DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT SUBMITTED TO

EXPERT APPRAISAL COMMITTEE (EAC) /MINISTRY OF ENVIRONMENT AND FOREST & CLIMATE CHANGE

FOR OBTAINING

Environmental Clearance under EIA Notification – 2006
Schedule Sl. No. 1 (a) : VIOLATION Category 'A'

EXTENT = 180.83.0 ha

Total Production (ROM) Proposed (2023-28)– 703411 Tons

Life of the mine 22 years, Lease valid upto 2048

(As per MMDR Amendment Act 2015, the validity of lease period shall be deemed to have been extended upto 31.03.2030 years)

ALANGULAM & LAKSHMIPURAM LIMESTONE MINES

at

Alangulam & Lakshmipuram Village, Sivakasi Taluk, Virudhunagar District, Tamil Nadu

G.O No & Date	Village and Taluk	Total Extent (Ha)	MoEFCC ToR obtained
G.O.No 215, 18.09.1995	Alangulam & Lakshmipuram Village, Sivakasi Taluk	180.83.0 Ha	F.No.23-167/2018-1A.III (V) dated 26th July 2021
Total		180.83.0 Ha	

APPLICANT

M/S TAMIL NADU CEMENTS CORPORATION LTD.
(A GOVERNMENT OF TAMIL NADU UNDERTAKING)
5th Floor, Aavin Illam, No.3A, Pasumpon Muthuramalingam Salai, Nandanam, Chennai – 600 035

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'
Certificate No: NABET/EIA/2225/RA0276
Phone: 0427-2431989,
Email: ifthiahmed@gmail.com, geothangam@gmail.com
Web: www.gemssalem.com

Baseline survey: March 2023 to May 2023 (Summer)

AUGUST- 2023

TERMS OF REFERENCES

M/s Tamil Nadu Cements Corporation Ltd.

Alangulam & Lakshmipuram Limestone mines Extent (180.83.0 Ha)
MoEF&CC, Govt of India, New Delhi vide letter no. F.No.23-167/2018-1A.III (V) dated 26th July 2021

Specific Terms of References		
Sno	**Conditons**	**Referneces**
1	The state government/SPCB to take action against the project proponent under the provisions of section 19 of the Environment (Protection) Act 1986, and further no consent to operate to be issued till the project is granted EC.	Noted and agreed
2	The project proponent shall be required to submit a bank gurantee equivalent to the amount of remediation plan and natural and community resource augmentation plan with the SPCB prior to the grant of EC. The quantum shall be recommended by the EAC and finalized by the requlatory authority. The bank gurantee shall be released after successful implementation of the EMP, followed by recommendations of the EAC and approval of the requlatory authority.	Noted and agreed
3	Assessment of ecological damage with respect to air, water, land and other environmental attributes. The collection and analysis of data shall be done by an environmental laboratory duly notified under the Environmental (Protection) Act 1986. Or an Environmental laboratory accredited by NABL, or a laboratory of a Council of scientific and Industrial research (CSIR) institution working in the field of environmental.	All environmental attributed Accredited NABL laboratory.
4	Preparation of EMP comprising remediation plan and natural and community resource augmentation plan corresponding to the ecological damage assessed and economic benefits derived due to violation.	Include 13th chapter the natural and community resource augmentation plan in the Draft EIA report
5	The remediation plan and the natural and community resource augmentation plan to be prepared as an independent chapter in the EIA report by the accredited consultants.	Include 13th chapter the natural and community resource augmentation plan in the Draft EIA report
6	The PP is required to conduct public hearing as per EIA notification, 2006.	Noted and agreed
7	One season base line data is to be collected and reported in the EIA/EMP report.	Noted Summer season (Mar-May 2023)
8	Mine plan approved by Indian Bureau of mines to be submiied.	Approved ROMP plan attached
9	The PP should also address the all the issues raised during public hearing along with commitments made and with fund provision to address above issues in tabular form to be submitted along with EIA/EMP report.	Noted and agreed
10	Detailed hydrological study to be carried out in core and buffer zone of the project as per GEC 2015 guidelines	Attached annexure Detailed hydrological study
11	In case of Violation of above undertaking, the ToR/environmental clearance shall be liable to be terminated forthwith.	Noted and agreed
12	Budget of remediation plan and natural and community resource augmentation plan corresponding to the ecological damage shall be completed within three years and to be prepared accordingly.	Chapter-13 detailed Budget of remediation plan and natural and community resource augmentation plan

13	The Action plan on the compliance of the recommendation of the CAG as per Ministry's circular no J-11013/71/2016-1A. l(M), Dated 25.10.2017 needs to be submitted at the time of appraisal of the project and induced in the EIA/EMP report.	Noted and agreed

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 a violation category project. This proposal falls under A Category.
2	A copy of the document in support of the fact that the Proponent is the rightful lessee of the mine should be given.	The applied land for quarrying is a Government and Patta Land. Attached as Annexure-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.	All documents including approved mine plan, EIA is compatible with one another in terms of the mine lease area, production level, waste generation and its management, mining technology etc. and should be in the name of lessee.
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).	All corner coordinates of the mine lease area, superimposed on a High-Resolution Imagery/ toposheet, topographic sheet is present in Ch-2, Map 2-2 and 2-3
5	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.
6	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	It is an opencast quarrying operation The height and width of the bench will be maintained as 9m with 60^0 bench angles.

	proposed safeguard measures in each case should also be provided.	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.
7	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.
8	Land use of the study area delineating forest area, agricultural land, grazing land, wildlife sanctuary, national park, migratory routes of fauna, water bodies, human settlements and other ecological features should be indicated. Land use plan of the mine lease area should be prepared to encompass preoperational, operational and post operational phases and submitted. Impact, if any, of change of land use should be given.	Land use and land cover of the study area is discussed in Chapter No. 3. Land use plan of the project area showing pre-operational, operational and post-operational phases are discussed in Chapter No. 2, Table No 2.3.
9	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.
10	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. This ToR point is not applicable for this project as there is no forest land within the 10km radius of the project area.
11	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.
12	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.
13	The vegetation in the RF / PF areas in the study area, with necessary details, should be given.	No Reserve Forest within the Study Area.

14	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.
15	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.
16	A detailed biological study of the study area [core zone and buffer zone (10 KM radius of the periphery of the mine lease)] shall be carried out. Details of flora and fauna, endangered, endemic and RET Species duly authenticated, separately for core and buffer zone should be furnished based on such primary field survey, clearly indicating the Schedule of the fauna present. In case of any scheduled-I fauna found in the study area, the necessary plan along with budgetary provisions for their conservation should be prepared in consultation with State Forest and Wildlife Department and details furnished. Necessary allocation of funds for implementing the same should be made as part of the project cost.	Detailed biological study of the study area [core zone and buffer zone (10 km radius of the periphery of the mine lease)] was carried out and discussed under Chapter No. 3. There is no schedule I species of animals observed within study area as per Wildlife Protection Act 1972 as well as no species is in vulnerable, endangered or threatened category as per IUCN. There is no endangered red list species found in the study area.
17	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.
18	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.

19	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.
20	One season (non-monsoon) [i.e. March-May (Summer Season); October-December (post monsoon season); December-February (winter season) primary baseline data on ambient air quality as per CPCB Notification of 2009, water quality, noise level, soil and flora and fauna shall be collected and the AAQ and other data so compiled presented date-wise in the EIA and EMP Report. Site-specific meteorological data should also be collected. The location of the monitoring stations should be such as to represent whole of the study area and justified keeping in view the pre-dominant downwind direction and location of sensitive receptors. There should be at least one monitoring station within 500 m of the mine lease in the pre-dominant downwind direction. The mineralogical composition of PM10, particularly for free silica, should be given.	Baseline Data were collected for One Season (Summer) March– May 2023 as per CPCB Notification and MoEF & CC Guidelines. Details in Chapter No. 3.
21	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.

22	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: 23.0 KLD Discussed under Chapter 2, Table No 2.15.
23	Necessary clearance from the Competent Authority for drawl of requisite quantity of water for the Project should be provided.	Not Applicable.
24	Description of water conservation measures proposed to be adopted in the Project should be given. Details of rainwater harvesting proposed in the Project, if any, should be provided.	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.
25	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.
26	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 85-80m below ground level. The ultimate depth of mine is 89m (1m Topsoil +88m Limestone) Discussed under Chapter 3.
27	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.	There is no stream, seasonal or other water bodies passing within the project area. Therefore, no modification/ diversion of water bodies is anticipated in G.O.215
28	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.	Details mentioned in Ch-2 & 3
29	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	Greenbelt Development Plan is discussed under Chapter 4, Page No.123.

	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.	
30	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.
31	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.32.
32	Conceptual post mining land use and Reclamation and Restoration of mined out areas (with plans and with adequate number of sections) should be given in the EIA report.	Discussed under Chapter 2. Mine Closure Plan is a part of Approved ROMP Mining Plan enclosed as Annexure Volume – 1.
33	A time bound progressive greenbelt development plan shall be prepared ina tabular form (indicating the linear and quantitative coverage, plant species and time frame) and submieed, 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.	Chapter3 and 4 for A time bound progressive greenbelt development plan.
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.	Occupational Health Impacts of the project and preventive measures are detailed under Chapter 4.
35	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.

36	Measures of socio-economic significance and influence to the local community proposed to be provided by the Project Proponent should be indicated. As far as possible, quantitative dimensions may be given with time frames for implementation.	No Negative Impact on Socio Economic Environment on the Study Area is anticipated and this project shall benefit the Socio-Economic Environment by ways of employment for 48 people directly and 100 people indirectly.
37	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.
38	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.
39	Details of litigation pending against the project, if any, with direction /order passed by any Court of Law against the Project should be given.	No litigation is pending in any court against this project.
40	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. 16.13 Crores-P1 EMP cost 80 Lakhs
a)	All documents to be properly with index and continuous page numbering.	Noted and agreed
b)	Where data are presented in the Report especially in Tables, the period in which the data were collected and the sources should be indicated.	Noted and agreed
c)	Where the documents provided are in a language other than English, an English translation should be provided.	Noted and agreed
d)	The Questionnaire for environmental appraisal of mining projects as devised earlier by the Ministry shall also be filled and submitted	Noted and agreed
e)	While preparing the EIA report, the instructions for the Proponents and instructions for the Consultants issued by MoEF 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 and agreed
f)	Changes, if any made in the basic scope and project parameters (as submitted in Form-I and the PFR for securing the TOR) should be brought to the attention of MoEF&CC with reasons for such changes and permission should be sought, as the TOR may also have to be altered. Post Public Hearing changes in structure and content of the draft EIA/EMP (other than modifications arising out of the P.H. process) will entail conducting the PH again with the revised documentation.	Noted and agreed
g)	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	Not applicable as it is a Greenfield project

	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.	

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1. INTRODUCTION

1.0 PREAMBLE

Mineral resources of the nation reflect in terms of potential economic growth of the country at large. Our natural mineral wealth has been exploited considerably during the past 50 years. With increase in industrialization coupled with population growth, the demand for different minerals has increased and is likely to grow further in years to come. This has resulted in irreversible impacts on diminishing reserves, with simultaneous generation of solid wastes and effluents causing environmental degradation. It is therefore important to tackle the problem for control of pollution and mining of minerals in a cost-effective method causing least damage to the environment. In order to commence/enhance production/ renewal of any mines, it is necessary to obtain Environmental Clearance from the Ministry of Environment and Forests, Govt. of India as per EIA Notification 2006 and consecutive amendments.

Mining Operation Plan, Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) etc. are some of the important requisites from investor for Environmental Clearance.Hence, the lessee has to prepare an Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) report for Environmental Clearance before commencement of mining activities. To prepare an effective and sustainable EIA and EMP, it is necessary to conduct a baseline survey of the existing environmental attributes. It helps to evaluate anticipated environmental impacts to the proposed activities and in formulating a scientific Environmental Management Plan.

Irrespective of magnitude of operation, attempts have been made to maintain Environmental balance of the study area. Environmental Impact Assessment (EIA) is one of the tools available with the planners to achieve the above-mentioned goal. It is desirable to ensure that the development options under consideration are sustainable. In doing so, environmental consequences must be characterized early in the project cycle and accounted for in the project design.

There are many Acts/Rules & Notifications issued by MoEF&CC, New Delhi for keeping the environment in and around project sites congenial for healthy/better standard of living. Few of them are mentioned below:

1. Environment (Protection) Act, 1986
2. Environment (Protection) Rules, 1986
3. Water (Prevention & Control of Pollution) Act, 1974
4. Air (Prevention & Control of Pollution) Act, 1981
5. Environmental Impact Assessment (EIA) Notification, dated 27th January, 1994
6. Environmental Impact Assessment (EIA) Notification, dated 14th September, 2006
7. Environmental Impact Assessment (EIA) Notification as amended on 1st December, 2009.

TANCEM has hired an agency i.e., M/s Geoexploration and Mining Solutions Consultants for preparation of Environment Impact Assessment Report for obtaining Environment Clearance from MoEF&CC. The sole purpose of Environmental Impact Assessment report is to assess the beneficial and adverse impacts of the project on the existing environmental systems and to propose appropriate pollution control measures to ensure a secure, hale and hearty environment. Thus, the report is a presentation of environmental consequences of the project activity so that all the factors are considered tactfully in eventually claiming a decision. The main objectives are described as follows: -

- Evaluation of current level of pollution (air, soil, water & noise) in and around the mine under the existing conditions
- Assessment of existing Environmental Status of Water, Air, Flora, Fauna, Demography and Land use pattern
- Suggested measures, recommendations for pollution control, monitoring equipments and organizational set up for maintenance of pollution control.

1.1 PURPOSE OF THE REPORT

Environmental Impact Assessment (EIA) is a decision-making tool, which guides the authorities in arriving at an appropriate conclusion for the proposed project; to retain them, if environmentally sound and reject, if found having deleterious effect. EIA identifies the extent of the environmental, social and economic impacts of a project prior to decision-making. EIA systematically examines both beneficial and adverse impacts of the proposed project over and above the prevailing conditions and ensure that these combined impacts are taken into account during the project designing. The sole purpose of Environmental Impact Assessment report is to assess the

beneficial and adverse impacts of the project on the existing environmental systems and to propose appropriate pollution control measures to ensure a secure, hale and hearty environment. Thus, the report is a presentation of environmental consequences of the project activity so that all the factors are considered tactfully in eventually claiming a decision. The main objectives are described as follows:

- Evaluation of current level of pollution (air, soil, water & noise) in and around the mine under the existing conditions.
- Assessment of existing Environmental Status of Water, Air, Flora, Fauna, Demography and Land use pattern.
- Suggested measures, recommendations for pollution control, monitoring equipment's and organizational set up for maintenance of pollution control.

This Environmental Impact Assessment report is prepared seeking Environmental Clearance for mining of Limestone over an **extent of 180.83.0 Ha** for production of 703411Ts ROM for **G.O 215** Tamil Nadu cements Corporation, Alangulam and Lakshmipuram Village, Sivakasi Taluk, Virudhunagar Division in favor of M/s. Tamil Nadu Cement corporation Limited.

M/s Tamil Nadu Cements Corporation Limited (TANCEM) was operating a limestone Mine at **Villages**- Alangulam&Lakshmipuram Village Tehsil-Sivakasi, District Virudhunagar, State-Tamil Nadu with production capacity of 70,3411Ts.

The ministry has examined the proposal in accordance with the EIA notification,2006 and further amendments thereto, and after accepting the recommendation of EAC in its 44th meeting held during 18th -19th February 2021, after detailed presentation by the PP, EAC observed that PP has gone to enhanced production beyond 1993-94 base year production level without taking prior EC hence violated the provision of the EIA notification under E (P) Act. EAC further noted PP has submitted the letter dated 12.07.2018 of Department of mines and geology wherein it was informed that lease for extension till 31.03.2030 is under consideration under MMDR Act 2015, and corrigendum minutes of EAC in its 45th meeting held during 8th -9th March, 2021 grant the ToR for M/s. Tamil Nadu Cements Corporation Limited.

TANCEM applied for Terms of Reference (ToR) to MoEF&CC on 19.06.2017 under A category for Existing G.O. No. 215 & 427, Alangulam, Lakshmipuram, Pernaickenpatti, Duraisamypuram Village, Edirkottai & Narnapuram limestone mining lease over cluster extent of 449.63.0ha. wherein the committee deferred the proposal and essential detail sought the information PP submitted the information. and accordingly, the proposal was considered in the EAC in its 45th meeting held during 8th -9th March, 2021 wherein the committee recommended the proposal for grant of TOR vide **F.No.23-167/2018-1A.III (V) dated 26th July 2021 for G.O 215** (**copy enclosed as Annexure-I**) for preparation of EIA report along with assessment of ecological damage, remediation plan and natural and community resource augmentation plan.

Mining Plan and Progressive Mine Closure Plan/Mining Scheme: The Mining Plan for Alangulam&Lakshmipuram limestone mining lease over an extent of 180.83.0ha **(Copy enclosed as Annexure-III).** The details of previous approved Mining Plan and Scheme of Mining is given in below table: -

G.O No. 215

S.No	Mining Plan/Scheme of Mining	Period		Approval letter No. & Date
		From	To	
1.	The First Scheme Mining Plan	01/04/2004	31/03/2009	TN/VRD/LST/MS-74 SZ dated 13/03/2005
2.	The second Scheme Mining Plan	01/04/2009	23/11/2013	TN/VRD/LST/MS-641 SZ/258 dated 14.06.2012
3.	Mining Plan	04/09/2013	24/11/2013	TN/VRD/MP/LST-1852-SZ dated 04.09.2013
4	Review of Mining Plan	05/03/2021	01/04/2018	TN/VRD/LST/ROMP-1643 MDS dated 05.03.2021

1.2 IDENTIFICATION OF PROJECT & PROJECT PROPONENT

Identification of Project

The Proposal of G.O. no. 215 Alangulam Limestone Mines of M/s.Tamil Nadu Cements Corporation Ltd. is for expansion in production capacity **703411Tons** from Mine lease area of 180.83.0Ha out of which 165.51Ha is Patta Land and 15.32 ha is Govt. Poramboke land. The mine is situated at Villages- Alangulam & Lakshmipuram Village, Sivakasi Taluk & District- Virudhunagar, Tamil Nadu. Mine lease area falls in the survey of India Toposheet no 58 G/11 and lies between East longitude 77^0 40'24" E to 77^0 41'47" E" and North latitude, 09^0 21'25" N to 09^0 22'20" N. The method of mining is Open cast mechanized. Mining lease area is about 103m above mean sea level and forms a sloping ground towards East exists within the lease.

1.3 Project Proponent

M/s Tamil Nadu Cement Corporation Limited (TANCEM) is a state-government undertaking of Government of Tamil Nadu located in the Indian state of Tamil Nadu. It manufactures cement and stone wire pipes. It was incorporated on April 1, 1976 to take over and operate the existing cement plant in Alangulam, Virudhunagar with an authorized share capital of Rs. 16.13 Crores.

TANCEM, as its expansion and conversion activities, set up Asbestos Sheet unit at Alangulam during 1981. TANCEM also took over during 1989, a Stoneware pipe plant from TANCEM with a view to provide employment to the retrenched employees. The company has its main objective in production of cement and cement-based products and primarily caters to the needs of Government departments. Limestone being the main raw material, the company acquired and reserved enough limestone bearing lands in and around Alangulam and Ariyalur which are sufficient to run the cement plants for decades to come. Hence, the role of TANCEM in the development of state is immense.

M/s Tamil Nadu Cements Corporation Limited is having two cement units, one at Alangulam and another at Ariyalur. The installed capacity of the Ariyalur cement unit is 5 lakh tones per annum. It is a modern dry process plant. TANCEM has expanded the capacity of Ariyalur Works from 5 lakh tones per annum to 15 lakh tones per annum by installing the green field plant.

The Applicant details are gives below

S.No.	Name of the Mine lease area	Applicant	Proponent Name
1.	Expansion in production capacity **703411Tons**, of Alangulam & Lakshmipuram Villages, Alangulam Limestone Mines (G.O. No. 215) Over an extent of 180.83.0 Ha	**M/s. Tamilnadu Cements Corporation Ltd.,** (A Govt. of Tamilnadu undertaking) 735, Anna Salai, L.L.A. Building, IInd Floor, Chennai- 600 002, Tamilnadu.	Thiru.R. Kannan I.A.S The Managing Director (Mines), M/s Tamil Nadu Cements Corporation Limited, 5th Floor, AavinIllam, No.3A, Pasumpon Muthuramalingam Salai, Nandanam, Chennai – 600 035. Tamil Nadu..
2	Expansion in production capacity **836101Tons** of Alangulam, Lakhsmipuram, Pernaickenpatti, Duraisamipuram, Edirkottai and Narnapuram villages of Sivakasi Taluk of Virudhunagar District (G.O. No. 427) Over an extent of 268.80.0 Ha		

Table-1.1 Details of the directors of the company

S. No.	Name of the Director	Address	Contact No.	Designation
1.	Thiru. R.Kannan, IAS.,	Managing Director M/s. Tamilnadu Cements Corporation Limited 5th Floor Aavin Illam, No.3A, Pasumpon Muthuramalingam Salai Nandanam, Chennai - 600 035	044-28524287	Managing Director
2.	Thiru. C. Kamaraj, IAS.,	Managing Director M/s. Tamilnadu Cements Corporation Limited	044-28524287	Managing Director

		5th Floor Aavin Illam, No.3A, Pasumpon Muthuramalingam Salai, Nandanam, Chennai - 600 035		
3.	Tmt. R.Lilly, , IAS.,	Special Secretary to Government, Industries, Investment, Promotion and Commerce Department Secretariat, Chennai – 600 009	044-25665565	Director
4.	Dr. V.Dakshinamoorthy, IAS.,	Managing Director, TWAD Board, Chepauk, Chennai-600 005.	044-28525501	Director
5.	Thiru J.Jayakanthan IAS	Commissioner, Geology and Mining, Guindy, Chennai – 600 032.	044-22501874	Director
6.	Dr. Darez Ahamed IAS	Commissioner, Rural Development and Panchayat Raj, Saidapet, Chennai – 600 015.	044- 24323794	Director
7.	Thiru Pratik Tayal IAS	Deputy Secretary to Government Finance Department, Secretariat, Chennai – 600 009.	044- 25671401	Director
8.	Thiru D.Rajendran	5 th floor, TANTRANSCO building,144, Anna Salai, Chennai - 600 002	044-28521915	Director
9.	Dr G.Natarajan	(Independent Director) 288, TTK Road, Alwarpet, Chennai – 600 018	044- 28525461	Independent Director
10.	Thiru P.Krishnamurthi	(Independent Director) 1B, SuvarnaLok 34, Melony Road, T. Nagar, Chennai – 600 017	044- 28525461	Independent Director
11.	Er. R. Viswanath	Engineer-in-Chief (Buildings) and Chief Engineer (Buildings), Public Works Department, Chepauk, Chennai -600 005.	044- 2381804	Chief Engineer

1.4 BRIEF DESCRIPTION OF THE PROJECT

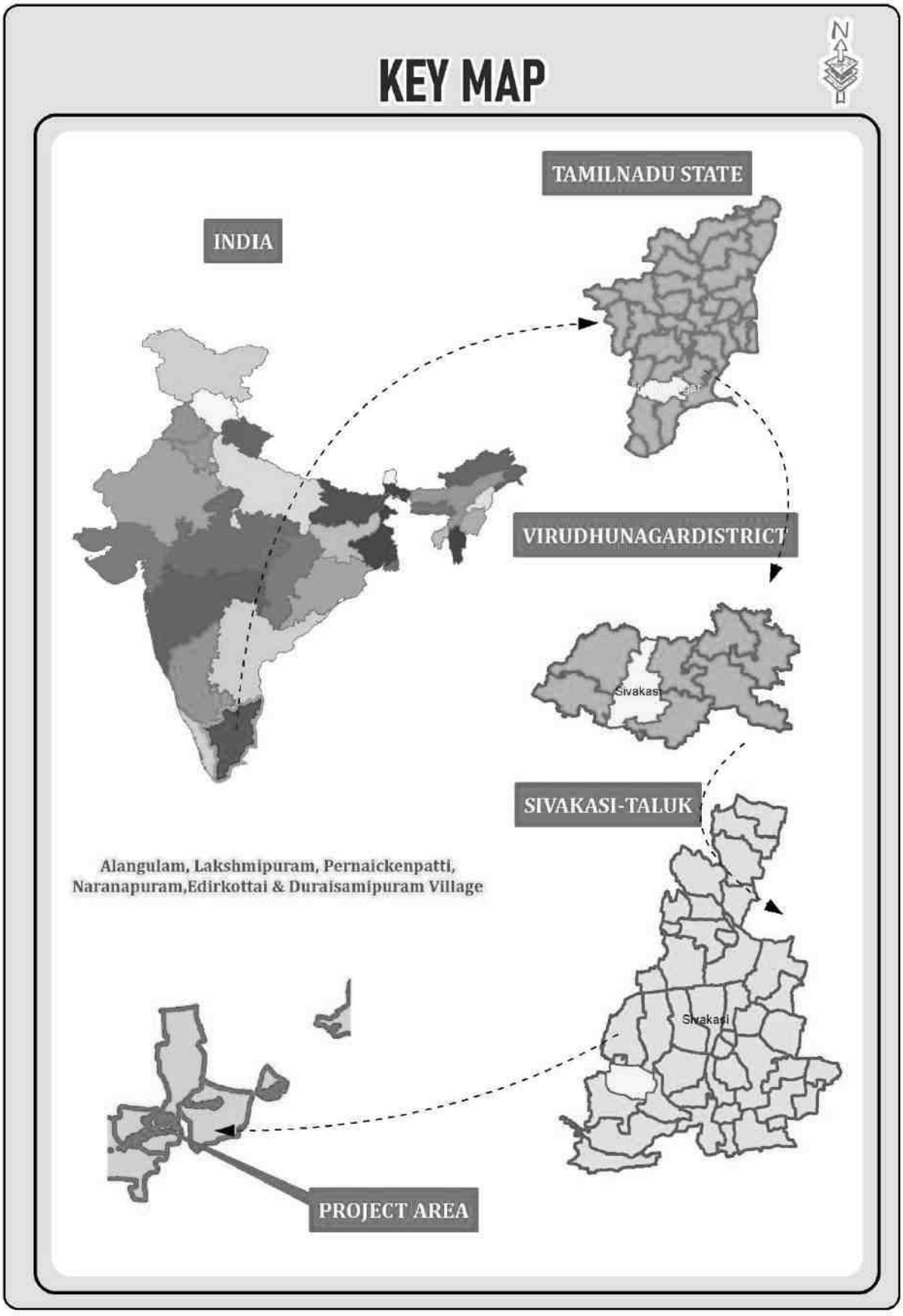
TABLE 1.2: BRIEF DESCRIPTION OF THE PROJECT

