schedule IV	LC
24	Black drongo	Dicruridae	*Dicrurus macrocercus*	NE	LC

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

FAUNA IN BUFFER ZONE

Taxonomically a total of 49 species belonging to 35 families have been recorded from the buffer mining lease area. Based on habitat classification the majority of species were Birds 20 (41%) followed by insects 14 (29%), Reptiles 8 (16%) Mammals 4 (8%) and, Amphibians 3 (6%). There are three Schedule II species and twenty four species are under schedule IV according to Indian wild life Act 1972. A total twenty species of bird were sighted in the study area. There are no critically endangered, endangered, vulnerable and endemic species were observed..

Dominant species are mostly birds and insects and three amphibians were observed during the extensive field visit (Hoplobatrachus tigerinus), (Rana hexadactyla), (Sphaerotheca breviceps). The result of core & Buffer zone of fauna studies shows that Nymphalidae and Libellulidae and Agamidae are the main dominating species in the study area it mentioned inTable No.3.36. There is no schedule I Species in study area. A detail of fauna diversity of family's pattern is given in Fig No.3.30. There are no critically endangered, endangered, vulnerable and endemic species were observed. Details of faunal diversity in buffer zone are given in Table No.3.36.

TABLE 3.36: FAUNA IN BUFFER ZONE

SI.No	***Common name/English Name***	***Family Name***	***Scientific Name***	***Schedule list wildlife Protection act 1972***	***IUCN Red List data***
INSECTS					
1	Striped tiger	Nymphalidae	*Danaus plexippus*	Schedule IV	LC
2	Common Tiger	Nymphalidae	*Danaus genutia*	Schedule IV	LC
3	Grasshopper	Acrididae	*Hieroglyphus sp*	NL	LC
4	Tawny coster	Nymphalidae	*Danaus chrysippus*	Schedule IV	LC
5	Green marsh hawk	Libellulidae	*Orthetrum sabina*	NL	LC
6	Mottled emigrant	Peridae	*Catopsilia pyranthe*	NL	LC
7	Lesser grass blue	Lycaenidae	*Zizina Otis indica*	Schedule IV	LC
8	Ant	Formicidae	*Camponotus Vicinus*	NL	NL
9	Common Indian crow	Nymphalidae	*Euploea core*	Schedule IV	LC
10	Termite	Blattodea	*Hamitermes silvestri*	NL	LC
11	Stick insect	Lonchodidae	*carausius morosus*	NL	LC
12	Milkweed butterfly	Nymphalidae	*Danainae*	NL	LC
13	Red-veined darter	Libellulidae	*Sympetrum fonscolombii*	NL	LC
14	Blue tiger	Nymphalidae	*Tirumala limniace*	Schedule IV	LC

REPTILES					
15	Garden lizard	Agamidae	*Calotes versicolor*	NL	LC
16	Common house gecko	Gekkonidae	*Hemidactylus frenatus*	NL	LC
17	Fan-Throated Lizard	Agamidae	*Sitanaponticeriana*	NL	LC
18	Cow	Bovidae	*Bus taurus*	NL	NL
19	Olive keel back water snake	Natricidae	*Atretium schistosum*	Sch II (Part II)	LC
20	Brahminy skink	Scincidae	*Eutropis carinata*	NL	LC
21	Rat snake	Colubridae	*Ptyas mucosa*	Sch II (Part II)	LC
22	Common vine snake	Colubridae	*Ahaetulla nasuta*	Schedule IV	NE
MAMMALS					
23	Indian palm squirrel	Sciuridae	*Funambulus palmarum*	Schedule IV	LC
24	Common Mongoose	Herpestidae	*Herpestesewardsii*	Schedule II (Part I)	LC
25	Indian Field Mouse	Muridae	*Mus booduga*	Schedule IV	LC
26	Goat	Bividae	*Capra aegagrus hircus*	NL	NL
AVES					
27	Koel	Cucalidae	*Eudynamys*	Schedule IV	LC
28	Common myna	Sturnidae	*Acridotheres tristis*	NL	LC
29	Small blue Kingfisher	Alcedinidae	*Alcedo atthis*	Schedule IV	LC
30	Grey Francolin	Phasianidae	*Francolinus pondicerianus*	Schedule IV	LC
31	Cattle egret	Ardeidae	*Bubulcus ibis*	NL	LC
32	Two-tailed Sparrow	Dicruridae	*Dicrurus macrocercus*	Schedule IV	LC
33	Shikra	Accipitridae	*Accipiter badius*	NL	LC
34	Red-vented Bulbul	Pycnonotidae	*Pycnonotuscafer*	Schedule IV	LC
35	Blue Rock Pigeon	Columbidae	*Columba livia*	Schedule IV	LC
36	House crow	Corvidae	*Corvussplendens*	NL	LC
37	Asian green bee-eater	Meropidae	*Meropsorientalis*	NL	LC
38	Common quail	Phasianidae	*Coturnix coturnix*	Schedule IV	LC
39	White-breasted waterhen	Rallidae	*Amaurornis phoenicurus*	NL	LC
40	Small Sunbird	Nectariniidae	*Nectarinia asiatica*	Schedule IV	LC
41	Rose-ringed parkeet	Psittaculidae	*Psittacula krameri*	NL	LC
42	Brahminy starling	Sturnidae	*Sturnia pagodarum*	Schedule IV	LC
43	Common Coot	Rallidae	*Fulica atra*	Schedule IV	LC
44	Shikra	Accipitridae	*Accipiter badius*	NL	LC
45	Black drongo	Dicruridae	*Dicrurus macrocercus*	Schedule IV	LC
46	Indian pond heron	Ardeidae	*Ardeola grayii*	Schedule IV	LC
AMPHIBIANS					
47	Green Pond Frog	Ranidae	*Rana hexadactyla*	Schedule IV	LC
48	Tiger Frog	Chordata	*Hoplobatrachus tigerinus (Rana tigerina)*	Schedule IV	LC
49	Indian Burrowing frog	Dicroglossidae	*Sphaerotheca breviceps*	Schedule IV	LC

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

FIGURE 3.28: FLORAL DIVERSITY IN CORE ZONE

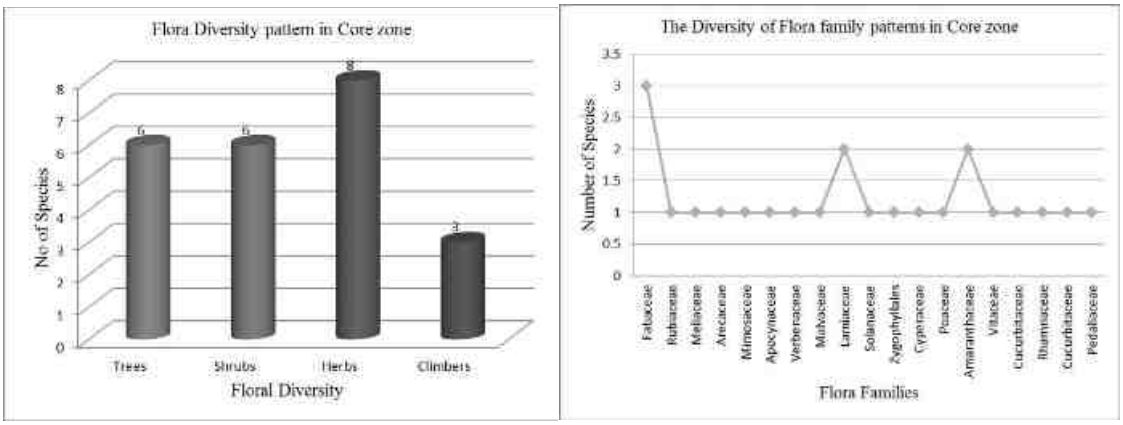


FIGURE 3.29: FLORAL DIVERSITY IN BUFFER ZONE

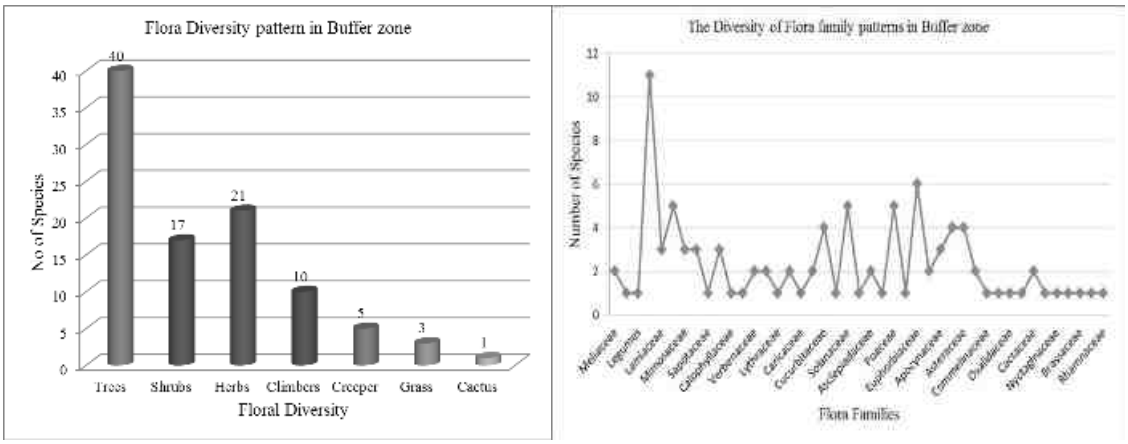


FIGURE 3.30: FAUNA DIVERSITY IN CORE ZONE

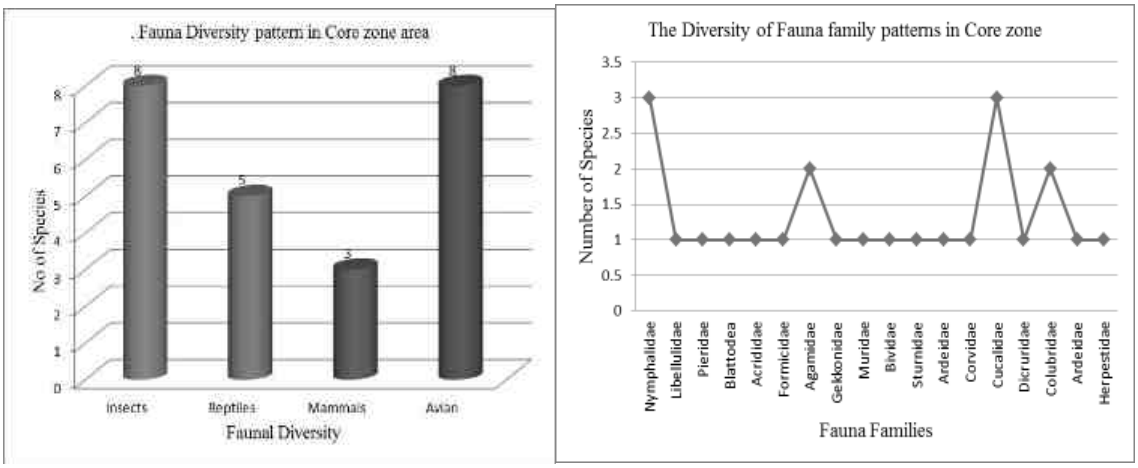
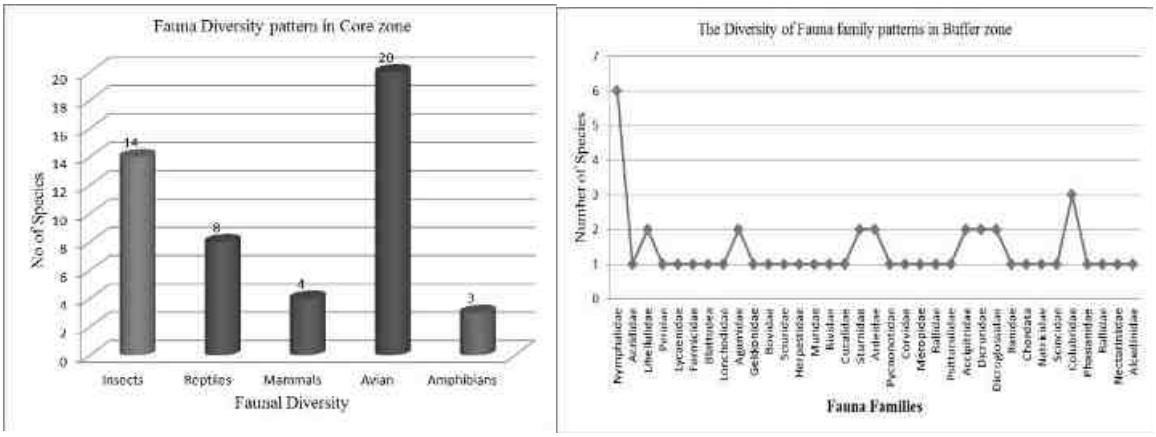


FIGURE 3.31: FAUNA DIVERSITY IN BUFFER ZONE



3.5.4 Interpretation& Conclusion:

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

3.6 SOCIO ECONOMIC ENVIRONMENT

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 District Profile

Salem is a Geologist's paradise, surrounded by hills and the landscape dotted with hillocks. Salem has a vibrant culture dating back to the ancient Kongu Nadu. As a district, Salem has its significance in various aspects. The Salem Steel Plant was an ambitious project started with a view to utilise the locally available iron-ore from Kanchamalai to produce steel. This public sector company engaged in rolling out cast steel blacks into sheets of required dimensions by cold and hot extrusion methods. Mango fruits from Salem are enjoyed and much sought after, especially the variety Malgoa-which is the pride of Salem besides a number of other newly introduced hybrid varieties. Rope making is another major cottage industry. Yercaud is a popular summer resort in Salem, quite inexpensive yet exquisitely picturesque.

3.6.4 Study area:

PALAPATTI VILLAGE

Palapatti village is situated in Teshil Vazhapadi, District Salem and in State of Tamil Nadu India. Village has population of 1547 as per census data of 2011, in which male population is 800 and female population is 747. Total geographical area of Palapatti village is 345.8 Hectares. Population density of Palapatti is 4 persons per Hectares. Total number of house hold in village is 405.

TABLE 3.37: PALAPATTI VILLAGE POPULATION FACTS

Number of Households	405
Population	1547
Male Population	800
Female Population	747
Children Population	147
Sex-ratio	934
Literacy	71.29%
Male Literacy	77.69%
Female Literacy	64.39%
Scheduled Tribes (ST) %	0.3%
Scheduled Caste (SC) %	14.9%

Source: https://etrace.in/census/village/palapatti-vazhapadi-district-salem-tamil-nadu-634177

Gram Panchayat name of the Palapatti village is Kuttathipatti. CD Block name is Ayothiyapattinam and Teshil/Taluk or sub-district is Vazhapadi. Data Reference year is 2009 of Census 2011. Sub District HQ Name is VAZHAPADI and Sub District HQ Distance is 17 Km from the village. District Head Quarter name is SALEM and it's distance from the village is 19KM. Nearest Town of the Palapatti village is AYOTHIAPATTINAM and nearest town distance is 13 km. Pincode of Palapatti village is 636139. As per census 2011 village code of village Palapatti is 634177.

TABLE 3.38: DEMOGRAPHICS POPULATION OF PALAPATTI VILLAGE

Total Population	Male Population	Female Population
1547	**800**	**747**

Source: https://etrace.in/census/village/palapatti-vazhapadi-district-salem-tamil-nadu-634177

Sex Ratio of Palapatti Village -Census 2011

As per the Census Data 2011 there are 934 Femals per 1000 males out of 1547 total population of village. There are 986 girls per 1000 boys under 6 years of age in the village.

Literacy of Palapatti Village

Out of total poplation total 998 people in Palapatti Village are literate, among them 564 are male and 434 are female in the village. Total literacy rate of of Palapatti is 71.29%, for male literacy is 77.69% and for female literacy rate is 64.39%.

Workers profile of Palapatti Village

Total working population of Palapatti is 687 which are either main or marginal workers. Total workers in the village are 687 out of which 488 are male and 199 are female. Total main workers are 669 out of which female main workers are 480 and male main workers are 189. Total marginal workers of village are 18.

TABLE 3.39: PALAPATTI VILLAGE CENSUS 2011 DATA

Description	Census 2011 Data
Village Name	Palapatti
Teshil Name	Vazhapadi
District Name	Salem
State Name	Tamil Nadu
Total Population	1547
Total Area	346 (Hectares)
Total No of House Holds	405
Total Male Population	800
Total Female Population	747
0-6 Age group Total Population	147
0-6 Age group Male Population	74
0-6 Age group Female Population	73
Total Person Literates	998
Total Male Literates	564
Total Male Literates	434
Total Person Illiterates	549
Total Male Illiterates	236
Total Male Illiterates	313
Scheduled Cast Persons	231
Scheduled Cast Males	125
Scheduled Cast Females	106
Scheduled Tribe Persons	5
Scheduled Tribe Males	2
Scheduled Tribe Females	5

Source: https://etrace.in/census/village/palapatti-vazhapadi-district-salem-tamil-nadu-634177

TABLE 3.40: PALAPATTI WORKING POPULATION ---CENSUS 2011

	Total	Male	Female
Total Workers	687	488	199
Main Workers	669	480	189
Main Workers Cultivators	156	101	55
Agriculture Labourer	272	166	106
Household Industries	5	3	2
Other Workers	236	210	26
Marginal Workers	18	8	10
Non Working Persons	860	312	548

Source: https://etrace.in/census/village/palapatti-vazhapadi-district-salem-tamil-nadu-634177

TABLE 3.41: POPULATION DATA OF STUDY AREA

SI.No.	Village Name	No of House Holds	Total Population	Male	Female	Total Literate Population	Male Literate	Female Literate	Total Illiterate Population	Male Illiterate	Female Illiterate
1	Achanguttaipatti	624	2406	1249	1157	1461	885	576	945	364	581
2	Achanguttapattipudur	109	335	165	170	200	121	79	135	44	91
3	Anuppur	885	3385	1736	1649	2169	1254	915	1216	482	734
4	Aramanur	94	314	165	149	162	94	68	152	71	81
5	Chandrapillaivalasai	1222	4709	2445	2264	2958	1715	1243	1751	730	1021
6	Chenrayapalayam	406	1439	732	707	1015	565	450	424	167	257
7	Chinnakavundapuram	838	3534	1805	1729	2295	1297	998	1239	508	731
8	Chinnamadur	66	252	133	119	99	66	33	153	67	86
9	Chinnamanayakanpalayam	1112	4384	2263	2121	2577	1483	1094	1807	780	1027
10	Chinnanur	656	2434	1264	1170	1434	859	575	1000	405	595
11	D.Perumalpalayam	979	3644	1858	1786	2263	1290	973	1381	568	813
12	Dasinayakkanpatti	200	804	395	409	495	273	222	309	122	187
13	Eripudur	475	1806	910	896	1191	662	529	615	248	367
14	J.Veeranam	2865	11037	5624	5413	6646	3790	2856	4391	1834	2557
15	Kakkambadi	164	571	287	284	319	199	120	252	88	164
16	Karipatti	1278	4937	2450	2487	3482	1888	1594	1455	562	893
17	Karumapuram	596	2329	1185	1144	1482	839	643	847	346	501
18	Kathiripatti	155	560	290	270	292	173	119	268	117	151
19	Kattuveppilaipatti	1124	4297	2175	2122	2940	1644	1296	1357	531	826
20	Kavurkkalpatti	336	1279	640	639	869	476	393	410	164	246
21	Kolathukombai	745	2732	1378	1354	1446	837	609	1286	541	745
22	Kottachchedu	87	311	176	135	124	84	40	187	92	95
23	Kullampatti	748	2849	1417	1432	1924	1086	838	925	331	594
24	Kumarasamiyur	141	525	279	246	347	213	134	178	66	112
25	Kuppanur	486	1793	942	851	1054	609	445	739	333	406
26	Kuttathipatti	1146	4490	2289	2201	2781	1575	1206	1709	714	995
27	M.Perumalpalayam	1360	5232	2615	2617	3008	1712	1296	2224	903	1321
28	Mannayakanpatti	608	2201	1099	1102	1188	659	529	1013	440	573
29	Mettupattithathanur	1852	6606	3322	3284	4558	2538	2020	2048	784	1264
30	Minnampalli	2272	9327	4770	4557	6437	3603	2834	2890	1167	1723
31	Mookkanur	295	1138	560	578	753	430	323	385	130	255
32	Muttampatti	1023	3731	1872	1859	2502	1389	1113	1229	483	746
33	Nirmullikuttai	1159	4419	2248	2171	2688	1502	1186	1731	746	985
34	**Palapatti**	405	1547	800	747	998	564	434	549	236	313
35	Pallikkadu	40	151	69	82	34	14	20	117	55	62
36	Pallipatti	969	3487	1796	1691	2116	1219	897	1371	577	794
37	Pelakkadu	168	646	334	312	251	155	96	395	179	216
38	Periyakavundapuram	975	3536	1740	1796	1920	1085	835	1616	655	961
39	Pilleri	152	542	266	276	319	181	138	223	85	138

40	Pottakkadu	178	653	338	315	371	228	143	282	110	172
41	Sarkar Nattamangalam	672	2561	1328	1233	1555	919	636	1006	409	597
42	Sukkampatti	1077	4104	2056	2048	2579	1439	1140	1525	617	908
43	Tadanur	572	2169	1074	1095	1309	746	563	860	328	532
44	Talai cholai	259	899	435	464	471	295	176	428	140	288
45	Udayapatti	2046	7888	3944	3944	5268	2868	2400	2620	1076	1544
46	Valaiyakkaranur	239	890	464	426	467	266	201	423	198	225
47	Valasaiyur	1485	5363	2720	2643	3532	1951	1581	1831	769	1062
48	Vedapatti	348	1302	683	619	746	428	318	556	255	301
49	Velampatti	528	1995	1035	960	1217	718	499	778	317	461
50	Vellaiyanpatti	320	1257	639	618	725	408	317	532	231	301
51	Vellalakundam	1843	6904	3470	3434	4484	2552	1932	2420	918	1502
52	Vettaikkaranur	190	710	385	325	442	264	178	268	121	147

Source: www.censusindia.gov.in - Tamilnadu Census of India – 2011

TABLE 3.42: WORKERS PROFILE OF STUDY AREA

SI.No.	Village Name	Total Workers Population	Male Workers	Female Workers	Total Main Workers	Main Workers Male	Main Workers Female	Main Cultivation Workers	Main Agriculture Workers	Main Other Workers	Non-Worker Population
1	Achanguttaipatti	1264	731	533	1033	624	409	172	451	393	1142
2	Achanguttapattipudur	233	117	116	233	117	116	144	27	61	102
3	Anuppur	1922	1090	832	1915	1087	828	595	943	360	1463
4	Aramanur	215	112	103	215	112	103	144	63	3	99
5	Chandrapillaivalasai	2643	1498	1145	2471	1431	1040	869	951	639	2066
6	Chenrayapalayam	842	469	373	832	462	370	238	353	232	597
7	Chinnakavundapuram	1651	993	658	1321	833	488	212	690	396	1883
8	Chinnamadur	164	83	81	152	78	74	93	10	42	88
9	Chinnamanayakanpalayam	1923	1340	583	1856	1303	553	1030	277	474	2461
10	Chinnanur	1174	756	418	1126	752	374	166	224	527	1260
11	D.Perumalpalayam	2044	1174	870	1942	1151	791	315	891	709	1600
12	Dasinayakkanpatti	499	255	244	495	253	242	17	443	35	305
13	Eripudur	902	551	351	854	531	323	204	266	375	904
14	J.Veeranam	5176	3481	1695	4503	3198	1305	595	947	2503	5861
15	Kakkambadi	400	190	210	336	163	173	1	21	312	171
16	Karipatti	2324	1468	856	2213	1441	772	235	847	1074	2613
17	Karumapuram	1128	723	405	1050	695	355	352	391	304	1201
18	Kathiripatti	318	181	137	318	181	137	128	137	51	242
19	Kattuveppilaipatti	2101	1296	805	1898	1206	692	338	579	950	2196
20	Kavurkkalpatti	588	352	236	348	226	122	34	146	156	691
21	Kolathukombai	1411	879	532	1199	821	378	330	282	573	1321
22	Kottachchedu	170	90	80	169	90	79	1	145	23	141
23	Kullampatti	1488	881	607	1270	847	423	188	419	641	1361
24	Kumarasamiyur	322	181	141	319	181	138	231	16	69	203
25	Kuppanur	1030	600	430	905	563	342	235	333	274	763
26	Kuttathipatti	2310	1371	939	2105	1344	761	239	1192	657	2180
27	M.Perumalpalayam	2657	1519	1138	1775	1213	562	132	506	1119	2575
28	Mannayakanpatti	1164	678	486	413	296	117	140	53	216	1037
29	Mettupattithathanur	3282	2143	1139	3174	2101	1073	390	622	1535	3324
30	Minnampalli	3937	2612	1325	3595	2469	1126	444	934	2167	5390
31	Mookkanur	725	372	353	712	365	347	166	344	186	413
32	Muttampatti	1963	1132	831	1452	847	605	479	612	344	1768
33	Nirmullikuttai	2445	1440	1005	2250	1416	834	524	1212	507	1974
34	**Palapatti**	687	488	199	669	480	189	156	272	236	860
35	Pallikkadu	89	45	44	89	45	44	88	1	0	62
36	Pallipatti	1850	1079	771	1804	1070	734	302	704	721	1637
37	Pelakkadu	430	215	215	430	215	215	352	60	18	216
38	Periyakavundapuram	2093	1144	949	1302	788	514	441	494	352	1443
39	Pilleri	343	168	175	342	168	174	2	311	28	199

40	Pottakkadu	381	200	181	381	200	181	17	2	361	272
41	Sarkar Nattamangalam	1273	781	492	1267	779	488	562	301	385	1288
42	Sukkampatti	2264	1227	1037	2261	1224	1037	252	1412	561	1840
43	Tadanur	1036	633	403	1013	616	397	206	561	222	1133
44	Talai cholai	578	274	304	548	260	288	0	245	303	321
45	Udayapatti	3552	2367	1185	3354	2300	1054	366	658	2198	4336
46	Valaiyakkaranur	482	301	181	481	300	181	269	138	50	408
47	Valasaiyur	2592	1653	939	2564	1643	921	239	916	883	2771
48	Vedapatti	638	408	230	631	405	226	210	235	159	664
49	Velampatti	1056	632	424	994	596	398	225	532	226	939
50	Vellaiyanpatti	752	379	373	739	372	367	211	454	72	505
51	Vellalakundam	3838	2209	1629	3403	2028	1375	1033	1042	1259	3066
52	Vettaikkaranur	378	247	131	348	236	112	86	157	100	332

Source: www.censusindia.gov.in – Tamil Nadu Census of India – 2011

TABLE 3.43: COMMUNICATION & TRANSPORT FACILITIES IN THE STUDY AREA

Sl	Village Name	PO	SPO	PTO	T	PCO	MP	IC / CSC	PCF	BS	PBS	RS	NH	SH	MDR	BTR	GR	NWR	FP
1	Achanguttaipatti	2	1	2	1	1	1	2	2	1	1	2	2	2	2	1	1	2	1
2	Achanguttapattipudur	2	2	2	1	2	1	2	2	1	1	2	2	1	2	1	1	2	1
3	Anuppur	2	1	2	1	1	1	2	2	1	2	2	2	2	1	1	1	2	1
4	Aramanur	2	2	2	1	1	1	2	2	1	1	2	2	2	2	1	1	2	1
5	Chandrapillaivalasai	2	1	1	1	1	1	2	2	1	1	2	2	1	1	1	1	2	1
6	Chenrayapalayam	2	1	2	1	1	1	2	2	2	2	2	2	2	2	1	1	2	1
7	Chinnakavundapuram	2	1	2	2	2	1	2	1	1	2	2	1	1	1	1	1	2	1
8	Chinnamadur	2	2	2	1	1	1	2	2	2	2	2	2	2	2	1	1	2	1
9	Chinnamanayakanpalayam	2	1	2	1	1	1	2	2	1	1	2	2	2	1	1	1	2	1
10	Chinnanur	2	1	2	1	1	1	2	2	1	1	2	2	2	2	1	1	2	1
11	D.Perumalpalayam	2	1	2	1	1	1	2	2	1	1	2	2	1	1	1	1	2	1
12	Dasinayakkanpatti	2	2	2	1	1	1	2	2	2	2	2	2	2	2	1	1	2	1
13	Eripudur	2	2	2	1	1	1	2	2	1	1	2	2	1	2	1	1	2	1
14	J.Veeranam	2	1	2	1	1	1	2	2	1	1	2	2	2	2	1	1	2	1
15	Kakkambadi	2	2	2	1	1	1	2	2	2	2	2	2	2	2	1	1	2	1
16	Karipatti	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	2	1
17	Karumapuram	2	1	2	1	1	1	2	2	1	1	2	1	1	1	1	1	2	1
18	Kathiripatti	2	2	2	1	1	1	2	2	2	2	2	2	2	2	1	1	2	1
19	Kattuveppilaipatti	1	1	1	1	1	1	2	2	1	1	2	1	1	1	1	1	2	1
20	Kavurkkalpatti	2	2	2	1	1	1	2	2	2	2	2	2	2	1	1	1	2	1
21	Kolathukombai	2	1	2	1	2	1	2	2	1	2	2	2	2	2	1	1	2	1
22	Kottachchedu	2	1	2	1	1	1	2	2	2	2	2	2	2	2	1	1	2	1
23	Kullampatti	2	1	2	1	1	1	2	2	1	2	2	2	2	1	1	1	2	1
24	Kumarasamiyur	2	2	2	1	2	1	2	2	2	2	2	2	2	2	1	1	2	1
25	Kuppanur	2	1	2	1	1	1	2	2	2	2	2	2	2	2	1	1	2	1
26	Kuttathipatti	1	1	1	1	1	1	2	2	1	1	2	2	1	1	1	1	2	1
27	M.Perumalpalayam	2	1	2	1	2	1	2	2	1	1	2	2	2	1	1	1	2	1
28	Mannayakanpatti	2	2	2	1	1	2	2	2	1	1	2	2	2	2	1	1	2	1
29	Mettupattithathanur	2	2	2	1	1	1	2	2	1	1	2	2	1	1	1	1	2	1
30	Minnampalli	2	1	2	1	1	1	1	2	1	1	2	1	1	1	1	1	2	1
31	Mookkanur	2	2	2	1	1	1	2	2	1	1	2	2	2	2	1	1	2	1
32	Muttampatti	2	1	2	1	1	2	2	2	1	1	2	1	1	1	1	1	2	1
33	Nirmullikuttai	2	1	2	1	2	1	2	2	1	1	2	2	2	2	1	1	2	1
34	**Palapatti**	2	2	2	1	1	1	2	2	2	2	2	2	1	1	1	1	2	1
35	Pallikkadu	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	2	1
36	Pallipatti	2	1	2	1	1	1	2	2	1	1	2	2	1	1	1	1	2	1
37	Pelakkadu	2	1	2	2	2	1	2	2	1	2	2	2	2	2	1	1	2	1
38	Periyakavundapuram	2	1	2	1	2	1	2	2	1	1	2	2	2	1	1	1	2	1
39	Pilleri	2	2	2	1	1	1	2	2	2	2	2	2	2	2	1	1	2	1
40	Pottakkadu	2	2	2	1	1	1	2	2	1	2	2	2	2	2	1	1	2	1

41	Sarkar Nattamangalam	2	1	2	1	1	1	2	2	1	1	2	2	1	1	1	1	2	1
42	Sukkampatti	1	1	1	1	1	1	2	2	1	1	2	2	1	1	1	1	2	1
43	Tadanur	2	1	2	1	1	1	2	2	2	2	2	1	1	2	1	1	2	1
44	Talai cholai	2	1	2	1	1	1	2	2	2	2	2	2	2	2	1	1	2	1
45	Udayapatti	1	1	1	1	1	1	2	2	1	1	2	1	1	1	1	1	2	1
46	Valaiyakkaranur	2	2	2	1	1	1	2	2	1	1	2	2	2	2	1	1	2	1
47	Valasaiyur	2	2	2	1	1	1	2	2	1	1	2	2	1	1	1	1	2	1
48	Vedapatti	2	2	2	1	1	1	2	2	1	1	2	2	2	2	1	1	2	1
49	Velampatti	2	1	2	1	1	1	2	2	1	2	2	2	2	1	1	1	2	1
50	Vellaiyanpatti	2	2	2	1	2	1	2	2	1	2	2	2	2	2	1	1	2	1
51	Vellalakundam	2	1	2	1	1	1	2	2	1	1	2	2	2	2	1	1	2	1
52	Vettaikkaranur	2	2	2	2	2	1	2	2	1	1	2	2	1	1	1	1	2	1

Abbreviations: PO - Post Office; MP - Mobile Phone Coverage; RS - Railway Station; GR - Gravel Roads; SPO - Sub Post Office; IC / CSC - Internet Cafe/Common Service Centre; NH - National Highways; NWR - Navigate waterways River; PTO - Post & Telegraph office; PCF - Private Courier Facility; SH - State Highways; FP - Foot path; T- Telephone (Landline); BS - Public Bus Service; MDR - Major District Road; PCO - Public call office / Mobile; PBS - Private Bus Service; BTR - Black Topped (Pucca Roads). Note: 1 - Available within the village 2 - Not available

TABLE 3.44: WATER & DRAINAGE FACILITIES IN THE STUDY AREA

Sl	Village Name	TP	CW	UCW	HP	TW/BH	S	R/C	T/P/L	CD	OD	CT
1	Achanguttaipatti	1	1	1	1	1	2	2	2	1	1	1
2	Achanguttapattipudur	2	2	1	2	1	2	2	2	2	1	2
3	Anuppur	1	2	1	1	1	2	2	2	1	1	2
4	Aramanur	1	1	1	1	1	2	2	2	1	1	2
5	Chandrapillaivalasai	1	1	1	1	1	2	2	2	1	1	2
6	Chenrayapalayam	1	1	1	1	1	1	2	2	1	1	2
7	Chinnakavundapuram	1	1	1	2	1	1	2	2	1	1	2
8	Chinnamadur	2	2	1	2	2	2	2	2	2	2	2
9	Chinnamanayakanpalayam	1	1	1	1	1	2	1	1	1	1	2
10	Chinnanur	1	2	1	1	2	2	2	2	1	1	1
11	D.Perumalpalayam	1	1	1	1	1	1	2	2	1	1	2
12	Dasinayakkanpatti	1	2	1	1	1	2	2	2	1	1	2
13	Eripudur	1	1	1	2	1	2	2	2	1	1	2
14	J.Veeranam	1	1	1	1	1	2	2	2	1	1	2
15	Kakkambadi	2	1	1	2	2	2	1	2	1	1	2
16	Karipatti	1	1	1	1	1	2	2	2	1	1	2
17	Karumapuram	1	1	1	2	1	2	2	2	1	1	2
18	Kathiripatti	1	1	1	2	1	1	2	2	1	1	2
19	Kattuveppilaipatti	1	1	1	1	1	2	2	2	1	1	1
20	Kavurkkalpatti	1	1	1	1	1	1	2	2	1	1	1
21	Kolathukombai	1	1	1	1	1	2	2	2	1	1	1
22	Kottachchedu	2	2	1	2	2	2	2	2	1	1	2
23	Kullampatti	1	2	1	2	1	2	2	2	1	1	1
24	Kumarasamiyur	1	2	1	1	1	2	2	2	2	2	2
25	Kuppanur	1	1	1	1	1	2	2	2	1	1	2
26	Kuttathipatti	1	1	1	1	1	2	1	1	1	1	1
27	M.Perumalpalayam	1	1	1	1	1	2	2	2	1	1	1
28	Mannayakanpatti	1	2	1	2	1	1	2	2	1	1	2
29	Mettupattithathanur	1	1	1	1	1	1	2	2	1	1	1
30	Minnampalli	1	1	1	1	1	2	2	2	1	1	2
31	Mookkanur	2	1	1	2	1	2	2	2	1	1	2
32	Muttampatti	1	2	1	1	1	2	2	2	1	1	2
33	Nirmullikuttai	1	1	1	1	1	2	2	2	1	1	2
34	**Palapatti**	1	1	1	1	1	2	2	2	1	1	1
35	Pallikkadu	2	2	2	2	2	2	2	2	2	2	2
36	Pallipatti	1	1	1	2	1	2	2	2	1	1	2
37	Pelakkadu	1	2	1	2	2	1	1	2	1	2	2
38	Periyakavundapuram	1	1	1	1	1	2	2	2	1	1	1
39	Pilleri	1	1	1	2	2	2	2	2	1	1	2
40	Pottakkadu	1	1	1	2	1	2	2	2	1	1	1
41	Sarkar Nattamangalam	1	1	1	2	1	1	2	2	1	1	2

42	Sukkampatti	1	1	1	1	1	1	1	1	1	1	1
43	Tadanur	1	2	1	2	2	2	2	2	1	1	2
44	Talai cholai	2	2	1	2	2	2	1	2	1	2	1
45	Udayapatti	1	1	1	1	1	1	2	2	1	1	2
46	Valaiyakkaranur	1	1	1	1	1	2	2	2	1	1	2
47	Valasaiyur	1	1	1	1	1	2	2	2	1	1	2
48	Vedapatti	2	1	1	1	1	1	2	2	1	1	2
49	Velampatti	2	2	1	1	1	2	1	2	1	1	1
50	Vellaiyanpatti	1	1	1	1	2	2	2	2	1	2	2
51	Vellalakundam	1	1	1	1	1	2	2	1	1	1	2
52	Vettaikkaranur	1	1	1	2	1	2	2	2	2	1	2

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

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

TABLE 3.45: OTHER FACILITIES IN THE STUDY AREA

Sl	Village Name	ATM	CB	COB	ACS	SHG	PDS	RM	AMS	NC	NC-AC	CC	SF	PL	NPS	APS	BDRO
1	Achanguttaipatti	2	2	2	2	1	1	2	2	1	1	2	2	2	1	1	1
2	Achanguttapattipudur	2	2	2	2	1	2	2	2	2	2	2	2	2	1	2	2
3	Anuppur	2	2	2	2	1	1	2	2	1	1	1	1	1	1	1	1
4	Aramanur	2	2	2	2	1	1	2	2	1	1	2	2	2	1	1	1
5	Chandrapillaivalasai	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1
6	Chenrayapalayam	2	2	2	1	1	1	2	2	1	1	1	1	2	1	1	2
7	Chinnakavundapuram	2	2	2	2	1	1	2	2	1	1	1	1	2	1	1	1
8	Chinnamadur	2	2	2	2	1	1	2	2	1	1	2	2	2	2	2	2
9	Chinnamanayakanpalayam	2	2	2	1	1	1	2	2	1	1	2	2	1	1	1	1
10	Chinnanur	2	2	2	2	1	1	2	2	1	1	1	1	1	1	1	1
11	D.Perumalpalayam	2	2	2	1	1	1	2	2	1	1	2	1	1	1	1	1
12	Dasinayakkanpatti	2	2	2	2	1	1	2	2	1	1	2	2	2	1	1	2
13	Eripudur	2	2	2	2	1	1	2	2	1	1	1	1	1	1	1	1
14	J.Veeranam	2	2	2	2	1	1	2	2	1	1	1	2	2	1	1	1
15	Kakkambadi	2	2	2	2	1	2	2	2	1	1	2	2	2	2	1	2
16	Karipatti	2	2	2	1	1	1	2	2	1	1	1	1	1	1	1	1
17	Karumapuram	2	2	2	2	1	1	2	2	1	1	1	1	1	1	1	1
18	Kathiripatti	2	2	2	2	2	1	2	2	1	1	2	2	2	1	2	1
19	Kattuveppilaipatti	2	2	2	1	1	1	2	2	1	1	1	1	1	1	1	1
20	Kavurkkalpatti	2	2	2	1	1	1	2	2	1	1	1	1	2	2	2	2
21	Kolathukombai	2	2	2	2	1	1	2	2	1	1	1	1	1	1	1	1
22	Kottachchedu	2	2	2	2	1	1	2	2	1	1	1	2	2	2	1	2
23	Kullampatti	2	1	2	1	1	1	2	2	1	1	1	1	1	1	1	1
24	Kumarasamiyur	2	2	2	2	1	1	2	2	1	1	2	2	2	1	2	2
25	Kuppanur	2	2	1	1	1	1	2	2	1	1	2	2	1	1	1	1
26	Kuttathipatti	2	1	2	2	1	1	2	2	1	1	1	1	1	1	1	1
27	M.Perumalpalayam	2	2	2	2	1	1	2	2	1	1	1	2	2	1	1	1
28	Mannayakanpatti	2	2	2	2	1	1	2	2	1	1	2	1	1	1	2	1
29	Mettupattithathanur	2	2	2	2	1	1	2	2	1	1	1	1	1	1	1	1
30	Minnampalli	2	2	2	1	1	1	2	2	1	1	1	1	1	1	1	1
31	Mookkanur	2	2	2	2	1	2	2	2	1	1	2	2	2	1	2	2
32	Muttampatti	2	2	2	2	1	1	2	2	1	1	2	2	2	2	1	1
33	Nirmullikuttai	2	2	2	1	1	1	2	2	1	1	1	1	1	1	1	1
34	**Palapatti**	2	2	2	2	1	1	2	2	1	1	2	2	2	1	2	2
35	Pallikkadu	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2
36	Pallipatti	2	2	2	2	1	1	2	2	1	1	1	1	1	1	1	1
37	Pelakkadu	2	2	2	2	1	1	1	2	1	1	2	2	2	2	1	1
38	Periyakavundapuram	2	2	2	1	1	1	2	2	1	1	1	1	2	1	1	1

39	Pilleri	2	2	2	2	1	2	2	2	1	1	2	2	2	2	2	2
40	Pottakkadu	2	2	2	2	1	1	2	2	1	1	2	2	2	2	1	2
41	Sarkar Nattamangalam	2	1	2	1	1	1	2	2	1	1	1	1	1	1	1	1
42	Sukkampatti	2	2	1	1	1	1	2	2	1	1	1	1	1	1	1	1
43	Tadanur	2	2	2	2	1	1	2	2	1	1	2	2	2	1	1	1
44	Talai cholai	2	2	2	2	1	1	2	2	1	1	2	2	1	1	1	2
45	Udayapatti	2	1	2	1	1	1	2	2	1	1	1	1	1	1	1	1
46	Valaiyakkaranur	2	2	2	2	1	1	2	2	1	1	2	2	2	1	2	2
47	Valasaiyur	2	1	1	1	1	1	2	2	1	1	1	1	1	1	1	1
48	Vedapatti	2	2	2	2	1	1	2	2	1	1	1	2	1	1	1	2
49	Velampatti	2	2	2	2	1	1	2	2	1	1	1	1	2	1	1	1
50	Vellaiyanpatti	2	2	2	2	1	1	2	2	1	1	2	2	2	1	1	1
51	Vellalakundam	2	1	2	1	1	1	1	1	1	1	1	2	1	1	1	1
52	Vettaikkaranur	2	2	2	2	1	1	2	2	1	1	2	2	2	1	2	2

Abbreviations: ATM - Automatic Teller Machine; PDS - Public Distribution System (Shop); CB - Commerical Bank; RM - Regular Market; COB - Co-operative Bank; AMS - Agricultural Market Society; ACS - Agricultural Credit Societies; NC - Nutritional Centres; SHG - Self Help Group; NC-AC - Nutritional Centres - Anganwadi Centre; DBRO - Birth & Death Registration Office; PS - Power Supply Note – 1 - Available within the village; 2 - Not available