S. No.	Particulars	Details	
A	**Nature and Size of the Project**	Production capacity **703411Tons**, of Alangulam Limestone Mines (G.O. No. 215) by Tamil Nadu Cement Corporation Limited.	
B.	**Location**		
Name of Unit		**Survey No**	**Area in Ha**
Alangulam Limestone Mines		28,29,30/2,31,32/1,32/3, etc.,	180.83.0 Ha
IBM registration No		IBM/7446/2011	
Mine Code		38TMN30033	
a	**Village**	Alangulam & Lakshmipuram	
b	**Taluk**	Vembakottai/Sivakasi	
c	**District**	Virudhunagar	
d	**State**	Tamil Nadu	
e	**Geographical Coordinates**	North latitude, 09^0 21'25" N to 09^0 22'20" N East Longitude 77^0 40'24" E to 77^0 41'47" E"	
f	**Toposheet No**	58 G/11	
C	**Lease area details**		
	Lease Area	**180.83.0Ha**	
	Type of Land	Governmment and Patta Land	
	Depth of mining	89m (1m Topsoil +88m Limestone)	
	Year wise Production (ROM) [2023-2024 to 2027-28],	ROM 703411 Tons	
	Water table	85-80m	
D	**Machinery Details**		
S. No	**Name of the machine**	**Nos.**	**Capacity**
1	Excavator L&T Komatsu	1	Bucket capacity 1.20m^3
2	Mechanicia	1	Atlas Copco 1.81 (t)
3	Excavator	8	Tata Hitachi 1.20m^3
4	Dozer BD	1	D10 Dozer BEML 3.60hp
E	**Cost details**		
	Cost of the project	Approx. Rs. 16.13 Crores	
	Cost for EMP	Rs. 80 Lakhs	
F	**Environmental Settings of the area**		
a)	Ecological Sensitive Areas (National Park, Wild Life Sanctuary, Biosphere Reserve, Reserve/ Protected Forest etc.) within 10 Km radius	No such area is located within 10km radius of the mine lease area.	
b)	Inter-state boundary within 5 Km radius	No such area is located within 10km radius of the mine lease area.	
c)	NearestTown/ Major City	Vembakottai-7km SE	
d)	Nearest Railway Station	Rajapalayam –15km-NW	

e)	Nearest State Highway/ National Highway	SH-186 Rajapalayam Vembakottai 50m-South SH-183 Sivakasi-Alangulam Vembakottai west side NH-44 Virudhunagar-Tirunelveli-14km-East
f)	Nearest Airport	Madurai airport - 65km-NE
g)	Medical Facilities	Dr.Anantharaj Hospital-Alangulam-W
h)	Education Facilities	ERRSM Government Higher secondary school-Alangulam-W
i)	Seismic Zone	Zone III
j)	Water body	Vaippar River-S Vembakottai reservoir-SE

Source: Prefeasibility Report and IBM approved mining Plan

FIGURE: 1. KEY MAP SHOWING THE LOCATION KEY MAP



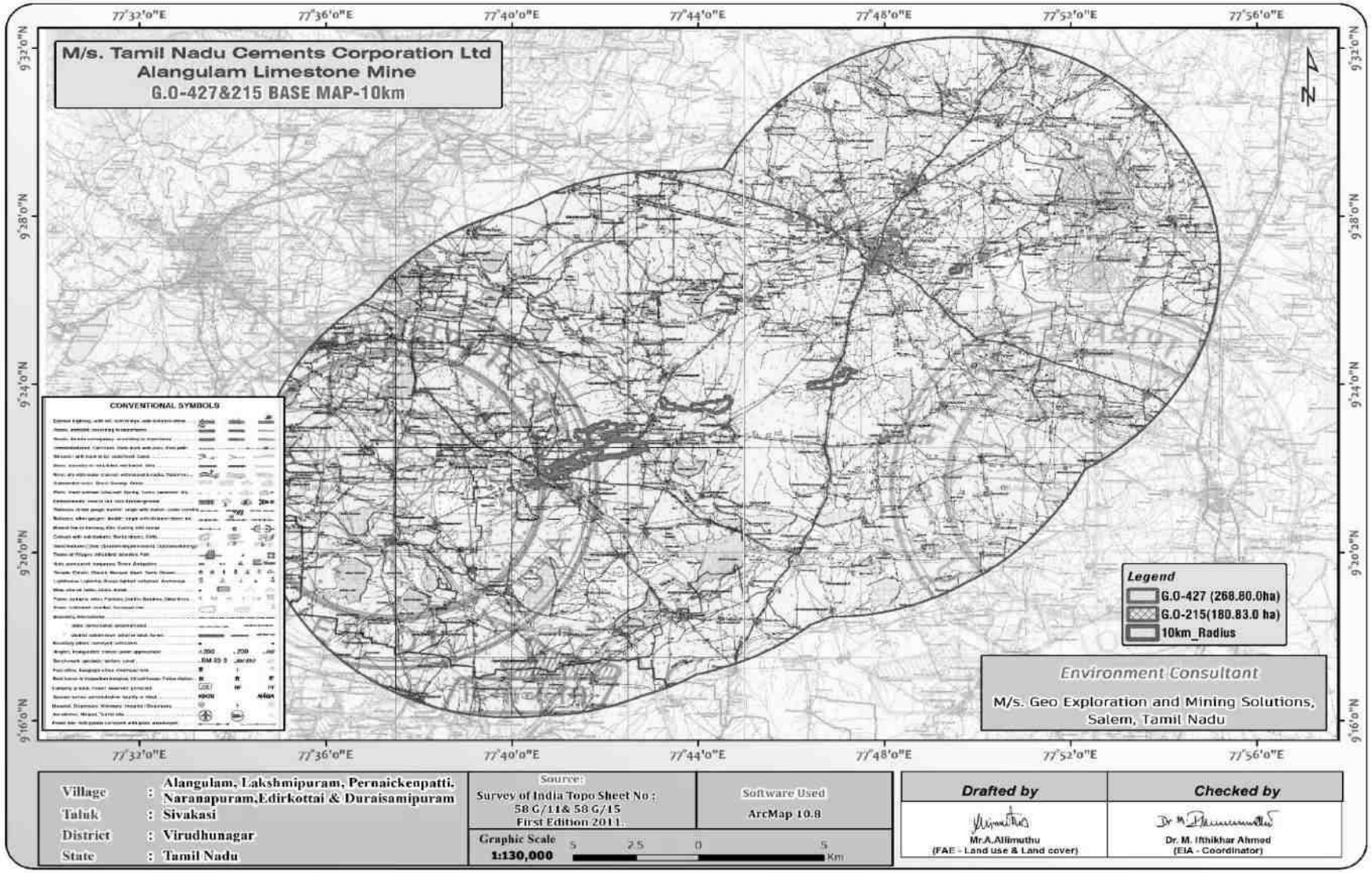


FIGURE 1.2: TOPOSHEET MAP OF THE STUDY AREA 10 KM RADIUS

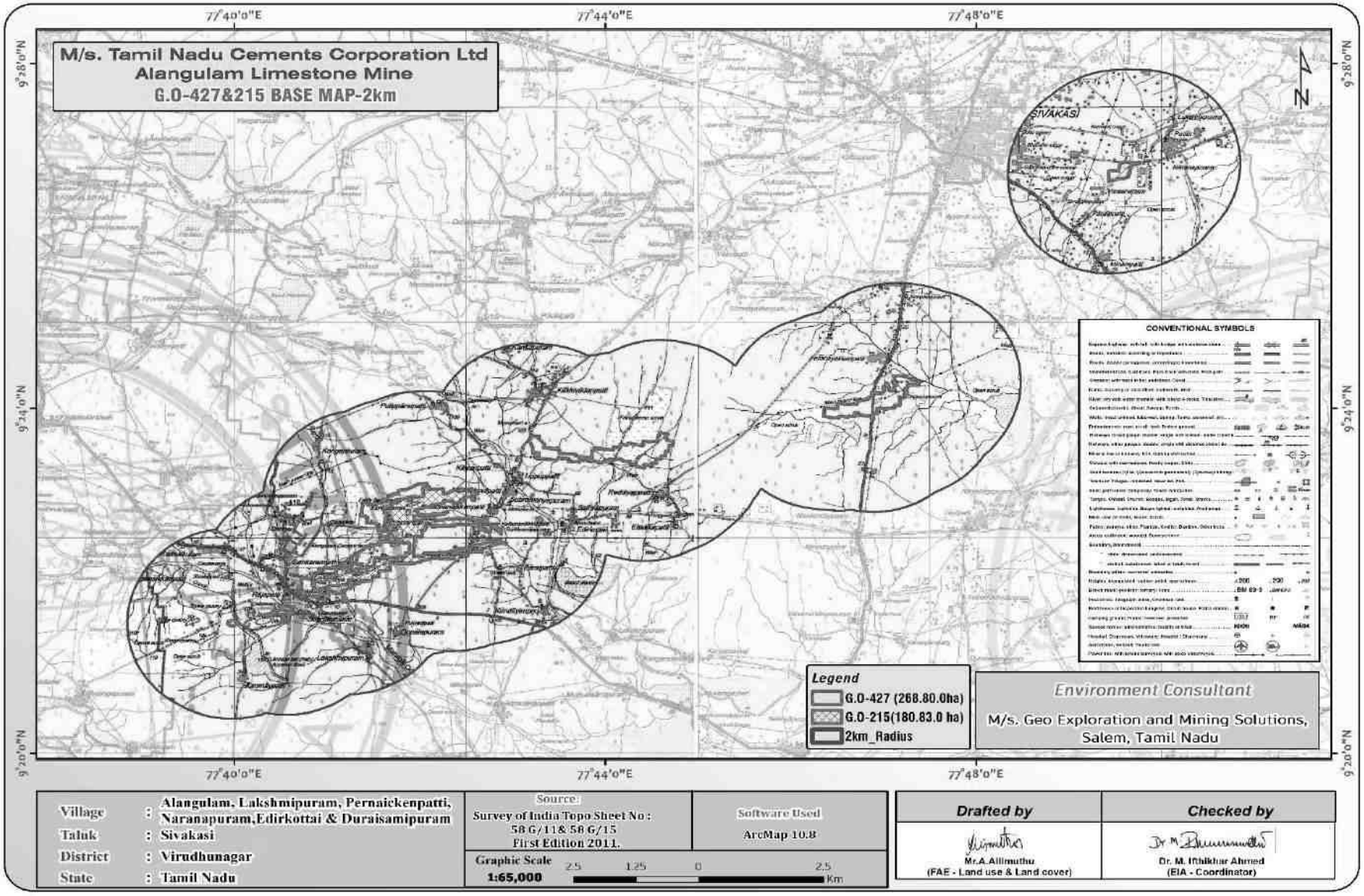


FIGURE 1.3: TOPOSHEET MAP OF THE STUDY AREA 2 KM

1.5 SIZE OF THE PROJECT

TABLE 1.3 YEAR WISE PRODUCTION DETAILS (2023 TO 2028)

Year	ROM (Ts)	Limestone @70%(Ts)	Mineral Rejects@ 30%(Ts)	Inter burden (Ts)	Topsoil (Ts)	Side burden(Ts)
2023-24	140433	98303	42130	144717	0	253845
2024-25	141570	99099	42471	0	0	0
2025-26	140415	98291	42124	0	0	356962
2026-27	140837	98586	42251	26125	4560	57713
2027-28	140156	98109	42047	65224	0	102600
Total	**703411**	**492388**	**211023**	**236066**	**4560**	**771120**

1.6 PAST PRODUCTION DETAILS

The mining operation was commenced in the year of 1973; the production details are as below –

Quantity of Spoil/Mineral Reject/Waste generated and dumped from the inception of the Company i.e. January 1979 to September 2017 = 117,26,046 Ts

Mineral extracted from the inception of the Company i.e., January 1973 to September 2017.

TABLE 1.4 PAST PRODUCTION DETAILS

YEAR	G.O 215
1967-68	-
1968-69	-
1969-70	-
1970-71	-
1971-72	-
1972-73	-
1973-74	16075.9
1974-75	2521.63
1975-76	198720
1976-77	428947
1977-78	370459
1978-79	536839
1979-80	425817
1980-81	463640
1981-82	443937
1982-83	394489
1983-84	368968
1984-85	348642
1985-86	443348
1986-87	492680
1987-88	393683
1988-89	426503
1989-90	356037
1990-91	294421
1991-92	314713
1992-93	298957
1993-94	256053
1994-95	266276
1995-96	262661
1996-97	374210
1997-98	156982
1998-99	155094
1999-2000	7947.75
2000-01	151084
2001-02	45989.7

2002-03	47500.1
2003-04	164476
2004-05	84949.3
2005-06	90396.1
2006-07	76048.9
2007-08	50392.6
2008-09	54469.4
2009-2010	59888
2010-11	60132.7
2011-12	41617.2
2012-13	33682
2013-14	48165.2
2014-15	30568.4
2015-16	125811
2016-17	60989.6
2017-18	-

1.7 SCOPE OF THE STUDY

The main scope of the EIA study is to identify, quantify the Impacts due to this mining operation and to formulate appropriate mitigation measures with effective environmental management plan. This EIA study initiates the effective ways to mitigate and protect the environment from increasing pollution caused by the mining operation and recommendations for environmental-friendly development initiatives in the region. The EIA/EMP report has been prepared as per the generic structure specified in the EIA Notification 2006.

1.7.1 Environmental Clearance Process in line with the Terms of Reference (TOR) prescribed by EAC, Tamil Nadu vide.

F.No.23-167/2018-1A.III (V) dated 26th July 2021

the area comprising 10 km radius around the proposed mine lease boundary is considered as the study area. The scope of the study includes detailed characterization of the environmental attributes like Air, Water, Noise and Land, Biological and Socio-economic aspects.

The EIA includes the following details:

1. Study of the reports like Geological Report, Pre-Feasibility Report (PFR) or Mining Plan made available by the client.

2. Present Environmental Setting

3. Identification, prediction and evaluation of Anticipated Environmental Impact due to the proposed mine and related facilities.

The environmental impacts will be anticipated in core and buffer zone on:

- Topography and drainage
- Climate
- Water quality (Surface/Ground)
- Hydro-geological Regime
- Air quality
- Noise Levels
- Soil Quality
- Flora and Fauna
- Traffic density survey
- Land-Use
- Socio-Economic Conditions
- Health, culture, human environment including public health, occupational health and safety

This EIA Report is prepared in accordance with EIA Notification, 2006 and its subsequent amendments and that has been divided into thirteen (13) chapters (in addition to Executive Summary) as briefed hereunder:

Chapter 1 – Introduction

The chapter provides description of project background, site and surroundings, objectives, scope and organization of the study and format of this report.

Chapter 2 – Project Description

This chapter provides information on project and capacity; need for the project; location; size or magnitude of operation; technology and process description; maps showing project layout, component of projects etc.

Chapter 3– Description of the Environment

This chapter deals with the methodology and findings of field studies undertaken with respect to ambient air, meteorology, water, soils, noise levels, ecology to define the various existing environmental status in the area of the project. This also deals with the infrastructural development as a part of project and sources of pollution from the proposed mining project.

Chapter 4 – Anticipated Environmental Impacts and Mitigation Measures

In this chapter, the potential impacts of the proposed mining and allied activities, which could cause significant environmental concerns, are identified and discussed. This discussion will form the basis for environmental management activities.

Chapter 5 – Analysis of Alternatives (Technology and Site)

This chapter will include a comparison of alternatives in this chapter to determine the best method of achieving the project objectives with minimum environmental impacts or indicates the most environmentally friendly and cost-effective options, if any.

Chapter 6 – Environmental Monitoring Program

This chapter will include ascertaining the environmental impacts; state of pollution within the mine lease and in its vicinity; planning for predictive or corrective actions in respect of pollution to keep it within permissible limits.

Chapter 7 – Additional Studies

This chapter will include outcomes of public consultation, risk assessment, social impact assessment, R&R action plan, biodiversity conservation plan, watershed management etc.

Chapter 8 – Project Benefits

This chapter deals with improvements in the physical infrastructure, social infrastructure, employment potential and other tangible benefits due to proposed project activity.

Chapter 9 – Environmental Cost Benefit Analysis

This chapter includes environmental value enhancement (Biodiversity, crop productivity, eco tourism etc.)

Chapter 10 – Environmental Management Plan

This chapter will include the description of administrative aspects of ensuring that the mitigation measures suggested are implemented and their effectiveness is monitored, after approval of the EIA.

Chapter 11 – Summary

This will constitute the summary of EIA Report.

Chapter 12 – Disclosure of Consultant

This will include the names of the consultants engaged in preparation of EIA and nature of consultancy rendered.

Chapter-13–Ecological Damage Assessment, Remediation Plan and Natural &Community Augmentation Plan

This will include Ecological Damage Assessment, Remediation Plan and Natural &Community Augmentation Plan as suggested by MoEF&CC notification dated 14.03.2017 for violation projects.

1.8 DATA GENERATION (SCOPING)

The base line data have been generated by M/s Geo Exploration and Mining Solutions in association with Chennai Mettex Lab Private Limited approved by AAI, FSSAI, MOEF & TEA Board in accordance with the requirement of statutory agencies to carry out all the regulatory scoping as per the Terms of Reference issued to the project proponent. The monitoring and testing have been carried out as per the guidelines of MoEF and the IS standards. Monitoring has been conducted for the following parameters:

TABLE 1.5: REGULATORY SCOPING CARRIED OUT FOR EIA AS PER TOR

S.No	Description	No of locations	Total No of samples
1	Air Ambient Air Monitoring (24 hourly samples), Parameters: PM_{10}, $PM_{2.5}$, SO_2, NO_X etc., (As per IS 5182 (Part 1-23), National Ambient Air Quality Standards and CPCB)	18 Locations	
2	Meteorological parameters at 1 Hourly Continuous Mechanical/Automatic Weather Station Parameters: a. Wind speed, direction b. Relative humidity c. Temperature d. Cloudiness e. Rainfall	-	IS 5182 Part 1-20 Secondary Data from IMD Station.
3	WATER Water/Effluents samples to be collected from each of the various locations (surface and ground water) in core and buffer zone (10 km radius). Analyzed as per IS 10500, IS 3025 And IS 2488 (Part 1-5) Parameters: Water/Effluents: tested for physical, chemical and biological parameters as well Grab sampling once in a Season for Ground Water.	10 Locations	10 Samples
4	Soil Quality Monitoring.\	10 Locations	10 Sample
5	Noise Quality monitoring IS 9989 and as per CPCB Guidelines Hourly observation for 24 hours per location once in the Season At all air quality monitoring station for L_{eq}, L_{day} and L_{night} values.	18 Locations	

1.8.1 DATA COLLECTION

The EIA study has been carried out for the mine lease area (core zone) and area within 10 km radius (buffer zone), both of which comprise the ***'study area'***. The following data, through field survey and other sources, has been collected by Chennai Mettex Lab Private Limited approved by AAI, FSSAI, MOEF & TEA Board for preparing the EIA/EMP for the proposed mining area with related facilities.

The following data were collected and discussed in this report

- Identification of Eco-Sensitive Places, Wild Life Sanctuaries, Biosphere Reserves within 10km Radius through the base map.
- Religious Places / Historical Monuments and Tourist Places within 10km Radius.
- Land use pattern within core zone and buffer zone (10km Radius around the core zone) based on Bhuvan.
- Population Density, Welfare Amenities and Demography based on last available Census data for entire study area.
- Collecting the Meteorological Data, for previous decades from IMD Station and relevant websites.
- Geo-Hydrological aspects based on available data from various secondary sources and correlated by the consultant at the field site.
- Identification of water bodies, hills, roads etc., within 10km Radius.

- Details of Fauna and Flora within a distance of 10km from the project site.
- Socio Economic studies within 10km buffer zone by secondary sources like District Census handbook correlating the same by primary survey.

Figure 1.4: Cadastral Map of Lease area

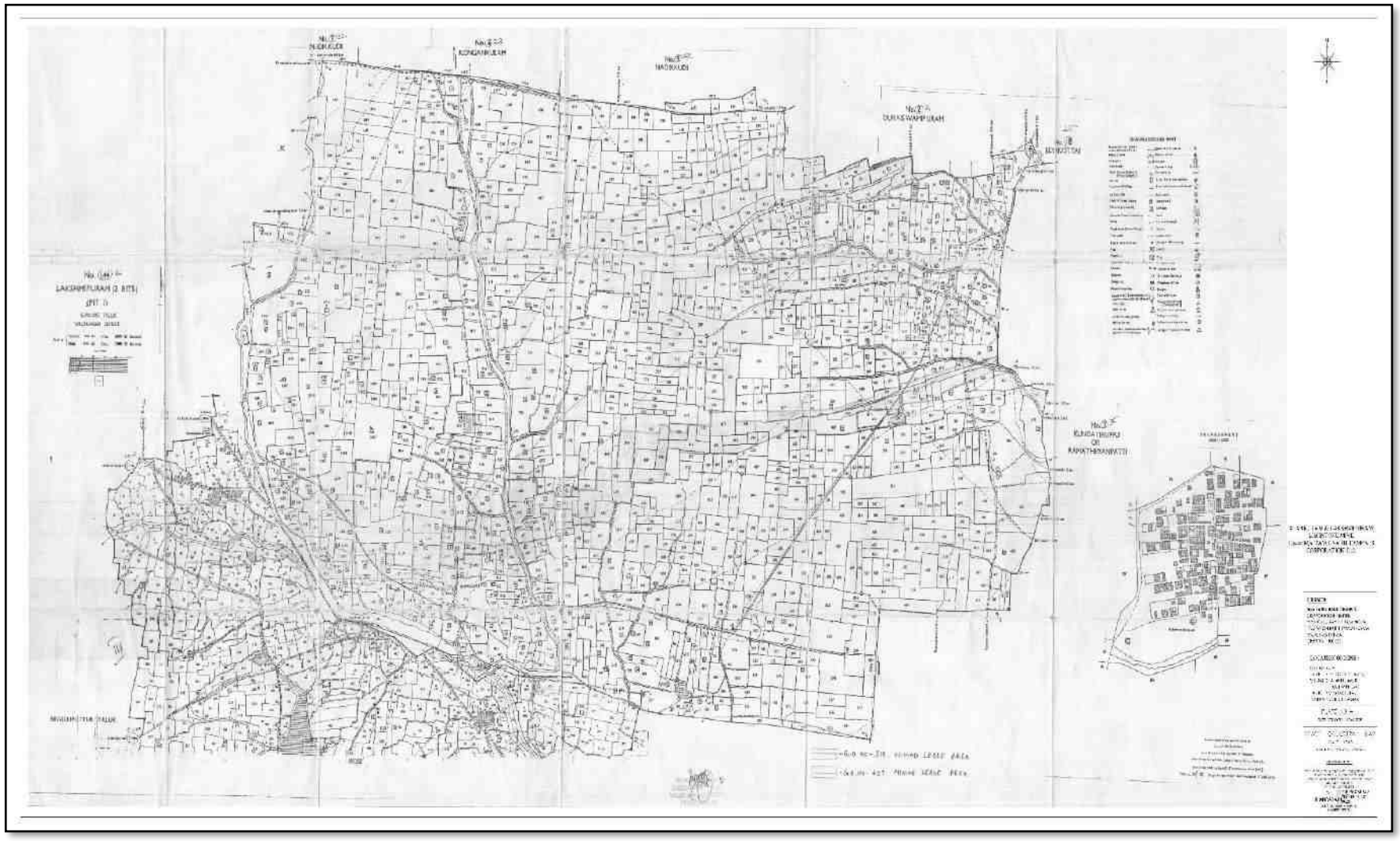


TABLE 1.6: WATER BODIES WITHIN 10KM RADIUS

G.O 215		
No	**Name**	**Distance&Direction**
1	Odai	Inside Lease Area
2	Odai	25m East
3	Tank	420m South
4	Odai	580m SW
5	Kayalkudi Stream	800m NE
6	Tank	1.6km SE
7	Odai	1.8km East
8	Eri Near Sivalingapuram	3.2km SW
9	Solaseri Stream	4.2km SW
10	Sirukulam Kanmoi	4.4km North
11	Vembakottai Reservoir	4.5km SE
12	Vaipper River	5.8km South
13	Eri Near Keelarajakulam	6.4km NW
14	Odai	8km NE
15	Lake Near Solapuram	9.5km NW

1.9 ENVIRONMENTAL SETTINGS WITHIN THE RADIUS OF 10KM.

- There are no Wild Life Sanctuaries and National Park as per The Indian Wildlife (Protection) Act, 1972, within the radius of 10KM.
- The village (project area) is not cover under HACA region.
- There is no Western Ghats region within the radius of 10KM.
- There is no interstate boundary within the radius of 10KM.
- There is no CRZ within the radius of 10KM.

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2. PROJECT DESCRIPTION

2.1 GENERAL

Proposed proposal pertains to Limestone mining projectby mechanized open cast method on allotted mine lease area at Alangulam & Lakshmipuram Limestone mines at Villages- Alangulam & Lakshmipuram, Village Sivakasi Taluk & District- Virudhunagar, Tamil Nadu. Mine lease for the proposed project is 180.83.0ha. This chapter deals with the broad description of the project, location, type of mineraldeposit(s), quality of reserve, mining methodology, various site utilities and infrastructure, etc.

2.2 TYPE OF THE PROJECT

TANCEM has proposed to obtain Environment Clearance under violation category and also for the enhanced **production capacity is about 703411**Tones for Alangulam & Lakshmipuram Limestone mines at Virudhunagar District. The extent of **Mine lease area is 180.83.0ha**. It is an opencast mechanized mining project. Mine falls in the survey of India Toposheet no. 58G11 & G15. As per EIA Notification dated 14.09.2006 and its latest amendments, this project falls under Violation Category 'A' Project of Activity 1(a) for "Mining of Mineral".

2.3 NEED FOR THE PROJECT

The captive Limestone mine is linked to Cement Plant of the Project Proponent. Limestone is very important industrial mineral and is the principal raw material for the production of clinker for cement etc.

The entire limestone production from Alangulam Limestone mine is proposed to be sent to Alangulam cement Works, for cement manufacturing unit at Alangulam. The limestone produced from this Mining Lease will be used for manufacture of Cement in company's factories in Tamil Nadu initially and can also cater to the need of the Alangulam cement Works.

The existing mining & cement plant operations by TANCEM in Virudhunagar area have brought improvement in social, infrastructural and employment sectors in the area. Besides above benefits, financial accruals will be derived by Central, State governments and Local Panchayat on account of royalty, cess, duties, DMF and NMET, etc, from project output. Cement being a core infrastructural sector component, limestone supplies for cement Manufacture also assumes great importance.