TABLE 3.46: EDUCATIONAL FACILITIES IN THE STUDY AREA

		PPS		PS		MS		SS		SSS		DC		EC		MC		MI		PT		VTS		SSD	
Sl	Village Name	G	P	G	P	G	P	G	P	G	P	G	P	G	P	G	P	G	P	G	P	G	P	G	P
1	Achanguttaipatti	1	2	1	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
2	Achanguttapattipudur	2	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
3	Anuppur	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
4	Aramanur	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
5	Chandrapillaivalasai	1	1	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
6	Chenrayapalayam	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
7	Chinnakavundapuram	1	2	1	2	1	2	2	2	2	2	2	1	2	2	2	2	2	1	2	2	2	2	2	2
8	Chinnamadur	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
9	Chinnamanayakanpalayam	1	2	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
10	Chinnanur	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
11	D.Perumalpalayam	2	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
12	Dasinayakkanpatti	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
13	Eripudur	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
14	J.Veeranam	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
15	Kakkambadi	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
16	Karipatti	1	1	1	1	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2	2	2
17	Karumapuram	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2	2	2	2
18	Kathiripatti	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
19	Kattuveppilaipatti	1	1	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
20	Kavurkkalpatti	1	2	1	2	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
21	Kolathukombai	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
22	Kottachchedu	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
23	Kullampatti	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
24	Kumarasamiyur	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
25	Kuppanur	1	2	1	2	1	2	2	2	2	2	2	2	2	1	2	2	2	2	2	2	2	2	2	2
26	Kuttathipatti	1	2	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
27	M.Perumalpalayam	1	2	1	2	1	2	2	2	2	2	2	2	2	1	2	2	2	2	2	2	2	2	2	2
28	Mannayakanpatti	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
29	Mettupattithathanur	1	2	1	2	2	2	2	2	2	2	2	1	2	1	2	2	1	2	2	2	2	2	2	2
30	Minnampalli	1	1	1	1	1	2	1	2	1	2	2	2	2	1	2	2	2	2	2	1	2	2	1	1
31	Mookkanur	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
32	Muttampatti	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
33	Nirmullikuttai	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
34	**Palapatti**	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
35	Pallikkadu	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
36	Pallipatti	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2

37	Pelakkadu	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
38	Periyakavundapuram	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
39	Pilleri	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
40	Pottakkadu	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
41	Sarkar Nattamangalam	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
42	Sukkampatti	1	2	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
43	Tadanur	1	1	1	1	1	1	1	1	1	1	2	1	2	2	2	2	2	2	2	2	2	2	2
44	Talai cholai	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
45	Udayapatti	1	2	1	1	1	1	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2
46	Valaiyakkaranur	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
47	Valasaiyur	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2
48	Vedapatti	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
49	Velampatti	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
50	Vellaiyanpatti	2	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
51	Vellalakundam	1	1	1	2	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2
52	Vettaikkaranur	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2

Abbreviations: PPS-Pre Primary School; SSS-Senior Secondary School; DC-Degree School; PT-Polytechnic; PS-Primary School; G-Government ; EC-Engineering College; VTS-Vocational School /ITI; MS-Middle School; P-Private; MC-Medical College; SSD-Special School For Disabled; SS-Secondary School; MI-Management College/Institute;

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

TABLE 3.47: MEDICAL FACILITIES IN THE STUDY AREA

Sl. No.	Village Name	CHC	PHC	PHSC	MCW	TBC	HA	HAM	D	VH	MHC	FWC	NGM-I/O
1	Achanguttaipatti	0	1	1	1	1	0	0	1	1	0	1	
2	Achanguttapattipudur	0	0	0	0	0	0	0	0	0	0	0	a
3	Anuppur	0	0	1	0	0	0	0	0	0	0	0	c
4	Aramanur	0	0	1	0	0	0	0	0	0	0	0	a
5	Chandrapillaivalasai	0	0	1	0	0	0	0	0	0	0	0	a
6	Chenrayapalayam	0	0	0	0	0	0	0	0	0	0	0	b
7	Chinnakavundapuram	0	0	1	1	0	0	0	0	0	0	0	a
8	Chinnamadur	0	0	0	0	0	0	0	0	0	0	0	b
9	Chinnamanayakanpalayam	0	0	1	1	0	0	0	0	0	0	0	a
10	Chinnanur	0	0	1	0	0	0	0	0	0	0	0	a
11	D.Perumalpalayam	0	0	1	0	0	0	0	0	0	0	0	a
12	Dasinayakkanpatti	0	0	0	0	0	0	0	0	0	0	0	a
13	Eripudur	0	0	0	0	0	0	0	0	0	0	0	a
14	J.Veeranam	0	2	1	2	2	0	0	2	1	0	2	
15	Kakkambadi	0	0	0	0	0	0	0	0	0	0	0	b
16	Karipatti	1	1	1	1	1	0	0	1	1	0	1	
17	Karumapuram	0	0	1	0	0	0	0	0	0	0	0	a
18	Kathiripatti	0	0	0	0	0	0	0	0	0	0	0	a
19	Kattuveppilaipatti	0	0	1	1	0	0	0	0	1	0	0	b
20	Kavurkkalpatti	0	0	0	0	0	0	0	0	0	0	0	b
21	Kolathukombai	0	0	2	0	0	0	0	0	0	0	0	b
22	Kottachchedu	0	0	0	0	0	0	0	0	0	0	0	b
23	Kullampatti	0	0	2	0	0	0	0	0	1	0	0	b
24	Kumarasamiyur	0	0	0	0	0	0	0	0	0	0	0	a
25	Kuppanur	0	0	0	0	0	0	0	0	1	0	0	a
26	Kuttathipatti	0	0	1	0	0	0	0	0	1	0	0	c
27	M.Perumalpalayam	0	0	1	0	0	0	0	0	0	0	0	a
28	Mannayakanpatti	0	0	0	0	0	0	0	0	0	0	0	a
29	Mettupattithathanur	0	0	1	0	0	0	0	0	1	0	0	a
30	Minnampalli	0	0	1	0	0	0	0	0	0	0	0	a
31	Mookkanur	0	0	1	0	0	0	0	0	0	0	0	a
32	Muttampatti	0	0	1	1	0	0	0	0	1	0	0	a
33	Nirmullikuttai	0	0	1	0	0	0	0	0	1	0	0	b
34	**Palapatti**	0	0	0	0	0	0	0	0	0	0	0	c
35	Pallikkadu	0	0	0	0	0	0	0	0	0	0	0	a
36	Pallipatti	0	0	1	0	0	0	0	0	0	0	0	a
37	Pelakkadu	0	0	0	0	0	0	0	0	0	0	0	b
38	Periyakavundapuram	0	0	1	1	0	0	0	0	0	0	0	a

39	Pilleri	0	0	0	0	0	0	0	0	0	0	0	b
40	Pottakkadu	0	0	0	0	0	0	0	0	0	0	0	b
41	Sarkar Nattamangalam	0	0	1	0	0	0	0	0	0	0	0	a
42	Sukkampatti	0	0	1	1	0	0	0	0	0	0	0	a
43	Tadanur	0	0	0	0	0	0	0	0	0	0	0	a
44	Talai cholai	0	0	0	0	0	0	0	0	0	0	0	b
45	Udayapatti	0	0	3	0	0	0	0	0	0	0	0	a
46	Valaiyakkaranur	0	0	0	0	0	0	0	0	0	0	0	b
47	Valasaiyur	0	1	1	1	1	0	0	1	0	0	1	
48	Vedapatti	0	0	1	0	0	0	0	0	0	0	0	b
49	Velampatti	0	0	0	0	0	0	0	0	0	0	0	c
50	Vellaiyanpatti	0	0	0	0	0	0	0	0	0	0	0	a
51	Vellalakundam	0	0	1	0	0	0	0	0	1	0	0	c
52	Vettaikkaranur	0	0	0	0	0	0	0	0	0	0	0	a

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

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

Source: www.censusindia.gov.in – Tamil Nadu Census of India – 2011

3.6.6 Recommendation and Suggestion

- Awareness program to be conducted to make the population aware to get education and a better livelihood.
- 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 community may be preferred. Long term and short-term employments can be generated.
- Health care centre and ambulance facility can be provided to the population to get easy access to medical facilities. Maternity facility should be made available at the place to avoid going to distant 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 Summary & 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.

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 Impacts

- Permanent or temporary change on land use and land cover.
- Change in Topography: Topography of the ML area will change at the end of the life of the mine.
- Movement of heavy vehicles sometimes cause problems to agricultural land, human habitations due to dust, noise and it also causes traffic hazards.
- Due to degradation of land by pitting the aesthetic environment of the core zone may be affected.
- Earthworks during the rainy season increase the potential for soil erosion and sediment laden water entering the water ways.
- If no due care is taken wash off from the exposed working area may choke the water course & can also causes the siltation of water course

4.1.2 Mitigation Measures

- The mining activity will be gradual confined in blocks and excavation will be undertaken progressively along with other mitigative measures like phase wise development of greenbelt etc.
- Construction of garland drains all around the quarry pits and construction of check dam at strategic location in lower elevations to prevent erosion due to surface runoff during rainfall and also to collect the storm water for various uses within the proposed area
- Green belt development along the boundary within safety zone. The small quantity of water stored in the mined-out pit will be used for greenbelt

- Thick plantation will be carried out on unutilized area, top benches of mined out pits, on safety barrier, etc.,
- At conceptual stage, the land use pattern of the quarry will be changed into Greenbelt area and temporary reservoir
- In terms of aesthetics, natural vegetation surrounding the quarry will be retained (such as in a buffer area i.e., 7.5 m safety barrier and other safety provided) so as to help minimise dust emissions.
- Proper fencing will be carried out at the conceptual stage, Security will be posted round the clock, to prevent inherent entry of the public and cattle.

4.1.3 Soil Environment

The proposed project area is covered by thin layer of Topsoil formation of about 1m, the excavated Topsoil will be stored within the project area and later on will be used for green belt development.

4.1.4 Impacts on Soil Environment

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

4.1.5 Mitigation Measures

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

4.1.6 Waste Dump Management

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

4.2 WATER ENVIRONMENT

4.2.1 Anticipated Impacts

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

Detail of water requirements in KLD as given below:

TABLE 4.1: WATER REQUIREMENT "P1"

*Purpose	Quantity	Source
Dust Suppression	1.5 KLD	Rainwater accumulated in Mine Pit/ Water Tanker
Green Belt development	0.7 KLD	Rainwater accumulated in Mine Pit/ Water Tanker
Domestic purpose	0.6 KLD	Water Tankers
Total	**2.8 KLD**	

TABLE 4.2: WATER REQUIREMENT "P2"

*Purpose	Quantity	Source
Dust Suppression	0.80 KLD	Rainwater accumulated in Mine Pit/ Water Tanker
Green Belt development	0.50 KLD	Rainwater accumulated in Mine Pit/ Water Tanker
Domestic purpose	0.50 KLD	Water Tankers
Total	**1.8 KLD**	

TABLE 4.3: WATER REQUIREMENT "P3"

*Purpose	Quantity	Source
Dust Suppression	1.0 KLD	Rainwater accumulated in Mine Pit/ Water Tanker
Green Belt development	0.5 KLD	Rainwater accumulated in Mine Pit/ Water Tanker
Domestic purpose	0.5 KLD	Water Tankers
Total	**3.0 KLD**	

TABLE 4.4: WATER REQUIREMENT "P4"

*Purpose	Quantity	Source
Dust Suppression	1.00 KLD	Rainwater accumulated in Mine Pit/ Water Tanker
Green Belt development	0.50 KLD	Rainwater accumulated in Mine Pit/ Water Tanker
Domestic purpose	0.50 KLD	Water Tankers
Total	**2.0 KLD**	

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

Source: Approved Mining Plan Pre-Feasibility Report

4.2.2 Mitigation Measures

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

4.3 AIR ENVIRONMENT

4.3.1. Anticipated Impacts

- 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

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

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

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

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

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

By using the above-mentioned inputs, ground level concentrations due to the quarrying activities have been estimated to know the incremental concentration in ambient air quality and impact in the study area. The effect of air pollutants upon receptors are influenced by concentration of pollutants and their dispersion in the atmosphere. Air quality modelling is an important tool for prediction, planning and evaluation of air pollution control activities besides identifying the requirements for emission control to meet the regulatory standards and to apply mitigation measures

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

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

TABLE 4.2: ESTIMATED EMISSION RATE FOR PM_{10}

Activity	Source type	Value	Unit
Drilling	Point Source	0.060382634	g/s
Blasting	Point Source	0.000194167	g/s
Mineral Loading	Point Source	0.038328045	g/s
Haul Road	Line Source	0.002485738	g/s/m
Overall Mine	Area Source	0.038555283	g/s

TABLE 4.3: ESTIMATED EMISSION RATE FOR SO_2

Activity	Source type	Value	Unit
Overall Mine	Area Source	0.000223403	g/s

TABLE 4.4: ESTIMATED EMISSION RATE FOR NO_X

Activity	Source type	Value	Unit
Overall Mine	Area Source	0.000005362	g/s

FIGURE 4.1: AERMOD TERRAIN MAP

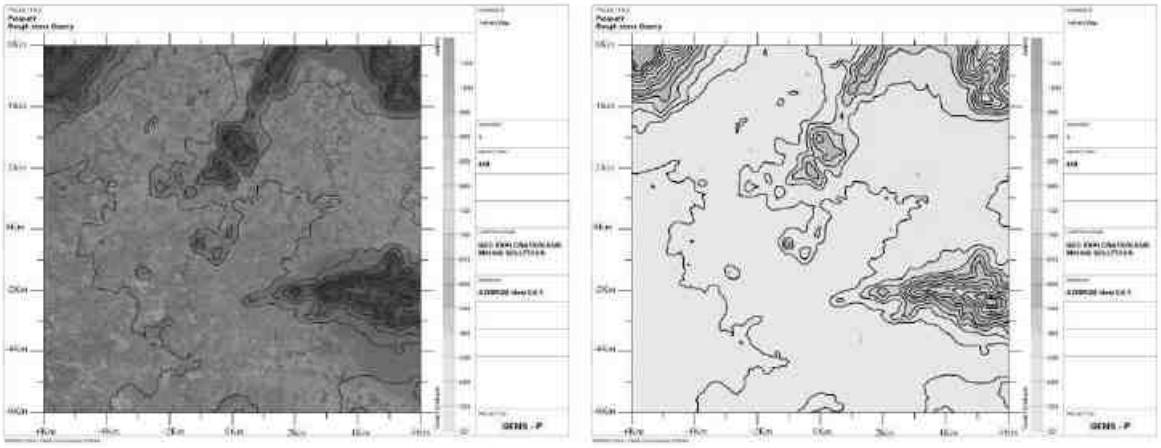


FIGURE 4.2: PREDICTED INCREMENTAL CONCENTRATION OF $PM_{2.5}$

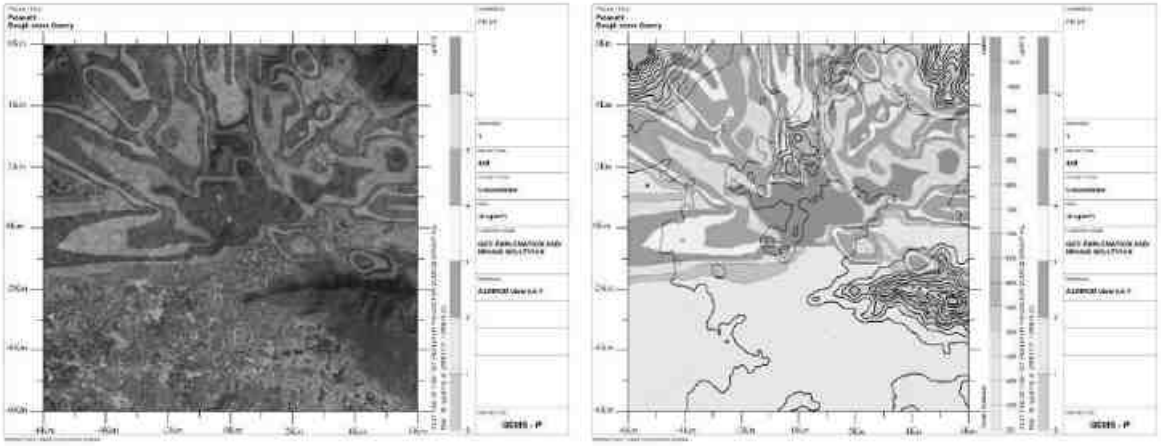


FIGURE 4.3: PREDICTED INCREMENTAL CONCENTRATION OF PM_{10}

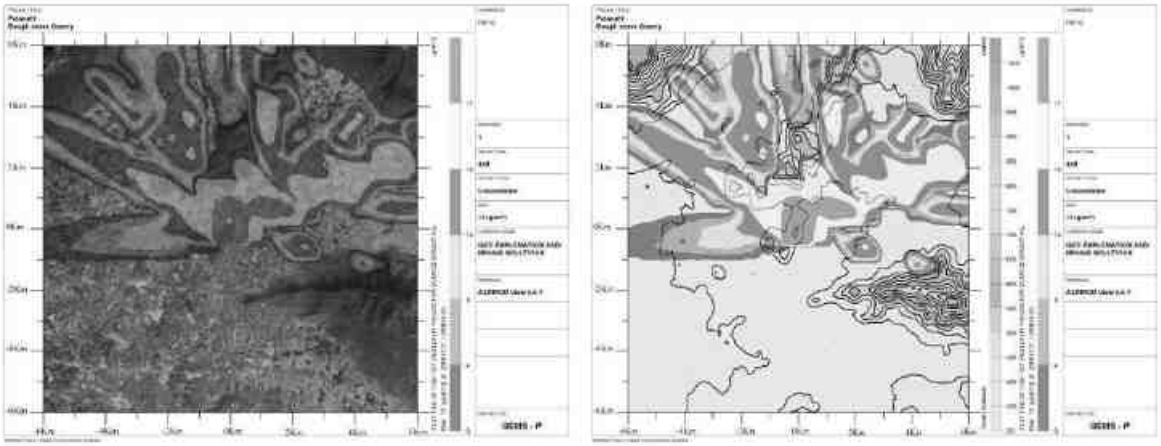


FIGURE 4.4: PREDICTED INCREMENTAL CONCENTRATION OF SO_2

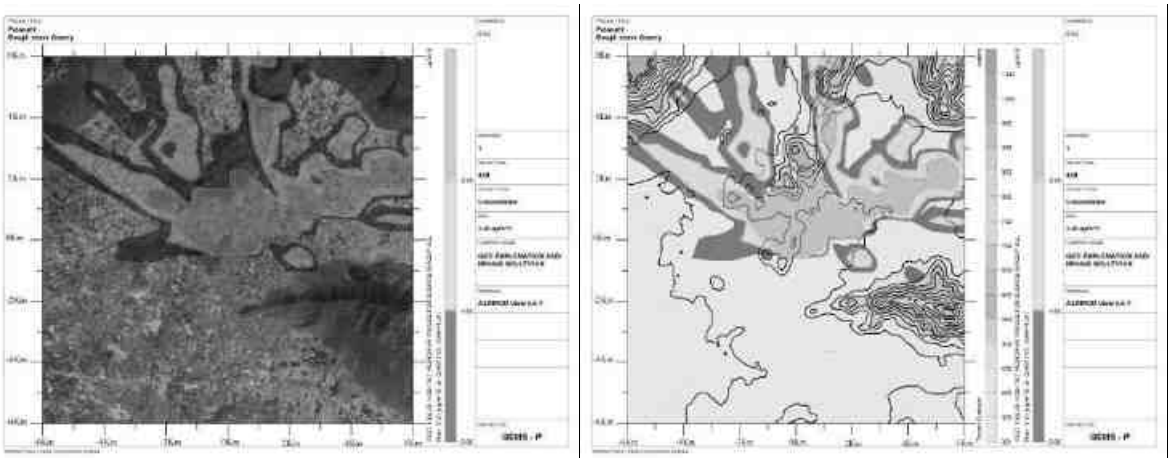


FIGURE 4.5: PREDICTED INCREMENTAL CONCENTRATION OF NO_X

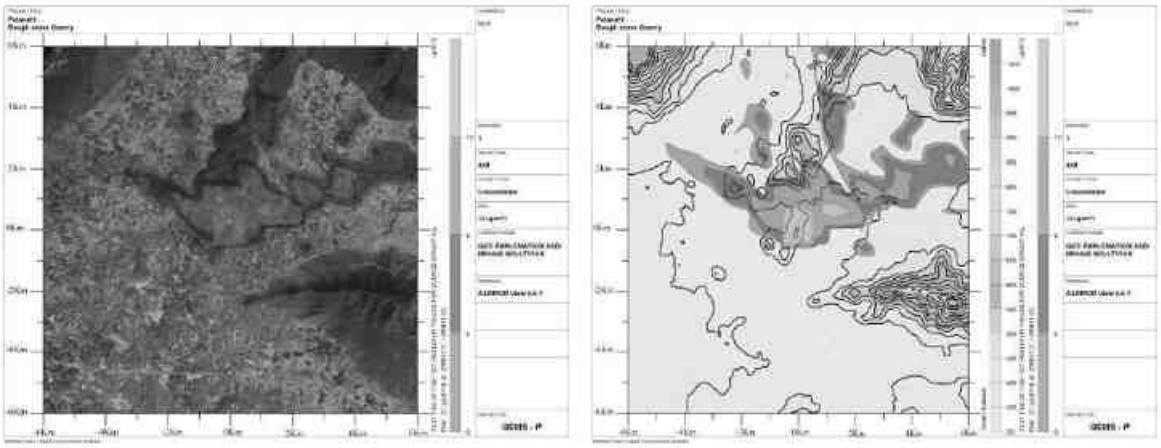
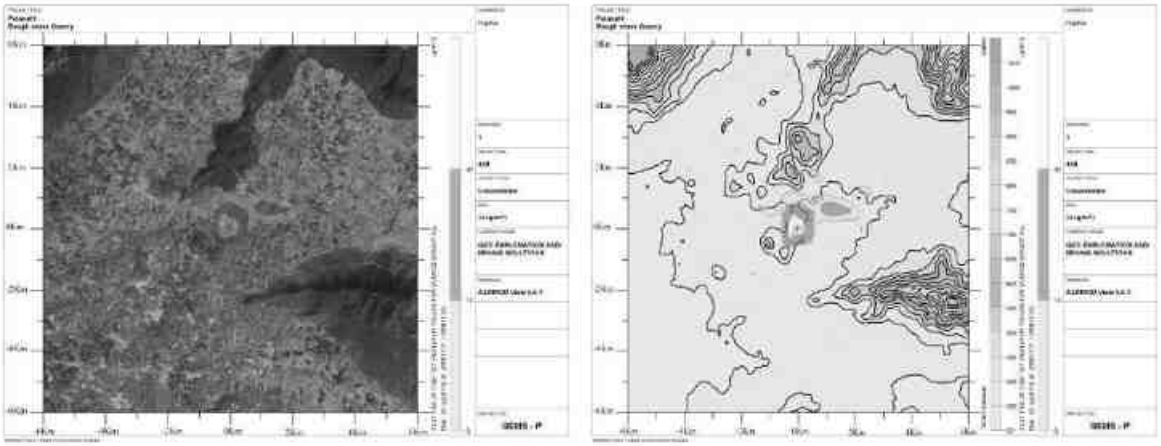


FIGURE 4.6: PREDICTED INCREMENTAL CONCENTRATION OF FUGITIVE DUST



4.3.2.1 Model Results

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

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

Station Code	Location	X Coordinate (m)	Y Coordinate (m)	Average Baseline PM_{10} ($\mu g/m^3$)	Incremental value of PM_{10} due to mining ($\mu g/m^3$)	Total PM_{10} ($\mu g/m^3$)
AAQ1	11°42'26.96"N 78°18'4.97"E	-31	27	42.8	17.98	60.8
AAQ2	11°42'49.80"N 78°17'55.05"E	-335	734	43.0	17.30	60.3
AAQ3	11°41'37.08"N 78°17'14.99"E	-1565	-1523	43.2	0	43.2
AAQ4	11°43'49.49"N 78°16'52.57"E	-2247	2590	43.3	12.98	56.3
AAQ5	11°43'25.28"N 78°19'47.17"E	3093	1837	24.1	15.61	39.7
AAQ6	11°40'28.42"N 78°18'50.96"E	1374	-3653	19.0	0	19.0
AAQ7	11°45'10.28"N 78°17'50.76"E	-469	5097	41.5	6.37	47.9
AAQ8	11°42'39.64"N 78°15'51.24"E	-4123	424	40.5	2.06	42.6

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

Station Code	Location	X Coordinate (m)	Y Coordinate (m)	Average Baseline $PM_{2.5}$ ($\mu g/m^3$)	Incremental value of $PM_{2.5}$ due to mining ($\mu g/m^3$)	Total $PM_{2.5}$ ($\mu g/m^3$)

AAQ1	11°42'26.96"N 78°18'4.97"E	-31	27	23.4	10.82	34.2
AAQ2	11°42'49.80"N 78°17'55.05"E	-335	734	23.5	10.33	33.9
AAQ3	11°41'37.08"N 78°17'14.99"E	-1565	-1523	24.1	0.49	24.5
AAQ4	11°43'49.49"N 78°16'52.57"E	-2247	2590	24.2	7.05	31.2
AAQ5	11°43'25.28"N 78°19'47.17"E	3093	1837	24.1	9.00	33.1
AAQ6	11°40'28.42"N 78°18'50.96"E	1374	-3653	24.1	0	24.1
AAQ7	11°45'10.28"N 78°17'50.76"E	-469	5097	20.8	5.32	26.1
AAQ8	11°42'39.64"N 78°15'51.24"E	-4123	424	20.2	3.10	23.3

TABLE 4.7: INCREMENTAL & RESULTANT GLC OF SO_2

Station Code	Location	X Coordinate (m)	Y Coordinate (m)	Average Baseline SO_2 ($\mu g/m^3$)	Incremental value due to mining ($\mu g/m^3$)	Total SO_2($\mu g/m^3$)
AAQ1	11°42'26.96"N 78°18'4.97"E	-31	27	8.0	3.29	11.3
AAQ2	11°42'49.80"N 78°17'55.05"E	-335	734	7.4	3.20	10.6
AAQ3	11°41'37.08"N 78°17'14.99"E	-1565	-1523	6.5	0	6.5
AAQ4	11°43'49.49"N 78°16'52.57"E	-2247	2590	8.1	0.72	8.8
AAQ5	11°43'25.28"N 78°19'47.17"E	3093	1837	6.5	2.23	8.7
AAQ6	11°40'28.42"N 78°18'50.96"E	1374	-3653	6.2	0	6.2
AAQ7	11°45'10.28"N 78°17'50.76"E	-469	5097	7.6	0	7.6
AAQ8	11°42'39.64"N 78°15'51.24"E	-4123	424	6.6	0	6.6

TABLE 4.8: INCREMENTAL & RESULTANT GLC OF NO_X

Station Code	Location	X Coordinate (m)	Y Coordinate (m)	Average Baseline NOx ($\mu g/m^3$)	Incremental value due to mining ($\mu g/m^3$)	Total NOx ($\mu g/m^3$)
AAQ1	11°42'26.96"N 78°18'4.97"E	-31	27	26.4	12.56	39.0
AAQ2	11°42'49.80"N 78°17'55.05"E	-335	734	25.1	10.79	35.9
AAQ3	11°41'37.08"N 78°17'14.99"E	-1565	-1523	25.3	0	25.3
AAQ4	11°43'49.49"N 78°16'52.57"E	-2247	2590	23.5	0	23.5
AAQ5	11°43'25.28"N 78°19'47.17"E	3093	1837	22.1	3.01	25.1
AAQ6	11°40'28.42"N 78°18'50.96"E	1374	-3653	21.2	0	21.2
AAQ7	11°45'10.28"N 78°17'50.76"E	-469	5097	21.4	0	21.4
AAQ8	11°42'39.64"N 78°15'51.24"E	-4123	424	23.0	0	23.0

TABLE 4.9: INCREMENTAL & RESULTANT GLC OF FUGITIVE DUST

Station Code	Location	X Coordinate (m)	Y Coordinate (m)	Average Baseline Fugitive ($\mu g/m^3$)	Incremental value due to mining ($\mu g/m^3$)	Total Fugitive Dust ($\mu g/m^3$)
AAQ1	11°42'26.96"N 78°18'4.97"E	-31	27	63.58	32.51	96.09
AAQ2	11°42'49.80"N 78°17'55.05"E	-335	734	63.15	9.64	72.79
AAQ3	11°41'37.08"N 78°17'14.99"E	-1565	-1523	63.26	0	63.26
AAQ4	11°43'49.49"N 78°16'52.57"E	-2247	2590	63.48	0	63.48
AAQ5	11°43'25.28"N 78°19'47.17"E	3093	1837	63.26	0	63.26
AAQ6	11°40'28.42"N 78°18'50.96"E	1374	-3653	64.31	0	64.31
AAQ7	11°45'10.28"N 78°17'50.76"E	-469	5097	61.63	0	61.63
AAQ8	11°42'39.64"N 78°15'51.24"E	-4123	424	68.30	0	68.30

From the resultant of cumulative concentration i.e., Background + Incremental Concentration of pollutant in all the receptor locations without effective mitigation measures are still within the prescribed NAAQ limits of 100, 80 & 80 $\mu g/m^3$ for PM_{10}, SO_2 & NO_X respectively. By adopting suitable mitigation measures, the pollutant levels in the atmosphere can be further being controlled.

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

Green Belt –

- Planting of trees all along main mine haul roads and regular grading of haul roads will be practiced to prevent the generation of dust due to movement of dumpers/trucks
- Green belt of adequate width will be developed around the project areas

Occupational Health –

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

4.4 NOISE ENVIRONMENT

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

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

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

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

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

Where:

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

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

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

4.4.1 Anticipated Impacts

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

- Source data
- Receptor data
- Attenuation factor

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

TABLE 4.10: ACTIVITY AND NOISE LEVEL PRODUCED BY MACHINERY

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

*50 feet from source = 15.24 meters

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

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

TABLE 4.11: PREDICTED NOISE INCREMENTAL VALUES

Location ID	N1	N2	N3	N4	N5	N6	N7	N8
Maximum Monitored Value (Day) dB(A)	48.1	46.6	46.6	45.5	47.2	42.5	44.8	44.9
Incremental Value dB(A)	56.6	52.1	36.6	29.2	26.1	29.2	29.22	29.22
Total Predicted Noise level dB(A)	57.2	53.2	47.0	45.6	47.2	42.7	44.9	45.0

The incremental noise level is found to be 63.2 dB (A) in Core Zone and 26.1 to 56.6 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;
- 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 though training and awareness.
- Regular medical check–up and proper training to personnel to create awareness about adverse noise level effects

4.4.3 Ground Vibrations

Ground vibrations due to the proposed mining activities are anticipated due to operation of Mining Machines like Excavators, 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 area is listed in below table. The ground vibrations due to the blasting in the quarry are calculated using the empirical equation.

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

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

Where –
V = peak particle velocity (mm/s)
K = site and rock factor constant
Q = maximum instantaneous charge (kg)

B = constant related to the rock and site (usually 1.6)
R = distance from charge (m)

TABLE 4.12: PREDICTED PPV VALUES DUE TO BLASTING 4 PROPOSAL MINES

Location ID	Maximum Charge in kgs	Nearest Habitation in m	PPV in m/ms
P1	24	660	0.196
P2	87	500	0.856
P3	89	360	1.474
P4	87	320	1.747

FIGURE 4.7: GROUND VIBRATION PREDICTION "P1"

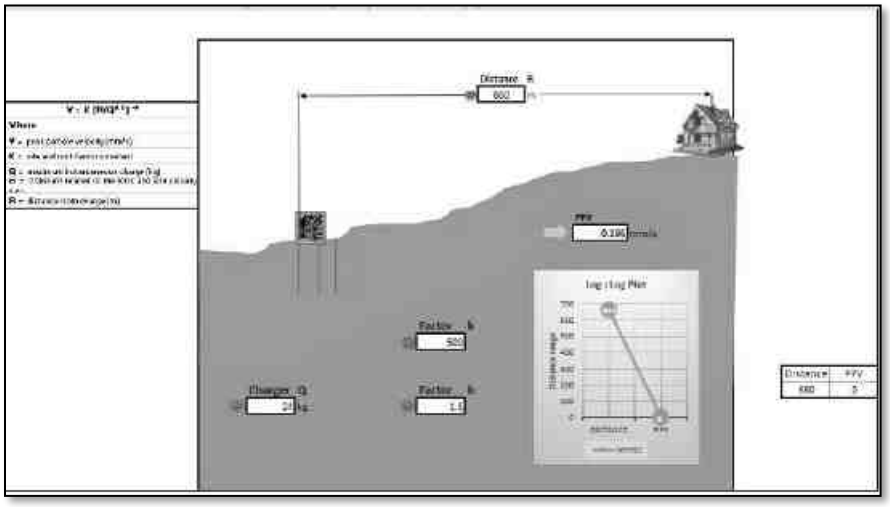


FIGURE 4.8: GROUND VIBRATION PREDICTION "P2"

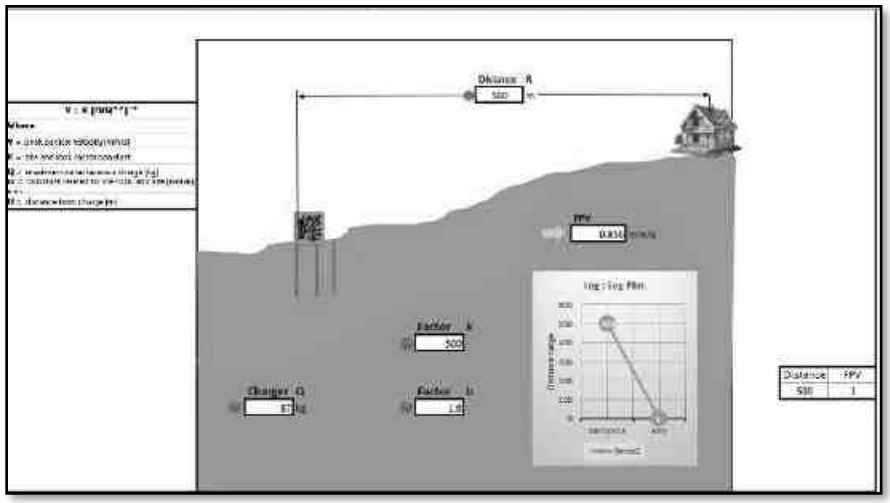


FIGURE 4.9: GROUND VIBRATION PREDICTION "P3"

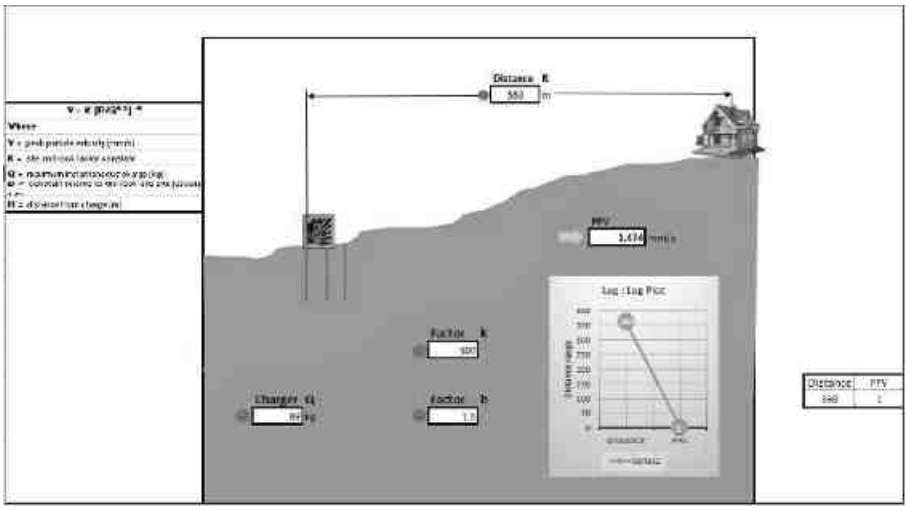
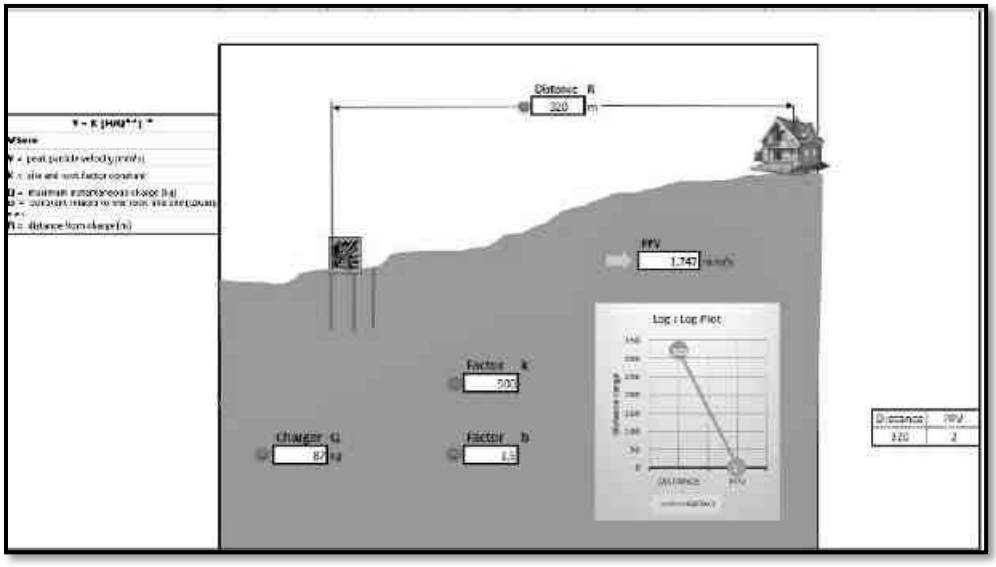


FIGURE 4.9: GROUND VIBRATION PREDICTION "P4"



From the above graph, the Maximum charge per blast of 89 kg is well below the Peak Particle Velocity of 8 mm/s as per Directorate General of Mines Safety for safe level criteria through Circular No. 7 dated 29/8/1997. It is proposed to carry out blasting not exceeding 2kg of Explosives per one blasting round. However, as per statutory requirement control measures will be adopted to avoid the impacts due to ground vibrations and fly rocks due to blasting.

4.4.3.1 Mitigation Measures

- 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 more number of delays will be used per blasts;
- During blasting, other activities in the immediate vicinity will be temporarily stopped;

- Drilling parameters like depth, diameter and spacing will be properly designed to give proper blast;
- A fully trained explosives blast man (Mining Mate, Mines Foreman, 2nd Class Mines Manager/ 1st Class Mines Manager) will be appointed.
- A set of shot firing rules will be drawn up and blasting shall commence outlining the detailed operating procedures that will be followed to ensure that shot firing operations on site take place without endangering the workforce or public.
- Sufficient angular stemming material will be used to confine the explosive force and minimise environmental disturbance caused by venting / misfire.
- The detonators will be connected in a predetermined sequence to ensure that only one charge is detonated at any one time and a NONEL or similar type initiation system will be used.
- The detonation delay sequence shall be designed so as to ensure that firing of the holes is in the direction of free faces so as to minimise vibration effects.
- Appropriate blasting techniques shall be adopted such that the predicted peak particle velocity shall not exceed 8 Hz.
- Vibration monitoring will be carried out every 6 months to check the efficacy of blasting practices

4.5 ECOLOGY AND BIODIVERSITY

4.5.1 Impact on Ecology and Biodiversity

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

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

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

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

4.5.2 Mitigation Measures

Keeping all this in mind the mitigations have been suggested under environmental management plan. With the understanding of the role of plant species as bio-filter to control air pollution, appropriate plant species (mainly tree species) have been suggested conceding the area/site requirements and needed performance of specific species. The details of year wise proposed plantation program are given in Table 4.13.

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

In order to compensate the loss of vegetation cover, it is suggested to carry out afforestation program mainly in proposed areas falls in the cluster earmarked for plantation program as per Approved Mining Plan in different phases. This

habitat improvement program would ensure the faunal species to re-colonize and improve the abundance status in the core zone.

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

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

4.5.2.2.1. Species Recommendation for Plantation granted in the District

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

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

TABLE 4.13: RECOMMENDED SPECIES FOR GREENBELT DEVELOPMENT PLAN

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

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

TABLE 4.14: GREENBELT DEVELOPMENT PLAN

PROPOSAL FOR P1 – Thiru. S.Dhanapal,				
Year	**No. of trees proposed to be planted**	**Survial %**	**Area to be planted**	**Name of the species**
I	It is proposed to plant 600 **Nos** of trees in the 1st year	80%	Safety barrier, Un utilized areas and nearby village roads	Neem, Pungam,Sengondrai, Panai, Naval
PROPOSAL FOR P2 – Thiru.K.Venkatraman,				
I	It is proposed to plant **900 Nos** of trees in the 1st year	80%	Safety barrier, Un utilized area's and nearby village roads	Neem, Pungam,Sengondrai, Panai, Naval
PROPOSAL FOR P3 – Tmt.S.Sumathi,				
I	It is proposed to plant **900 Nos** of trees in the 1st year	80%	Safety barrier, Un utilized area's and nearby village roads	Neem, Pungam,Sengondrai, Panai, Naval
PROPOSAL FOR P4 – Thiru.A.Rajarajacholan,				
I	It is proposed to plant **900** Nos of trees in the 1st year	80%	Safety barrier, Un utilized area's and nearby village roads	Neem, Pungam,Sengondrai, Panai, Naval

TABLE 4.15: BUDGET FOR GREENBELT DEVELOPMENT PLAN

Proposal	Activity	Year & No of Trees	Cost	Total Cost
P1	Greenbelt development within the project area and nearby village roads	1st year 600 Nos of trees	Site clearance, preparation of land, digging of pits / trenches, soil amendments, transplantation of saplings @ 200 per plant and maintenance	Rs 1,20,000/-
P2		1st year 900 Nos of trees		Rs 1,80,000/-
P3		1st year 900 Nos of trees		Rs 1,80,000/-
P4		1st year 900 Nos of trees		Rs 1,80,000/-
P1-P4	Renovation of Wire Fencing (1300 meters)	1st year	@ 300 Rs per meter	Rs 3,90,000
P1-P4	Renovation of Garland Drain (1200 meters)	1st year	@ 300Rs per meter	Rs 3,60,000
Total no of Trees from the 4 Proposals		**3,300 Trees**	**Total Budget**	**Rs 14,10,000/-**

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

4.5.3. Anticipated Impact on Fauna

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

4.5.3.1. Measures for protection and conservation of wildlife species

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

4.5.3.2. Mitigation Measures

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

4.5.4. Impact on Aquatic Biodiversity

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

4.5.5. Impact Assessment on Biological Environment

A detail of impact and assessments was mentioned in Table No 4.16.

TABLE 4.16: ECOLOGICAL IMPACT ASSESSMENTS

Sl.No	Attributes	Assessment
1	Activities of the project affects the breeding/nesting sites of birds and animals	No breeding and nesting site was identified in mining lease site. The fauna sighted mostly migrated from buffer area.
2	Located near an area populated by rare or endangered species	No endangered, critically endangered, vulnerable species sighted in core mining lease area.
3	Proximity to national park/wildlife sanctuary/reserve forest /mangroves/ coastline/estuary/sea	No national park or eco-sensitive zone around 10km radius.
4	Proposed project restricts access to waterholes for wildlife	'NO'
5	Proposed mining project impact surface water quality that also provide water to wildlife	'NO 'scheduled or threatened wildlife animal sighted regularly core in core area.
6	Proposed mining project increase siltation that would affect nearby biodiversity area.	Surface runoff management such as drains is constructed properly so there will be no siltation affect in 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 chances of water become polluted is low.
9	Mining project effect the forest based livelihood/ any specific forest product on which local livelihood depended	'NO'
10	Project likely to affect migration routes	'NO 'migration route observed during monitoring period.
11	Project likely to affect 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 likely to affect wetlands, Fish breeding grounds, marine ecology	'NO'. Wetland was not present in near core Mining lease area. No breeding and nesting ground present in core mining area.