2.4 Location of Project

The Mine is located in various survey numbers in Alangulam, Lakshmipuram, Villages, Taluk Sivakasi & District-Virudhunagar, State-Tamil Nadu. Mine falls in the survey of India Toposheet no. 58G11 & G15 and lies between East longitude 77^0 40'24" E to 77^0 47'16.00" E" and North latitude, 09^0 21'25" N to 09^0 24'16.00" N The coordinates of the mine lease area rae given below: -

TABLE 2.1: SITE CONNECTIVITY

Nearest Roadway	SH-186 Rajapalayam Vembakottai 50m-South SH-183 Sivakasi-Alangulam Vembakottai west side NH-44 Virudhunagar-Tirunelveli-14km-East
Nearest Village	Alangulam- 80m-SW
Nearest Town	Vembakottai-7km SE
Nearest Railway	Rajapalayam –15km-NW
Nearest Airport	Madurai airport - 65km-NE
Seaport	Thoothukudi-82km – SE
Interstate Boundary	Tamilnadu-Kerala -33km-W

Source: Survey of India Toposheet

TABLE 2.2: BOUNDARY CO-ORDINATES OF PROPOSED PROJECT

Boundary of Pillars	Latitude	Longitude	Boundary of Pillars	Latitude	Longitude
1	N 09° 21' 52.61"	E 77° 40' 51.35"	201	N 09° 22' 43.20"	E 77° 42' 22.32"
2	N 09° 21' 55.99"	E 77° 40' 51.60"	202	N 09° 22' 43.54"	E 77° 42' 24.04"
3	N 09° 21' 56.71"	E 77° 40' 51.60"	203	N 09° 22' 43.59"	E 77° 42' 25.52"
4	N 09° 21' 58.33"	E 77° 40' 51.68"	204	N 09° 22' 43.31"	E 77° 42' 25.54"
5	N 09° 21' 59.78"	E 77° 40' 51.86"	205	N 09° 22' 43.37"	E 77° 42' 26.75"
6	N 09° 21' 59.66"	E 77° 40' 53.26"	206	N 09° 22' 43.64"	E 77° 42' 30.59"
7	N 09° 21' 59.59"	E 77° 40' 54.65"	207	N 09° 22' 43.04"	E 77° 42' 30.66"
8	N 09° 21' 59.70"	E 77° 40' 57.14"	208	N 09° 22' 42.73"	E 77° 42' 33.13"
9	N 09° 21' 59.74"	E 77° 40' 58.90"	209	N 09° 22' 42.30"	E 77° 42' 36.19"
10	N 09° 22' 02.24"	E 77° 40' 59.59"	210	N 09° 22' 42.12"	E 77° 42' 37.75"
11	N 09° 22' 03.77"	E 77° 40' 58.57"	211	N 09° 22' 41.72"	E 77° 42' 39.56"
12	N 09° 22' 04.00"	E 77° 40' 58.83"	212	N 09° 22' 41.13"	E 77° 42' 41.58"
13	N 09° 22' 02.59"	E 77° 40' 59.80"	213	N 09° 22' 43.27"	E 77° 42' 42.13"
14	N 09° 22' 02.19"	E 77° 41' 01.36"	214	N 09° 22' 43.61"	E 77° 42' 42.42"
15	N 09° 22' 01.93"	E 77° 41' 03.30"	215	N 09° 22' 43.83"	E 77° 42' 43.68"
16	N 09° 22' 02.32"	E 77° 41' 05.58"	216	N 09° 22' 39.77"	E 77° 42' 43.32"
17	N 09° 22' 05.62"	E 77° 41' 05.08"	217	N 09° 22' 39.32"	E 77° 42' 45.52"
18	N 09° 22' 05.80"	E 77° 41' 05.38"	218	N 09° 22' 39.10"	E 77° 42' 46.46"
19	N 09° 22' 07.00"	E 77° 41' 05.58"	219	N 09° 22' 38.97"	E 77° 42' 46.42"
20	N 09° 22' 08.51"	E 77° 41' 05.79"	220	N 09° 22' 38.36"	E 77° 42' 48.48"
21	N 09° 22' 08.40"	E 77° 41' 06.88"	221	N 09° 22' 37.88"	E 77° 42' 48.39"
22	N 09° 22' 08.31"	E 77° 41' 11.26"	222	N 09° 22' 37.60"	E 77° 42' 49.37"
23	N 09° 22' 08.82"	E 77° 41' 11.30"	223	N 09° 22' 36.40"	E 77° 42' 49.30"
24	N 09° 22' 08.81"	E 77° 41' 12.27"	224	N 09° 22' 35.91"	E 77° 42' 51.81"
25	N 09° 22' 08.57"	E 77° 41' 12.87"	225	N 09° 22' 35.90"	E 77° 42' 52.05"
26	N 09° 22' 05.58"	E 77° 41' 12.69"	226	N 09° 22' 35.81"	E 77° 42' 52.52"
27	N 09° 22' 05.49"	E 77° 41' 14.36"	227	N 09° 22' 33.89"	E 77° 42' 52.41"
28	N 09° 22' 05.73"	E 77° 41' 15.85"	228	N 09° 22' 32.42"	E 77° 42' 52.38"
29	N 09° 22' 05.54"	E 77° 41' 16.47"	229	N 09° 22' 34.15"	E 77° 42' 51.82"
30	N 09° 22' 05.17"	E 77° 41' 16.49"	230	N 09° 22' 34.42"	E 77° 42' 50.61"
31	N 09° 22' 04.86"	E 77° 41' 18.04"	231	N 09° 22' 35.00"	E 77° 42' 50.44"
32	N 09° 22' 04.57"	E 77° 41' 20.34"	232	N 09° 22' 35.32"	E 77° 42' 49.40"
33	N 09° 22' 05.81"	E 77° 41' 20.58"	233	N 09° 22' 35.95"	E 77° 42' 49.48"
34	N 09° 22' 05.64"	E 77° 41' 21.89"	234	N 09° 22' 36.68"	E 77° 42' 47.73"
35	N 09° 22' 05.35"	E 77° 41' 25.57"	235	N 09° 22' 37.55"	E 77° 42' 46.02"
36	N 09° 22' 07.39"	E 77° 41' 25.72"	236	N 09° 22' 35.52"	E 77° 42' 45.66"
37	N 09° 22' 09.57"	E 77° 41' 25.85"	237	N 09° 22' 33.88"	E 77° 42' 45.41"
38	N 09° 22' 09.64"	E 77° 41' 30.07"	238	N 09° 22' 33.89"	E 77° 42' 45.13"
39	N 09° 22' 13.47"	E 77° 41' 30.68"	239	N 09° 22' 34.12"	E 77° 42' 43.22"
40	N 09° 22' 16.12"	E 77° 41' 31.08"	240	N 09° 22' 34.25"	E 77° 42' 41.96"

41	N 09° 22' 15.83"	E 77° 41' 34.37"	241	N 09° 22' 35.56"	E 77° 42' 42.05"
42	N 09° 22' 15.50"	E 77° 41' 39.20"	242	N 09° 22' 35.90"	E 77° 42' 38.65"
43	N 09° 22' 16.43"	E 77° 41' 39.23"	243	N 09° 22' 39.69"	E 77° 42' 39.11"
44	N 09° 22' 16.37"	E 77° 41' 41.47"	244	N 09° 22' 40.19"	E 77° 42' 36.57"
45	N 09° 22' 15.89"	E 77° 41' 41.44"	245	N 09° 22' 40.24"	E 77° 42' 36.25"
46	N 09° 22' 15.68"	E 77° 41' 45.47"	246	N 09° 22' 40.39"	E 77° 42' 36.24"
47	N 09° 22' 16.85"	E 77° 41' 45.60"	247	N 09° 22' 40.56"	E 77° 42' 35.22"
48	N 09° 22' 16.73"	E 77° 41' 47.60"	248	N 09° 22' 37.60"	E 77° 42' 34.94"
49	N 09° 22' 16.47"	E 77° 41' 50.46"	249	N 09° 22' 37.61"	E 77° 42' 34.49"
50	N 09° 22' 19.23"	E 77° 41' 50.52"	250	N 09° 22' 38.66"	E 77° 42' 34.59"
51	N 09° 22' 19.14"	E 77° 41' 53.29"	251	N 09° 22' 38.78"	E 77° 42' 32.92"
52	N 09° 22' 21.09"	E 77° 41' 53.32"	252	N 09° 22' 38.89"	E 77° 42' 31.47"
53	N 09° 22' 23.92"	E 77° 41' 53.29"	253	N 09° 22' 38.97"	E 77° 42' 30.02"
54	N 09° 22' 23.95"	E 77° 41' 53.04"	254	N 09° 22' 39.04"	E 77° 42' 28.89"
55	N 09° 22' 26.27"	E 77° 41' 53.07"	255	N 09° 22' 39.10"	E 77° 42' 27.74"
56	N 09° 22' 26.22"	E 77° 41' 49.13"	256	N 09° 22' 39.19"	E 77° 42' 25.71"
57	N 09° 22' 26.66"	E 77° 41' 49.17"	257	N 09° 22' 39.29"	E 77° 42' 22.52"
58	N 09° 22' 26.67"	E 77° 41' 47.31"	258	N 09° 22' 37.90"	E 77° 42' 22.46"
59	N 09° 22' 26.97"	E 77° 41' 47.35"	259	N 09° 22' 37.93"	E 77° 42' 21.36"
60	N 09° 22' 27.18"	E 77° 41' 45.59"	260	N 09° 22' 37.95"	E 77° 42' 20.82"
61	N 09° 22' 26.70"	E 77° 41' 45.57"	261	N 09° 22' 37.97"	E 77° 42' 20.25"
62	N 09° 22' 26.61"	E 77° 41' 43.53"	262	N 09° 22' 37.94"	E 77° 42' 19.30"
63	N 09° 22' 26.92"	E 77° 41' 39.18"	263	N 09° 22' 37.87"	E 77° 42' 17.02"
64	N 09° 22' 29.20"	E 77° 41' 39.40"	264	N 09° 22' 38.06"	E 77° 42' 14.12"
65	N 09° 22' 31.03"	E 77° 41' 39.57"	265	N 09° 22' 37.98"	E 77° 42' 12.77"
66	N 09° 22' 32.05"	E 77° 41' 39.66"	266	N 09° 22' 37.90"	E 77° 42' 11.47"
67	N 09° 22' 32.46"	E 77° 41' 39.70"	267	N 09° 22' 38.33"	E 77° 42' 11.46"
68	N 09° 22' 34.36"	E 77° 41' 40.04"	268	N 09° 22' 38.28"	E 77° 42' 09.96"
69	N 09° 22' 34.36"	E 77° 41' 39.10"	269	N 09° 22' 37.82"	E 77° 42' 09.96"
70	N 09° 22' 34.62"	E 77° 41' 36.82"	270	N 09° 22' 37.75"	E 77° 42' 08.76"
71	N 09° 22' 43.52"	E 77° 41' 37.58"	271	N 09° 22' 37.69"	E 77° 42' 07.73"
72	N 09° 22' 43.46"	E 77° 41' 38.57"	272	N 09° 22' 38.58"	E 77° 42' 08.12"
73	N 09° 22' 46.63"	E 77° 41' 38.79"	273	N 09° 22' 38.52"	E 77° 42' 03.91"
74	N 09° 22' 47.03"	E 77° 41' 38.83"	274	N 09° 22' 37.06"	E 77° 42' 03.94"
75	N 09° 22' 47.34"	E 77° 41' 36.80"	275	N 09° 22' 37.05"	E 77° 42' 03.16"
76	N 09° 22' 50.77"	E 77° 41' 36.63"	276	N 09° 22' 35.32"	E 77° 42' 03.16"
77	N 09° 22' 51.51"	E 77° 41' 36.59"	277	N 09° 22' 35.29"	E 77° 42' 02.30"
78	N 09° 22' 51.90"	E 77° 41' 41.45"	278	N 09° 22' 35.30"	E 77° 42' 01.56"
79	N 09° 22' 53.44"	E 77° 41' 41.32"	279	N 09° 22' 30.87"	E 77° 42' 01.42"
80	N 09° 22' 54.03"	E 77° 41' 41.15"	280	N 09° 22' 31.24"	E 77° 41' 56.76"
81	N 09° 22' 54.39"	E 77° 41' 44.84"	281	N 09° 22' 28.96"	E 77° 41' 56.70"
82	N 09° 22' 56.24"	E 77° 41' 44.71"	282	N 09° 22' 25.02"	E 77° 41' 56.40"

83	N 09° 22' 56.47"	E 77° 41' 48.03"	283	N 09° 22' 25.01"	E 77° 41' 55.94"
84	N 09° 22' 57.26"	E 77° 41' 50.45"	284	N 09° 22' 21.97"	E 77° 41' 55.99"
85	N 09° 22' 57.39"	E 77° 41' 51.00"	285	N 09° 22' 19.03"	E 77° 41' 56.01"
86	N 09° 22' 58.23"	E 77° 41' 54.16"	286	N 09° 22' 17.35"	E 77° 41' 56.00"
87	N 09° 22' 58.38"	E 77° 41' 54.14"	287	N 09° 22' 17.37"	E 77° 41' 59.86"
88	N 09° 22' 58.63"	E 77° 41' 54.49"	288	N 09° 22' 17.30"	E 77° 42' 01.11"
89	N 09° 22' 58.79"	E 77° 41' 56.77"	289	N 09° 22' 17.43"	E 77° 42' 01.13"
90	N 09° 22' 58.11"	E 77° 41' 56.87"	290	N 09° 22' 17.33"	E 77° 42' 02.46"
91	N 09° 22' 58.26"	E 77° 41' 58.46"	291	N 09° 22' 19.17"	E 77° 42' 02.46"
92	N 09° 22' 58.49"	E 77° 41' 59.95"	292	N 09° 22' 18.82"	E 77° 42' 04.62"
93	N 09° 22' 58.82"	E 77° 42' 02.33"	293	N 09° 22' 18.93"	E 77° 42' 06.69"
94	N 09° 23' 04.48"	E 77° 42' 02.02"	294	N 09° 22' 19.02"	E 77° 42' 10.10"
95	N 09° 23' 04.53"	E 77° 42' 02.19"	295	N 09° 22' 19.44"	E 77° 42' 13.91"
96	N 09° 23' 04.52"	E 77° 42' 03.67"	296	N 09° 22' 19.37"	E 77° 42' 15.27"
97	N 09° 23' 05.43"	E 77° 42' 03.62"	297	N 09° 22' 20.24"	E 77° 42' 19.42"
98	N 09° 23' 05.46"	E 77° 42' 04.26"	298	N 09° 22' 21.54"	E 77° 42' 25.51"
99	N 09° 23' 05.44"	E 77° 42' 05.80"	299	N 09° 22' 22.24"	E 77° 42' 25.42"
100	N 09° 23' 03.85"	E 77° 42' 05.90"	300	N 09° 22' 22.50"	E 77° 42' 27.85"
101	N 09° 23' 03.62"	E 77° 42' 09.87"	301	N 09° 22' 22.75"	E 77° 42' 30.75"
102	N 09° 23' 03.77"	E 77° 42' 09.87"	302	N 09° 22' 22.24"	E 77° 42' 30.90"
103	N 09° 23' 03.74"	E 77° 42' 10.33"	303	N 09° 22' 22.40"	E 77° 42' 31.26"
104	N 09° 23' 04.00"	E 77° 42' 14.64"	304	N 09° 22' 23.14"	E 77° 42' 31.19"
105	N 09° 23' 03.96"	E 77° 42' 14.98"	305	N 09° 22' 24.82"	E 77° 42' 36.57"
106	N 09° 23' 03.82"	E 77° 42' 15.13"	306	N 09° 22' 26.46"	E 77° 42' 43.18"
107	N 09° 23' 02.51"	E 77° 42' 15.10"	307	N 09° 22' 27.60"	E 77° 42' 43.19"
108	N 09° 23' 01.27"	E 77° 42' 15.17"	308	N 09° 22' 27.51"	E 77° 42' 44.16"
109	N 09° 23' 00.16"	E 77° 42' 15.27"	309	N 09° 22' 27.98"	E 77° 42' 45.70"
110	N 09° 23' 01.22"	E 77° 42' 18.27"	310	N 09° 22' 27.38"	E 77° 42' 46.84"
111	N 09° 23' 01.89"	E 77° 42' 19.69"	311	N 09° 22' 26.85"	E 77° 42' 46.97"
112	N 09° 23' 02.11"	E 77° 42' 19.72"	312	N 09° 22' 27.21"	E 77° 42' 48.69"
113	N 09° 23' 03.82"	E 77° 42' 24.39"	313	N 09° 22' 28.71"	E 77° 42' 52.21"
114	N 09° 23' 02.09"	E 77° 42' 24.80"	314	N 09° 22' 26.98"	E 77° 42' 52.28"
115	N 09° 23' 03.85"	E 77° 42' 30.42"	315	N 09° 22' 26.12"	E 77° 42' 55.98"
116	N 09° 23' 03.58"	E 77° 42' 30.49"	316	N 09° 22' 25.48"	E 77° 42' 55.47"
117	N 09° 23' 04.18"	E 77° 42' 33.72"	317	N 09° 22' 25.91"	E 77° 42' 54.67"
118	N 09° 23' 01.04"	E 77° 42' 33.99"	318	N 09° 22' 25.96"	E 77° 42' 51.29"
119	N 09° 23' 01.27"	E 77° 42' 37.40"	319	N 09° 22' 24.56"	E 77° 42' 47.19"
120	N 09° 23' 00.67"	E 77° 42' 37.46"	320	N 09° 22' 23.93"	E 77° 42' 45.27"
121	N 09° 22' 59.80"	E 77° 42' 35.16"	321	N 09° 22' 21.93"	E 77° 42' 39.94"
122	N 09° 22' 58.99"	E 77° 42' 35.41"	322	N 09° 22' 20.31"	E 77° 42' 40.17"
123	N 09° 22' 58.29"	E 77° 42' 35.40"	323	N 09° 22' 20.38"	E 77° 42' 38.11"
124	N 09° 22' 56.19"	E 77° 42' 35.24"	324	N 09° 22' 20.42"	E 77° 42' 36.81"

125	N 09° 22' 56.34"	E 77° 42' 33.81"	325	N 09° 22' 20.39"	E 77° 42' 35.33"
126	N 09° 22' 58.89"	E 77° 42' 33.72"	326	N 09° 22' 20.06"	E 77° 42' 33.50"
127	N 09° 22' 57.87"	E 77° 42' 29.05"	327	N 09° 22' 19.71"	E 77° 42' 31.54"
128	N 09° 22' 57.04"	E 77° 42' 29.18"	328	N 09° 22' 21.63"	E 77° 42' 31.18"
129	N 09° 22' 56.82"	E 77° 42' 29.07"	329	N 09° 22' 21.53"	E 77° 42' 30.84"
130	N 09° 22' 56.67"	E 77° 42' 28.75"	330	N 09° 22' 19.24"	E 77° 42' 31.03"
131	N 09° 22' 56.27"	E 77° 42' 26.17"	331	N 09° 22' 19.05"	E 77° 42' 30.66"
132	N 09° 22' 54.67"	E 77° 42' 26.10"	332	N 09° 22' 18.11"	E 77° 42' 30.59"
133	N 09° 22' 54.44"N	E 77° 42' 24.18"	333	N 09° 22' 17.85"	E 77° 42' 28.50"
134	N 09° 22' 54.51"N	E 77° 42' 22.64"	334	N 09° 22' 17.86"	E 77° 42' 28.32"
135	N 09° 22' 54.47"N	E 77° 42' 21.47"	335	N 09° 22' 18.95"	E 77° 42' 28.29"
136	N 09° 22' 55.05"N	E 77° 42' 21.45"	336	N 09° 22' 18.83"	E 77° 42' 23.53"
137	N 09° 22' 55.34"N	E 77° 42' 20.24"	337	N 09° 22' 18.63"	E 77° 42' 21.96"
138	N 09° 22' 55.38"N	E 77° 42' 19.23"	338	N 09° 22' 18.52"	E 77° 42' 21.99"
139	N 09° 22' 55.51"N	E 77° 42' 18.27"	339	N 09° 22' 15.43"	E 77° 42' 21.98"
140	N 09° 22' 55.95"N	E 77° 42' 18.24"	340	N 09° 22' 15.20"	E 77° 42' 19.68"
141	N 09° 22' 55.84"N	E 77° 42' 15.58"	341	N 09° 22' 15.17"	E 77° 42' 16.96"
142	N 09° 22' 54.10"N	E 77° 42' 15.73"	342	N 09° 22' 15.24"	E 77° 42' 14.92"
143	N 09° 22' 53.98"N	E 77° 42' 14.21"	343	N 09° 22' 15.37"	E 77° 42' 12.89"
144	N 09° 22' 53.68"N	E 77° 42' 12.61"	344	N 09° 22' 15.83"	E 77° 42' 12.88"
145	N 09° 22' 53.44"N	E 77° 42' 12.61"	345	N 09° 22' 15.78"	E 77° 42' 11.33"
146	N 09° 22' 53.19"N	E 77° 42' 09.98"	346	N 09° 22' 15.64"	E 77° 42' 09.80"
147	N 09° 22' 53.05"N	E 77° 42' 09.25"	347	N 09° 22' 15.59"	E 77° 42' 07.21"
148	N 09° 22' 53.09"N	E 77° 42' 08.51"	348	N 09° 22' 14.32"	E 77° 42' 02.68"
149	N 09° 22' 52.61"N	E 77° 42' 08.55"	349	N 09° 22' 13.43"	E 77° 42' 00.47"
150	N 09° 22' 52.24"N	E 77° 42' 06.65"	350	N 09° 22' 12.12"	E 77° 41' 56.21"
151	N 09° 22' 51.68"N	E 77° 42' 06.80"	351	N 09° 22' 12.04"	E 77° 41' 53.00"
152	N 09° 22' 50.98"N	E 77° 42' 03.41"	352	N 09° 22' 11.98"	E 77° 41' 51.01"
153	N 09° 22' 50.76"N	E 77° 42' 01.87"	353	N 09° 22' 11.94"	E 77° 41' 50.28"
154	N 09° 22' 50.24"N	E 77° 42' 00.33"	354	N 09° 22' 11.85"	E 77° 41' 48.96"
155	N 09° 22' 49.47"N	E 77° 41' 57.73"	355	N 09° 22' 12.21"	E 77° 41' 43.62"
156	N 09° 22' 47.17"N	E 77° 41' 58.61"	356	N 09° 22' 12.75"	E 77° 41' 43.66"
157	N 09° 22' 47.21"N	E 77° 41' 58.85"	357	N 09° 22' 12.94"	E 77° 41' 41.17"
158	N 09° 22' 46.23"N	E 77° 41' 59.24"	358	N 09° 22' 09.15"	E 77° 41' 40.53"
159	N 09° 22' 45.88"N	E 77° 41' 59.37"	359	N 09° 22' 06.86"	E 77° 41' 40.36"
160	N 09° 22' 45.81"N	E 77° 42' 00.53"	360	N 09° 22' 06.94"	E 77° 41' 38.30"
161	N 09° 22' 46.18"N	E 77° 42' 03.86"	361	N 09° 22' 06.80"	E 77° 41' 37.44"
162	N 09° 22' 46.21"N	E 77° 42' 05.34"	362	N 09° 22' 06.92"	E 77° 41' 33.73"
163	N 09° 22' 46.01"N	E 77° 42' 06.39"	363	N 09° 22' 04.68"	E 77° 41' 33.55"
164	N 09° 22' 46.45"N	E 77° 42' 08.10"	364	N 09° 22' 02.92"	E 77° 41' 33.27"
165	N 09° 22' 46.92"N	E 77° 42' 09.01"	365	N 09° 22' 03.32"	E 77° 41' 30.24"
166	N 09° 22' 46.51"N	E 77° 42' 12.18"	366	N 09° 22' 03.22"	E 77° 41' 29.81"

167	N 09° 22' 46.91"N	E 77° 42' 14.99"	367	N 09° 21' 59.74"	E 77° 41' 28.60"
168	N 09° 22' 48.17"N	E 77° 42' 17.87"	368	N 09° 22' 00.06"	E 77° 41' 24.40"
169	N 09° 22' 47.84"N	E 77° 42' 17.98"	369	N 09° 21' 59.53"	E 77° 41' 24.40"
170	N 09° 22' 47.19"N	E 77° 42' 16.30"	370	N 09° 21' 59.52"	E 77° 41' 22.35"
171	N 09° 22' 46.57"N	E 77° 42' 16.34"	371	N 09° 21' 59.42"	E 77° 41' 20.86"
172	N 09° 22' 46.14"N	E 77° 42' 13.14"	372	N 09° 21' 59.10"	E 77° 41' 20.91"
173	N 09° 22' 46.15"N	E 77° 42' 09.44"	373	N 09° 21' 57.99"	E 77° 41' 20.86"
174	N 09° 22' 46.34"N	E 77° 42' 09.42"	374	N 09° 21' 57.87"	E 77° 41' 17.99"
175	N 09° 22' 45.97"N	E 77° 42' 07.14"	375	N 09° 21' 58.12"	E 77° 41' 17.95"
176	N 09° 22' 45.68"N	E 77° 42' 06.67"	376	N 09° 21' 57.95"	E 77° 41' 16.89"
177	N 09° 22' 45.65"N	E 77° 42' 05.10"	377	N 09° 21' 57.82"	E 77° 41' 16.89"
178	N 09° 22' 45.48"	E 77° 42' 03.88"	378	N 09° 21' 57.80"	E 77° 41' 16.52"
179	N 09° 22' 45.21"	E 77° 42' 02.62"	379	N 09° 21' 57.66"	E 77° 41' 15.47"
180	N 09° 22' 45.12"	E 77° 42' 01.67"	380	N 09° 21' 57.47"	E 77° 41' 14.48"
181	N 09° 22' 45.16"	E 77° 42' 00.74"	381	N 09° 21' 57.32"	E 77° 41' 11.80"
182	N 09° 22' 45.15"	E 77° 41' 59.68"	382	N 09° 21' 56.90"	E 77° 41' 08.30"
183	N 09° 22' 45.49"	E 77° 41' 58.62"	383	N 09° 21' 56.76"	E 77° 41' 07.31"
184	N 09° 22' 45.24"	E 77° 41' 56.12"	384	N 09° 21' 56.79"	E 77° 41' 06.17"
185	N 09° 22' 42.20"	E 77° 41' 56.31"	385	N 09° 21' 56.74"	E 77° 41' 03.86"
186	N 09° 22' 41.78"	E 77° 41' 59.37"	386	N 09° 21' 56.51"	E 77° 41' 03.68"
187	N 09° 22' 42.12"	E 77° 42' 00.49"	387	N 09° 21' 56.65"	E 77° 41' 02.52"
188	N 09° 22' 42.63"	E 77° 42' 01.55"	388	N 09° 21' 56.80"	E 77° 41' 00.89"
189	N 09° 22' 43.23"	E 77° 42' 02.59"	389	N 09° 21' 54.96"	E 77° 41' 00.81"
190	N 09° 22' 44.14"	E 77° 42' 05.01"	390	N 09° 21' 54.97"	E 77° 41' 00.61"
191	N 09° 22' 44.62"	E 77° 42' 09.37"	391	N 09° 21' 55.05"	E 77° 40' 56.80"
192	N 09° 22' 44.09"	E 77° 42' 09.40"	392	N 09° 21' 54.05"	E 77° 40' 56.67"
193	N 09° 22' 42.11"	E 77° 42' 09.40"	393	N 09° 21' 54.03"	E 77° 40' 55.12"
194	N 09° 22' 42.04"	E 77° 42' 11.11"	394	N 09° 21' 52.16"	E 77° 40' 55.16"
195	N 09° 22' 42.13"	E 77° 42' 13.04"	395	N 09° 21' 29.94"	E 77° 40' 01.56"
196	N 09° 22' 42.66"	E 77° 42' 16.09"	396	N 09° 21' 28.48"	E 77° 39' 58.96"
197	N 09° 22' 42.81"	E 77° 42' 17.69"	397	N 09° 21' 28.44"	E 77° 39' 57.86"
198	N 09° 22' 42.84"	E 77° 42' 18.07"	398	N 09° 21' 29.93"	E 77° 39' 55.40"
199	N 09° 22' 42.98"	E 77° 42' 19.75"	399	N 09° 21' 30.49"	E 77° 39' 55.45"
200	N 09° 22' 43.13"	E 77° 42' 20.87"	400	N 09° 21' 30.62"	E 77° 39' 56.18"
			401	N 09° 21' 31.89"	E 77° 39' 56.23"
			402	N 09° 21' 32.58"	E 77° 40' 00.10"