TABLE 4.17: ANTICIPATED IMPACT OF ECOLOGY AND BIODIVERSITY

Sl. No	Aspect Description	Likely Impacts on Ecology and Biodiversity (EB)	Impact Consequence - Probability Description / Justification	Significance	Mitigation Measures
Pre-Mining Phase					
1	Uprooting of vegetation of lease area	Site specific loss of common floral diversity (Direct impact)	Site possesses common floral (not trees) species. Clearance of these species will not result in loss of flora	Less severe	No immediate action required. However, Greenbelt /plantation will be developed in project site and in periphery of the project

		Site specific loss of associated faunal diversity (Partial impact)	Site supports only common species, which use wide variety of habitats of the buffer zone reserve forest area. So, there is no threat of faunal diversity.		boundary, which will improve flora and fauna diversity of the project area.
		-Loss of Habitat (Direct impact)	Site does not form Unique / critical habitat structure for unique flora or fauna.		
Mining phase					
2	Excavation of mineral using machine and labours, Transportation activities will generate noise.	Site-specific disturbance to normal faunal movements at the site due to noise. (Partial impact)	Site does not form unique / critical habitat structure for unique flora or fauna.	Less severe	Mining activity should not be operated after 5PM. Excavation of dump and transportation work should stop before 7PM.
3	Vehicular Movement for transportation of materials will result in generation of dust (SPM) due to haul roads and emission of SO2, NO2, CO etc.	Impact on surrounding agriculture and associated fauna due to deposition of dust and Emission of CO. (Indirect impact)	Impact is less as the agricultural land far from core area.	Less severe	All vehicles will be certified for appropriate Emission levels. More plantation has been suggested Upgrade the vehicles with alternative fuel such biodiesel, methanol and biofuel around the mining area.

4.6 SOCIO ECONOMIC

4.6.1 Anticipated Impacts

- 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

4.7 OCCUPATIONAL HEALTH AND SAFETY

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

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

4.7.1 Respiratory Hazards

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

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

4.7.2 Noise

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

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

4.7.3 Physical Hazards

The following measures are proposed for control of physical hazards

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

4.7.4 Occupational Health Survey

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

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

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

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

4.8 MINE WASTE MANAGEMENT

No waste is anticipated from this proposed quarry.

4.9 MINE CLOSURE

Mine closure plan is the most important environmental requirement in mining projects. The mine closure plan should cover technical, environmental, social, legal and financial aspects dealing with progressive and post closure activities. The closure operation is a continuous series of activities starting from the decommissioning of the project. Therefore, progressive mine closure plan should be specifically dealt with in the mining plan and is to be reviewed along with mining plan. As progressive mine closure is a continuous series of activities, it is obvious that the proposals of scientific mining have included most of the activities to be included in the closure plan. While formulating the closure objectives for the site, it is important to consider the existing or the pre-mining land use of the site; and how the operation will affect this activity.

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

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

4.9.1 Mine Closure Criteria

The criteria involved in mine closure are discussed below:

4.9.1.1 Physical Stability

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

4.9.1.2 Chemical Stability

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

4.9.1.3 Biological Stability

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

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

- Where the nutrient level of spread topsoil is lower than material in-situ e.g. for development of social forestry

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

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

5. ANALYSIS OF ALTERNATIVES (TECHNOLOGY AND SITE)

5.1 INTRODUCTION

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

5.2 FACTORS BEHIND THE SELECTION OF PROJECT SITE

Palapatti Rough Stone Quarries Project at Palapatti Village, Vazhapady taluk, Salem is a mining project for excavation of Rough Stone, which is site specific. All the proposed mining lease areas have following advantages: -

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

5.3 ANALYSIS OF ALTERNATIVE SITE

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

5.4 FACTORS BEHIND SELECTION OF PROPOSED TECHNOLOGY

Mechanized open cast mining operation with 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

5.5 ANALYSIS OF ALTERNATIVE TECHNOLOGY

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

6. ENVIRONMENTAL MONITORING PROGRAMME

6.0 GENERAL

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

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

6.1 METHODOLOGY OF MONITORING MECHANISM

Implementation of EMP and periodic monitoring will be carried out by Project Proponent (Mine Owner). A comprehensive monitoring mechanism has been devised for monitoring of impacts due to this proposed 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 the Respective Mine Management. On the other hand, implementation of area level protection measures like green belt development, environmental quality monitoring etc., are taken up by a senior executive who reports to their Mine Management.

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

The responsibilities of this cell will be:

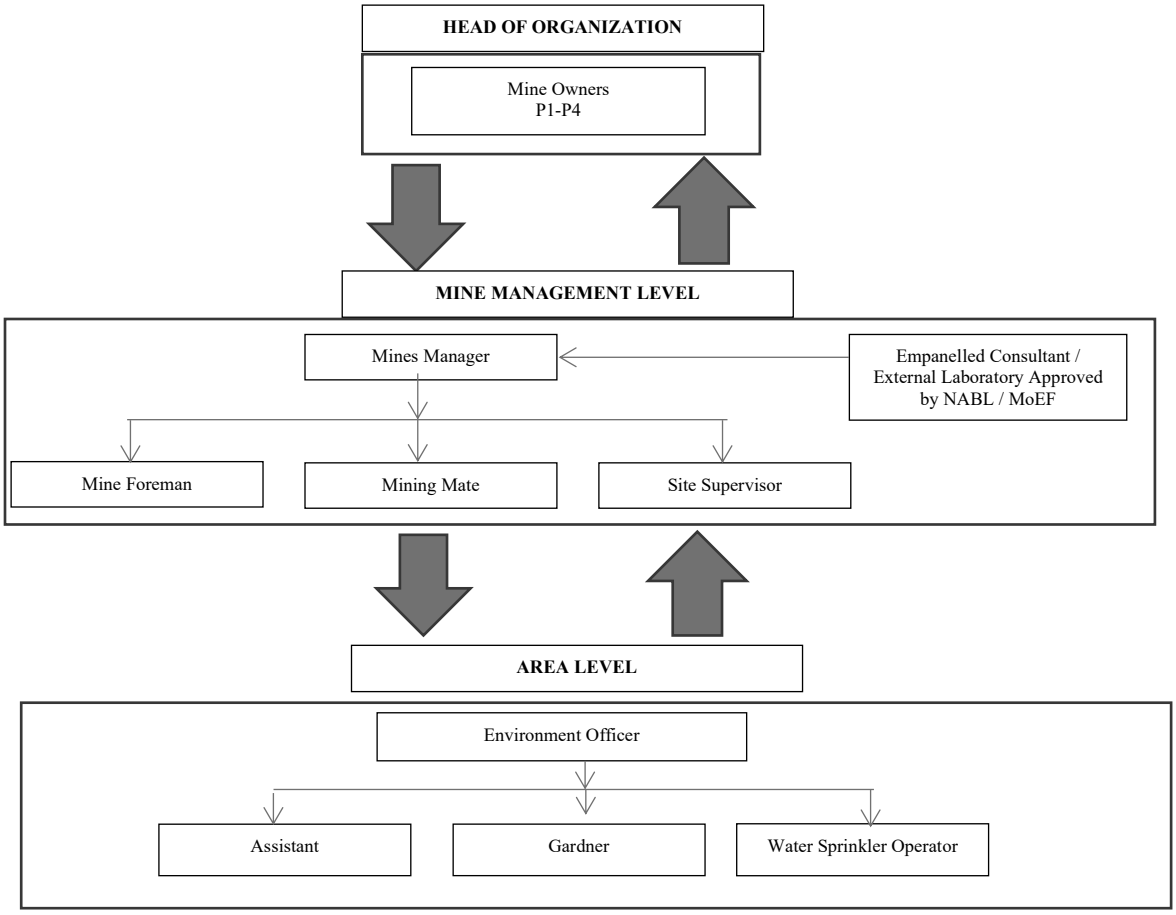
- Implementation of pollution control measures
- Monitoring programme implementation
- Post-plantation care
- To check the efficiency of pollution control measures taken
- Any other activity as may be related to environment
- Seeking expert’s advice when needed.

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

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

6.3 MONITORING SCHEDULE AND FREQUENCY

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

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

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

The details of monitoring are detailed in Table 6.2

TABLE 6.2: PROPOSED MONITORING SCHEDULE POST EC

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

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

6.4 BUDGETARY PROVISION FOR EMP

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

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

TABLE 6.3 ENVIRONMENT MONITORING BUDGET FOR P1-P4

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

Source: Approved Mining Plan

6.5 REPORTING SCHEDULES OF MONITORED DATA

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

Periodical reports to be submitted to: -

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

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

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

7. ADDITIONAL STUDIES

7.0 GENERAL

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

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

7.1. PUBLIC CONSULTATION

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

7.2 RISK ASSESSMENT

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

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

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

TABLE 7.1 RISK ASSESSMENT& CONTROL MEASURES

S. No	Risk factors	Causes of risk	Control measures
1	Accidents due to explosives and heavy mining machineries	Improper handling and unsafe working practice	▪ All safety precautions and provisions of Mine Act, 1952, Metalliferous Mines Regulation, 1961 and Mines Rules, 1955 will be strictly followed during all mining operations; ▪ Workers will be sent to the Training in the nearby Group Vocational Training Centre ▪ Entry of unauthorized persons will be prohibited; ▪ Fire-fighting and first-aid provisions in the mine office complex and mining area; ▪ Provisions of all the safety appliances such as safety boot, helmets, goggles etc. will be made available to the employees and regular check for their use ▪ Working of quarry, as per approved plans and regularly updating the mine plans; ▪ Cleaning of mine faces on daily basis shall be daily done in order to avoid any overhang or undercut; ▪ Handling of explosives, charging and firing shall be carried out by competent persons only under the supervision of a Mine Manager;

			▪ Maintenance and testing of all mining equipment as per manufacturer‘s guidelines.
2	Drilling	Improper and unsafe practices Due to high pressure of compressed air, hoses may burst Drill Rod may break	▪ Safe operating procedure established for drilling (SOP) will be strictly followed. ▪ Only trained operators will be deployed. ▪ No drilling shall be commenced in an area where shots have been fired until the blaster/blasting foreman has made a thorough Examination of all places, ▪ Drilling shall not be carried on simultaneously on the benches at places directly one above the other. ▪ Periodical preventive maintenance and replacement of worn-out accessories in the compressor and drill equipment as per operator manual. ▪ All drills unit shall be provided with wet drilling shall be maintained in efficient working in condition. ▪ Operator shall regularly use all the personal protective equipment.
4	Blasting	Fly rock, ground vibration, Noise and dust. Improper charging, stemming & Blasting/ fining of blast holes Vibration due to movement of vehicles	▪ Restrict maximum charge per delay as per regulations and by optimum blast hole pattern, vibrations will be controlled within the permissible limit and blasting can be conducted safely. ▪ SOP for Charging, Stemming & Blasting/Firing of Blast Holes will be followed by blasting crew during initial stage of operation ▪ Shots are fired during daytime only. ▪ All holes charged on any one day shall be fired on the same day. ▪ The danger zone will be distinctly demarcated (by means of red flags)
5	Transportation	Potential hazards and unsafe workings contributing to accident and injuries Overloading of material While reversal & overtaking of vehicle Operator of truck leaving his cabin when it is loaded.	▪ Before commencing work, drivers personally check the dumper/truck/tipper for oil(s), fuel and water levels, tyre inflation, general cleanliness and inspect the brakes, steering system, warning devices including automatically operated audio-visual reversing alarm, rear view mirrors, side indicator lights etc., are in good condition. ▪ Not allow any unauthorized person to ride on the vehicle nor allow any unauthorized person to operate the vehicle. ▪ Concave mirrors should be kept at all corners ▪ All vehicles should be fitted with reverse horn with one spotter at every tipping point ▪ Loading according to the vehicle capacity ▪ Periodical maintenance of vehicles as per operator manual
6	Natural calamities	Unexpected happenings	▪ Escape Routes will be provided to prevent inundation of storm water ▪ Fire Extinguishers & Sand Buckets
7	Failure of Mine Benches and Pit Slope	Slope geometry, Geological structure	▪ Ultimate or over all pit slope shall be below 60° and each bench height shall be 5m height.

Source: Analysed and Proposed by FAE & EC

7.3 DISASTER MANAGEMENT PLAN

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

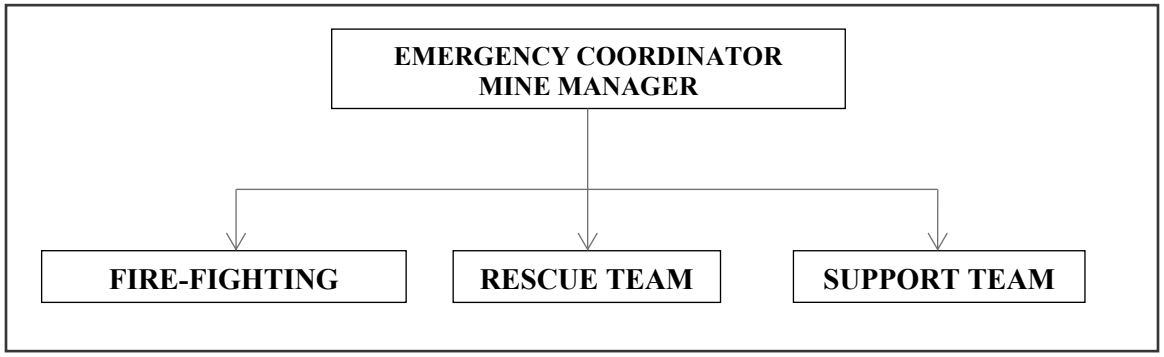
The Disaster Management Plan is aimed to ensure safety of life, protection of environment, protection of installation, restoration of production and salvage operations in this same order of priorities.

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

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

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

FIGURE 7.1: DISASTER MANAGEMENT TEAM LAYOUT



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

TABLE 7.2: PROPOSED TEAMS TO DEAL WITH EMERGENCY SITUATION

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

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

Roles and responsibilities of emergency team –

(a) Emergency coordinator (EC)

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

(b) Incident controller (IC)

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

(c) Communication and advisory team

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

(d) Roll call coordinator

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

(e) Search and rescue team

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

(f) Emergency security controller

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

Emergency control procedure –

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

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

Proposed fire extinguishers at different locations

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

TABLE 7.3: PROPOSED FIRE EXTINGUISHERS AT DIFFERENT LOCATIONS

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

Alarm system to be followed during disaster –

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

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

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

7.4 CUMULATIVE IMPACT STUDY

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

TABLE 7.4: LIST OF QUARRIES WITHIN 500 METER RADIUS

PROPOSED QUARRIES				
CODE	**Name of the Owner**	**S.F. Nos**	**Extent**	**Status**
P1	**Thiru. S.Dhanapal,** S/o. Sengodan, No.438, Mahakaliyamman Kovil Street, dagapatti Post,, Salem District– 636 006	106 (Part-1)	1.00.0 ha	TOR Vide Lr No. SEIAA-TN/F.No.8121/SEAC/TOR-930/2020 Dated :16.04.2021
P2	**Thiru.K.Venkatraman,** S/o. Krishnan, No.74A/77A, Narayanan Pillai Street, Peramanur, Salem – 636 007.	106 (Part-2)	1.50.0 ha	TOR Vide Lr No. SEIAA-TN/F.No.9332/TOR-1244/2022 Dated :30.08.2022
P3	**Tmt.S.Sumathi,** W/o.Sathishkumar, No.3/43, Nadu Street, Singipuram, Vazhappadi, Salem – 636 115	106 (Part-3)	1.50.0 ha	TOR Vide Lr No. SEIAA-TN/F.No.9685/SEAC/TOR-1428/2022 Dated :18.04.2023
P4	**Thiru.A.Rajarajacholan,** S/o.Alagappan, No.3/22, Rajaveethi, Minnampalli Post, Vazhappadi, Salem – 636 106.	106 (Part-4)	1.50.0 ha	TOR Vide Lr No. SEIAA-TN/F.No.9333/TOR-1234/2022 Dated :30.08.2022
TOTAL			**5.50.0 ha**	
EXISTING QUARRIES				
NIL				
ABANDONED QUARRIES				
NIL				
Total Cluster			**5.50.0 Ha**	

Note: -

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

TABLE 7.5: SALIENT FEATURES OF PROPOSAL "P1"

Name of the Quarry	Thiru. S.Dhanapal Rough Stone Quarry	
Toposheet No	58-I/06	
Latitude between	11°42'24.17"N to 11°42'27.73"N	
Longitude between	78°18'03.95"E to 78°18'08.71"E	
Highest Elevation	448-400 m AMSL	
Proposed Depth of Mining	41 m agl (1m Topsoil + 40m Rough Stone)	
Geological Resources	Rough Stone in m^3	Topsoil m^3
	4,38,620	10,112
Mineable Reserves	Rough Stone in m^3	Topsoil m^3
	1,51,795	6,372
Proposal for this Mining Plan Period	Rough Stone in m^3	Topsoil m^3
	83,425	6,372
Existing Pit Dimension	-	
Ultimate Pit Dimension	108m (L) x 59m (W) x 71m (D) (56m agl +15 bgl)	
Water Level in the surrounds area	63 – 68 m bgl	
Method of Mining	Opencast Mechanized Mining Method involving drilling and blasting	
Topography	The lease applied area is hilly terrain. The area has gentle slope with a gradient of 1 to 4 towards Eastern side. The altitude of the area is 448-400m (max) above mean sea level. The area is covered by 1m (avg) thickness of Topsoil Formation. Massive Charnockite is found after 1m (Topsoil Formation) which is clearly inferred from the nearby existing quarry pit.	
Machinery proposed	Jack Hammer	2 Nos
	Compressor	1 Nos
	Excavator with Bucket & Rock Breaker	1 Nos
	Tippers	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	14 Nos	
Total Project Cost	Project Cost	Rs.40,91,000/-
	Environment Monitoring Cost	Rs.3,80,000/-
	Total	Rs.44,71,000/-
CER Cost	Rs.5,00,000/-	
Nearby Water Bodies	Tank near Anuppur	4.25km NE
	Tank near Kuttathupatti	2.40km NE
	Tank near Achanguttaipatti	5.63km NW
	Tank near Valasaiyur	5.25km SW
	Tank near D. Perumapalayam	7.47km SW
	Tank near Pallapatty	6.88km SW
	Tank near Poovanur	5.37km NW
	Tank near Vellalagundam	6km SE
	Tank near Chinnakavundapuram	7km SW
	Tank near Sukkampatti	5.2km NW
	Tank Near Eripudur	1.8km SW
Greenbelt Development Plan	Proposed to plant 600 trees in the 7.5m safety distance and village road	
Proposed Water Requirement	2.8 KLD	
Nearest Habitation	660m Southeast	

Source: Approved Mining Plan

TABLE 1.4: BRIEF DESCRIPTION OF THE APPLIED PROJECT "P2"

Name of the Quarry	Thiru.K. Venkatraman Rough Stone Quarry
Toposheet No	58-I/06
S.f No & Extent	106 (P-IIq) and 1.50.0 Ha

Land type	Government Poramboke Land	
Lease Period	10	
Proposed Period of Mining	5	
Latitude between	11°42'30.41"N to 11°42'28.96"N	
Longitude between	78°18'06.24"E to 78°18'00.47"E	
Highest Elevation	447 m AMSL	
Proposed Depth of Mining	43 m (1m Topsoil + 42m Rough Stone)	
Geological Resources	Rough Stone in m^3	Topsoil m^3
	7,80,604	15,000
Mineable Reserves	Rough Stone in m^3	Topsoil m^3
	3,39,516	11,700
Proposal for this Mining Plan Period	Rough Stone in m^3	Topsoil m^3
	3,02,716	11,700
Existing Pit Dimension	-	
Ultimate Pit Dimension	130.0m (L) x 90m (W) x 63m (D)	
Water Level in the surrounds area	70m bgl	
Method of Mining	Opencast Mechanized Mining Method involving drilling and blasting	
Topography	The lease applied for quarry lease is almost plain area sloping towards western covered with Roughstone which does not sustain any type of vegetation. The altitude of the area is 447m Amsl.	
Machinery proposed	Jack Hammer	5 Nos
	Hydraulic Excavator	1 Nos
	Tippers	2 Nos
Blasting Method	Controlled Blasting Method by shot hole drilling and small dia of 25mm slurry explosive are proposed to be used for shattering and heaving effect for removal and winning of Rough Stone. No deep hole drilling is proposed.	
Proposed Manpower Deployment	18 Nos	
Total Project Cost	Fixed Cost	Rs.40,90,000/-
	Operational cost	Rs. 30,00,000/-
	Environment Monitoring Cost	Rs.3,50,000/-
	Total	Rs.74,40,000/-
CER Cost @ 2% of Project Cost	Rs.5,00,000/-	
Nearby Water Bodies	Tank near Anuppur	4.34km NE
	Tank near Kuttathupatti	2.54km NE
	Tank near Achanguttaipatti	5.47km NW
	Tank near Valasaiyur	5.13km SW
	Tank near D. Perumapalayam	7.38km SW
	Tank near Pallapatty	6.73km SW
	Tank near Poovanur	5.24km NW
	Tank near Vellalagundam	6km SE
	Tank near Chinnakavundapuram	7km SW
	Tank near Sukkampatti	5.2km NW
	Tank Near Eripudur	1.8km SW
Greenbelt Development Plan	Proposed to plant 900trees in the7.5m safety distance and village road	
Proposed Water Requirement	1.8 KLD	
Nearest Habitation	500m Southeast	

TABLE 1.5: BRIEF DESCRIPTION OF THE APPLIED PROJECT "P3"