FIGURE 2.1: GOOGLE IMAGE OF LEASE BOUNDARY MAP

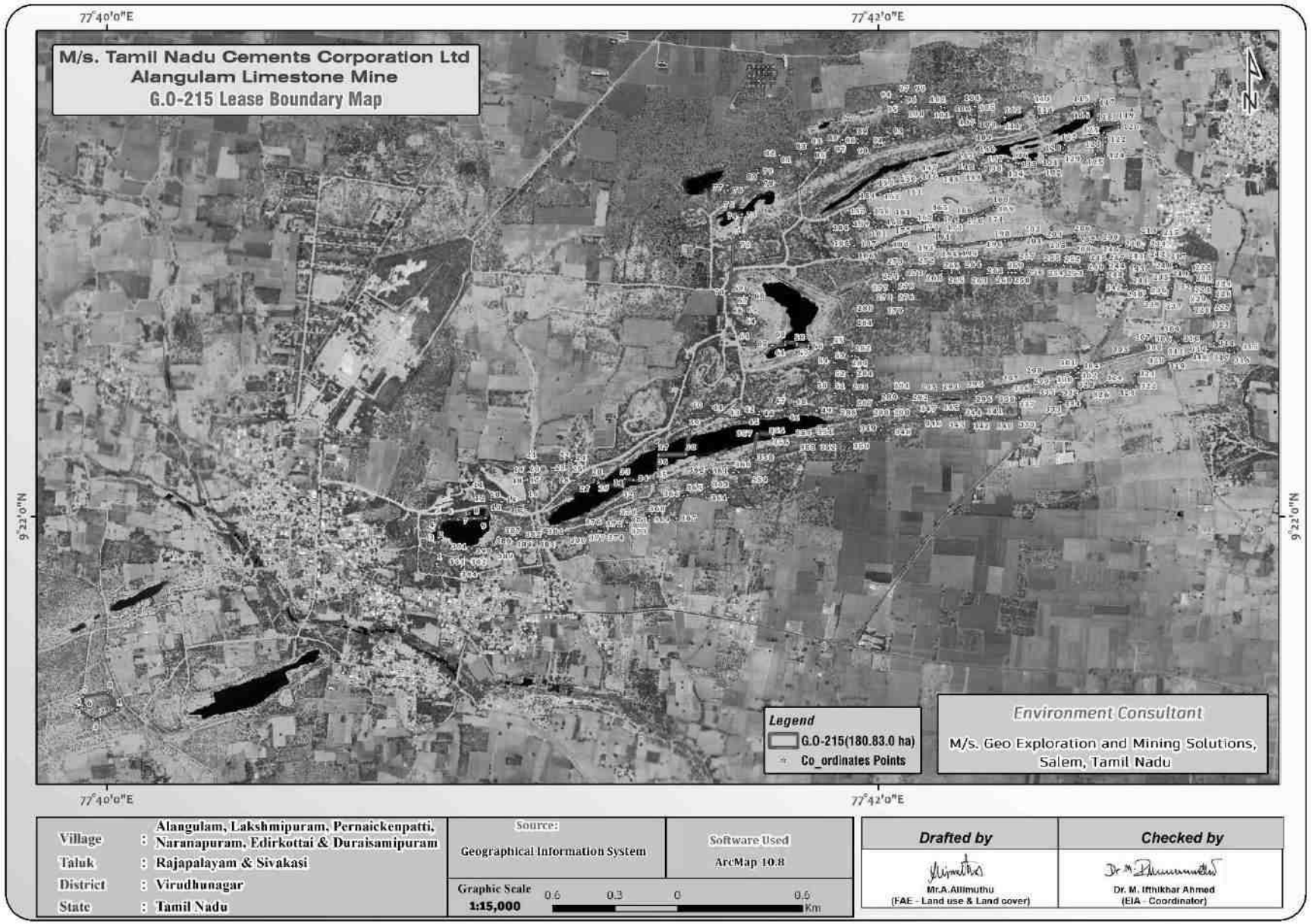
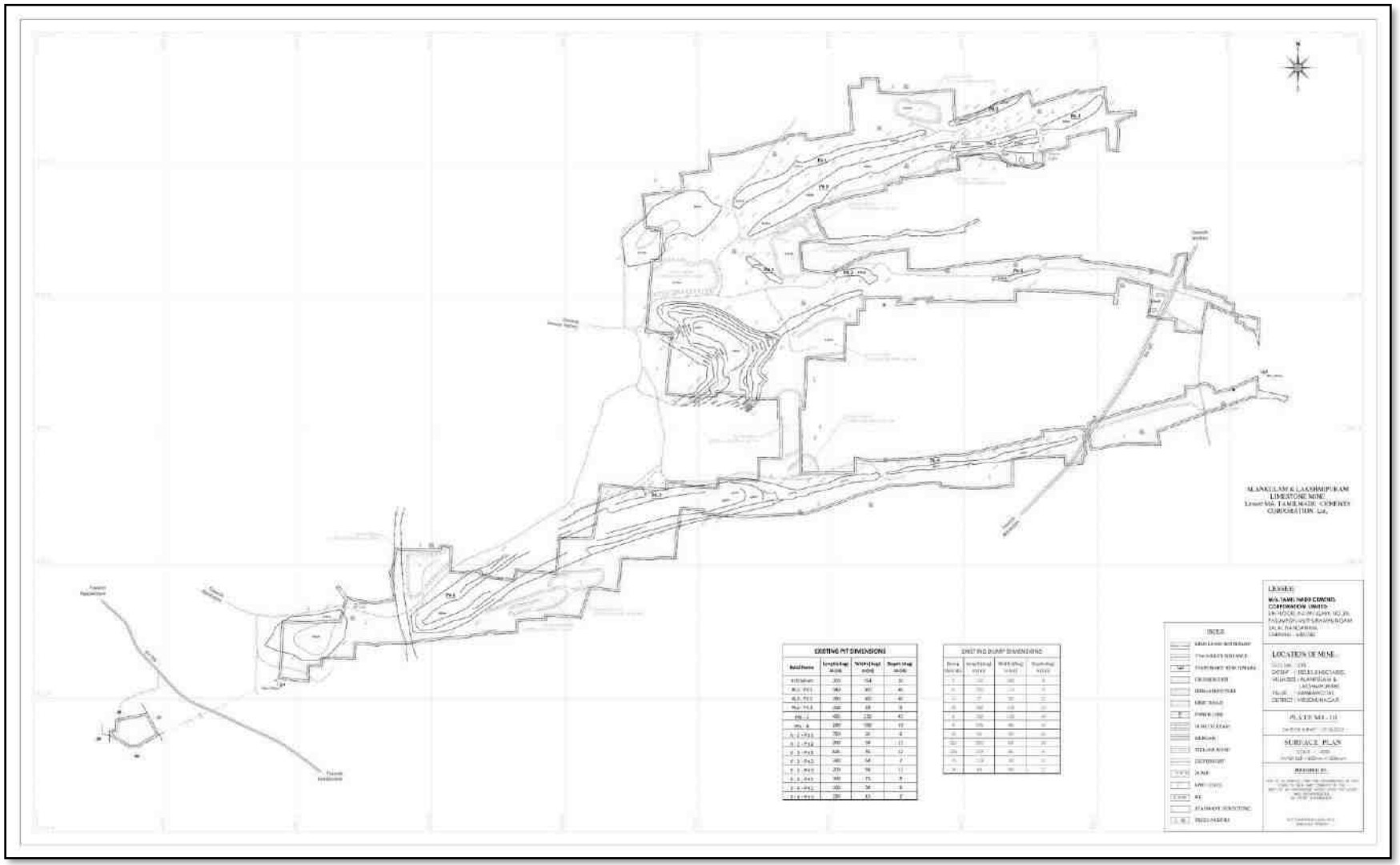


FIGURE 2.2: QUARRY LEASE PLAN / SURFACE PLAN (G.O No.215)



Cont..

FIGURE 2.3: GEOLOGICAL PLAN ((G.O No.215)

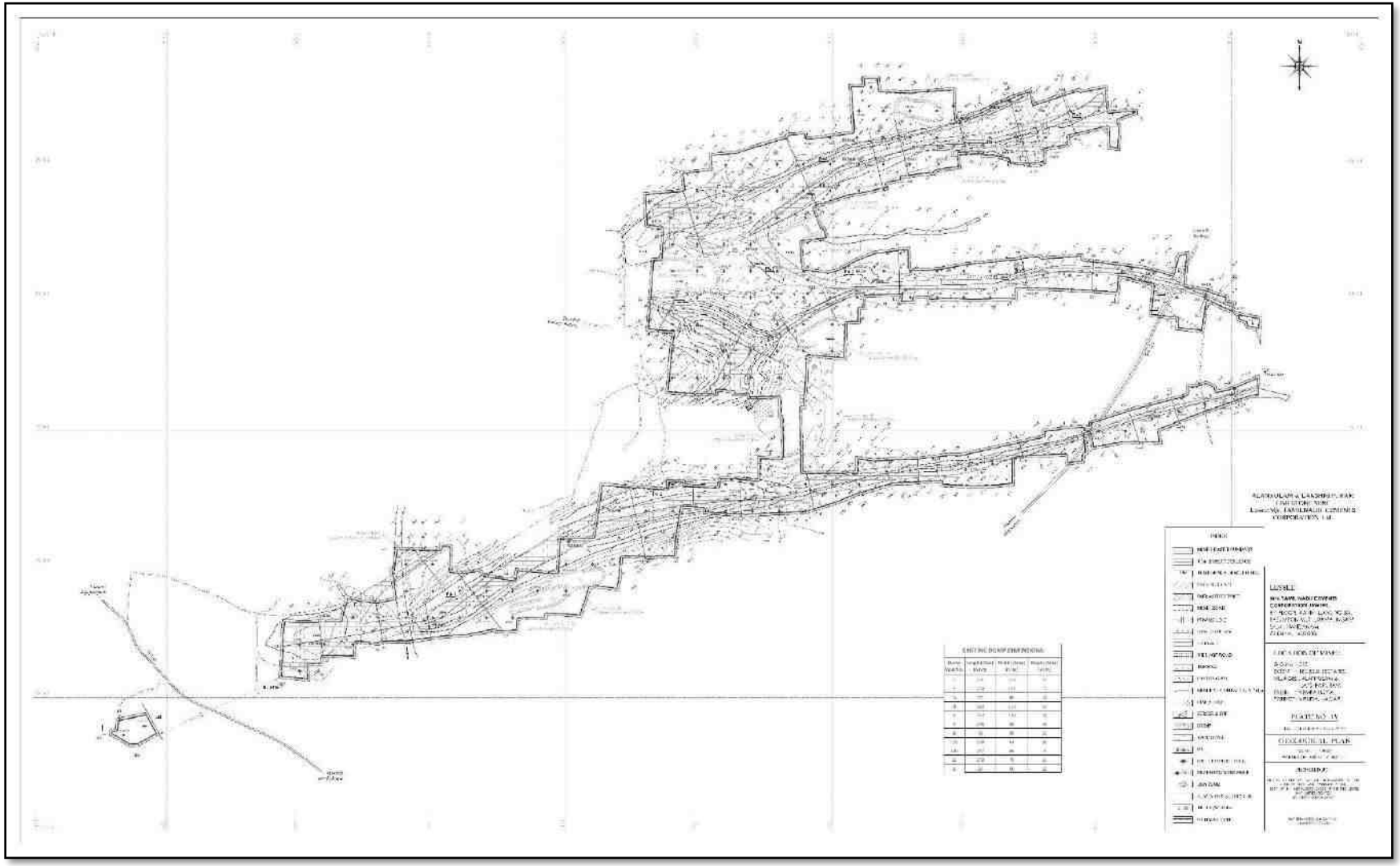
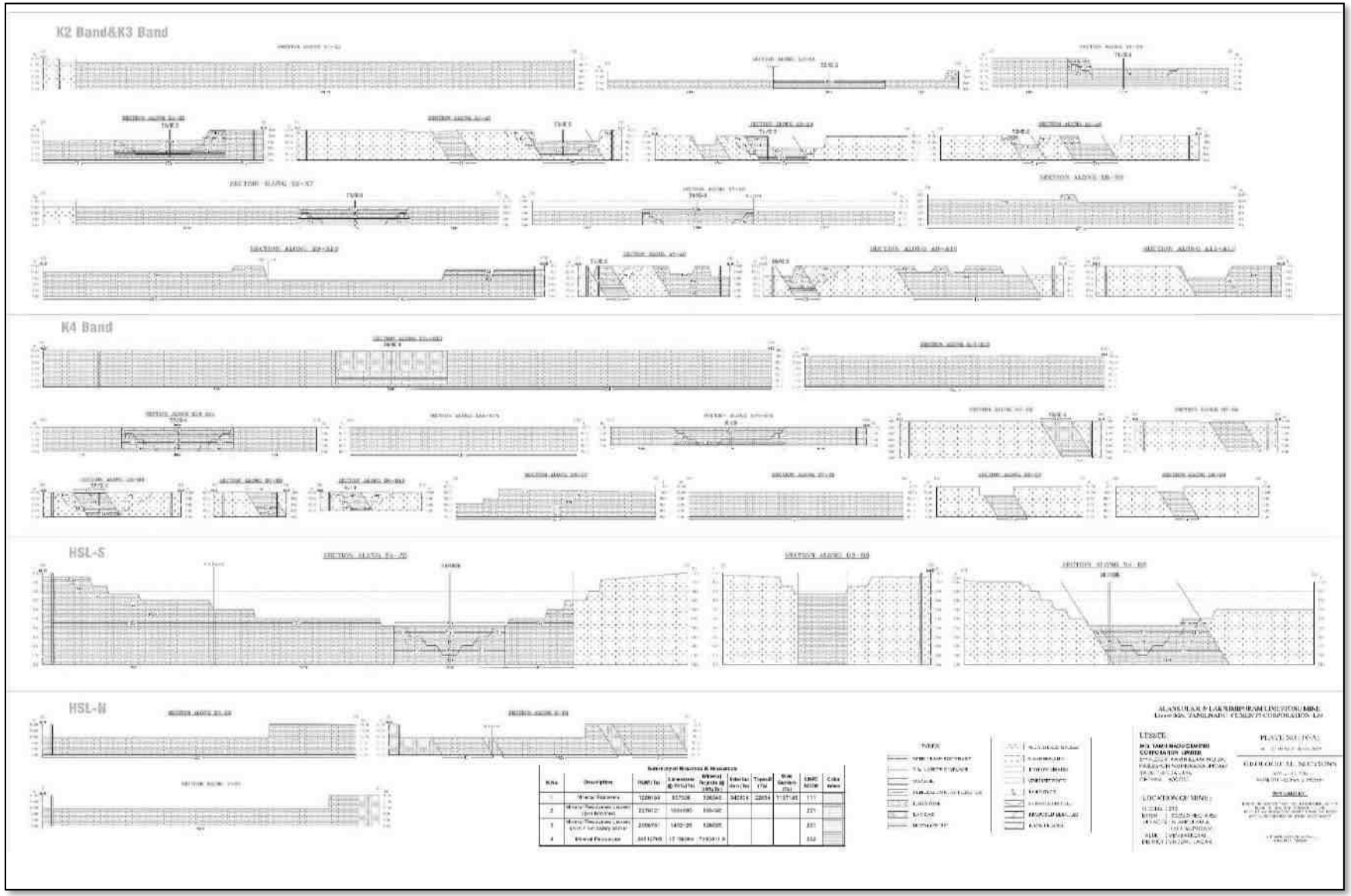


FIGURE 2.4: GEOLOGICAL SECTIONS OF THE AREA (G.O No.215)



Cont..

FIGURE.2.5. GEOLOGICAL SECTIONS OF THE AREA (G.O No.215)

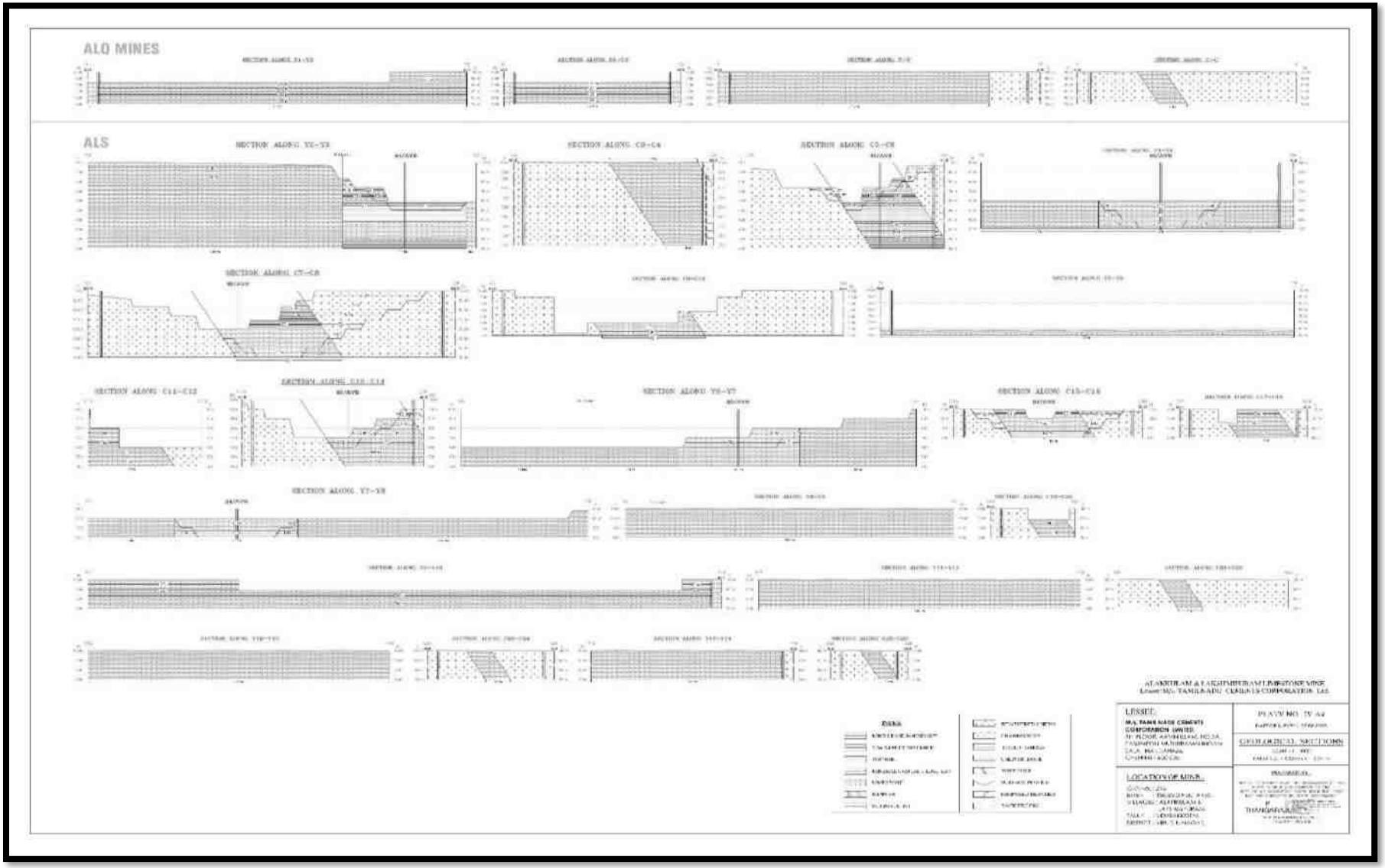


FIGURE 2.6: GOOGLE EARTH IMAGE SHOWING AROUND 500M RADIUS

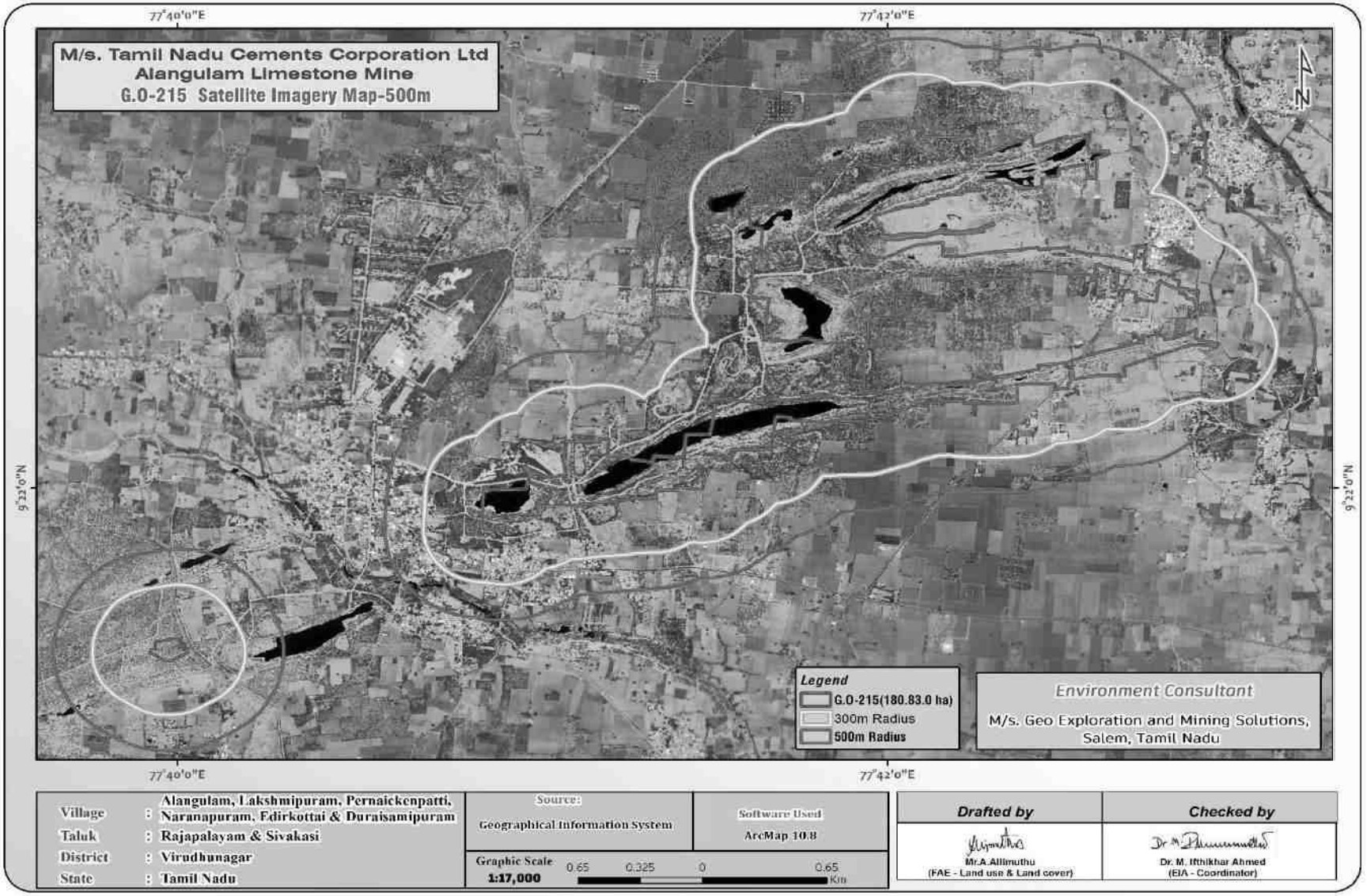


FIGURE 2.7: IMAGE SHOWING SURFACE FEATURES AROUND 10 KM RADIUS

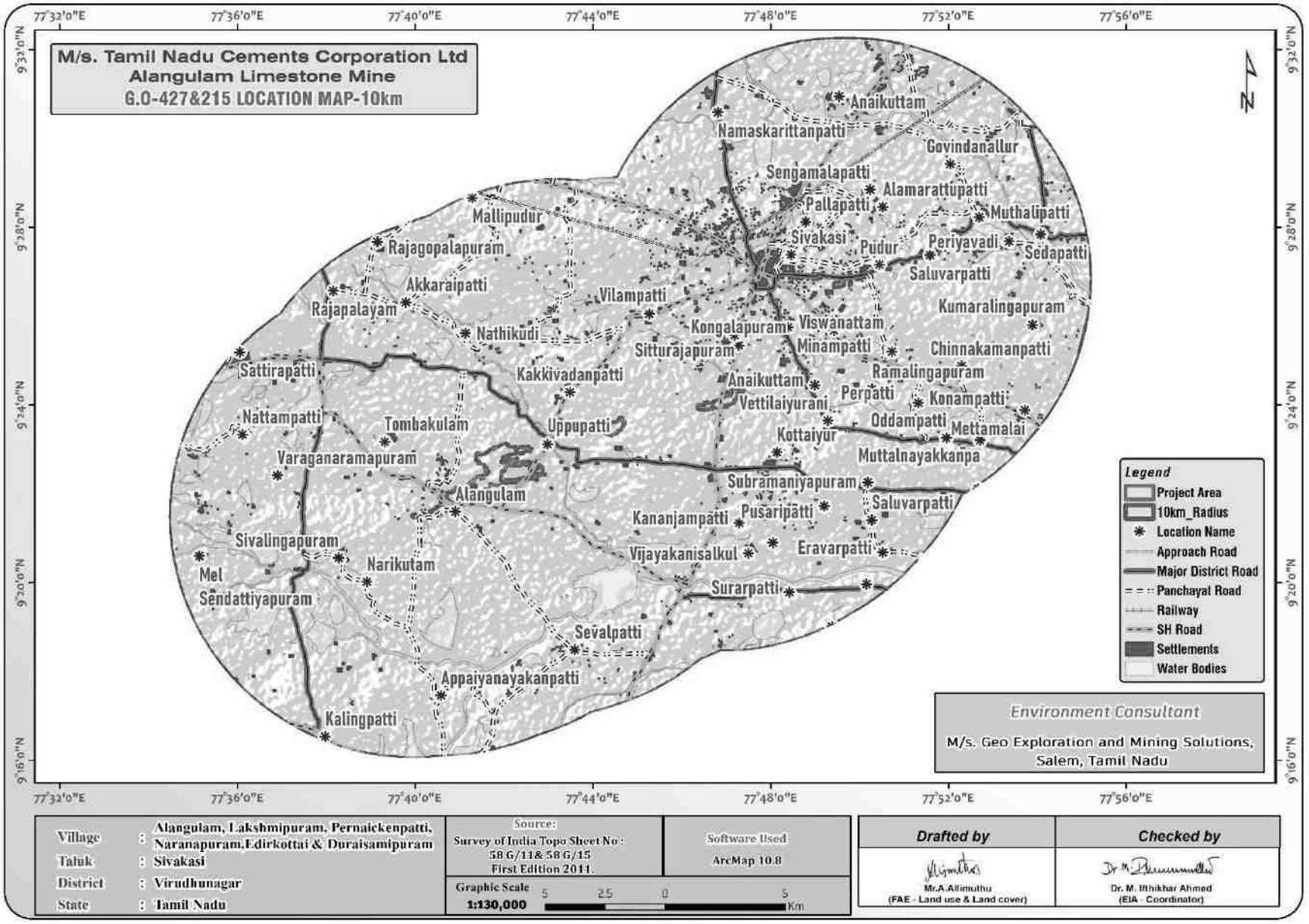
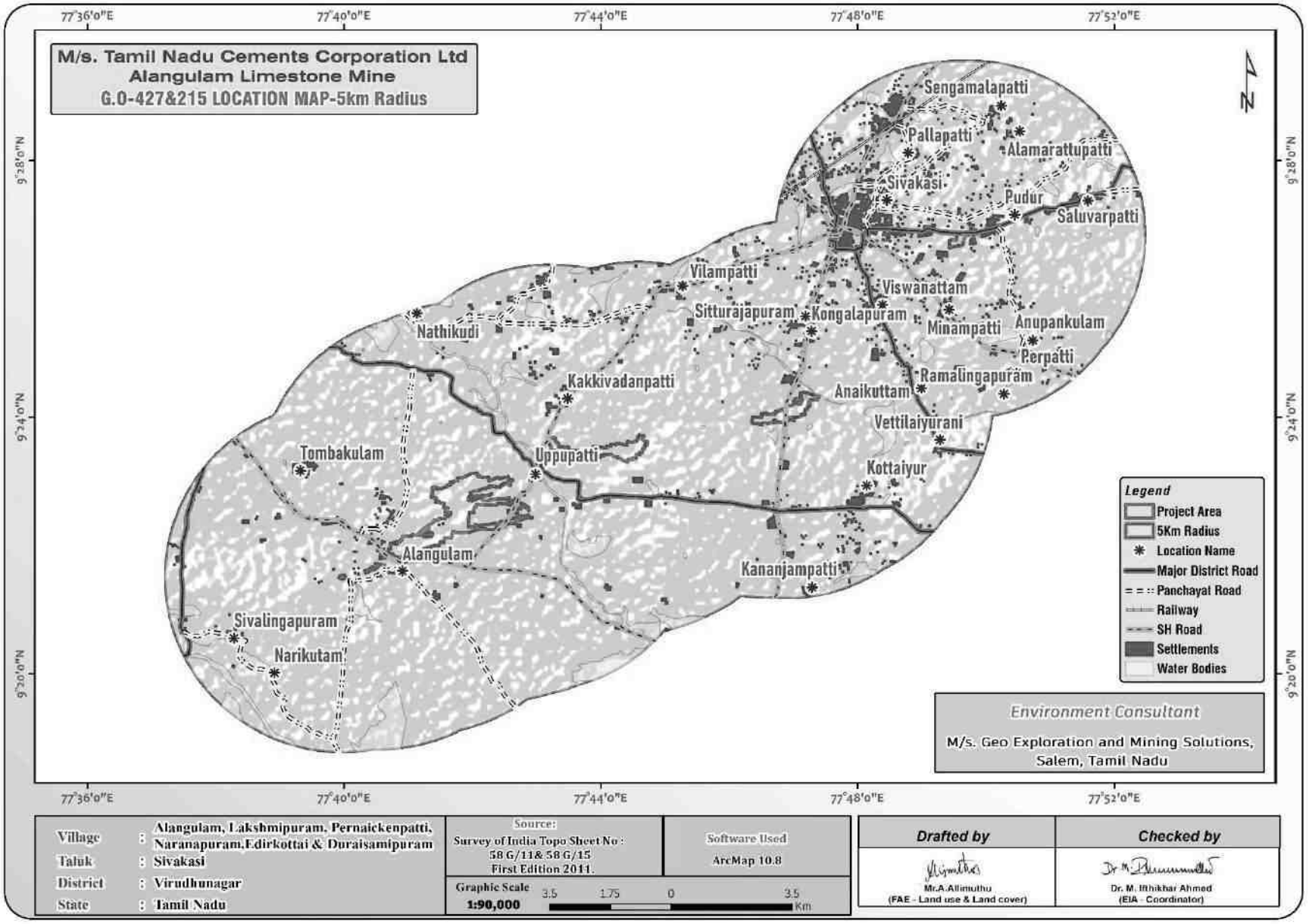