Name of the Quarry	Tmt.S. Sumathi Rough Stone Quarry
S.f No & Extent	106 (P-III) and 1.50.0 Ha
Land type	Government Poramboke Land
Lease Period	10
Proposed Period of Mining	5
Toposheet No	58-I/06
Latitude between	11°42'27.93"N to 11°42'25.89"N
Longitude between	78°18'05.14"E to 78°17'59.38"E
Highest Elevation	471 m AMSL

Proposed Depth of Mining	58 m (1 m Topsoil + 57m Rough Stone)	
Geological Resources	Rough Stone in m^3	Topsoil m^3
	6,34,948	15,000
Mineable Reserves	Rough Stone in m^3	Topsoil m^3
	3,47,617	13,000
Proposal for this Mining Plan Period	Rough Stone in m^3	Topsoil m^3
	3,09,617	13,000
Existing Pit Dimension	-	
Ultimate Pit Dimension	130m (L) x 100m (W) x 63m (D)	
Water Level in the surrounds area	70 m bgl	
Method of Mining	Opencast Mechanized Mining Method involving drilling and blasting	
Topography	The area applied for quarry lease is almost plain area sloping towards western covered with roughstone doesnot sustain any type of Vegetation. The altitude of the area is 471m Amsl.	
Machinery proposed	Jack Hammer	7 Nos
	Hydraulic Excavator	1 Nos
	Tippers	4 Nos
Blasting Method	Controlled Blasting Method by shot hole drilling and small dia of 25mm slurry explosive are proposed to be used for shattering and heaving effect for removal and winning of Rough Stone. No deep hole drilling is proposed.	
Proposed Manpower Deployment	18 Nos	
Total Project Cost	Operational Cost	Rs.40,77,000/-
	Machinery Cost	Rs.30,00,000/-
	Environment Monitoring Cost	Rs.3,50,000/-
	Total	Rs.74,27,000/-
CER Cost	Rs.5,00,000/-	
Nearby Water Bodies	Tank near Anuppur	4.38km NE
	Tank near Kuttathupatti	2.58km NE
	Tank near Achanguttaipatti	5.50km NW
	Tank near Valasaiyur	5.11km SW
	Tank near D. Perumapalayam	7.36km SW
	Tank near Pallapatty	6.78km SW
	Tank near Poovanur	5.28km NW
	Tank near Vellalagundam	6km SE
	Tank near Chinnakavundapuram	7km SW
	Tank near Sukkampatti	5.2km NW
	Tank Near Eripudur	1.8km SW
Greenbelt Development Plan	Proposed to plant 900 trees in the7.5m safety distance and village road.	
Proposed Water Requirement	3.0 KLD	
Nearest Habitation	360m East	

TABLE 1.6: BRIEF DESCRIPTION OF THE APPLIED PROJECT "P4"

Name of the Quarry	Thiru.A. Rajarajacholan Rough Stone Quarry	
S.f No & Extent	106 (P-IV) and 1.50.0 Ha	
Land type	Government Poramboke Land	
Lease Period	10	
Proposed Period of Mining	5	
Toposheet No	58-I/06	
Latitude between	11°42'24.27"N to 11°42'22.83"N	
Longitude between	78°18'04.05"E to 78°17'58.28"E	
Highest Elevation	471 m AMSL	
Proposed Depth of Mining	51 m (1 m Topsoil + 50m Rough Stone)	
Geological Resources	Rough Stone in m^3	Topsoil m^3
	7,77,500	15,000
Mineable Reserves	Rough Stone in m^3	Topsoil m^3
	3,39,925	11,700

Proposal for this Mining Plan Period	Rough Stone in m^3		Topsoil m^3
	3,00,650		11,700
Existing Pit Dimension	-		
Ultimate Pit Dimension	Pit-I	130m (L) x 90m (W) x 66m (D)	
Water Level depth in the surrounds area	70m		
Method of Mining	Opencast Mechanized Mining Method involving drilling and blasting		
Topography	The lease applied area is hilly terrain. The area has gentle sloping towards western side. The altitude of the area is 471m (max) above mean sea level. The area is covered by 1m (avg) thickness of Topsoil Formation. Massive Charnockite is found after 1m (Topsoil Formation) which is clearly inferred from the nearby existing quarry pit.		
Machinery proposed	Jack Hammer		5 Nos
	Hydraulic Excavator		1 Nos
	Tippers		2 Nos
Blasting Method	Controlled Blasting Method by shot hole drilling and small dia of 25mm slurry explosive are proposed to be used for shattering and heaving effect for removal and winning of Rough Stone. No deep hole drilling is proposed.		
Proposed Manpower Deployment	18 Nos		
Total Project Cost	Fixed asset Cost		Rs.40,90,000/-
	Operational cost		Rs.30,00,000/-
	Environment Monitoring Cost		Rs.3,50,000/-
	Total		Rs.74,40,000/-
CER Cost	Rs.5,00,000		
Nearby Water Bodies	Tank near Anuppur		4.42km NE
	Tank near Kuttathupatti		2.64km NE
	Tank near Achanguttaipatti		5.54km NW
	Tank near Valasaiyur		5.07km SW
	Tank near D. Perumapalayam		7.34km SW
	Tank near Pallapatty		6.70km SW
	Tank near Poovanur		5.31km NW
	Tank near Vellalagundam		6km SE
	Tank near Chinnakavundapuram		7km SW
	Tank near Sukkampatti		5.2km NW
	Tank Near Eripudur		1.8km SW
Greenbelt Development Plan	Proposed to plant 900 trees in the 7.5m safety distance and village road.		
Proposed Water Requirement	2.0 KLD		
Nearest Habitation	320m South		

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 7.9 to 7.10.

TABLE 7.9: CUMULATIVE PRODUCTION LOAD OF ROUGH STONE

	PROPOSED PRODUCTION DETAILS			
Quarry	**5 Years in m^3**	**Per Year in m^3**	**Per Day in m^3**	**Number of Lorry Load Per Day**
P1	83,425	16,685	56	9
P2	3,02,716	60,543	202	34
P3	3,09,617	61,923	206	34
P4	3,00,650	60,130	200	33
Grand Total	**9,96,408**	**1,99,281**	**664**	**110**

TABLE 7.10: CUMULATIVE PRODUCTION LOAD OF TOPSOIL

	PROPOSED PRODUCTION DETAILS			
Quarry	**1 - 3 Years in m^3**	**Per Year in m^3**	**Per Day in m^3**	**Number of Lorry Load Per Day**
P1	6,372	6,372	21	4
P2	11,700	11,700	39	7
P3	13,000	13,000	43	7
P4	11,700	11,700	39	7
Grand Total	**42,772**	**42,772**	**142**	**25**

On a cumulative basis considering all the 4 quarries it can be seen that the overall production of Rough Stone is 664 m^3 per day with a capacity of 110 trips of Rough Stone per day from the cluster.

The excavated topsoil will be stored within the project premises and later will be used for green belt development.

Note: Per day production of Rough Stone is calculated for 5 Years Lease Period and for Topsoil production with 1 year of production period.

Based on the above production quantities the emissions due to various activities in all the 4 mines includes various activities like ground preparation, excavation, handling and transport of ore. These activities have been analysed systematically basing on USEPA-Emission Estimation Technique Manual, for Mining AP-42, to arrive at possible emissions to the atmosphere and estimated emissions are given in Table 7.11.

TABLE 7.11: EMISSION ESTIMATION FROM QUARRIES WITHIN 500 METER RADIUS

EMISSION ESTIMATION FOR QUARRY "P1"				
Estimated Emission Rate for PM_{10}	**Activity**	**Source type**	**Value**	**Unit**
	Drilling	Point Source	0.060382634	g/s
	Blasting	Point Source	0.000194167	g/s
	Mineral Loading	Point Source	0.038328045	g/s
	Haul Road	Line Source	0.002485738	g/s/m
	Overall Mine	Area Source	0.038555283	g/s
Estimated Emission Rate for SO_2	Overall Mine	Area Source	0.000223403	g/s
Estimated Emission Rate for NOx	Overall Mine	Area Source	0.000005362	g/s
EMISSION ESTIMATION FOR QUARRY "P2"				
Estimated Emission Rate for PM_{10}	**Activity**	**Source type**	**Value**	**Unit**
	Drilling	Point Source	0.088886002	g/s
	Blasting	Point Source	0.001342089	g/s
	Mineral Loading	Point Source	0.042965113	g/s
	Haul Road	Line Source	0.002493371	g/s/m
	Overall Mine	Area Source	0.046689477	g/s
Estimated Emission Rate for SO_2	Overall Mine	Area Source	0.000732475	g/s
Estimated Emission Rate for NOx	Overall Mine	Area Source	0.000025811	g/s
EMISSION ESTIMATION FOR QUARRY "P3"				
Estimated Emission Rate for PM_{10}	**Activity**	**Source type**	**Value**	**Unit**
	Drilling	Point Source	0.089489027	g/s
	Blasting	Point Source	0.001388236	g/s
	Mineral Loading	Point Source	0.043121901	g/s
	Haul Road	Line Source	0.002493787	g/s/m
	Overall Mine	Area Source	0.046757139	g/s
Estimated Emission Rate for SO_2	Overall Mine	Area Source	0.000757113	g/s
Estimated Emission Rate for NOx	Overall Mine	Area Source	0.000026704	g/s
EMISSION ESTIMATION FOR QUARRY "P4"				
Estimated Emission Rate for PM_{10}	**Activity**	**Source type**	**Value**	**Unit**
	Drilling	Point Source	0.088703662	g/s
	Blasting	Point Source	0.001328380	g/s
	Mineral Loading	Point Source	0.042940488	g/s
	Haul Road	Line Source	0.002493307	g/s/m
	Overall Mine	Area Source	0.046677930	g/s
Estimated Emission Rate for SO_2	Overall Mine	Area Source	0.000728266	g/s
Estimated Emission Rate for NOx	Overall Mine	Area Source	0.000025658	g/s

Source: Emission Calculations

TABLE 7.12: INCREMENTAL & RESULTANT GLC WITHIN CLUSTER

$PM_{2.5}$ in µg/m³	
Location	**P1**
Background	23.4
Incremental	10.82
Resultant	34.2
NAAQ Norms	**60 µg/m³**
PM_{10} in µg/m³	
Location	**P1**
Background	42.8
Incremental	17.98
Resultant	60.8
NAAQ Norms	**100 µg/m³**
SO_2 in µg/m³	
Location	**P1**
Background	8.0

Incremental	3.29
Resultant	11.3
NAAQ Norms	**80 µg/m^3**
NO_x in µg/m^3	
Location	**P1**
Background	26.4
Incremental	12.56
Resultant	39.0
NAAQ Norms	**80 µg/m^3**

Noise Environment –

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

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

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

Where:

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

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

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

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

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

TABLE 7.13: 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	41.1	43.7	44.6	55
Habitation Near P2	39.3	46.1	46.7	
Habitation Near P3	38.9	49.0	49.2	
Habitation Near P4	38.1	50.0	50.3	

Source: Lab Monitoring Data

The incremental noise level is found within the range of 43.7 – 50.0 dB (A) in Buffer zone. The noise level at different receptors in buffer zone is lower due to the distance involved and other topographical features adding to the noise attenuation. The resultant Noise level due to monitored values and calculated values at the receptors are based on the mathematical formula considering attenuation due to Green Belt as 4.9 dB (A)the barrier effect. From the above table, it can be seen that the ambient noise levels at all the locations near habitations are within permissible limits of Residential Area (buffer zone) as per THE NOISE POLLUTION (REGULATION AND CONTROL) RULES, 2000(The Principal Rules were published in the Gazette of India, vide S.O.123(E), dated 14.2.2000 and subsequently amended vide S.O. 1046(E),dated 22.11.2000, S.O. 1088(E), dated 11.10.2002, S.O. 1569 (E), dated19.09.2006 and S.O. 50 (E) dated 11.01.2010 under the Environment(Protection) Act, 1986.).

Ground Vibrations

Ground vibrations due to mining activities in the all the 4 Mines within cluster are anticipated due to operation of Mining Machines like Excavators, drilling and blasting, transportation vehicles, etc. However, the major source of

ground vibration from the all the 4 mines is blasting. The major impact of the ground vibrations is observed on the domestic houses located in the villages nearby the mine lease area. The kuchha houses are more prone to cracks and damage due to the vibrations induced by blasting whereas RCC framed structures can withstand more ground vibrations. Apart from this, the ground vibrations may develop a fear factor in the nearby settlements.

Another impact due to blasting activities is fly rocks. These may fall on the houses or agricultural fields nearby the mining areas and may cause injury to persons or damage to the structures. The nearest habitations from 4 mines are given below in Table 7.14

TABLE 7.14: NEAREST HABITATION FROM EACH MINE

Location ID	Distance & Direction
Habitation Near P1	660m South East
Habitation Near P2	500m South East
Habitation Near P3	360m East
Habitation Near P4	320m South

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 7.15: GROUND VIBRATIONS AT 4 MINES

Location ID	Maximum Charge in kgs	Nearest Habitation in m	PPV in m/ms
P1	24	660	0.196
P2	87	500	0.856
P3	89	360	1.474
P4	87	320	1.747

Source: Blasting Calculations

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

Socio Economic Environment –

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

TABLE 7.16: SOCIO ECONOMIC BENEFITS FROM 4 MINES

Location ID	Project Cost	CER Cost
P1	Rs.44,71,000/-	Rs.5,00,000
P2	Rs.74,40,000/-	Rs.5,00,000
P3	Rs.74,27,000/-	Rs.5,00,000
P4	Rs.74,40,000/-	Rs.5,00,000
Grand Total	**Rs.2,67,78,000/-**	**Rs.20,00,000**

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

- The 4 Projects in Cluster shall fund towards CER – **Rs 20,00,000/-**

TABLE 7.17: EMPLOYMENT BENEFITS FROM 4 MINES

Location ID	Employment
P1	14
P2	18

P3	18
P4	18
Grand Total	**68**

A total of 68 people will get employment due to the proposed mines in cluster.

TABLE 7.18: GREENBELT DEVELOPMENT BENEFITS FROM 4 MINES

PROPOSAL FOR P1 – Thiru. S.Dhanapal,				
Year	**No. of trees proposed to be planted**	**Survial %**	**Area to be planted**	**Name of the species**
I	It is proposed to plant 600 **Nos** of trees in the 1st year	80%	Safety barrier, Un utilized areas and nearby village roads	Neem, Pungam,Sengondrai, Panai, Naval
PROPOSAL FOR P2 – Thiru.K.Venkatraman,				
I	It is proposed to plant **900Nos** of trees in the 1st year	80%	Safety barrier, Un utilized area's and nearby village roads	Neem, Pungam,Sengondrai, Panai, Naval
PROPOSAL FOR P3 – Tmt.S.Sumathi,				
I	It is proposed to plant **900 Nos** of trees in the 1st year	80%	Safety barrier, Un utilized area's and nearby village roads	Neem, Pungam,Sengondrai, Panai, Naval
PROPOSAL FOR P4 – Thiru.A.Rajarajacholan,				
I	It is proposed to plant 9**00** Nos of trees in the 1st year	80%	Safety barrier, Un utilized area's and nearby village roads	Neem, Pungam,Sengondrai, Panai, Naval

Based on the Proposed Mining Plan it is anticipated that the proponent P1-P4 shall grow native species of Neem in the Cluster at a rate of 3300 Trees Planted over a period of 5 Years with Survival Rate of 80% Besides every individual lease holder will plant Saplings in the School ground as part of CER activities.

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 7.19: ACTION PLAN TO MANAGE PLASTIC WASTE

Sl.No.	Activity	Responsibility
1	Framing of Layout Design by incorporating provision of the Rules, user fee to be charged from waste generators for plastic waste management, penalties/fines for littering, burning plastic waste or committing any other acts of public nuisance	Mines Manager
2	Enforcing waste generators to practice segregation of bio-degradable, recyclable and domestic hazardous waste	Mines Manager
3	Collection of plastic waste	Mines Foreman
4	Setting up of Material Recovery Facilities	Mines Manager
5	Segregation of Recyclable and Non-Recyclable plastic waste at Material Recovery Facilities	Mines Foreman

6	Channelization of Recyclable Plastic Waste to registered recyclers	Mines Foreman
7	Channelization of Non-Recyclable Plastic Waste for use either in Cement kilns, in Road Construction	Mines Foreman
8	Creating awareness among all the stakeholders about their responsibility	Mines Manager
9	Surprise checking's of littering, open burning of plastic waste or committing any other acts of public nuisance	Mine Owner

Source: Proposed by FAE's and EC

8. PROJECT BENEFITS

8.0 GENERAL

This Proposed Project for Quarrying Rough Stone at Palapatti Village aims to produce cumulatively 9,96,408m^3 Rough Stone and 42,722 m^3 Topsoil over a period of 5 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 68 persons for carrying out mining operations and give preference to the local people in providing employment in this project. 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 quarry is located in Palapatti Village, Valapadi Taluk and Salem 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

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.

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

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

CSR Cost Estimation

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

CORPORATE ENVIRONMENT RESPONSIBILITY

For the existing quarries Allocation for Corporate Environment Responsibility (CER) shall be made as per Government of India, MoEF & CC Office Memorandum F.No.22-65/2017-IA.III, Dated: 01.05.2018. As per para 6 (II) of the office memorandum, all the mines being a green field project & Capital Investment is ≤ 100 crores, they shall contribute 2% of Capital Investment towards CER.

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

TABLE 8.1 CER – ACTION PLAN

Code	CER
P1	Rs 5,00,000/-
P2	Rs 5,00,000/-
P3	Rs 5,00,000/-
P4	Rs 5,00,000/-
Total	**Rs 20,00,000/-**

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

9. ENVIRONMENTAL COST BENEFIT ANALYSIS

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

10. ENVIRONMENTAL MANAGEMENT PLAN - THIRU. S. DHANAPAL, "P1"

10.0 GENERAL

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

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

10.1 ENVIRONMENTAL POLICY

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

The Proponent Thiru. S. Dhanapal 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. Aesthetic of the Environment will not be affected. There is no major vegetation in the project area during the course of quarrying operation and after completion of the quarrying operation thick plantation will be developed under greenbelt development programme.

TABLE 10.1: PROPOSED CONTROLS FOR LAND ENVIRONMENT

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

Source: Proposed by FAE's & EIA Coordinator

10.3 SOIL MANAGEMENT

There is no overburden or waste anticipated from proposed project.

TABLE 10.2: PROPOSED CONTROLS FOR SOIL MANAGEMENT

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

Source: Proposed by FAE's & EIA Coordinator

10.4 WATER MANAGEMENT

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

The quarrying operation is proposed upto a depth of 41 m AGL, the water table in the area is 63 m – 68 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 access the impact due to the mining activities and the efficacy of the adopted air pollution control measures	Mines Manager
Provision of Dust Mask to all workers	Mines Manager
Greenbelt development all along the periphery of the project area	Mines Manager

Source: Proposed by FAE's & EIA Coordinator

10.6 NOISE POLLUTION CONTROL

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

TABLE 10.5: PROPOSED CONTROLS FOR NOISE ENVIRONMENT

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

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

Source: Proposed by FAE's & EIA Coordinator

10.7 GROUND VIBRATION AND FLY ROCK CONTROL

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

TABLE 10.6: PROPOSED CONTROLS FOR GROUND VIBRATIONS & FLY ROCK

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

Source: Proposed by FAE's & EIA Coordinator

10.8 BIOLOGICAL ENVIRONMENT MANAGEMENT

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

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

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

the Project at the end of mine life will attract the birds and animals towards the project area in the post mining period.