FIGURE 2.8: IMAGE SHOWING SURFACE FEATURES AROUND 5KM RADIUS



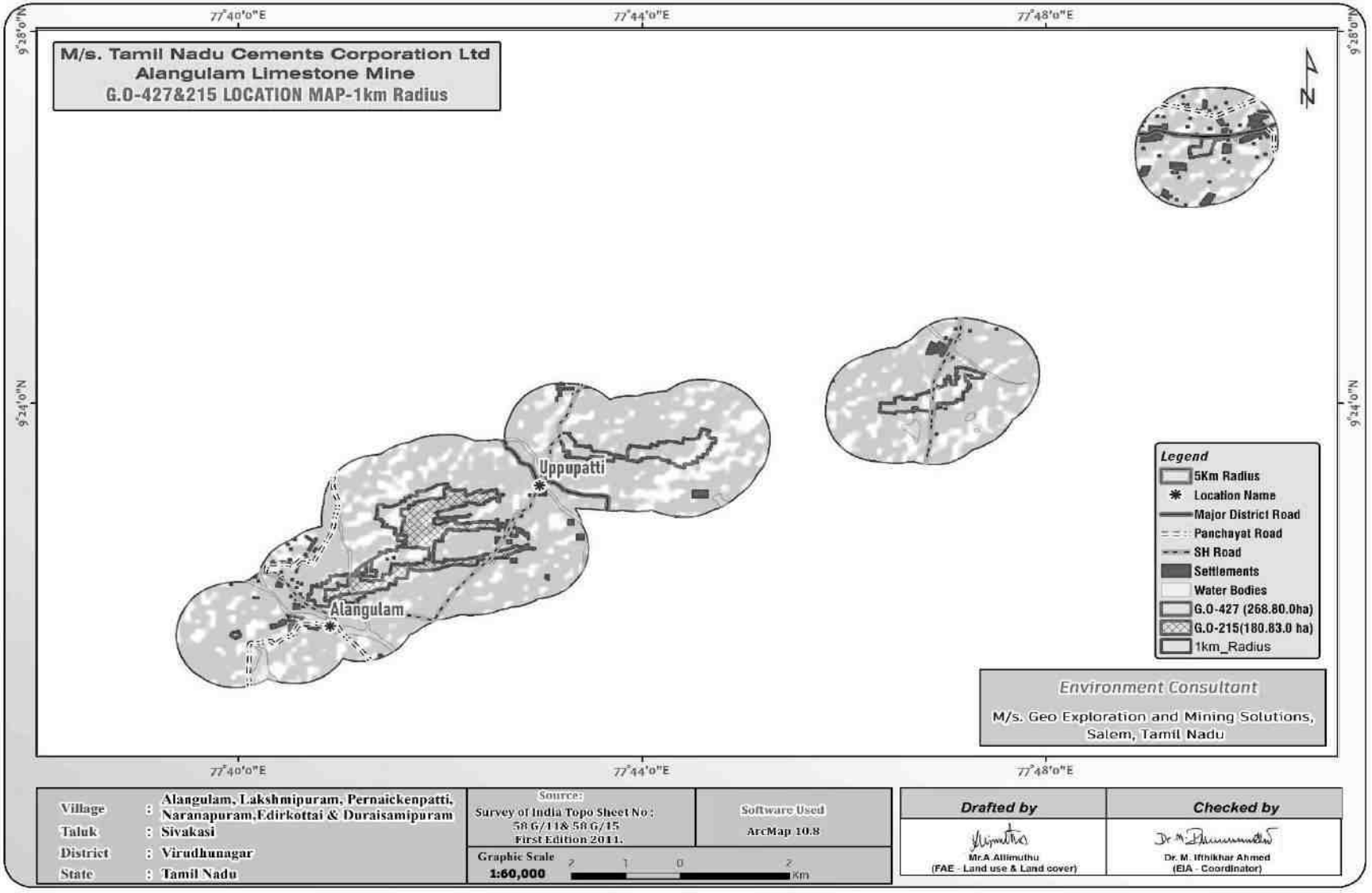


FIGURE 2.9: IMAGE SHOWING SURFACE FEATURES AROUND 1 KM RADIUS

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 projects and is devoid of major vegetation and trees.

TABLE 2.3: PRESENT AND POST LAND USE PATTERN OF THE LEASE AREA

Sno	Type of land use (in ha)	Present area (Ha)	Aditional area to be required at this Scheme period (Ha)	Area at the end of life of mine (Ha)
1	Area under Mining	46.36.0	2.30.0	51.74.0
2	Dumps	16.69.0	NIL	16.69.0
3	Roads	2.00.0	NIL	2.50.0
4	Green belt	-	15.78.0	15.78.0
5	Unutilized Area	115.78.0	97.70.0	94.12.0
Total		**180.83.0**	**115.78.0**	**180.83.0**

Source: ROMP Report

2.2.2 Size or Magnitude of Operation

TABLE 2.4 YEAR WISE PRODUCTION DETAILS (2023 TO 2028)

Year	ROM (Ts)	Limestone @70%(Ts)	Mineral Rejects@ 30%(Ts)	Inter burden (Ts)	Topsoil (Ts)	Side burden (Ts)
2023-24	140433	98303	42130	144717	0	253845
2024-25	141570	99099	42471	0	0	0
2025-26	140415	98291	42124	0	0	356962
2026-27	140837	98586	42251	26125	4560	57713
2027-28	140156	98109	42047	65224	0	102600
Total	**703411**	**492388**	**211023**	**236066**	**4560**	**771120**

Source: IBM online Report

2.3 REGIONAL GEOLOGY

The limestone belt represents Zone of mineralization of calcareous sediments which area subsequently metamorphosed in the geological past. The deposit belongs to Darwarian group of Archean era which forms the oldest group of rock formation. The limestone deposit shows different gradations both in physical and chemical composition. The colour of the limestone is white. The limestone is mostly coarse grained with pocket of fine-granied material. The topsoil is black cotton soil with an average thickness of about 1m. the lease area is not affected by any geological disturbances like fold, fault. The general geological sequence of the limestone deposits is as follows, Order of super position: Age Rock formation: Recent-Black soil. Archean-Crystalline Limestone-calc-gneisses.

Geomorphology

Virudhunagar district is bordered by Western Ghats (Ridge and valley complex) in the West. Vally fill area is observed in Watrap block. A major part of the district constitutes a plain terrain with a gentle slope toward East and Southeast, except for the hilly terrain in the west. The prominent geomorphic units identified in the district through interpretation of Satellite imagery are; 1. Flood Plain, 2. Bazada, 3. Pediment, 4. Shallow & deep buried Pediments and 6. Structural Hills.

Source: **http://cgwb.gov.in/District_Profile/TamilNadu/Virudhunagar.pdf)**

The district is divisible into three geomorphological units viz the western most hill ranges (denudational hills of Western Ghats), uplands (pediments) and the plains (pediplains). The hill ranges rise upto 2019 meters above mean sea level at Kottaimalai. The other notable hill is Andipatti hill with a NE-SW trend, in the northwestern part of the district. The Vaippar and Gundar rivers which flow to the east are ephemeral streams. The drainage pattern is subdendritic.

2.3.2 Local Geology: -

The area was surveyed in detail to prepare a geological map in the scale of 1:4000 showing the varous formations and attitude of the deposit. It is inferred that the Limestone mineral is of grade suitable for cement industries and in form band running S600W-N600E with SE600 dip. Top soil covers up to a depth in about 0.5m to 1.5m. Recovery of minerals as 70%. The recovery percentage is based on the knowledge gained from the present mine workings and adjacent working mine in thus region, by the field tests carried out in the lease area and analysis done in companys inhouse laboratories and government laboratory-National counsil for cement and Building Materials, New Delhi. The general geological sequence of the limestone deposits is as follows: Order of super position: AGE ROCK FORMATION: Recent-Black Soil Archean-Crystalline Limestone-cal-Gneisses.

2.3.3 Hydrogeology

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

Source: **https://Virudhunagar.nic.in/departments/geology-mining/**

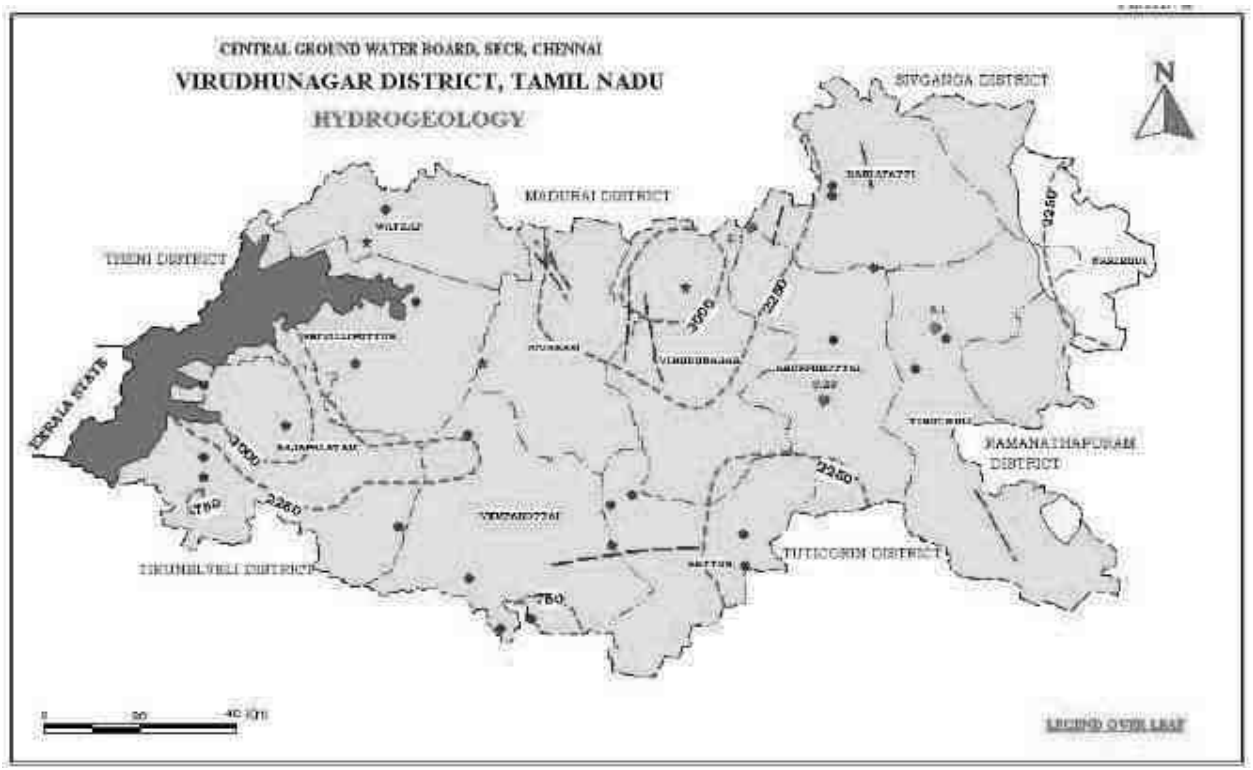


FIGURE 2.10: HYDROGEOLOGY MAP OF VIRUDHUNAGAR DISTRICT

FIGURE 2.11: REGIONAL GEOLOGY MAP

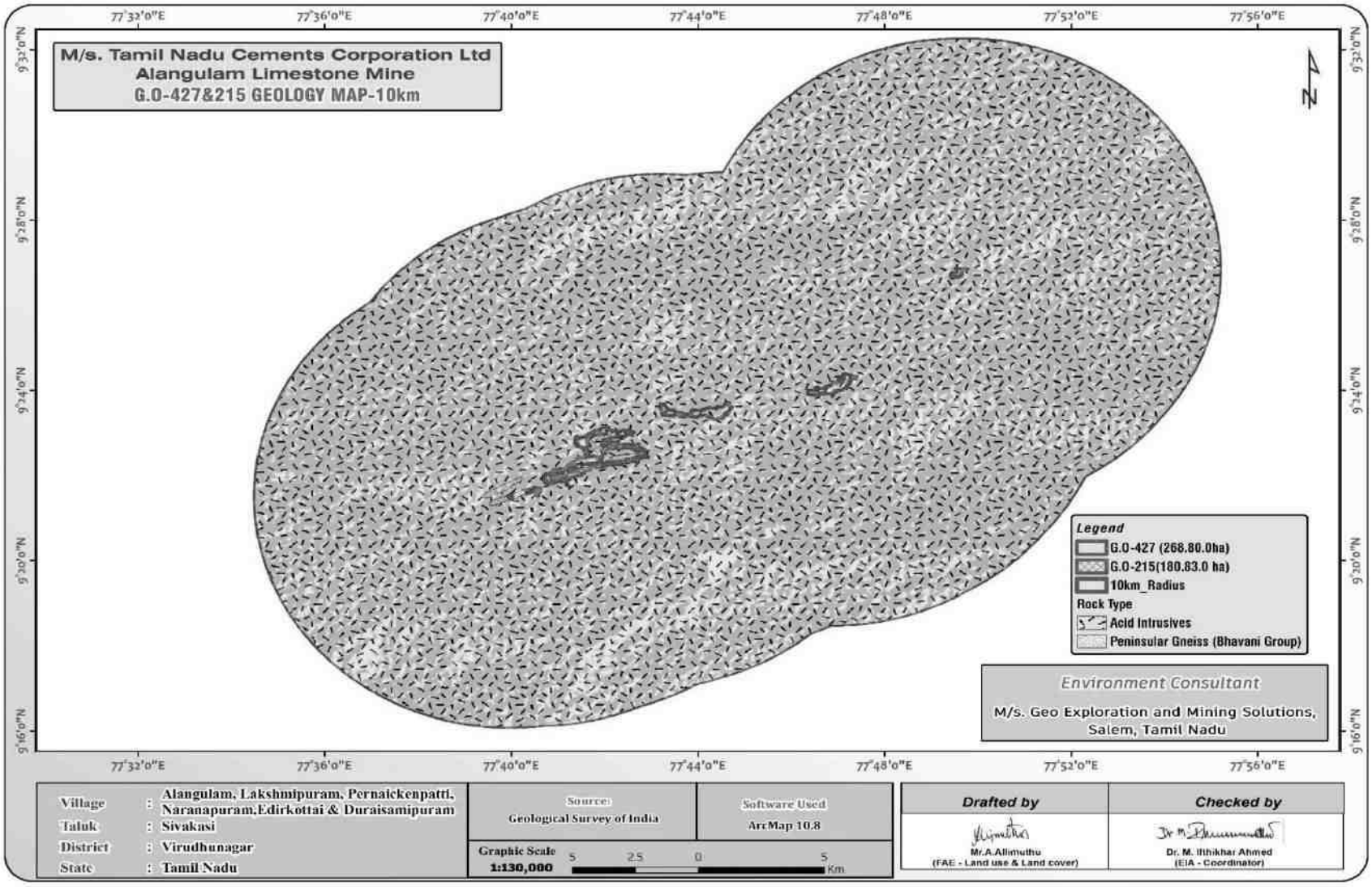


FIGURE 2.12: GEOMORPHOLOGY MAP

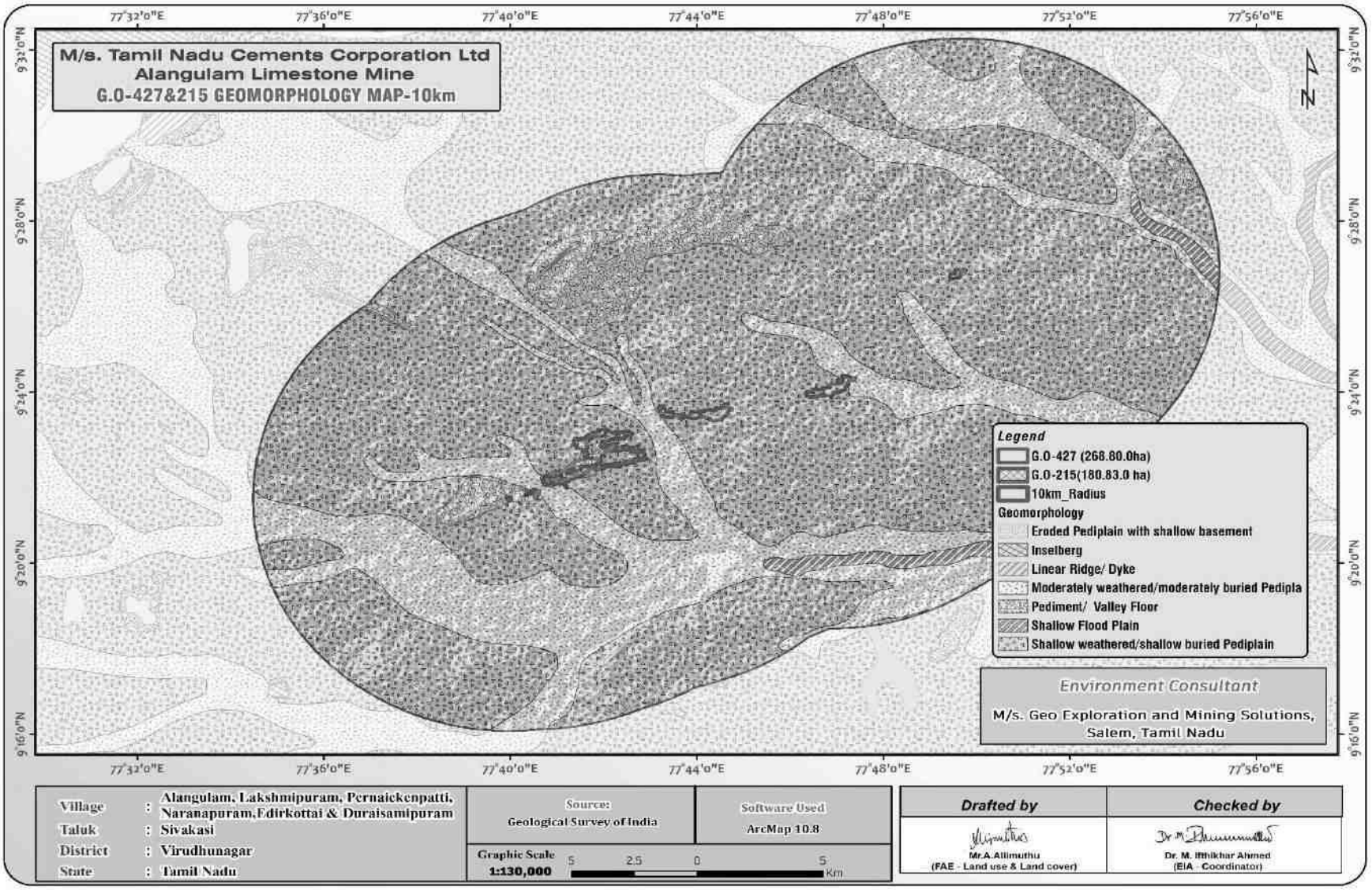


FIGURE. 2.13: PROGRESSIVE MINE CLOSURE PLAN AND SECTIONS (2023-2024)

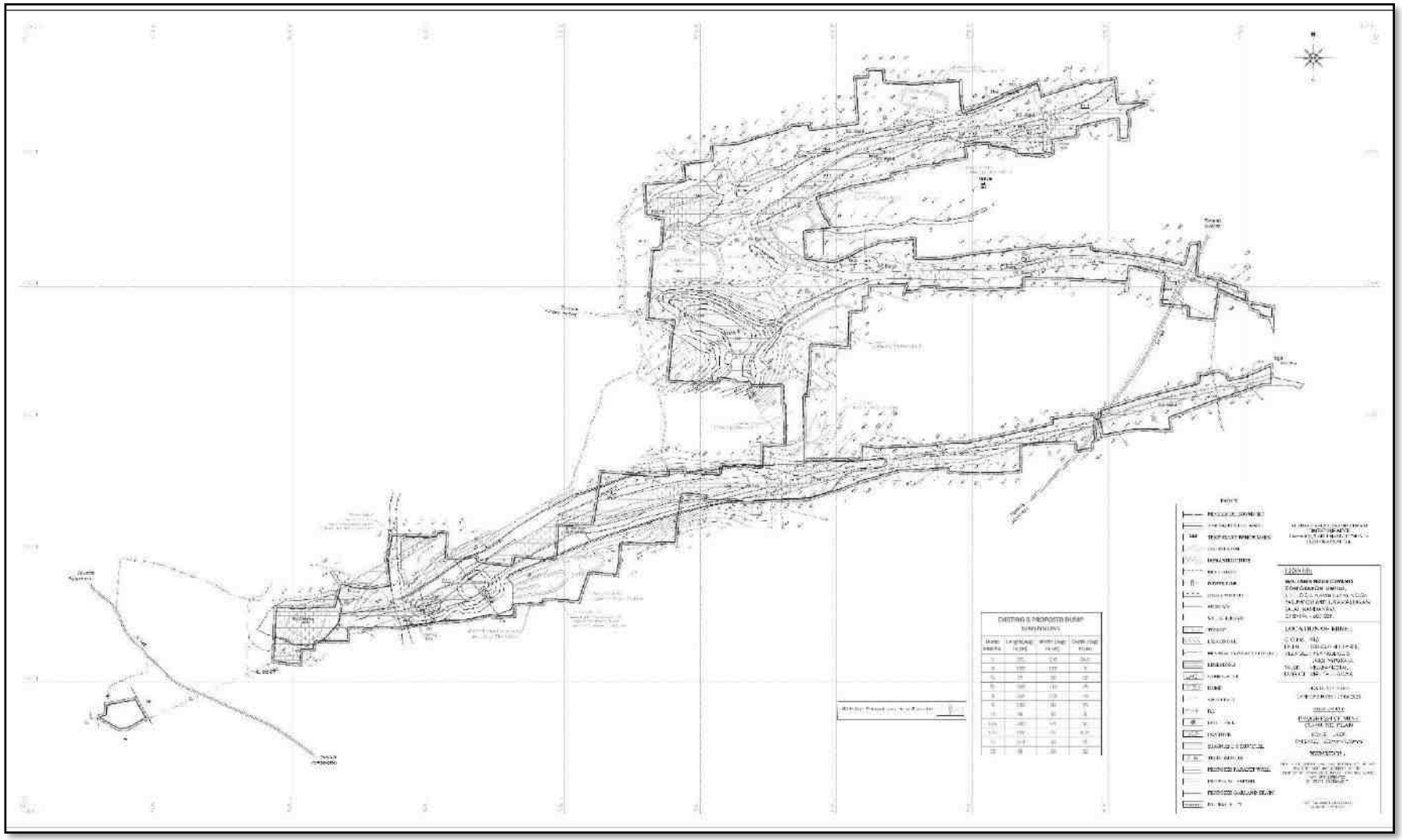


FIGURE. 2.14: PROGRESSIVE MINE CLOSURE PLAN AND SECTIONS(2024-2025)

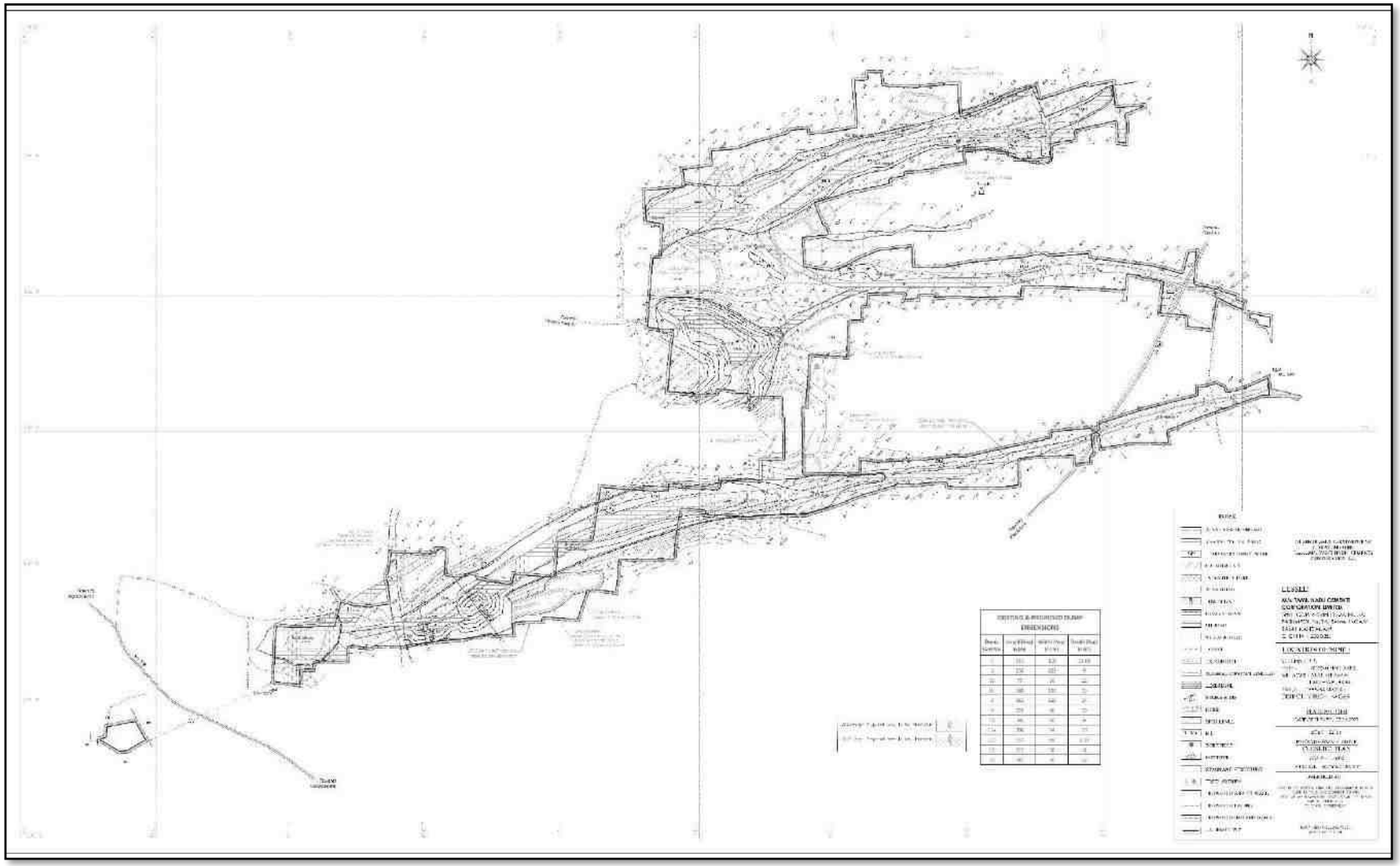


FIGURE. 2.15: PROGRESSIVE MINE CLOSURE PLAN AND SECTIONS(2025-2026)

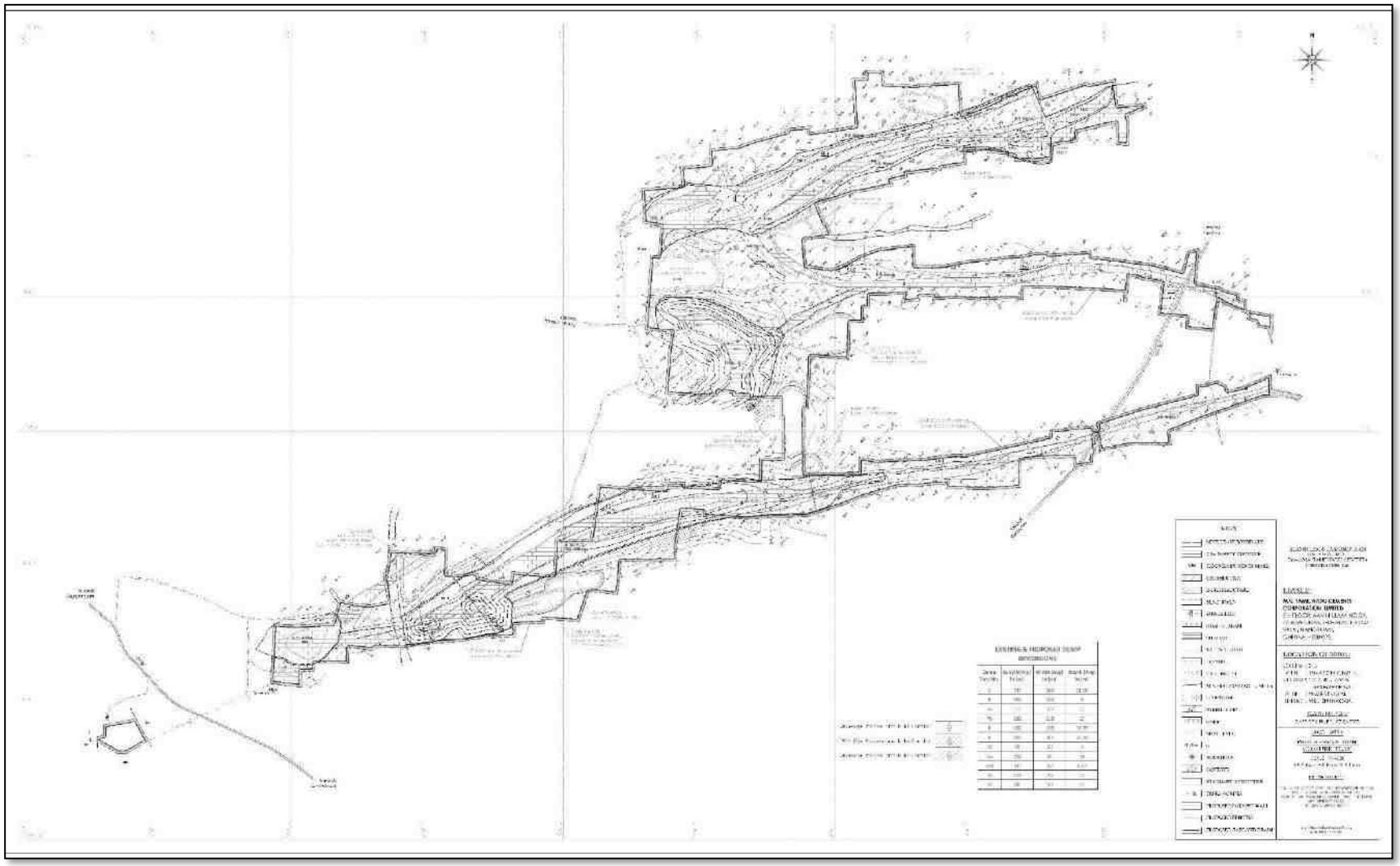


FIGURE. 2.16: PROGRESSIVE MINE CLOSURE PLAN AND SECTIONS (2026-2027)

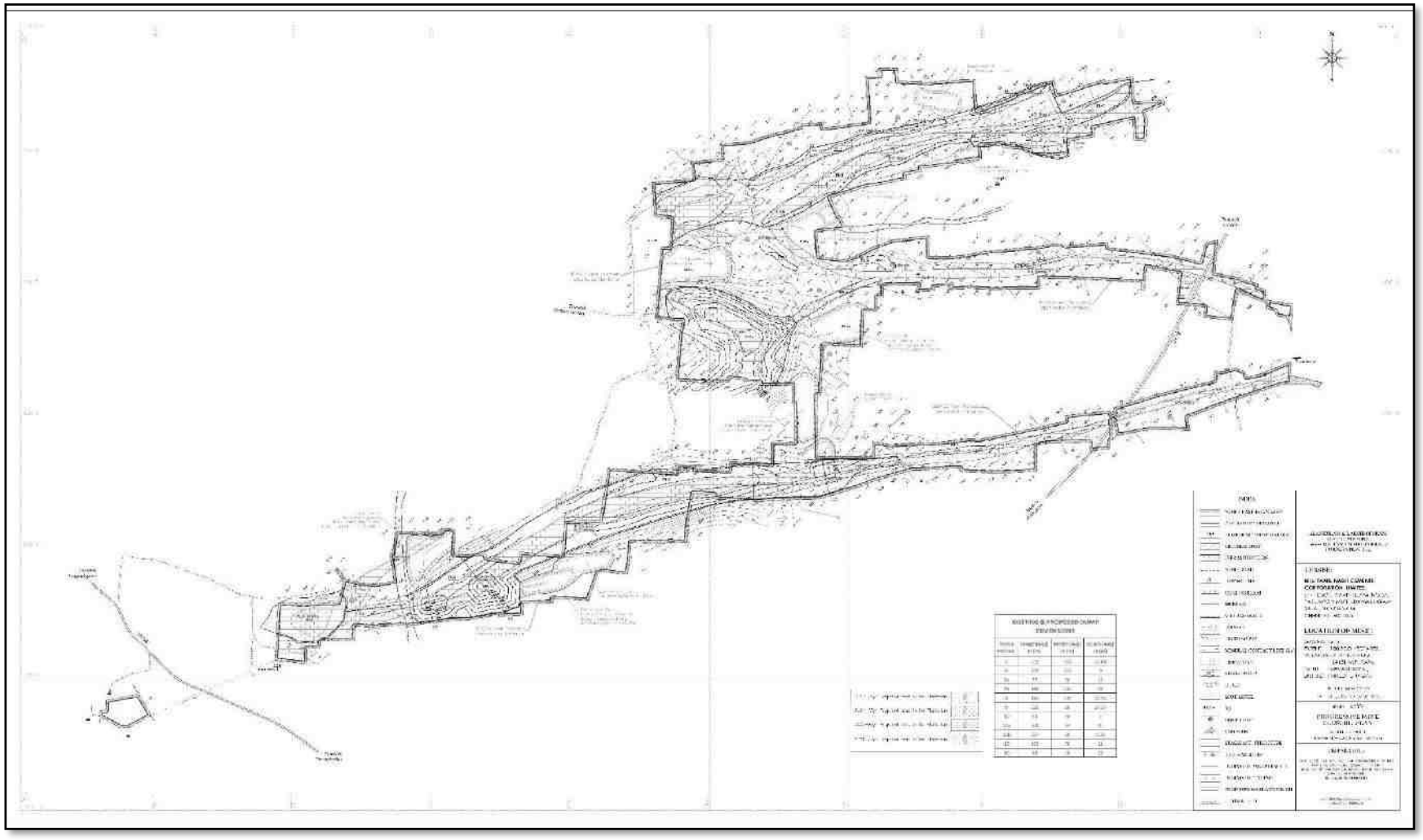


FIGURE. 2.17: PROGRESSIVE MINE CLOSURE PLAN AND SECTIONS(2027-2028)

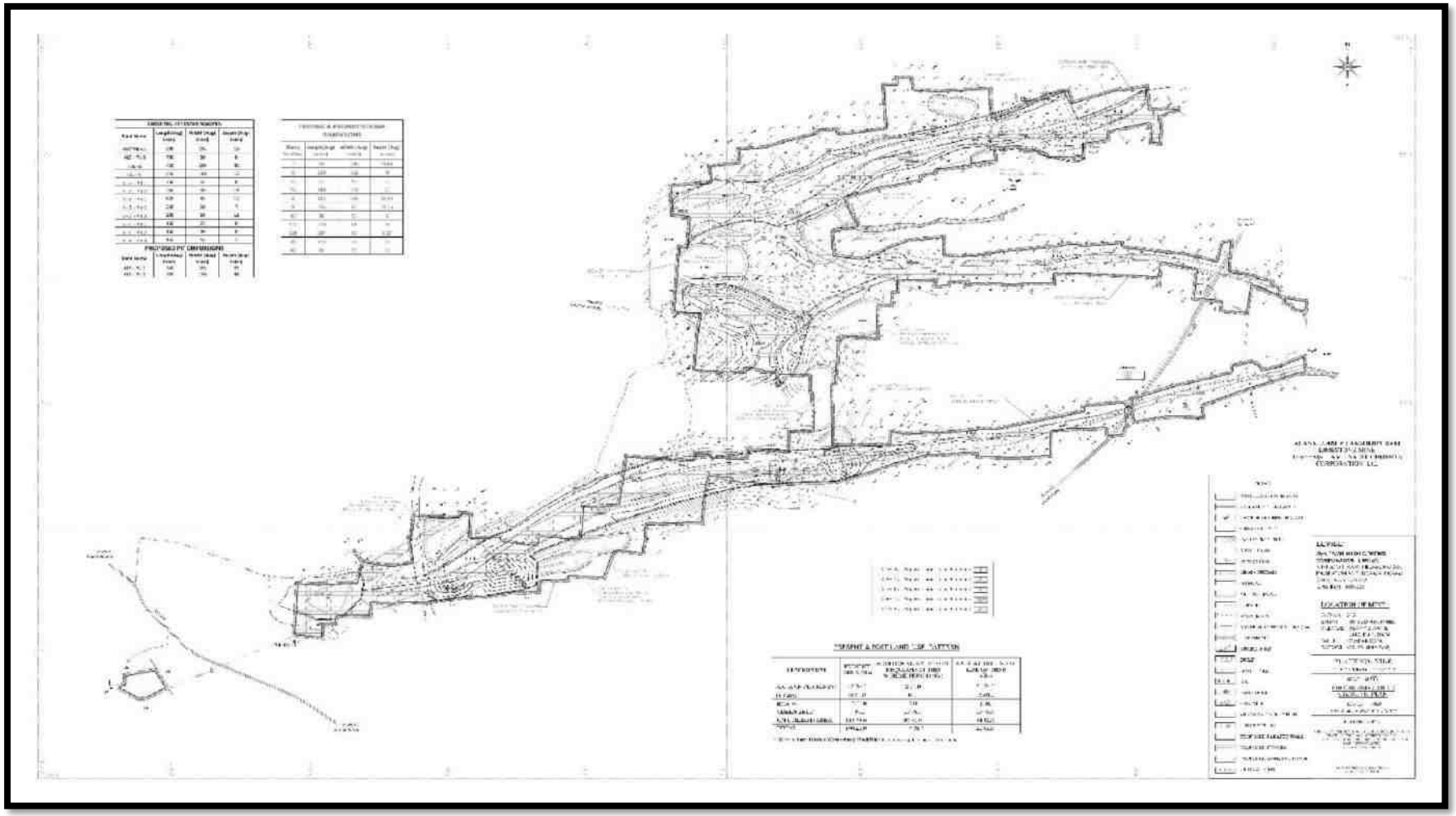
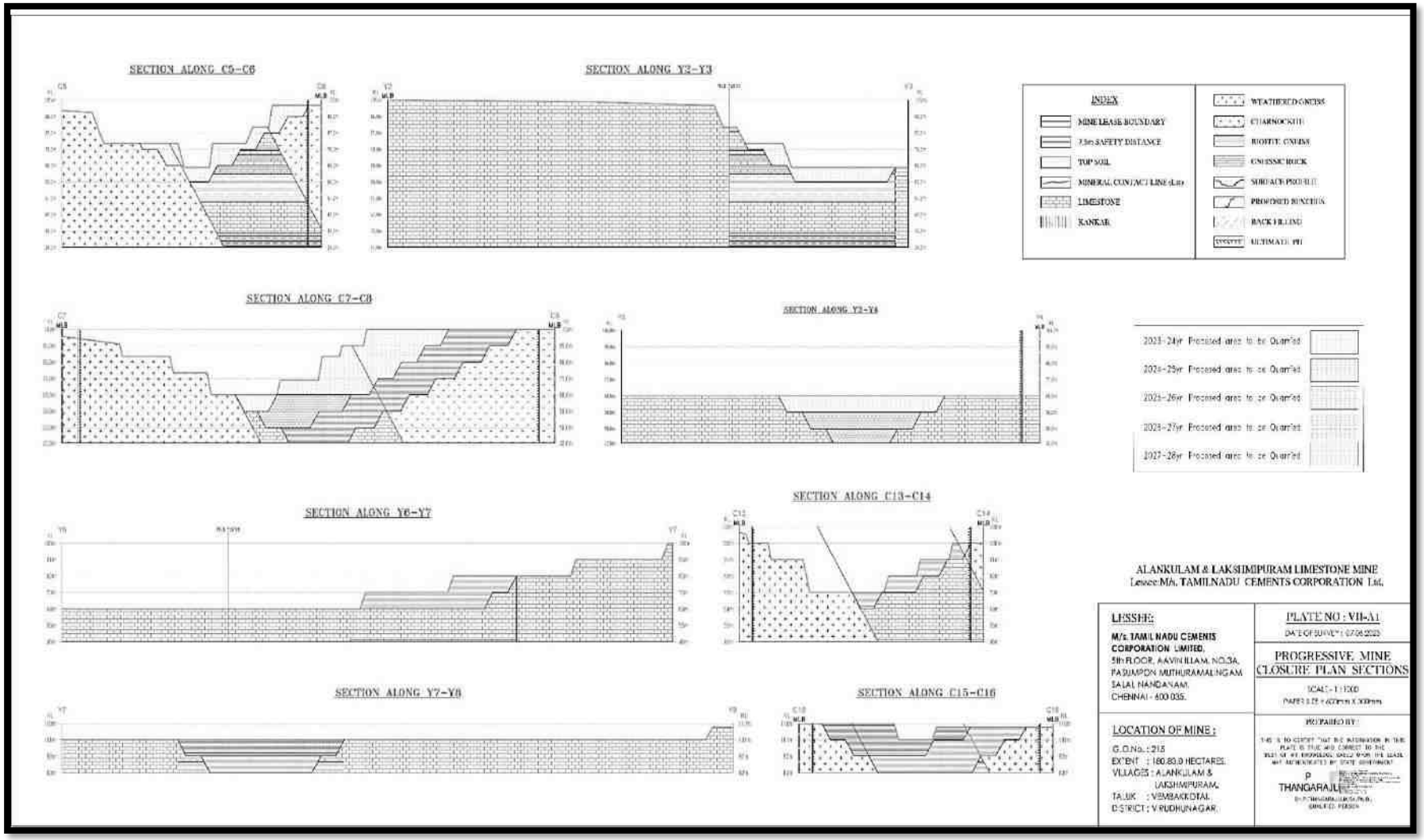


FIGURE. 2.18: PROGRESSIVE MINE CLOSURE PLAN AND SECTIONS



2.4 RESOURCES AND RESERVES

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

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

TABLE 2.5: YEAR WISE PRODUCTION DETAILS (2023 TO 2028)

Year	ROM (Ts)	Limestone @70%(Ts)	Mineral Rejects@ 30%(Ts)	Inter burden (Ts)	Topsoil (Ts)	Side burden (Ts)
2023-24	140433	98303	42130	144717	0	253845
2024-25	141570	99099	42471	0	0	0
2025-26	140415	98291	42125	0	0	356962
2026-27	140837	98586	42251	26125	4560	57713
2027-28	140156	98109	42047	65224	0	102600
Total	**703411**	**492388**	**211023**	**236066**	**4560**	**771120**

Source: IBM online Report

2.5 METHOD OF MINING

Existing method:

The mining operation was proposed to be carried out by "A" Category, fully mechanized during the previous plan period. Jackhammers with compressors and wagon drills was deployed for drilling. Deep hole blasting was carried out to loosen the insitu limestone. Slurry type of explosives with ANFO was used for blasting. Loading and transport of the mineral and waste was done by Hydraulic excavators and tippers.

Proposed method:

The method of mining is by fully mechanized open cast method; Jackhammers with compressors and wagon drills will be deployed for drilling. Deep hole blasting will be carried out to loosen the insitu limestone. Slurry type of explosives with ANFO will be used for blasting. The spacing and burden will be 3m and the depth of the hole will be 10m. The hole is drilled to a depth of 10m, giving 10% sub grade drilling to avoid toe formation. The blasting will be restricted to two to three rows of drilling with each row consisting of 10 to 12 holes. The holes are drilled either in a staggered pattern or square pattern. Loading and transport of the mineral and waste will be done by Hydraulic excavators and tippers.

2.5.1 Drilling & Blasting Parameters

i). Pitting:

P1

The depth of the mine has reached maximum 45m. Based on the existing trial pits and drilled core holes, the depth of the mineralization has been proved up-to 89.0 m depth (Maximum) with 1m of topsoil in the lease area. There is no additional formation of pits in the existing mine. The mining pit indicates the limestone band deposit and direction. To confirm the characteristics features of limestone band and to find out the further depth persistence of the mineralization, 158 core drills (PBH1- PBH158) of depth ranging from 18m to 110m are proposed from the existing floor level @ 100m grid interval, for future exploration during the present plan period in the year 2023-24 to 2024-25. Locations of the proposed core drills are marked in the geological plan and year wise plan (Refer Plate No.5A, 5B).

ii). Trenching

As discussed above, there is no requirement of trenching in the existing mine. Besides, active mines in this region prove that the terrain consist of meta-crystalline limestone formation.

iii). Drilling

The depth of the mine has reached maximum 15m. Based on the existing trial pits and drilled core holes, the depth of the mineralization has been proved up-to 89.0 m depth (Maximum) with 1m of topsoil in the lease area. There is no additional formation of pits in the existing mine. The mining pit indicates the limestone band deposit and direction. To confirm the characteristics features of limestone band and to find out the further depth persistence of the mineralization, 158 core drills (PBH1- PBH158) of depth ranging from 18m to 110m are proposed from the existing floor level @ 100m grid interval, for future exploration during the present plan period in the year

2023-24 to 2024-25. Locations of the proposed core drills are marked in the geological plan and year wise plan (Refer Plate No.5A, 5B).

2.5.2 Type of explosives to be used

Primary blasting is done with 83 mm diameter Slurry Explosives. Deep Hole drilling of 110 mm diameter by engaging Wagon Drill along with Air Compressor.

Controlled blasting measures will be adopted for minimizing ground vibration and fly rock.

P1

Spacing (S) = 15 * Hole Diameter (D) (Hard Rock Type)
= 15 * .110
= **1.65 m**

Burden (B) = 1.25 * Spacing
= 1.25 * 1.65
= 2.06 m

Bench Height (BH) = **6 m** (Proposed)

No of Holes (N) = [V/ (B*S*BH)]
= [180 / (2.06*1.65*6)]
= 9 **Holes**

Blast Volume (V) = [B*S*BH*N]
= [2.06*1.65*6*9]
= **183 m^3**

Powder Factor (PF) = **0.7 kg/m^3** (assumed)

Total explosive required = Volume of rock blasted * Powder Factor
= 128 Kg – Emulsion explosives

Charge/ hole = **14 Kg**

Blasting will be carried out by competent qualified blaster under the supervision of qualified statutory mines manager. Sufficient warning will be given to the public by Siren and red flags will be given to sentry posted on the all sides of quarry boundaries and will be re-allowed to the mines after inspection of mines manager and blaster.

2.5.3 Extent of Mechanization:

TABLE 2.6: PROPOSED MACHINERY DEPLOYMENT

S. No	Name of the machine	Nos.	Capacity
1	Excavator L&T Komatsu	1	Bucket capacity 1.20m^3
2	Mechanicia	1	Atlas Copco 1.81 (t)
3	Excavator	8	Tata Hitachi 1.20m^3
4	Dozer BD	1	D10 Dozer BEML 3.60hp

Source: IBM Online Report, Prefeasibility report.

TABLE 2.7: DRILLING AND BLASTING PARAMETERS

S.No	Parameters	Description
1	Drilling Source	Deep Hole drilling of 110 mm diameter by engaging Wagon Drill along with Air Compressor
2	Drilling parameters	Depth (M) x Burden (M) x Spacing (M) 6.0 x 2.06 x 1.65
3	Charge pattern	Charge 14 KG per hole. Stemming is 1/3 and explosives 2/3.The stemming material is moisture clay/ pyroxene mixed waste.

4	Initiation System	Bottom initiation system with safety fuses and ordinary or /plain electric detonators.
5	No of blast hole	Number of the hole required per day is 9, based on the above said parameters.
6	Powder factor	Powder factor is reported as 5 Ts per KG of explosives.

2.5.3 STORAGE OF EXPLOSIVES:

Explosive magazine, 2 Nos. are available at the southern end of the lease area for storing explosives. Licensed Magazines were constructed by brick work and RCC roofing with stipulated specifications. Capacity of magazine and License No. are as below –

2.5.3.1 Handling of Top Soil

The topsoil is black soil and it occurs to a depth of 1m. Topsoil generated is about 4560Ts (P1) will be generation during the present plan period. Topsoil generated during present plan period will be utilized for afforestation purposes.

2.5.3.2 Waste Management

The waste will be loaded with the help of hydraulic excavators of 1.20 m^3 bucket capacity for transporting it to the dump yard in the south, southwest and centre of the lease area and will be later utilized for backfilling purposes when the mine reaches its ultimate pit limit.

2.5.3.3 Green Belt Development

Additional area to be required at this scheme period is 15.78.0 Hectares; Greenbelt area at the end of life of mine is 15.78.0 Hectares. It is proposed to plant predominant local species like Pungum, casuarian and other regional trees.

2.5.5.5 RECLAMATION AND REHABILITATION:

Reclamation and Rehabilitation is not proposed in the present scheme period. After the end of the life of the mine the mined-out pit will be allowed to collect the rain water, the pit will be utilized as temporary storage reservoir which will enhance the ground water level.

2.6 GENERAL FEATURES.

Breakup of the land use and land cover within the lease area as approved in the ROMP by the Indian Bureau of Mines, Chennai.

TABLE 2.8: PRESENT AND POST LAND USE PATTERN OF THE LEASE AREA

Sno	Type of land use (in ha)	Present area (Ha)	Aditional area to be required at this Scheme period (Ha)	Area at the end of life of mine (Ha)
1	Area under Mining	46.36.0	2.30.0	51.74.0
2	Dumps	16.69.0	NIL	16.69.0
3	Roads	2.00.0	NIL	2.50.0
4	Green belt	-	15.78.0	15.78.0
5	Unutilized Area	115.78.0	97.70.0	94.12.0
Total		**180.83.0**	**115.78.0**	**180.83.0**

Source: ROMP, IBM online Report

2.6.1 Drainage Pattern

There are no streams, canals or water bodies crossing the project area, hence there is no requirement of stream deviation or canals in the near future.

2.6.2 Existing Infrastructures

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

2.6.3 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.

2.6.4 Traffic Density

The traffic survey conducted based on the transportation route of material, the Limestone is proposed to be transported mainly through. Kovilore Village Road –South west side of the Cluster and 2. Reddiapatti-Sattur District Road – South East side.

Traffic density measurements were performed at two locations

1. Kovilore Village Road – -SouthWest side
2. Reddiapatti-Sattur – South East side

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.2.9: TRAFFIC SURVEY LOCATIONS

Station Code	Road Name	Distance and Direction	Type of Road
TS1	Reddiapatti to Sattur	1.5Km & SE	District Road
TS2	Kovilore Village Road	2.5Km &SW	Panchayat Road

Source: On-site monitoring by GEMS FAE & TM

TABLE 2.10: EXISTING TRAFFIC VOLUME

Station code	HMV		LMV		2/3 Wheelers		Total PCU
	No	PCU	No	PCU	No	PCU	
TS1	100	300	150	150	300	150	600
TS2	50	150	100	100	150	75	325

Source: On-site monitoring by GEMS FAE & TM

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

TABLE 2.11: LIMESTONE HOURLY TRANSPORTATION REQUIREMENT

Transportation of Limestone per day		
Capacity of trucks	No. of Trips per day Cumulatively	Volume in PCU
10 tonnes	85	85

Source: Data analysed from Approved Mining Plan

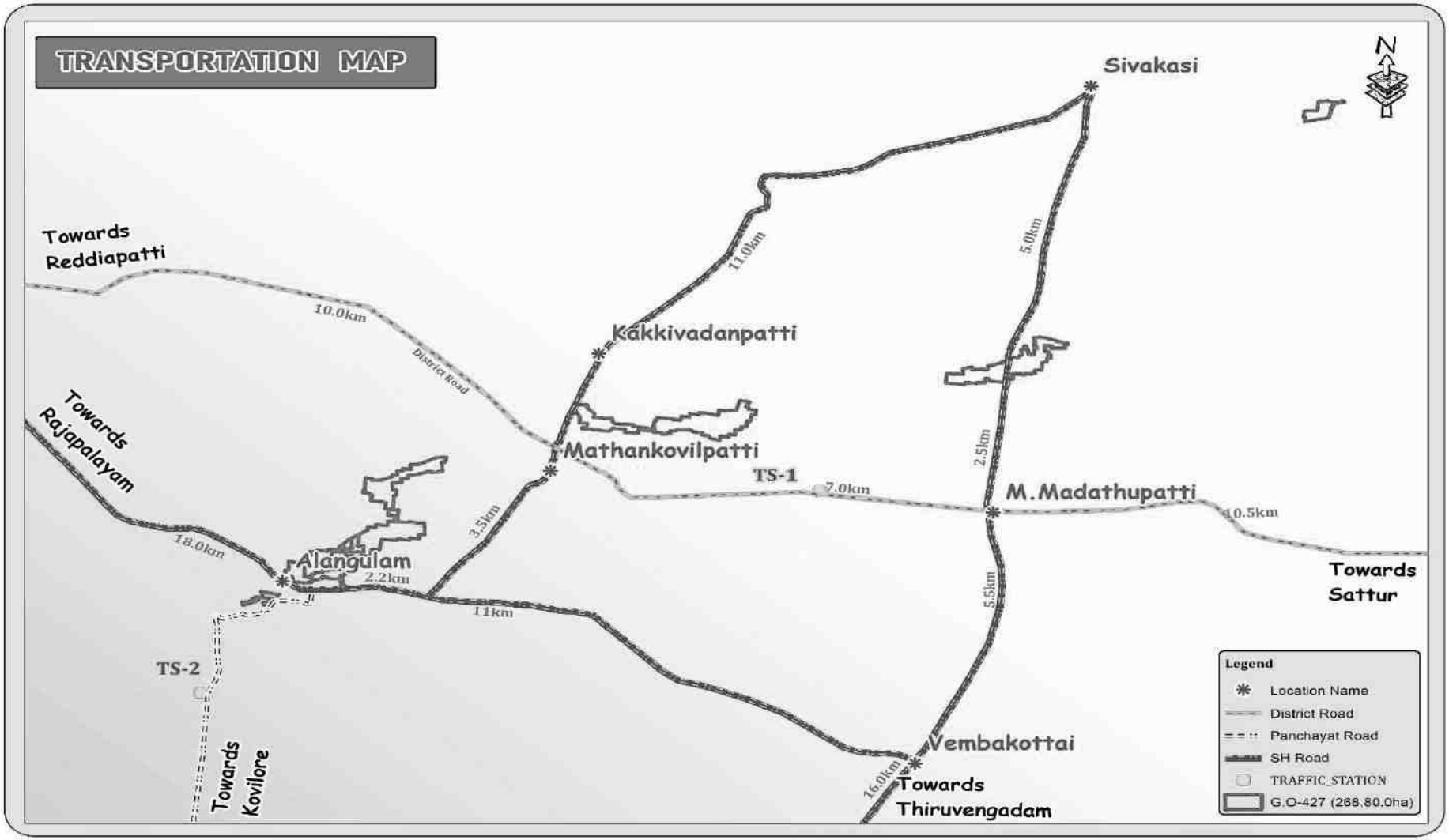
TABLE 2.12: SUMMARY OF TRAFFIC VOLUME

Route	Existing T raffic volume in PCU	Incremental traffic due to the project	Total traffic volume	Hourly Capacity in PCU as per (IRC – 1960 Guidelines)
Reddiapatti to Sattur- District Road	600	85	685	1800
Kovilore Village Road-Panchayat Road	325	85	410	1200

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

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

FIGURE.2.19: MINERAL TRANSPORTATION ROUTE MAP



2.6.4 Mineral Beneficiation and Processing

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

2.7 Project Requirement

2.7.1 Power, Water supply and Other Infrastructure Requirement

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

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

The temporary infrastructures such as Mine Office, First Aid Room, Rest Shelter etc., are available in the mine lease 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 and gases and the no requirement of waste treatment.