10.8.1 Green Belt Development Plan

About 600 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 FOR5 YEAR PLAN PERIOD -P1

Year	No. of tress proposed to be planted	Area to be covered	Name of the species	Survival rate expected in %
I	600	Safety zone, Un utilized area & Village roads	Neem, Pungam, Sengondrai, Panai, Naval	80

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

The objectives of the greenbelt development plan are –

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

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

10.8.2 Species Recommended for Plantation

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

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

TABLE 10.8: RECOMMENDED SPECIES TO PLANT IN THE GREENBELT

S.No	Botanical Name	Local Name	Importance
1.	Azadirachta indica	Neem, Vembu	Neem oil & neem products

Source: Proposed by FAE's & EIA Coordinator

10.9 OCCUPATIONAL SAFETY & HEALTH MANAGEMENT

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

10.9.1 Medical Surveillance and Examinations –

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

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

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

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

TABLE 10.9: MEDICAL EXAMINATION SCHEDULE

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

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

10.9.2 Proposed Occupational Health and Safety Measures –

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

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

FIGURE 10.1: PERSONAL PROTECTIVE EQUIPMENT TO THE MINE WORKERS

10.9.3 Health and Safety Training Programme

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

TABLE 10.10: LIST OF PERIODICAL TRAININGS PROPOSED FOR EMPLOYEES

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

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

10.9.4 Budgetary Provision for Environmental Management –

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

TABLE 10.11: EMP BUDGET FOR PROPOSED PROJECT – P1

	Mitigation Measure	Provision for Implementation	Capital	Recurring
Air Environment	Compaction, gradation and drainage on both sides for Haulage Road	Rental Dozer & drainage construction on haul road @ Rs. 10,000/- per hectare; and yearly maintenance @ Rs. 10,000/- per hectare	10000	10000
	Fixed Water Sprinkling Arrangements + Water sprinkling by own water tankers	Fixed Sprinkler Installation and New Water Tanker Cost for Capital; and Water Sprinkling (thrice a day) Cost for recurring	800000	50000
	Muffle blasting – To control fly rocks during blasting	Blasting face will be covered with sand bags / steel mesh / old tyres / used conveyor belts	0	5000
	Wet drilling procedure / latest eco-friendly drill machine with separate dust extractor unit	Dust extractor @ Rs. 25,000/- per unit deployed as capital & @ Rs. 2500 per unit recurring cost for maintenance - 2 Units	50000	5000
	No overloading of trucks/tippers/tractors	Manual Monitoring through Security guard	0	5000
	Stone carrying trucks will be covered by tarpaulin	Monitoring if trucks will be covered by tarpaulin	0	10000
	Enforcing speed limits of 20 km/hr within ML area	Installation of Speed Governers @ Rs. 5000/- per Tipper/Dumper deployed - 1 Units	5000	250
	Regular monitoring of exhaust fumes as per RTO norms	Monitoring of Exhaust Fumes by Manual Labour	0	5000
	Regular sweeping and maintenance of approach roads for at least about 200 m from ML Area	Provision for 2 labours @ Rs.10,000/labour (Contractual) per Hectare	0	20000
	Installing wheel wash system near gate of quarry	Installation + Maintenance + Supervision	50000	20000
Noise Environment	Source of noise will be during operation of transportation vehicles, HEMM for this proper maintenance will be done at regular intervals.	Provision made in Operating Cost	0	0
	Oiling & greasing of Transport vehicles and HEMM at regular interval will be done	Provision made in Operating Cost	0	0
	Adequate silencers will be provided in all the diesel engines of vehicles.	Provision made in Operating Cost	0	0

	It will be ensured that all transportation vehicles carry a fitness certificate.	Provision made in Operating Cost	0	0
	Safety tools and implements that are required will be kept adequately near blasting site at the time of charging.	Provision made in OHS part	0	0
	Line Drilling all along the boundary to reduce the PPV from blasting activity and implementing controlled blasting.	Provision made in Operating Cost	0	0
	Proper warning system before blasting will be adopted and clearance of the area before blasting will be ensured.	Blowing Whistle by Mining Mate / Blaster / Compentent Person	0	0
	Provision for Portable blaster shed	Installation of Portable blasting shelter	50000	2000
	NONEL Blasting will be practiced to control Ground vibration and fly rocks	Rs. 30/- per 6 Tonnes of Blasted Material	0	216905
Waste Management	Waste management (Spent Oil, Grease etc.,)	Provision for domestic waste collection and disposal through authorized agency	5000	20000
		Installation of dust bins	5000	2000
	Bio toilets will be made available outside mine lease on the land of owner itself	Provision made in Operating Cost	0	0
Mine Closure	1. Progressive Closure Activity - Surface Runoff managent	Provision for garland drain @ Rs. 10,000/- per Hectare with maintenance of Rs. 5,000/- per annum	10000	5000
	2. Progressive Closure Activity Barbed Wire Fencing to quarry area will be provisioned.	Per Hectare fencing Cost @ Rs. 2,00,000/- with Maintenance of Rs 10,000/- per annum	200000	10000
	3. Progressive Closure Activity Green belt development - 500 trees per one hectare - Proposal for 600 Trees - (250 Inside Lease Area & 350 Outside Lease Area)	Site clearance, preparation of land, digging of pits / trenches, soil amendments, transplantation of saplings @ 200 per plant (capital) for plantation inside the lease area and @ 30 per plant maintenance (recurring)	50000	7500

		Avenue Plantation @ 300 per plant (capital) for plantation outside the lease area and @ 30 per plant maintenance (recurring)	105000	10500
	4. Implementation of Final Mine Closure Actity as per Approved Mining Plan on Last Year	Few activities already covered as progressive closure activities as greenbelt development, wire fencing, garland drain. *For Final Closure Activities 15% of the proposed closure cost will be spent during the final mine closure stage - Last Year	41400	0
	5. Contribution towards Green Fund. As per TNMMCR 1959, Rule 35 A	The Contribution towards Green Funds @ 10% of Seigniorage fee are indicated as part of EMP Budge and not necessarily implemented in the Project Site	492208	
Implementation of EC, Mining Plan & DGMS Condition	Size 6' X 5' with blue background and white letters as mentioned in MoM Appendix II by the SEAC TN	Fixed Display Board at the Quarry Entrance as permanent structure mentioning Environmental Conditions	10000	1000
	Air, Water, Noise and Soil Quality Sampling every 6 Months for Compliance Report of EC Conditions	Submission of 2 Half Yearly Compliance - Lab Monitoring Report as per CPCB norms	0	50000
	Workers will be provided with Personal Protective Equipment's	Provision of PPE @ Rs. 4000/- per employee with recurring based on wear and tear (say, @ Rs. 1000/- per employee) - 14 Employees	56000	14000
	Health check up for workers will be provisioned	IME & PME Health check up @ Rs. 1000/- per employee	0	14000
	First aid facility will be provided	Provision of 2 Kits per Hectare @ Rs. 2000/-	0	2000
	Mine will have safety precaution signages, boards.	Provision for signages and boards made	10000	2000

	No parking will be provided on the transport routes. Separate provision on the south side of the hill will be made for vehicles /HEMMs. Flaggers will be deployed for traffic management	Parking area with shelter and flags @ Rs. 50,000/- per hectare project and Rs. 10,000/- as maintenance cost	50000	10000
	Installation of CCTV cameras in the mines and mine entrance	Camera 4 Nos, DVR, Monitor with internet facility	30000	5000
	Implementation as per Mining Plan and ensure safe quarry working	Mines Manager (1st Class / 2nd Class / Mine Foreman) under regulation 34 / 34 (6) of MMR, 1961 and Mining Mate under regulation 116 of MMR,1961 @ 40,000/- for Manager & @ 25,000/- for Foreman / Mate	0	780000
CER	As per MoEF &CC OM 22-65/2017-IA.III Dated 25.02.2021	Detailed Description in following slides and Budget allocation is included as per MoeEF & CC OM	500000	
TOTAL			**2488208**	**1282155**

Total Cost for the five years

Year	**Total Cost**

1st	Rs.37,70,363
2nd	Rs.13,46,263
3rd	Rs.14,13,576
4th	Rs.14,84,255
5th	Rs.15,99,867

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.

10. ENVIRONMENTAL MANAGEMENT PLAN - THIRU.K. VENKATRAMAN "P2"

10.0 GENERAL

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

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

10.1 ENVIRONMENTAL POLICY

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

The Proponent THIRU.K. VENKATRAMAN 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. Aesthetic of the Environment will not be affected. There is no major vegetation in the project area during the course of quarrying operation and after completion of the quarrying operation thick plantation will be developed under greenbelt development programme.

TABLE 10.1: PROPOSED CONTROLS FOR LAND ENVIRONMENT

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

Source: Proposed by FAE's & EIA Coordinator

10.3 SOIL MANAGEMENT

There is no overburden or waste anticipated from proposed project.

TABLE 10.2: PROPOSED CONTROLS FOR SOIL MANAGEMENT

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

Source: Proposed by FAE's & EIA Coordinator

10.4 WATER MANAGEMENT

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

The quarrying operation is proposed upto a depth of (18m AGL + 25m BGL), the water table in the area is 63 m – 68 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 access the impact due to the mining activities and the efficacy of the adopted air pollution control measures	Mines Manager
Provision of Dust Mask to all workers	Mines Manager
Greenbelt development all along the periphery of the project area	Mines Manager

Source: Proposed by FAE's & EIA Coordinator

10.6 NOISE POLLUTION CONTROL

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

TABLE 10.5: PROPOSED CONTROLS FOR NOISE ENVIRONMENT

CONTROL	RESPONSIBILITY
Development of thick greenbelt all along the Buffer Zone (7.5 Meters) of the project area to attenuate the noise and the same will be maintained	Mines Manager
Preventive maintenance of mining machinery and replacement of worn-out accessories to control noise generation	Mines Foreman
Deployment of mining equipment with an inbuilt mechanism to reduce noise	Mines Manager
Provision of earmuff / ear plugs to workers working in noise prone zones in the mines	Mining Mate
Provision of effective silencers for mining machinery and transport vehicles	Mines Manager
Provision of sound proof AC operator cabins to HEMM	Mines Manager
Sharp drill bits are used to minimize noise from drilling	Mines Foreman
Controlled blasting technologies are adopted by using delay detonators to minimize noise from blasting	Mines Manager
Annual ambient noise level monitoring are carried out in the project area and in surrounding villages to access the impact due to the mining activities and the efficacy of the adopted	Mines Manager

noise control measures. Additional noise control measures will be adopted if required as per the observations during monitoring	
Reduce maximum instantaneous charge using delays while blasting	Mining Mate
Change the burden and spacing by altering the drilling pattern and/or delay layout, or altering the hole inclination	Mines Manager
Undertake noise or vibration monitoring	Mines Manager

Source: Proposed by FAE's & EIA Coordinator

10.7 GROUND VIBRATION AND FLY ROCK CONTROL

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

TABLE 10.6: PROPOSED CONTROLS FOR GROUND VIBRATIONS & FLY ROCK

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

Source: Proposed by FAE's & EIA Coordinator

10.8 BIOLOGICAL ENVIRONMENT MANAGEMENT

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

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

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

10.8.1 Green Belt Development Plan

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

TABLE 10.7 PROPOSED GREENBELT ACTIVITIES FOR5 YEAR PLAN PERIOD -P2

Year	No. of tress proposed to be planted	Area to be covered	Name of the species	Survival rate expected in %
I	900	Safety zone, Un utilized area & Village roads	Neem, Pungam, Sengondrai, Panai, Naval	80

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

The objectives of the greenbelt development plan are –

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

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

10.8.2 Species Recommended for Plantation

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

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

TABLE 10.8: RECOMMENDED SPECIES TO PLANT IN THE GREENBELT

S.No	Botanical Name	Local Name	Importance
2.	Azadirachta indica	Neem, Vembu	Neem oil & neem products

Source: Proposed by FAE's & EIA Coordinator

10.9 OCCUPATIONAL SAFETY & HEALTH MANAGEMENT

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

10.9.1 Medical Surveillance and Examinations –

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

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

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

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

TABLE 10.9: MEDICAL EXAMINATION SCHEDULE

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

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

10.9.2 Proposed Occupational Health and Safety Measures –

- The mine site will have adequate drinking water supply so that workers do not get dehydrated.
- Lightweight and loose-fitting clothes having light colours will be preferred to wear.
- Noise exposure measurements will be taken to determine the need for noise control strategies.
- The personal protective equipment will be provided for mine workers.
- Supervisor will be instructed for reporting any problems with hearing protectors or noise control equipment.
- At noisy working activity, exposure time will be minimized.
- Dust generating sources will be identified and proper control measure will be adopted.
- Periodic medical examinations will be provided for all workers.
- Strict observance of the provisions of DGMS Acts, Rules and Regulations in respect of safety both by management and the workers.
- The width of road will be maintained more than thrice the width of the vehicle. A code of traffic rules will be implemented.
- In respect of contract work, safety code for contractors and workers will be implemented. They will be allowed to work under strict supervision of statutory person/officials only after they will impart training at vocational training centres. All personal protective equipment's will be provided to them.

- A safety committee meeting every month will be organized to discuss the safety of the mines and the persons employed.
- Celebration of annual mines safety week and environmental week in order to develop safety awareness and harmony amongst employees and co quarry owners.

FIGURE 10.1: PERSONAL PROTECTIVE EQUIPMENT TO THE MINE WORKERS

10.9.3 Health and Safety Training Programme

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

TABLE 10.10: LIST OF PERIODICAL TRAININGS PROPOSED FOR EMPLOYEES

Course	Personnel	Frequency	Duration	Instruction
New-Employee Training	All new employees exposed to mine hazards	Once	One week	Employee rights Supervisor responsibilities Self-rescue Respiratory devices Transportation controls Communication systems Escape and emergency evacuation Ground control hazards Occupational health hazards Electrical hazards

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

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

10.9.4 Budgetary Provision for Environmental Management –

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

TABLE 10.11: EMP BUDGET FOR PROPOSED PROJECT – P2

	Mitigation Measure	Provision for Implementation	Capital	Recurring
Air Environment	Compaction, gradation and drainage on both sides for Haulage Road	Rental Dozer & drainage construction on haul road @ Rs. 10,000/- per hectare; and yearly maintenance @ Rs. 10,000/- per hectare	15000	15000
	Fixed Water Sprinkling Arrangements + Water sprinkling by own water tankers	Fixed Sprinkler Installation and New Water Tanker Cost for Capital; and Water Sprinkling (thrice a day) Cost for recurring	800000	50000
	Muffle blasting – To control fly rocks during blasting	Blasting face will be covered with sand bags / steel mesh / old tyres / used conveyor belts	0	5000
	Wet drilling procedure / latest eco-friendly drill machine with separate dust extractor unit	Dust extractor @ Rs. 25,000/- per unit deployed as capital & @ Rs. 2500 per unit recurring cost for maintenance -5 Units	125000	12500
	No overloading of trucks/tippers/tractors	Manual Monitoring through Security guard	0	5000
	Stone carrying trucks will be covered by tarpaulin	Monitoring if trucks will be covered by tarpaulin	0	10000
	Enforcing speed limits of 20 km/hr within ML area	Installation of Speed Governers @ Rs. 5000/- per Tipper/Dumper deployed - 2 Units	10000	500
	Regular monitoring of exhaust fumes as per RTO norms	Monitoring of Exhaust Fumes by Manual Labour	0	5000
	Regular sweeping and maintenance of approach roads for at least about 200 m from ML Area	Provision for 2 labours @ Rs.10,000/labour (Contractual) per Hectare	0	30000
	Installing wheel wash system near gate of quarry	Installation + Maintenance + Supervision	50000	20000
Noise Environment	Source of noise will be during operation of transportation vehicles, HEMM for this proper maintenance will be done at regular intervals.	Provision made in Operating Cost	0	0
	Oiling & greasing of Transport vehicles and HEMM at regular interval will be done	Provision made in Operating Cost	0	0
	Adequate silencers will be provided in all the diesel engines of vehicles.	Provision made in Operating Cost	0	0

	It will be ensured that all transportation vehicles carry a fitness certificate.	Provision made in Operating Cost	0	0
	Safety tools and implements that are required will be kept adequately near blasting site at the time of charging.	Provision made in OHS part	0	0
	Line Drilling all along the boundary to reduce the PPV from blasting activity and implementing controlled blasting.	Provision made in Operating Cost	0	0
	Proper warning system before blasting will be adopted and clearance of the area before blasting will be ensured.	Blowing Whistle by Mining Mate / Blaster / Compentent Person	0	0
	Provision for Portable blaster shed	Installation of Portable blasting shelter	50000	2000
	NONEL Blasting will be practiced to control Ground vibration and fly rocks	Rs. 30/- per 6 Tonnes of Blasted Material	0	787062
Waste Management	Waste management (Spent Oil, Grease etc.,)	Provision for domestic waste collection and disposal through authorized agency	5000	20000
		Installation of dust bins	5000	2000
	Bio toilets will be made available outside mine lease on the land of owner itself	Provision made in Operating Cost	0	0
Mine Closure	1. Progressive Closure Activity - Surface Runoff managent	Provision for garland drain @ Rs. 10,000/- per Hectare with maintenance of Rs. 5,000/- per annum	15000	5000
	2. Progressive Closure Activity Barbed Wire Fencing to quarry area will be provisioned.	Per Hectare fencing Cost @ Rs. 2,00,000/- with Maintenance of Rs 10,000/- per annum	300000	10000
	3. Progressive Closure Activity Green belt development - 500 trees per one hectare - Proposal for 900 Trees - (350 Inside Lease Area & 550 Outside Lease Area)	Site clearance, preparation of land, digging of pits / trenches, soil amendments, transplantation of saplings @ 200 per plant (capital) for plantation inside the lease area and @ 30 per plant maintenance (recurring)	70000	10500

		Avenue Plantation @ 300 per plant (capital) for plantation outside the lease area and @ 30 per plant maintenance (recurring)	165000	16500
	4. Implementation of Final Mine Closure Actity as per Approved Mining Plan on Last Year	Few activities already covered as progressive closure activities as greenbelt development, wire fencing, garland drain. *For Final Closure Activities 15% of the proposed closure cost will be spent during the final mine closure stage - Last Year	50400	0
	5. Contribution towards Green Fund. As per TNMMCR 1959, Rule 35 A	The Contribution towards Green Funds @ 10% of Seigniorage fee are indicated as part of EMP Budge and not necessarily implemented in the Project Site	1786024	
Implementation of EC, Mining Plan & DGMS Condition	Size 6' X 5' with blue background and white letters as mentioned in MoM Appendix II by the SEAC TN	Fixed Display Board at the Quarry Entrance as permanent structure mentioning Environmental Conditions	10000	1000
	Air, Water, Noise and Soil Quality Sampling every 6 Months for Compliance Report of EC Conditions	Submission of 2 Half Yearly Compliance - Lab Monitoring Report as per CPCB norms	0	50000
	Workers will be provided with Personal Protective Equipment's	Provision of PPE @ Rs. 4000/- per employee with recurring based on wear and tear (say, @ Rs. 1000/- per employee) - 18 Employees	72000	18000
	Health check up for workers will be provisioned	IME & PME Health check up @ Rs. 1000/- per employee	0	18000
	First aid facility will be provided	Provision of 2 Kits per Hectare @ Rs. 2000/-	0	3000
	Mine will have safety precaution signages, boards.	Provision for signages and boards made	10000	2000

	No parking will be provided on the transport routes. Separate provision on the south side of the hill will be made for vehicles /HEMMs. Flaggers will be deployed for traffic management	Parking area with shelter and flags @ Rs. 50,000/- per hectare project and Rs. 10,000/- as maintenance cost	75000	10000
	Installation of CCTV cameras in the mines and mine entrance	Camera 4 Nos, DVR, Monitor with internet facility	30000	5000
	Implementation as per Mining Plan and ensure safe quarry working	Mines Manager (1st Class / 2nd Class / Mine Foreman) under regulation 34 / 34 (6) of MMR, 1961 and Mining Mate under regulation 116 of MMR,1961 @ 40,000/- for Manager & @ 25,000/- for Foreman / Mate	0	780000
CER	As per MoEF &CC OM 22-65/2017-IA.III Dated 25.02.2021	Detailed Description in following slides and Budget allocation is included as per MoeEF & CC OM	500000	
TOTAL			**40,93,024**	**18,93,062**

Total Cost for the five years

Year	Total Cost
1st	Rs.59,86,086
2nd	Rs.19,87,715
3rd	Rs.20,87,100
4th	Rs.21,91,455
5th	Rs.23,51,428

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.

10. ENVIRONMENTAL MANAGEMENT PLAN - TMT.S. SUMATHI "P3"

10.0 GENERAL

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

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

10.1 ENVIRONMENTAL POLICY

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

The Proponent Tmt.S. SUMATHI 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. Aesthetic of the Environment will not be affected. There is no major vegetation in the project area during the course of quarrying operation and after completion of the quarrying operation thick plantation will be developed under greenbelt development programme.

TABLE 10.1: PROPOSED CONTROLS FOR LAND ENVIRONMENT

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

Source: Proposed by FAE's & EIA Coordinator

10.3 SOIL MANAGEMENT

There is no overburden or waste anticipated from proposed project.

TABLE 10.2: PROPOSED CONTROLS FOR SOIL MANAGEMENT

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

Source: Proposed by FAE's & EIA Coordinator

10.4 WATER MANAGEMENT

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

The quarrying operation is proposed upto a depth of (33m AGL+ 30 m BGL) the water table in the area is 63m – 68m 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 access the impact due to the mining activities and the efficacy of the adopted air pollution control measures	Mines Manager
Provision of Dust Mask to all workers	Mines Manager
Greenbelt development all along the periphery of the project area	Mines Manager

Source: Proposed by FAE's & EIA Coordinator

10.6 NOISE POLLUTION CONTROL

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

TABLE 10.5: PROPOSED CONTROLS FOR NOISE ENVIRONMENT

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

Change the burden and spacing by altering the drilling pattern and/or delay layout, or altering the hole inclination	Mines Manager
Undertake noise or vibration monitoring	Mines Manager

Source: Proposed by FAE's & EIA Coordinator

10.7 GROUND VIBRATION AND FLY ROCK CONTROL

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

TABLE 10.6: PROPOSED CONTROLS FOR GROUND VIBRATIONS & FLY ROCK

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

Source: Proposed by FAE's & EIA Coordinator

10.8 BIOLOGICAL ENVIRONMENT MANAGEMENT

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

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

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

10.8.1 Green Belt Development Plan

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

TABLE 10.7 PROPOSED GREENBELT ACTIVITIES FOR5 YEAR PLAN PERIOD -P3

Year	No. of tress proposed to be planted	Area to be covered	Name of the species	Survival rate expected in %
I	900	Safety zone, Un utilized area & Village roads	Neem, Pungam, Sengondrai, Panai, Naval	80

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

The objectives of the greenbelt development plan are –

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

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

10.8.2 Species Recommended for Plantation

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

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

TABLE 10.8: RECOMMENDED SPECIES TO PLANT IN THE GREENBELT

S.No	Botanical Name	Local Name	Importance
3.	Azadirachta indica	Neem, Vembu	Neem oil & neem products

Source: Proposed by FAE's & EIA Coordinator

10.9 OCCUPATIONAL SAFETY & HEALTH MANAGEMENT

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

10.9.1 Medical Surveillance and Examinations –

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

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

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

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

TABLE 10.9: MEDICAL EXAMINATION SCHEDULE

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

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

10.9.2 Proposed Occupational Health and Safety Measures –

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

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

FIGURE 10.1: PERSONAL PROTECTIVE EQUIPMENT TO THE MINE WORKERS

10.9.3 Health and Safety Training Programme

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

TABLE 10.10: LIST OF PERIODICAL TRAININGS PROPOSED FOR EMPLOYEES

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

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

10.9.4 Budgetary Provision for Environmental Management –

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

TABLE 10.11: EMP BUDGET FOR PROPOSED PROJECT – P3

	Mitigation Measure	Provision for Implementation	Capital	Recurring
Air Environment	Compaction, gradation and drainage on both sides for Haulage Road	Rental Dozer & drainage construction on haul road @ Rs. 10,000/- per hectare; and yearly maintenance @ Rs. 10,000/- per hectare	15000	15000
	Fixed Water Sprinkling Arrangements + Water sprinkling by own water tankers	Fixed Sprinkler Installation and New Water Tanker Cost for Capital; and Water Sprinkling (thrice a day) Cost for recurring	800000	50000
	Muffle blasting – To control fly rocks during blasting	Blasting face will be covered with sand bags / steel mesh / old tyres / used conveyor belts	0	5000
	Wet drilling procedure / latest eco-friendly drill machine with separate dust extractor unit	Dust extractor @ Rs. 25,000/- per unit deployed as capital & @ Rs. 2500 per unit recurring cost for maintenance -7 Units	175000	17500
	No overloading of trucks/tippers/tractors	Manual Monitoring through Security guard	0	5000
	Stone carrying trucks will be covered by tarpaulin	Monitoring if trucks will be covered by tarpaulin	0	10000
	Enforcing speed limits of 20 km/hr within ML area	Installation of Speed Governers @ Rs. 5000/- per Tipper/Dumper deployed - 4 Units	20000	1000
	Regular monitoring of exhaust fumes as per RTO norms	Monitoring of Exhaust Fumes by Manual Labour	0	5000
	Regular sweeping and maintenance of approach roads for at least about 200 m from ML Area	Provision for 2 labours @ Rs.10,000/labour (Contractual) per Hectare	0	30000
	Installing wheel wash system near gate of quarry	Installation + Maintenance + Supervision	50000	20000
Noise Environment	Source of noise will be during operation of transportation vehicles, HEMM for this proper maintenance will be done at regular intervals.	Provision made in Operating Cost	0	0
	Oiling & greasing of Transport vehicles and HEMM at regular interval will be done	Provision made in Operating Cost	0	0