2.7.2 Water Source & Requirement

Detail of water requirements in KLD as given below:

Table 2.13: Water Requirement

Purpose	Fresh water	Waste water	Disposal
Dust Suppression	3.0 KLD	1.6	Septic tank followed by soak pit
Green Belt development	15.0 KLD	0	Nil
Domestic purpose	5.0 KLD	0	Nil
Total	**23.0 KLD**	**1.6 KLD**	

2.73 Fuel Requirement

Diesel (HSD) will be used for mining machineries. Diesel will be brought from nearby Fuel Stations.
One Hydraulic Excavator will excavate and load into the tipper about 50Ts / Hour,

Hydraulic Excavator will consume about 16 Ltrs per hour

Hence total production per day 469Ts of ROM per day

469Ts /50Ts per hour = 9 Hours (3 Hydraulic Excavators will be deployed)

= 9 Hours X 16 Liters

= about 144 Liters per day of HSD.

Besides other accessories like compressor etc., 100 -200 liters will be utilized per day.
Hence it is computed for the peak production capacity **100-200Ltrs** of HSD per day will utilized in the mining operation.

2.7.5 Project Cost

TABLE 2.14 PROJECT COST OF PROPOSED PROJECT

Code	Project cost (Rs)	EMP Cost (Rs)
P1	16.13 Crores	80 Lakhs

Source: 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 2.15: PROPOSED MANPOWER DEPLOYMENT

G.O 215		
Sno	**Employment**	**No. of persons**
1	Mines Engineer	1
2	Geologist	1
3	1st class Manager	1
4	2nd class Manager	1
5	Foreman	2
6	Mine mate	2
7	Blaster	2
Skilled worker operators		
8	Other	8
9	Operator	8
10	Drill operator	10
11	Other	2
12	Semi skilled workers	5
13	Unskilled workers	5
	Total	**48**

Source: Approved ROMP Report

2.9 PROJECT IMPLEMENTATION SCHEDULE

The Limestone mines were in operation from 1973 to 2017 and were temporarily stopped from 01.07.2017 to till date. The commercial operation will commence after the grant of Environmental Clearance. CTO and CTE will be obtained from the consent authority. The conditions imposed during the Environmental Clearance will be compiled before the start of mining operation.

2.9.1 Post Mining land - P1

a) Area covered by Cluster Pit : 46.36.0 Ha

b) Area required in next five years of mining plan period : 2.30.0 Ha

c) Area at the end of the life of the period : 51.74.0Ha

After complete exploitation of the Limestone mineral from the lease area, the mined-out pit will be allowed to collect the rain water which will act as a temporary reservoir, this temporary storage of water will act as an artificial recharge pond which will enhance the near ground water level and the static level of the nearby wells. Adequate measure will be taken care for constructing wall around the mined-out area with 2mts height and fenced as per the rules. A watchman (Security guard) will be posted around the clock to prevent inherent entry of public and cattle. During rains the accumulated/stagnated water will be pumped out by means of temporary electric source with 5 Hp motor and the water will be utilized for greenbelt.

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 and May 2023** with CPCB guidelines. Environmental data has been collected with reference to cluster quarries by **Chennai Mettex Lab Private Limited,** – An approved by APEDA, AGMARK, GAFTA,EIC, FSSAI, BIS & MOEF 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 to May 2023

Study Methodology

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

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

TABLE 3.1: MONITORING ATTRIBUTES AND FREQUENCY OF MONITORING

Attribute	Parameters	Frequency of Monitoring	No. of Locations	Protocol
Land-use Land cover	Land-use Pattern within 10 km radius of the study area	Data's from census handbook 2011 and from the satellite imagery	Study Area	Satellite Imagery Primary Survey
*Soil	Physio-Chemical Characteristics	Once during the study period	10 (5core & 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	10 (3 surface water & 7 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 (Mar to May 2023)	18 (5core & 13 buffer)	IS 5182 Part 1-23 National Ambient Air Quality Standards, CPCB
*Noise Levels	Ambient Noise	Hourly observation for 24 Hours per location	18 (5 core & 13 buffer zone)	IS 9989 As per CPCB Guidelines
Ecology	Existing Flora and Fauna	Through field visit during the study period	Study Area	Primary Survey by Quadrate & Transect Study Secondary Data – Forest Working Plan
Socio Economic Aspects	Socio–Economic Characteristics, Population Statistics and Existing Infrastructure in the study area	Site Visit & Census Handbook, 2011	Study Area	Primary Survey, census handbook & need based assessments.

Source: On-site monitoring/sampling by **Chennai Mettex Lab Private Limited**, in association with GEMS
* All monitoring and testing have been carried out as per the Guidelines of CPCB and MoEF & CC.

3.1 Land Environment

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

3.1.1 LAND USE/ LAND COVER

To study the land use pattern of the core as well as a buffer zone, land use/land cover details have been identified/ maps have been prepared in accordance with the **Standard ToR point no. 4 & 8 Stating**:

Point No. 4 All comer coordinates of the mine lease area, superimposed on a High-Resolution Imagery/ topo sheet. 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).

Point No. 8 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 landuse should be given.

Current vintage data of Indian Remote Sensing Satellite ResourceSat1 LISSIII (False Color Composite) has been used for Land Use / Land Cover study. Satellite image has been procured from National Remote Sensing Centre, Hyderabad.

3.1.2 OBJECTIVE

The objectives of the LULC study are as follow:

- To develop the Land use & Land cover map using land coordinates of the quarry area (Core Zone) and 10 km radius from the quarry site (Buffer area).
- To Identify and mark the important Land use and Land cover features using the primary and secondary data collected.
- To evaluate the impacts on Proposed/existing land use/cover features of the buffer area.
- To identify the mitigative measures for the sustainable use of land and to protect the buffer zone from the adverse impacts.

Technical specification of Satellite imagery Data Used:

Current vintage data of Indian Remote Sensing Satellite RESOURCESAT1 (LISS-III) digital FCC (False Color Composite) has been used for preparation of Land use/ Land cover thematic map of study area. Satellite image has been procured from National Remote Sensing Centre, Hyderabad. Survey of India Toposheet as a reference map on 1:50,000 scale has been used for preparation of base layer data like road, rail network; village for geo-referencing of satellite image.

Satellite Image - Resourcesat1-LISSIII, 23.5m Resolution
Satellite Data Source - NRSC, Hyderabad
Satellite Vintage - 14th July 2020, Swath 141km wide.
SOI Toposheet No - 58 G/11 & 58G/15
Software Used - ArcGIS 10.8

The satellite image (FCC colour 3,2,1) of the buffer zone is given in 3.1

The spatial resolution and the spectral bands in which the sensor collects the remotely sensed data are two important parameters for any land use survey. Resourcesat1-LISSIII, 23m Resolution of 23.5m and a 141 km wide swath of the earth in 23.5m resolution covering wide areas the data is collected in 4 visible bands namely band number and Resolution.

TABLE 3.2: Resourcesat1-LISSIII SENSOR characteristics

Band Number	Description	Wavelength	Resolution
Band 1	Green	0.52-0.59 µm	23.5 meters
Band 2	Red	0.62-0.68 µm	23.5meters
Band 3	NIR	0.77-0.86 µm	23.5meters
Band 4	SWIR	1.55-1.70 µm	70meters

Source: NRSC, Hyderabad

3.1.3 METHODOLOGY

The land use / land cover map is prepared by adopting the interpretation techniques of the Satellite image in combination with collateral data such as Survey of India topographical maps. Image classification is done by using visual interpretation techniques and digital classification using any of the image processing software. The various activities for preparation of LULC include pre-processing, rectification, image enhancements and classifying the satellite data for assessing the change in land use land cover due to proposed developmental activities.

- Preliminary/primary data collection of the study area
- Satellite data procurement from NRSC
- Secondary data collection from authorized bodies
- Survey of India Toposheet (SOI)
- Mine Layout
- Cadastral / Khasra map
- GPS Coordinates of Lease Boundary

- Processing of satellite data using ArcGIS 10.8 and preparing the Land Use & Land cover maps (e.g. Mine area, Existing Quarries, Settlements, Agriculture land, Non agriculture land, water bodies, etc.) by Digital Image Processing (DIP) technique.
- Geo-Referencing of the Survey of India Toposheet
- Geo-Referencing of satellite Imagery with the help of Geo-Referenced Toposheets
- Enhancement of the Satellite Imagery
- Base Map layer creation (Roads, Railway, Village Names, and other Secondary data, etc.)
- Data analysis and Classification using Digital interpretation techniques.
- Ground truth studies or field Verification.
- Error fixing / Reclassification
- Final Map Generation.

The land use/Land cover Map of the buffer zone is given in 3.4(b).

Land Use Pattern of the Buffer Zone (Study area)

Details of the same are given in Table - 3.3 and the map is shown in Figure - 3.2

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

S.No	CLASSIFICATION	AREA_HA	AREA_%
	BUILTUP		
1	URBAN	1518.51	2.00
2	RURAL	1320.95	1.74
3	MINING	624.12	0.82
	AGRICULTURAL LAND		
4	CROP LAND	44497.51	58.64
5	PLANTATION	633.97	0.84
6	FALLOW LAND	20452.18	26.95
	BARREN/WASTE LANDS		
7	SALT AFFECTED LAND	832.28	1.10
8	SCRUB LAND	1687.47	2.22
	WETLANDS/ WATER BODIES		
9	WATER BODIES	4319.01	5.69
TOTAL		75886.00	100.00

Source: Bhuvan, NRSC.

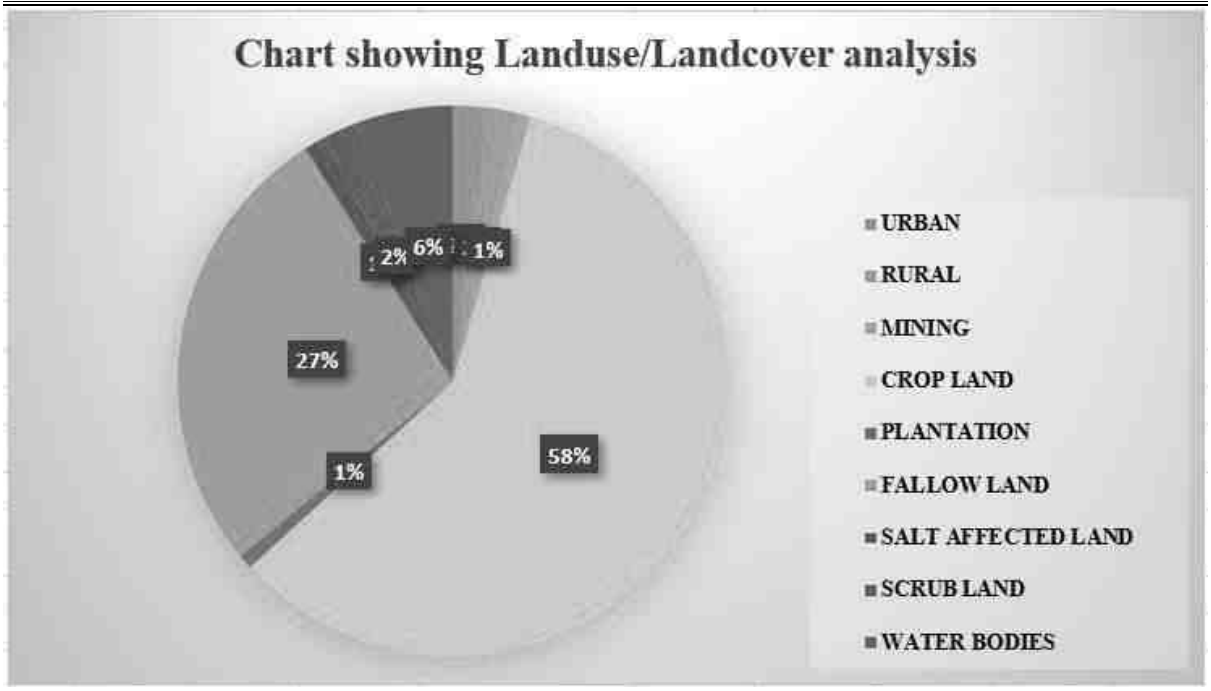


FIGURE 3.1: CHART SHOWING LANDUSE/LANDCOVER ANALYSIS USING LISS III DATA

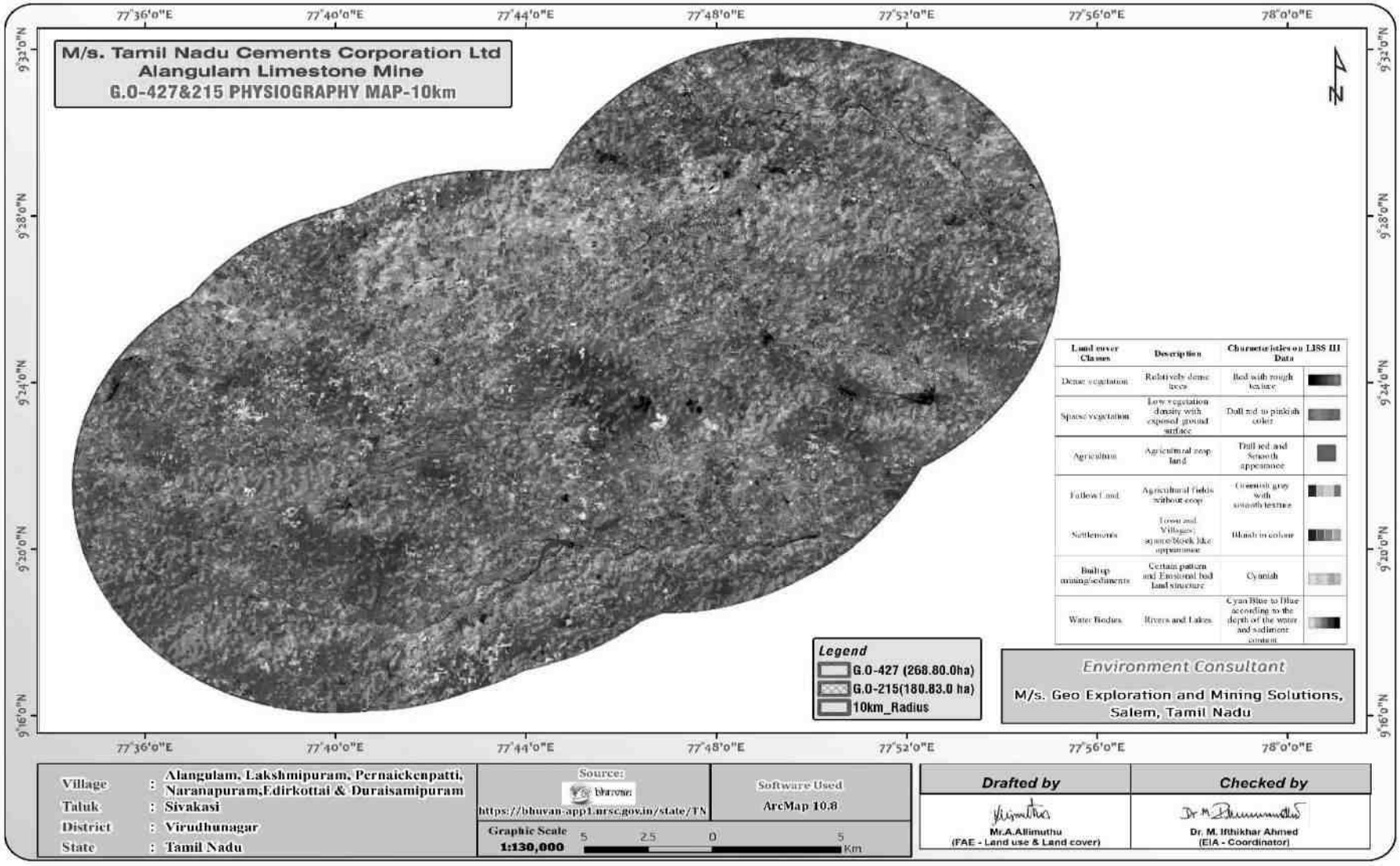
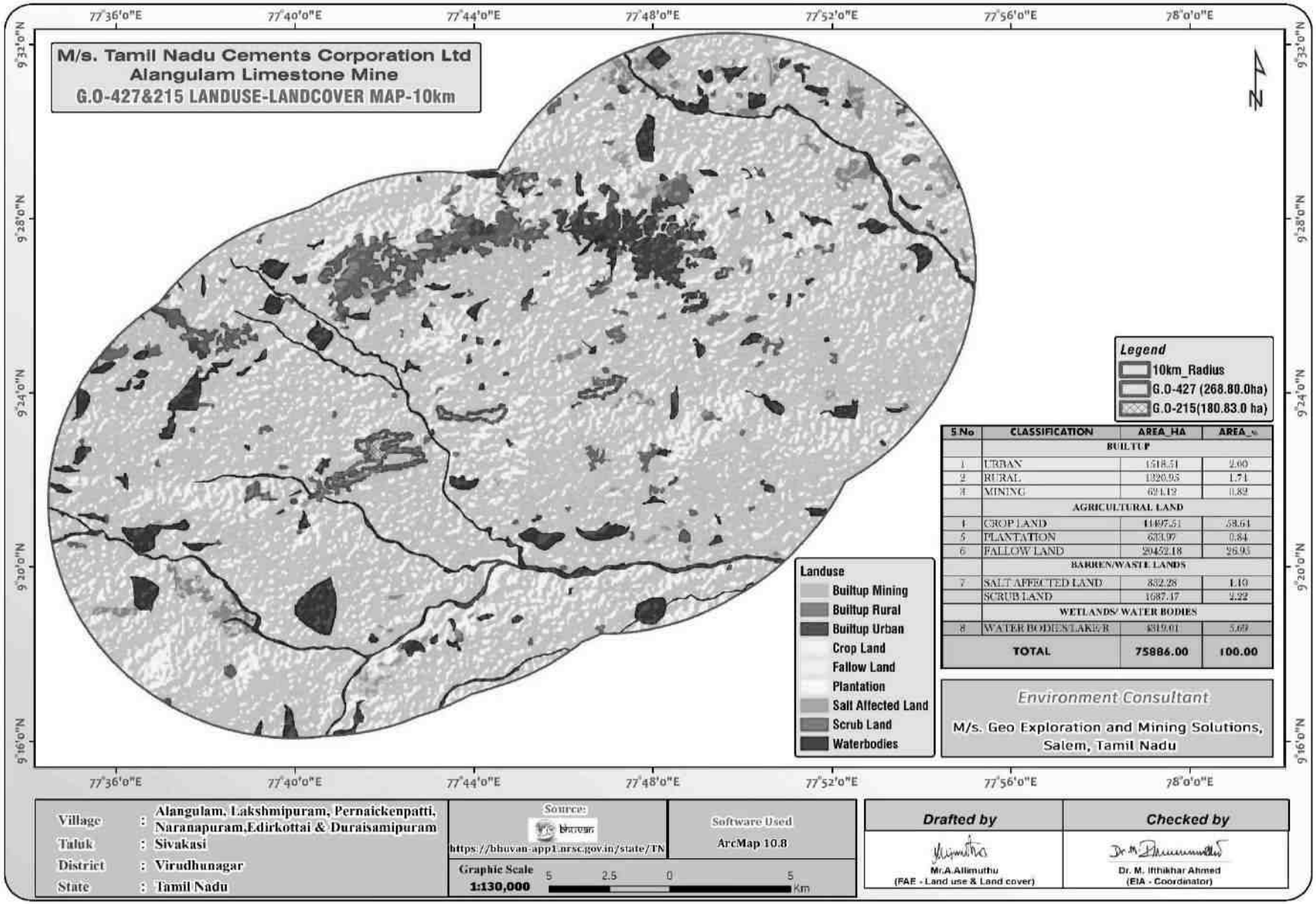


FIGURE 3.2: MAP SHOWING FALSE COLOR COMPOSITE (3,2,1) SATELLITE IMAGERY OF THE STUDY AREA



S No	CLASSIFICATION	AREA_HA	AREA_%
	BUILTUP		
1	URBAN	1518.51	2.00
2	RURAL	1320.95	1.74
3	MINING	621.12	0.82
	AGRICULTURAL LAND		
4	CROP LAND	11497.51	58.64
5	PLANTATION	633.99	0.84
6	FALLOW LAND	20452.18	26.95
	BARREN/WASTE LANDS		
7	SALT AFFECTED LAND	832.28	1.10
	SCRUB LAND	1687.17	2.22
	WETLANDS/ WATER BODIES		
8	WATER BODIES/LAKES	4319.01	5.69
	TOTAL	75886.00	100.00

FIGURE 3.3: LAND USE LAND COVER MAP 10KM RADIUS

3.1.4 Interpretation

- The 10 km radius study area mainly comprises of crop land & Plantation land accounting of 58.64% & 0.84 % of the total study area. The study area also consists of fallow land of 26.95%.
- Water Bodies such as ponds/ lakes comprises of 5.69% of the core and buffer area.
- The Scrub land accounts of 2.22%. As per the primary survey, it was observed the scrub land is mainly occupied by the grass with stony waste and left-over domestic waste generated by the nearby areas.
- 0.82% of the total study area is occupied by the mine industries of captive mines. The area occupied by Mainly Limestone mine of the total buffer area. As also observed within the primary survey, the 10 km buffer area.
- The 10 km study area mostly covers of crop land 58.64%. As per current study 2.22% of the area is occupied by scrub land.
- 3.74% of the area is covered under the human Settlement in rural and urban. The nearest village within the 3km radius from the project site boundary is observed to be villages like Alangulam (TP), Kallamanaickenpatti, Lakshmipuram, Duraisamipuram, Edirkottai, Kundairuppu etc,

3.1.4.1Cropping Pattern of the Buffer Zone

In Virudhunagar District the major Horticulture crops grown are Mango, Guava, Banana, Amla, Tomato, Brinjal, Bhendi, Onion, coriander, Chillies, flowers like jasmine, Arali, Tuberose etc., In total about 13590 ha of area covered by various Horticulture crops in this district. Doubling production and tripling income of farmers is the primary objective. Encouraging cultivation of traditional cultivars in horticultural crops, adopting Hi-Tech Horticulture technologies, promoting horticulture as a profitable and viable sector by leveraging technologies, encouraging farm mechanization and improved post harvest management etc.,

Source: https://virudhunagar.nic.in/horticulture/

3.1.4.2 Interpretation and Conclusion

- Alangulam and Lakshmipuram Limestone mine has proposed existing Project.
- Out of the total project area i.e.,75886ha, 1.10% (i.e.,0.84ha) will be developed under greenbelt development/ plantation.
- As new Proposed mine is coming in the area, percentage of human settlement will be increased in surrounding of project site and Infrastructure facilities also will be developed on the basis of requirement.
- The 10 km study area mostly covers of crop land 58.64%. As per current study 2.22% of the area is occupied by scrub land.
- The project site falls under the Limestone region. Therefore, the area is appropriate for developing Road development and building etc., it shows that the region has good prospects in the future. Due to proposed limestone mines in this region, economic condition of locals is expected to be improved directly & indirectly. Hence project will prove to be the best economic proposal for the coming times.

3.1.5 TOPOGRAPHY

The lease applied area is exhibits undulated topography. The area has gentle sloping towards Northeastern side. The altitude of the area is 117m AMSL The area is covered by 1m thickness of Topsoil formation. Limestone which is clearly inferred from the existing mine pits.

3.1.6 DIGITAL ELEVATION MODEL

Digital Elevation Model (DEM) has been prepared for the project at Alangulam and Lakshmipuram Village, Sivakasi Taluk, Virudhunagar District for a 10 km radius study area.

Data Used

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

Methodology

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

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

1st Stage:

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

2nd Stage:

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

3rd Stage:

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

4th Stage:

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

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

Slope

The slope map was derived from SRTM DEM data of the study area. The slope of the study area was classified into four classes: less than 0 to 2 Percent/degree Flat to almost flat, and no meaningful denudation process. 2 to 5 percent/degree gentle low speed ground motion, sheet erosion and soil rosion in the 3^0 to 10^0 more gentle the same as above but with a higher magnitude and slightly steep, a lot of ground movement and erosion especially landslides that are flat. Slope zone 4 class divide 0-0.2º, 0.2-0.5º, 0.5-1.5^0, and above-1.5º-4.9º (Fig.3.5)

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

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

Interpretation *& Conclusion*

It is very clear from the DEM that the elevation varies from 69.7m to 150.5m in the whole study area, thus having an elevation difference of 80.8m. The areas in the Northern and Northeastern, Western portion have higher elevation which is covered by plain land while the low-lying areas are generally used for agricultural purpose with builtup land. The contour over the DEM shows that the project site is 100-110m in the elevation range of 10 m interval present on the flat land in the study area.