	Adequate silencers will be provided in all the diesel engines of vehicles.	Provision made in Operating Cost	0	0
	It will be ensured that all transportation vehicles carry a fitness certificate.	Provision made in Operating Cost	0	0
	Safety tools and implements that are required will be kept adequately near blasting site at the time of charging.	Provision made in OHS part	0	0
	Line Drilling all along the boundary to reduce the PPV from blasting activity and implementing controlled blasting.	Provision made in Operating Cost	0	0
	Proper warning system before blasting will be adopted and clearance of the area before blasting will be ensured.	Blowing Whistle by Mining Mate / Blaster / Compentent Person	0	0
	Provision for Portable blaster shed	Installation of Portable blasting shelter	50000	2000
	NONEL Blasting will be practiced to control Ground vibration and fly rocks	Rs. 30/- per 6 Tonnes of Blasted Material	0	805004
Waste Management	Waste management (Spent Oil, Grease etc.,)	Provision for domestic waste collection and disposal through authorized agency	5000	20000
		Installation of dust bins	5000	2000
	Bio toilets will be made available outside mine lease on the land of owner itself	Provision made in Operating Cost	0	0
Mine Closure	1. Progressive Closure Activity - Surface Runoff managent	Provision for garland drain @ Rs. 10,000/- per Hectare with maintenance of Rs. 5,000/- per annum	15000	5000
	2. Progressive Closure Activity Barbed Wire Fencing to quarry area will be provisioned.	Per Hectare fencing Cost @ Rs. 2,00,000/- with Maintenance of Rs 10,000/- per annum	300000	10000
	3. Progressive Closure Activity Green belt development - 500 trees per one hectare - Proposal for 900 Trees - (350 Inside Lease Area & 550 Outside Lease Area)	Site clearance, preparation of land, digging of pits / trenches, soil amendments, transplantation of saplings @ 200 per plant (capital) for plantation inside the lease area and @ 30 per plant maintenance (recurring)	70000	10500

		Avenue Plantation @ 300 per plant (capital) for plantation outside the lease area and @ 30 per plant maintenance (recurring)	165000	16500
	4. Implementation of Final Mine Closure Actity as per Approved Mining Plan on Last Year	Few activities already covered as progressive closure activities as greenbelt development, wire fencing, garland drain. *For Final Closure Activities 15% of the proposed closure cost will be spent during the final mine closure stage - Last Year	50400	0
	5. Contribution towards Green Fund. As per TNMMCR 1959, Rule 35 A	The Contribution towards Green Funds @ 10% of Seigniorage fee are indicated as part of EMP Budge and not necessarily implemented in the Project Site	1826740	
Implementation of EC, Mining Plan & DGMS Condition	Size 6’ X 5’ with blue background and white letters as mentioned in MoM Appendix II by the SEAC TN	Fixed Display Board at the Quarry Entrance as permanent structure mentioning Environmental Conditions	10000	1000
	Air, Water, Noise and Soil Quality Sampling every 6 Months for Compliance Report of EC Conditions	Submission of 2 Half Yearly Compliance - Lab Monitoring Report as per CPCB norms	0	50000
	Workers will be provided with Personal Protective Equipment's	Provision of PPE @ Rs. 4000/- per employee with recurring based on wear and tear (say, @ Rs. 1000/- per employee) - 18 Employees	72000	18000
	Health check up for workers will be provisioned	IME & PME Health check up @ Rs. 1000/- per employee	0	18000
	First aid facility will be provided	Provision of 2 Kits per Hectare @ Rs. 2000/-	0	3000
	Mine will have safety precaution signages, boards.	Provision for signages and boards made	10000	2000

	No parking will be provided on the transport routes. Separate provision on the south side of the hill will be made for vehicles /HEMMs. Flaggers will be deployed for traffic management	Parking area with shelter and flags @ Rs. 50,000/- per hectare project and Rs. 10,000/- as maintenance cost	75000	10000
	Installation of CCTV cameras in the mines and mine entrance	Camera 4 Nos, DVR, Monitor with internet facility	30000	5000
	Implementation as per Mining Plan and ensure safe quarry working	Mines Manager (1st Class / 2nd Class / Mine Foreman) under regulation 34 / 34 (6) of MMR, 1961 and Mining Mate under regulation 116 of MMR,1961 @ 40,000/- for Manager & @ 25,000/- for Foreman / Mate	0	780000
CER	As per MoEF &CC OM 22-65/2017-IA.III Dated 25.02.2021	Detailed Description in following slides and Budget allocation is included as per MoeEF & CC OM	500000	
TOTAL			**41,93,740**	**19,16,504**

Total Cost for the five years

Year	Total Cost
1st	Rs.6110245
2nd	Rs.2012329
3rd	Rs.2112946
4th	Rs.2218593
5th	Rs.2379923

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.

10. ENVIRONMENTAL MANAGEMENT PLAN - THIRU.A. RAJARAJACHOLAN "P4"

10.0 GENERAL

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

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

10.1 ENVIRONMENTAL POLICY

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

The Proponent THIRU.A. RAJARAJACHOLAN 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. Aesthetic of the Environment will not be affected. There is no major vegetation in the project area during the course of quarrying operation and after completion of the quarrying operation thick plantation will be developed under greenbelt development programme.

TABLE 10.1: PROPOSED CONTROLS FOR LAND ENVIRONMENT

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

Source: Proposed by FAE's & EIA Coordinator

10.3 SOIL MANAGEMENT

There is no overburden or waste anticipated from proposed project.

TABLE 10.2: PROPOSED CONTROLS FOR SOIL MANAGEMENT

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

Source: Proposed by FAE's & EIA Coordinator

10.4 WATER MANAGEMENT

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

The quarrying operation is proposed upto a depth of 51 m BGL, the water table in the area is 63 m – 68 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 access the impact due to the mining activities and the efficacy of the adopted air pollution control measures	Mines Manager
Provision of Dust Mask to all workers	Mines Manager
Greenbelt development all along the periphery of the project area	Mines Manager

Source: Proposed by FAE's & EIA Coordinator

10.6 NOISE POLLUTION CONTROL

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

TABLE 10.5: PROPOSED CONTROLS FOR NOISE ENVIRONMENT

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

Change the burden and spacing by altering the drilling pattern and/or delay layout, or altering the hole inclination	Mines Manager
Undertake noise or vibration monitoring	Mines Manager

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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.

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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
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ensure blast holes are adequately stemmed for the depth of the hole and stemmed with suitable angular material	Mines Foreman

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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.
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- 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.

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TABLE 10.7 PROPOSED GREENBELT ACTIVITIES FOR 5 YEAR PLAN PERIOD -P4

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

The objectives of the greenbelt development plan are

- Provide a green belt around the periphery of the quarry area to combat the dispersal of dust in the adjoining areas,
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- 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.

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

TABLE 10.9: MEDICAL EXAMINATION SCHEDULE

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

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

10.9.2 Proposed Occupational Health and Safety Measures –

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

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

FIGURE 10.1: PERSONAL PROTECTIVE EQUIPMENT TO THE MINE WORKERS

10.9.3 Health and Safety Training Programme

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

TABLE 10.10: LIST OF PERIODICAL TRAININGS PROPOSED FOR EMPLOYEES

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

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

10.9.4 Budgetary Provision for Environmental Management –

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

TABLE 10.11: EMP BUDGET FOR PROPOSED PROJECT – P4

	Mitigation Measure	Provision for Implementation	Capital	Recurring
Air Environment	Compaction, gradation and drainage on both sides for Haulage Road	Rental Dozer & drainage construction on haul road @ Rs. 10,000/- per hectare; and yearly maintenance @ Rs. 10,000/- per hectare	15000	15000
	Fixed Water Sprinkling Arrangements + Water sprinkling by own water tankers	Fixed Sprinkler Installation and New Water Tanker Cost for Capital; and Water Sprinkling (thrice a day) Cost for recurring	800000	50000
	Muffle blasting – To control fly rocks during blasting	Blasting face will be covered with sand bags / steel mesh / old tyres / used conveyor belts	0	5000
	Wet drilling procedure / latest eco-friendly drill machine with separate dust extractor unit	Dust extractor @ Rs. 25,000/- per unit deployed as capital & @ Rs. 2500 per unit recurring cost for maintenance -5 Units	125000	12500
	No overloading of trucks/tippers/tractors	Manual Monitoring through Security guard	0	5000
	Stone carrying trucks will be covered by tarpaulin	Monitoring if trucks will be covered by tarpaulin	0	10000
	Enforcing speed limits of 20 km/hr within ML area	Installation of Speed Governers @ Rs. 5000/- per Tipper/Dumper deployed - 2 Units	10000	500
	Regular monitoring of exhaust fumes as per RTO norms	Monitoring of Exhaust Fumes by Manual Labour	0	5000
	Regular sweeping and maintenance of approach roads for at least about 200 m from ML Area	Provision for 2 labours @ Rs.10,000/labour (Contractual) per Hectare	0	30000
	Installing wheel wash system near gate of quarry	Installation + Maintenance + Supervision	50000	20000
Noise Environment	Source of noise will be during operation of transportation vehicles, HEMM for this proper maintenance will be done at regular intervals.	Provision made in Operating Cost	0	0
	Oiling & greasing of Transport vehicles and HEMM at regular interval will be done	Provision made in Operating Cost	0	0

	Adequate silencers will be provided in all the diesel engines of vehicles.	Provision made in Operating Cost	0	0
	It will be ensured that all transportation vehicles carry a fitness certificate.	Provision made in Operating Cost	0	0
	Safety tools and implements that are required will be kept adequately near blasting site at the time of charging.	Provision made in OHS part	0	0
	Line Drilling all along the boundary to reduce the PPV from blasting activity and implementing controlled blasting.	Provision made in Operating Cost	0	0
	Proper warning system before blasting will be adopted and clearance of the area before blasting will be ensured.	Blowing Whistle by Mining Mate / Blaster / Compentent Person	0	0
	Provision for Portable blaster shed	Installation of Portable blasting shelter	50000	2000
	NONEL Blasting will be practiced to control Ground vibration and fly rocks	Rs. 30/- per 6 Tonnes of Blasted Material	0	781690
Waste Management	Waste management (Spent Oil, Grease etc.,)	Provision for domestic waste collection and disposal through authorized agency	5000	20000
		Installation of dust bins	5000	2000
	Bio toilets will be made available outside mine lease on the land of owner itself	Provision made in Operating Cost	0	0
Mine Closure	1. Progressive Closure Activity - Surface Runoff managent	Provision for garland drain @ Rs. 10,000/- per Hectare with maintenance of Rs. 5,000/- per annum	15000	5000
	2. Progressive Closure Activity Barbed Wire Fencing to quarry area will be provisioned.	Per Hectare fencing Cost @ Rs. 2,00,000/- with Maintenance of Rs 10,000/- per annum	300000	10000
	3. Progressive Closure Activity Green belt development - 500 trees per one hectare - Proposal for 900 Trees - (350 Inside Lease Area & 550 Outside Lease Area)	Site clearance, preparation of land, digging of pits / trenches, soil amendments, transplantation of saplings @ 200 per plant (capital) for plantation inside the lease area and @ 30 per plant maintenance (recurring)	70000	10500

		Avenue Plantation @ 300 per plant (capital) for plantation outside the lease area and @ 30 per plant maintenance (recurring)	165000	16500
	4. Implementation of Final Mine Closure Actity as per Approved Mining Plan on Last Year	Few activities already covered as progressive closure activities as greenbelt development, wire fencing, garland drain. *For Final Closure Activities 15% of the proposed closure cost will be spent during the final mine closure stage - Last Year	50400	0
	5. Contribution towards Green Fund. As per TNMMCR 1959, Rule 35 A	The Contribution towards Green Funds @ 10% of Seigniorage fee are indicated as part of EMP Budge and not necessarily implemented in the Project Site	1773835	
Implementation of EC, Mining Plan & DGMS Condition	Size 6’ X 5’ with blue background and white letters as mentioned in MoM Appendix II by the SEAC TN	Fixed Display Board at the Quarry Entrance as permanent structure mentioning Environmental Conditions	10000	1000
	Air, Water, Noise and Soil Quality Sampling every 6 Months for Compliance Report of EC Conditions	Submission of 2 Half Yearly Compliance - Lab Monitoring Report as per CPCB norms	0	50000
	Workers will be provided with Personal Protective Equipment's	Provision of PPE @ Rs. 4000/- per employee with recurring based on wear and tear (say, @ Rs. 1000/- per employee) - 18 Employees	72000	18000
	Health check up for workers will be provisioned	IME & PME Health check up @ Rs. 1000/- per employee	0	18000
	First aid facility will be provided	Provision of 2 Kits per Hectare @ Rs. 2000/-	0	3000
	Mine will have safety precaution signages, boards.	Provision for signages and boards made	10000	2000

	No parking will be provided on the transport routes. Separate provision on the south side of the hill will be made for vehicles /HEMMs. Flaggers will be deployed for traffic management	Parking area with shelter and flags @ Rs. 50,000/- per hectare project and Rs. 10,000/- as maintenance cost	75000	10000
	Installation of CCTV cameras in the mines and mine entrance	Camera 4 Nos, DVR, Monitor with internet facility	30000	5000
	Implementation as per Mining Plan and ensure safe quarry working	Mines Manager (1st Class / 2nd Class / Mine Foreman) under regulation 34 / 34 (6) of MMR, 1961 and Mining Mate under regulation 116 of MMR,1961 @ 40,000/- for Manager & @ 25,000/- for Foreman / Mate	0	780000
CER	As per MoEF &CC OM 22-65/2017-IA.III Dated 25.02.2021	Detailed Description in following slides and Budget allocation is included as per MoeEF & CC OM	500000	
TOTAL			**4080835**	**1887690**

Total Cost for the five years

Year	Total Cost
1st	Rs.59,68,525
2nd	Rs.19,82,075
3rd	Rs.20,81,178
4th	Rs.21,85,237
5th	Rs.23,44,899

Cost inflation 5% per annum

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

10.10 CONCLUSION –

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

11. SUMMARY AND CONCLUSION

Palapatti Rough Stone Quarry (Cluster Extent 5.50.0 ha) falls under “B” category as per MoEF & CC Notification (S.O. 3977 (E)).

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

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

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

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

Sustainable and modern mining leads us to see positive impact of mining operation and providing consistent employment for nearly 68 people directly in the cluster and indirectly around 100 people.

As discussed, it is safe to say that the proposed quarries are not likely to cause any significant impact to the ecology of the area, as adequate preventive measures will be adopted to keep the various pollutants within the permissible limits. Green belt development around the area will also be taken up as an effective pollution mitigate technique, as well as to serve as biological indicators for the pollutants released from the Palapatti Rough Stone quarry (Cluster Extent: 5.50.0 ha).

12. DISCLOSURE OF CONSULTANT

The Project Proponent:

1. Thiru.S.Dhanapal
2. Thiru.K.Venkatraman,
3. Tmt.S.Sumathi,
4. Thiru.A.Rajarajacholan,

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

Name and address of the consultancy:

GEO EXPLORATION AND MINING SOLUTIONS

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

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

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

Abbreviations

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

DECLARATION BY EXPERTS CONTRIBUTING TO THE EIA/EMP

Declaration by experts contributing to the EIA/EMP of Palapatti Rough Stone Quarry Project over a Cluster Extent of 5.50.0 ha at Palapatti Village of Valapadi Taluk, Salem District of Tamil Nadu. It is also certified that information furnished in the above EIA study are true and correct to the best of our knowledge.

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

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

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

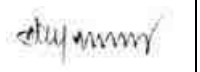
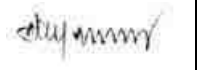
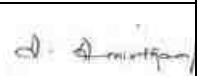
Date & Signature:

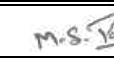
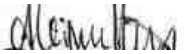
Period of Involvement: **January 2019 to till date**

Associated Team Member with EIA Coordinator:

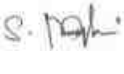
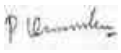
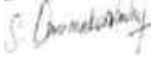
1. **Mr. S. Nagamani**
2. **Mr. Viswathanan**
3. **Mr. Santhoshkumar**
4. **Mr. S. Ilavarasan**

FUNCTIONAL AREA EXPERTS ENGAGED IN THE PROJECT

Sl. No.	Functional Area	Involvement	Name of the Expert/s	Signature
1	AP	▪ Identification of different sources of air pollution due to the proposed mine activity ▪ Prediction of air pollution and propose mitigation measures / control measures	Mr. A. Jagannathan	
2	WP	▪ Suggesting water treatment systems, drainage facilities ▪ Evaluating probable impacts of effluent/waste water discharges into the receiving environment/water bodies and suggesting control measures.	Dr. M. Ifthikhar Ahmed	
			Mr. N. Senthilkumar	
3	HG	▪ Interpretation of ground water table and predict impact and propose mitigation measures. ▪ Analysis and description of aquifer Characteristics	Dr. P. Thangaraju	
4	GEO	▪ Field Survey for assessing the regional and localgeology of the area. ▪ Preparation of mineral and geological maps. ▪ Geology and Geo morphological analysis/description and Stratigraphy/Lithology.	Dr. M. Ifthikhar Ahmed	
			Dr. P. Thangaraju	
5	SE	▪ Revision in secondary data as per Census ofIndia, 2011. ▪ Impact Assessment & Preventive ManagementPlan ▪ Corporate Environment Responsibility.	Mrs. K. Anitha	
6	EB	▪ Collection of Baseline data of Flora and Fauna. ▪ Identification of species labelled as Rare, Endangered and threatened as per IUCN list. ▪ Impact of the project on flora and fauna. ▪ Suggesting species for greenbelt development.	Mrs. Amirtham	
			Mr. Alagappa Moses	
7	RH	▪ Identification of hazards and hazardous substances	Mr. N. Senthilkumar	

		▪ Risks and consequences analysis ▪ Vulnerability assessment ▪ Preparation of Emergency Preparedness Plan ▪ Management plan for safety.	Mr. S. Pavel	
			Mr. J. R. Vikram Krishna	
8	LU	▪ Construction of Land use Map ▪ Impact of project on surrounding land use ▪ Suggesting post closure sustainable land use and mitigative measures.	Mr. A. Allimuthu	
9	NV	▪ Identify impacts due to noise and vibrations ▪ Suggesting appropriate mitigation measures for EMP.	Mr. A. Jagannathan	
10	AQ	▪ Identifying different source of emissions and propose predictions of incremental GLC using AERMOD. ▪ Recommending mitigations measures for EMP	Mr. N. Senthilkumar	
11	SC	▪ Assessing the impact on soil environment and proposed mitigation measures for soil conservation	Dr. M. Ifthikhar Ahmed	
12	SHW	▪ Identify source of generation of non-hazardous solid waste and hazardous waste. ▪ Suggesting measures for minimization of generation of waste and how it can be reused or recycled.	Mr. A. Jagannathan	
			Mr. J. R. Vikram Krishna	

LIST OF TEAM MEMBERS ENGAGED IN THIS PROJECT

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

6	Mr. S. Ilavarasan	LU; SC	▪ Site Visit with FAE ▪ Assisting FAE in preparation of land use maps ▪ Provide inputs & Assisting FAE with soil conservation methods and identifying impacts	
7	Mr. E. Vadivel	HG	▪ Site Visit with FAE ▪ Assist FAE & provide inputs on aquifer characteristics, ground water level/table ▪ Assist with methods of ground water recharge and conduct pump test, flow rate	
8	Mr. D. Dinesh	NV	▪ Site Visit with FAE ▪ Assist FAE and provide inputs on impacts due to proposed mine activity and suggest mitigation measures ▪ Assist FAE with prediction modelling	
9	Mr. Panneer Selvam	EB	▪ Site Visit with FAE ▪ Assist FAE with collection of baseline data ▪ Provide inputs and assist with labelling of Flora and Fauna	
10	Mrs. Nathiya	EB	▪ Site Visit with FAE ▪ Assist FAE with collection of baseline data ▪ Provide inputs and assist with labelling of Flora and Fauna	

DECLARATION BY THE HEAD OF THE ACCREDITED CONSULTANT ORGANIZATION

I, Dr. M. Ifthikhar Ahmed, Managing Partner, Geo Exploration and Mining Solutions, hereby, confirm that the above-mentioned Functional Area Experts and Team Members prepared the EIA/EMP for Palapatti Rough Stone Quarry Project over a Cluster Extent of 5.50.0ha at Palapatti Village of Valapadi Taluk, Salem 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. Ifhikhar Ahmed**

Designation: **Managing Partner**

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

NABET Certificate No & Issue Date: **NABET/EIA/2225/RA 0276 Dated: 20-02-2023**
Validity: **Valid till 06.8.2025**