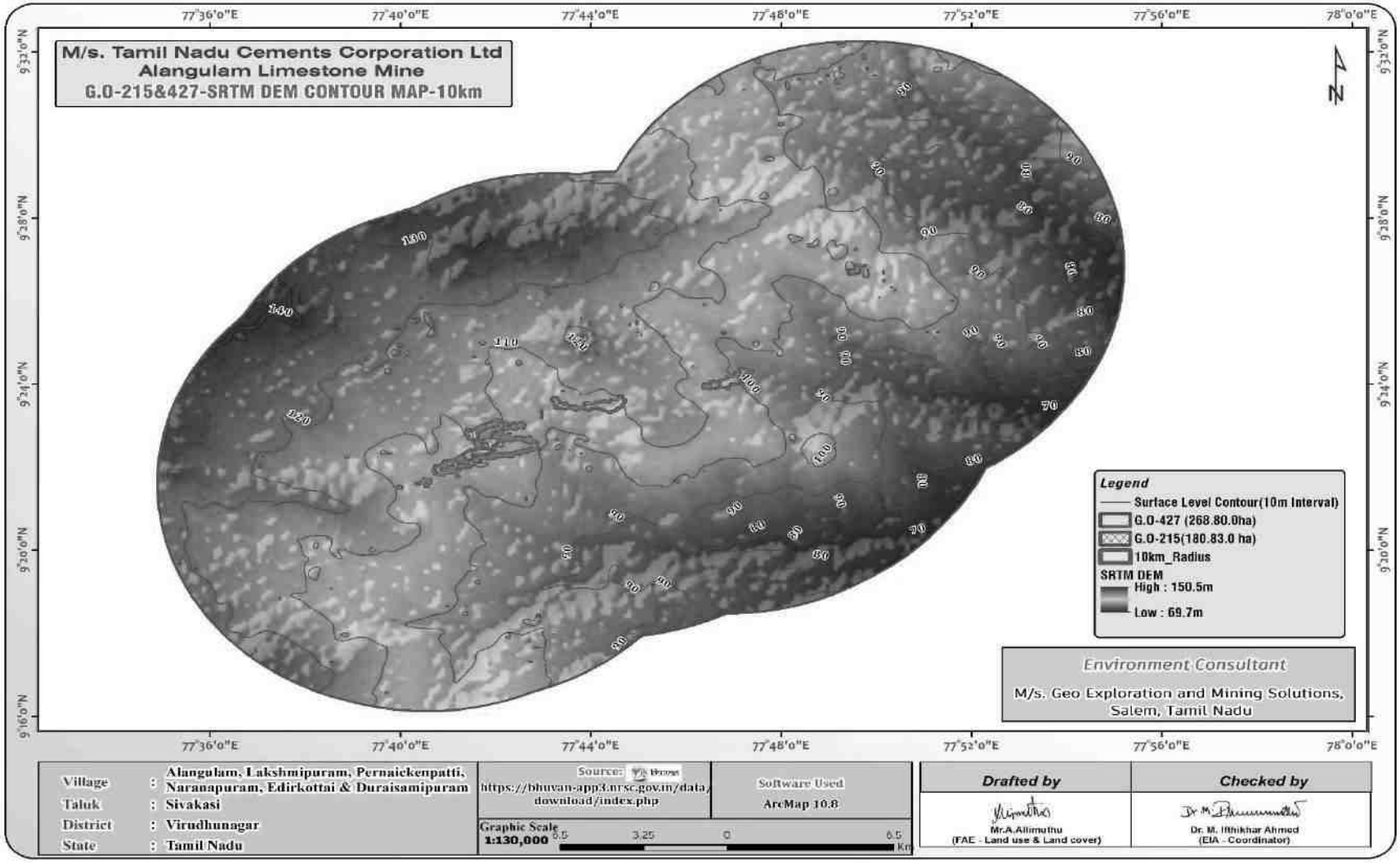


FIGURE 3.4: SRTM DATA USING CONTOUR MAP 10KM RADIUS

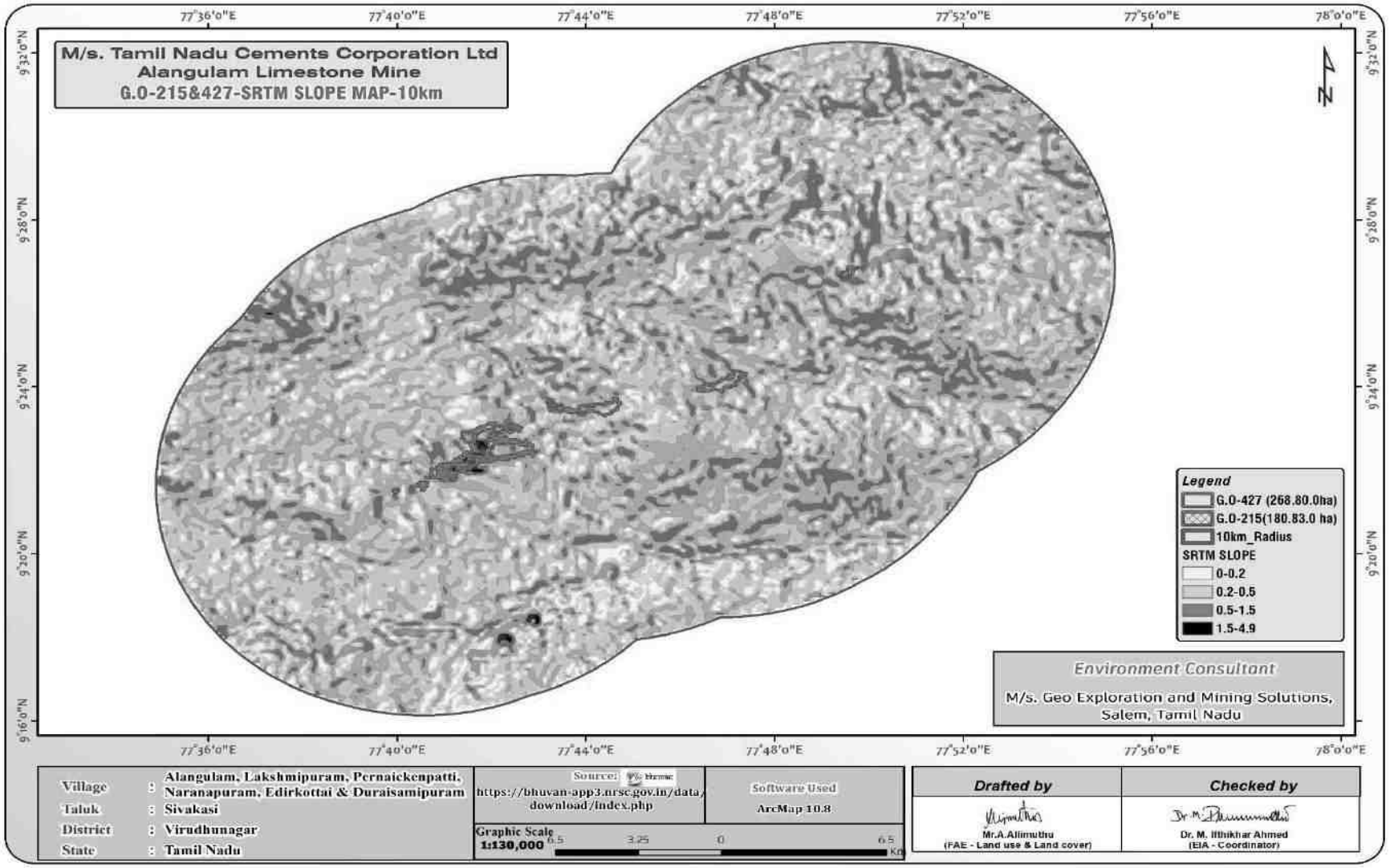


FIGURE 3.5: SRTM DATA USING SLOPE MAP 10KM RADIUS

3.1.7 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.

3.1.8 Seismic Sensitivity

Many parts of the Indian subcontinent have historically high seismicity. Seven catastrophic earthquakes of magnitude greater than 8 (Richter scale) have occurred in the western, northern and eastern parts of India and adjacent countries in the past 100 years. Bureau of Indian Standards [IS - 1893 (Part-1): 2002], has grouped the country into four seismic zones viz. Zone - II, III, IV and V. Of these, Zone - V is the most seismically active region, while Zone - II is the least. The Modified Mercalli Intensity (MMI) scale, which measures the impact of the earthquakes on the surface of the earth, broadly associated with various zones is as follows:

Table 3.4 Seismic Zones in India

S.no	seismic zones	Risk	Intensity of Earthquake (on Mercalli Intensity Scale)
1	Zone-V	Very High-Risk Zone	IX and above
2	Zone-IV	High Risk Zone	VIII
3	Zone-III	Moderate Risk Zone	VII
4	Zone-II	Low Risk Zone	VI and Below

Source: www.ndma.gov.in/images/guidelines/earthquakes.pdf

Figure 3.6: Seismic Zone Map

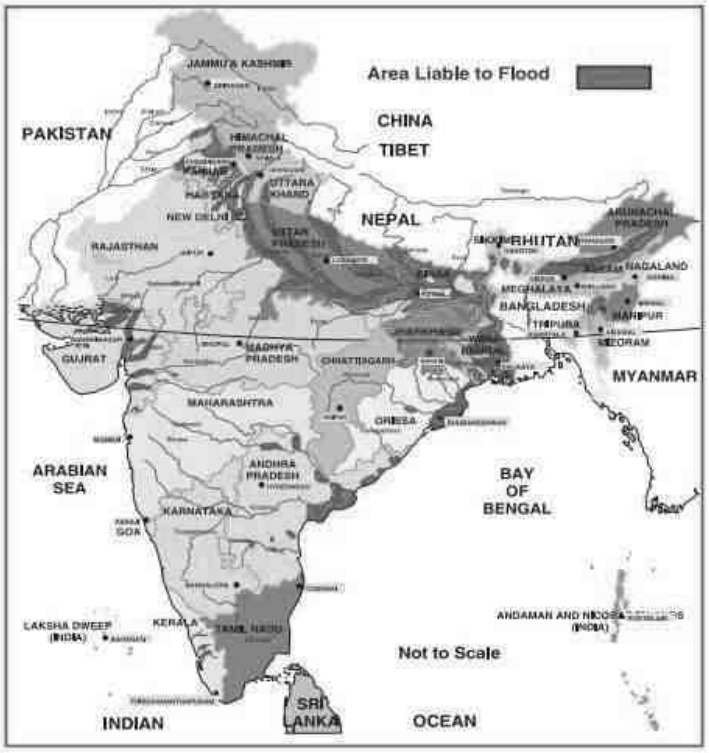


Figure 3.7: Flood Zone Map

3.1.9 Environmental Features in the Study Area

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

TABLE 3.5: 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	Grizzled Squirrel Wildlife Sanctuary	19km NW
2	Reserved Forest	Kothankulam RF	14km NW
3	Tiger Reserve/ Elephant Reserve/ Biosphere Reserve	None	Nil within 10Km Radius
4	Critically Polluted Areas	None	Nil within 10Km Radius
5	Mangroves	None	Nil within 10km Radius
6	Mountains/Hills	None	Nil within 10km Radius
7	Notified Archaeological Sites	None	Nil within 10km Radius
8	Industries/ Thermal Power Plants	None	Nil within 10km Radius
9	Defence Installation	None	Nil within 10km Radius

Source: Survey of India Toposheet

TABLE 3.6: NEARBY WATER BODIES FROM THE PROPOSED PROJECT SITE

G.O 215		
No	**Name**	**Distance&Direction**
1	Odai	Inside Lease Area
2	Odai	25m East
3	Tank	420m South
4	Odai	580m SW
5	Kayalkudi Stream	800m NE
6	Tank	1.6km SE
7	Odai	1.8km East
8	Eri Near Sivalingapuram	3.2km SW
9	Solaseri Stream	4.2km SW
10	Sirukulam Kanmoi	4.4km North
11	Vembakottai Reservoir	4.5km SE
12	Vaipper River	5.8km South
13	Eri Near Keelarajakulam	6.4km NW
14	Odai	8km NE
15	Lake Near Solapuram	9.5km NW

Source: Village Cadastral Map and Field Survey

3.1.10 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 3.6 and Figure 3.4.

The objective of the soil sampling is -

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

TABLE 3.7: SOIL SAMPLING LOCATIONS

S. No	Location Code	Monitoring Locations	Distance & Direction	Coordinates
1	**S-1**	Core Zone	Project Area	9°26'40.94"N 77°49'32.29"E
2	**S-2**	Core Zone	Project Area	9°24'0.36"N 77°46'39.36"E
3	**S-3**	Core Zone	Project Area	9°23'25.29"N 77°44'2.38"E
4	**S-4**	Core Zone	Project Area	9°22'38.69"N 77°41'42.35"E
5	**S-5**	Core Zone	Project Area	9°21'29.24"N 77°39'58.96"E
6	**S-6**	Appayanaickenpatti	7km South	9°17'35.17"N 77°40'26.24"E
7	**S-7**	Mamsapuram	3.6km North	9°25'33.51"N 77°42'11.77"E
8	**S-8**	Thayilpatti	2.6km SE	9°22'49.02"N 77°47'56.42"E
9	**S-9**	Kakkivadakkanpatti	0.98 m NW	9°23'53.73"N 77°43'9.77"E
10	**S-10**	Vadamangalapuram	6.3km NE	9°30'17.38"N 77°50'9.61"E

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

Methodology –

For studying soil quality, sampling locations were selected to assess the existing soil conditions in and around the project site representing various land use conditions. The samples were collected by auger boring into the soil up to 90-cm depth. Ten (10) locations were selected for soil sampling on the basis of soil types, vegetative cover, industrial & residential activities including infrastructure facilities, which would accord an overall idea of the soil characteristics. The samples were analysed for physical and chemical characteristics. The samples were sent to laboratory for analysis. The samples were filled in Polythene bags, coded and sent to laboratory for analysis and the details of methodology in respect are given in below Table 3.6.

TABLE 3.8: METHODOLOGY OF SAMPLING COLLECTION

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

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

Soil Testing Result –

The samples were analysed as per the standard methods prescribed in "Soil Chemical Analysis (M.L. Jackson, 1967) & Department of Agriculture, Cooperation & Farmers Welfare, Ministry of Agriculture & Farmers Welfare, Government of India". The important properties analysed for soil are bulk density, porosity, infiltration rate,

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

FIGURE 3.8: PHOTOGRAPH SHOWING SOIL SAMPLING LOCATION

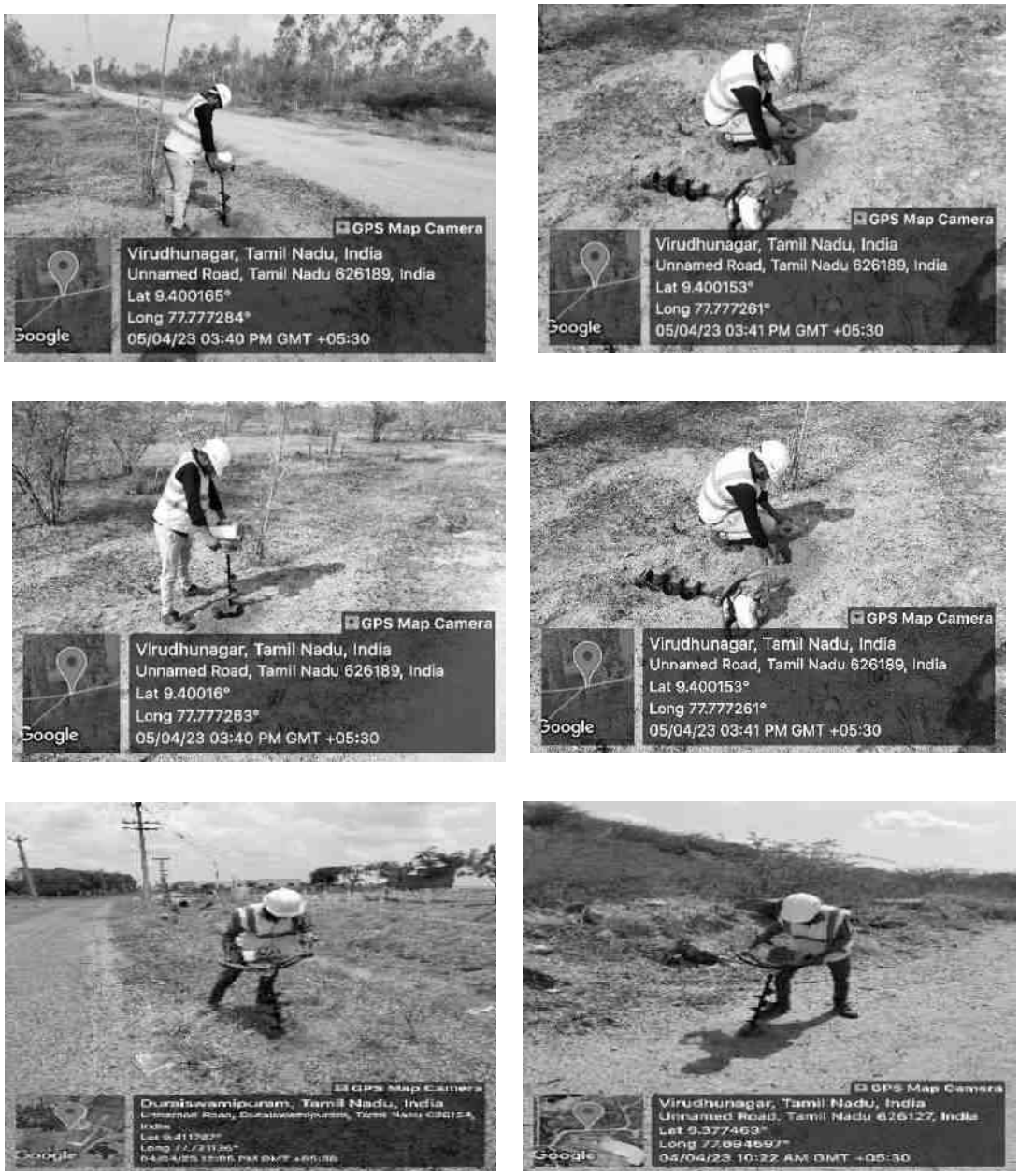


FIGURE 3.9: SOIL SAMPLING LOCATIONS AROUND 10 KM RADIUS

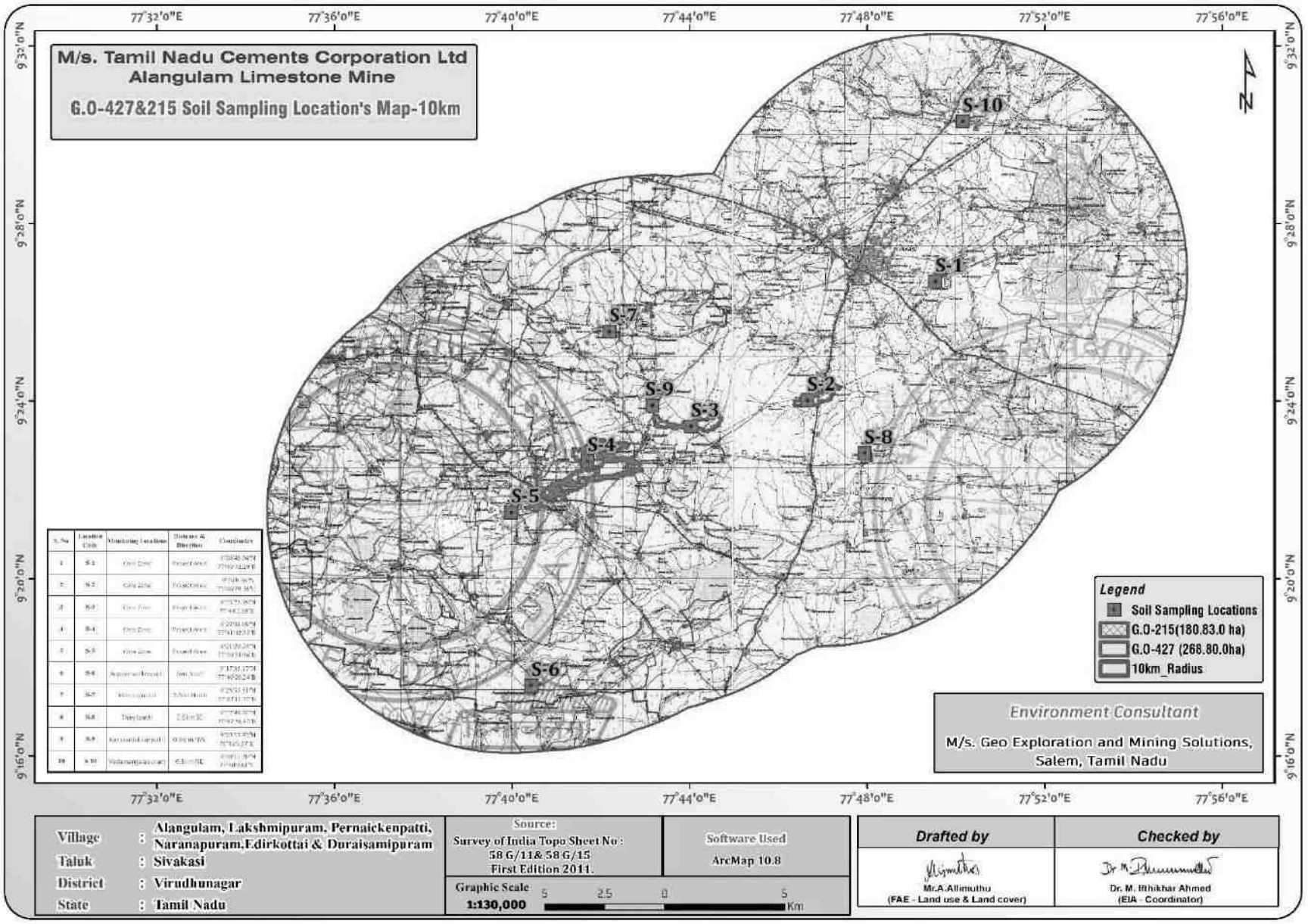


FIGURE 3.10: SOIL MAP

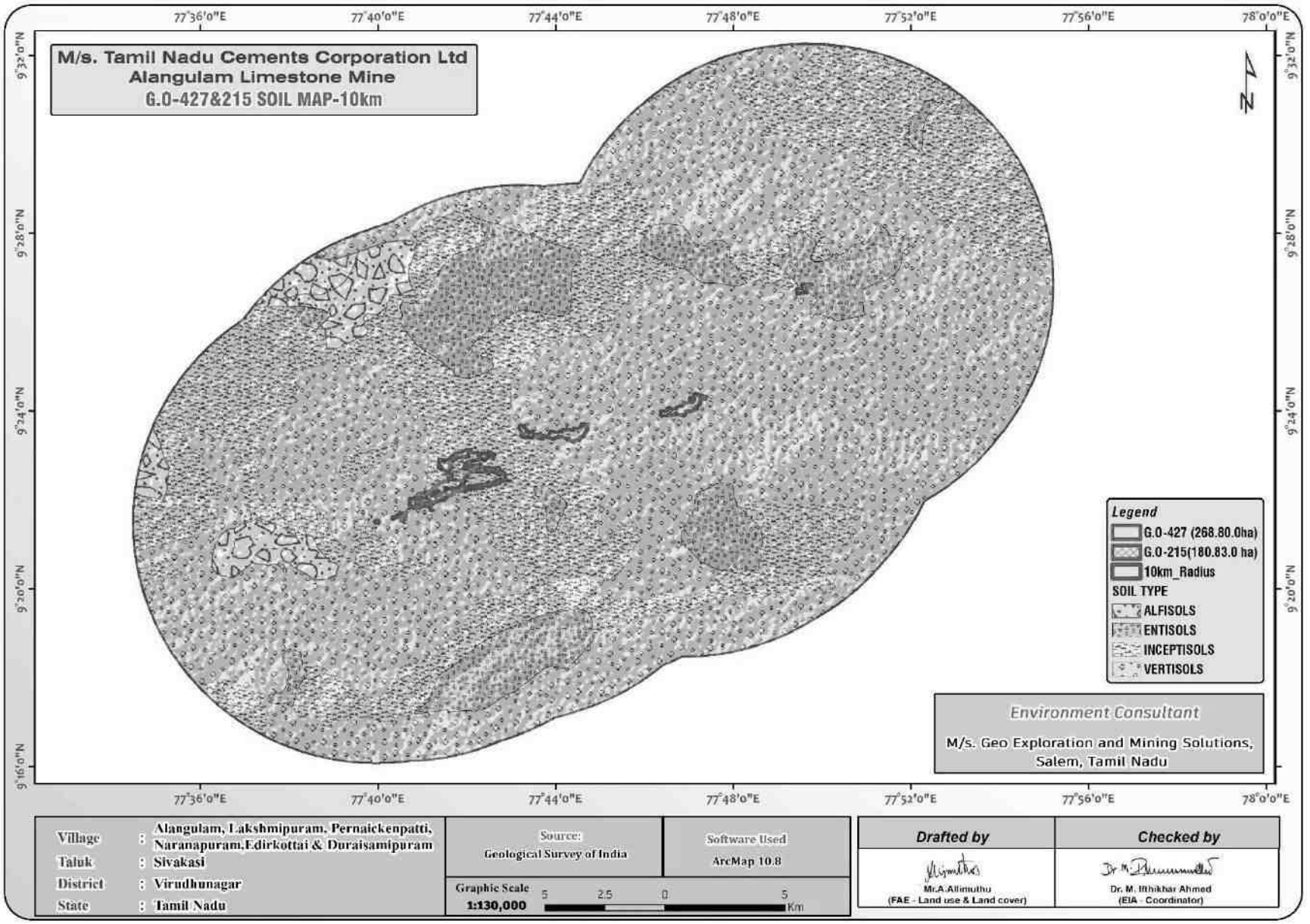


TABLE 3.9: SOIL QUALITY OF THE STUDY AREA

Parameter		Unit	S-1 Core Zone	S-2 Core Zone	S-3 Core Zone	S-4 Core Zone	S-5 Core Zone	S-6 Appayanaickenpatti	S-7 Mamsapuram
1	pHat27°C	-	8.72	8.21	8.23	7.98	8.63	8.63	8.34
2	ElectricalConductivityat25°C	µs/cm	385	415	408	452	395	395	408
3	Texture	-	Clay Loam	Clay Loam	Clay Loam	Clay Loam	Clay Loam	Clay Loam	Clay Loam
4	Sand	%	31.2	32.1	33.6	30.7	32.6	32.6	32.6
5	Slit	%	30.5	31.5	30.4	30.3	30.4	30.4	29.7
6	Clay	%	38.3	36.4	36.0	39.0	37.0	37.0	37.7
7	Water Holding Capacity	%	39.7	38.1	37.6	40.1	38.4	38.4	39.1
8	Bulk Density	g/cc	1.06	1.02	1.01	1.20	1.04	1.04	1.08
9	Porosity	%	34.5	33.3	31.8	32.6	34.6	34.6	35.4
10	Exchangeable Calcium(asCa)	mg/Kg	148	152	145	164	132	132	141.6
11	Exchangeable Magnesium(asMg)	mg/Kg	24.2	22.8	20.7	23.5	18.8	18.8	20.2
12	Exchangeable Manganese(asMn)	mg/Kg	18.9	17.6	16.7	18.4	15.6	15.6	16.1
13	Exchangeable Zinc as Zn	mg/Kg	0.22	0.34	0.42	0.63	0.27	0.27	0.37
14	Available Boron (as B)	mg/Kg	0.48	0.56	0.74	0.71	0.38	0.38	0.40
15	Soluble Chloride(as Cl)	mg/Kg	168	143	137	151	127	127	137
16	Soluble Sulphate(as S04)	mg/Kg	63.1	69.6	67.8	72.6	56.8	56.8	63.4
17	Available Potassium(asK)	mg/Kg	31.2	30.7	28.6	33.2	33.7	33.7	30.6
18	Available Phosphorous(asP)	Kg/hec	0.71	1.14	1.02	1.21	1.07	1.07	1.10
19	Available Nitrogen(as N)	Kg/hec	248	276	257	265	243	243	254
20	Cadmium (as Cd)	mg/Kg	BDL(DL:0.003)	BDL (DL:0.003)	BDL (DL:0.003)	BDL (DL:0.003)	BDL(DL:0.003)	BDL(DL:0.003)	BDL (DL:0.003)
21	Chromium (asCr)	mg/Kg	1.21	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)	1.03	1.03	BDL (DL:0.05)
22	Copper(asCu)	mg/Kg	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)
23	Lead (asPb)	mg/Kg	0.73	0.78	0.65	0.81	0.67	0.67	0.73
24	Total Iron	mg/Kg	1.22	1.32	1.29	1.36	1.23	1.23	1.31
25	Organic Matter	%	1.60	2.46	2.22	2.60	1.60	1.60	1.79
26	Organic Carbon	%	0.93	1.43	1.29	1.51	0.93	0.93	1.04
27	CEC	meq/l00g	33.1	28.6	23.1	29.6	29.7	29.7	28.2

Parameter		Unit	S-8 Thayilpatti	S-9 Kakkivadakkanpatti	S-10 Vadamangalapuram
1	pHat27°C	-	7.96	8.07	8.22
2	ElectricalConductivityat25°C	µs/cm	515	431	546
3	Texture	-	Clay	Clay Loam	Clay Loam
4	Sand	%	19.8	31.4	34.7
5	Slit	%	36.7	29.4	30.2
6	Clay	%	43.5	39.2	35.1
7	Water Holding Capacity	%	41.2	36.6	42.6
8	Bulk Density	g/cc	1.12	1.17	1.19
9	Porosity	%	33.1	32.7	35.2
10	Exchangeable Calcium(asCa)	mg/Kg	146.3	145.7	159
11	Exchangeable Magnesium(asMg)	mg/Kg	21.3	22.3	24.7
12	Exchangeable Manganese(asMn)	mg/Kg	17.4	18.7	20.3
13	Exchangeable Zinc as Zn	mg/Kg	0.94	0.48	0.69
14	Available Boron (as B)	mg/Kg	0.43	0.46	0.72
15	Soluble Chloride(as Cl)	mg/Kg	134	141	132
16	Soluble Sulphate(as S04)	mg/Kg	49.8	59.7	72.4
17	Available Potassium(asK)	mg/Kg	31.4	29.5	36.4
18	Available Phosphorous(asP)	Kg/hec	1.26	0.97	1.34
19	Available Nitrogen(as N)	Kg/hec	278	321	308
20	Cadmium (as Cd)	mg/Kg	BDL (DL:0.003)	BDL (DL:0.003)	BDL (DL:0.003)
21	Chromium (asCr)	mg/Kg	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)
22	Copper(asCu)	mg/Kg	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)
23	Lead (asPb)	mg/Kg	0.81	0.78	0.87
24	Total Iron	mg/Kg	1.13	1.36	1.79
25	Organic Matter	%	2.13	2.17	2.36
26	Organic Carbon	%	1.24	1.26	1.37
27	CEC	meq/l00g	26.5	26.3	32.7

Source: Sampling Results by Laboratories

Interpretation & Conclusion

Physical Characteristics –

The physical properties of the soil samples were examined for texture, bulk density, porosity and water holding capacity. The soil texture found in the study area is Clay Loam Soil and Bulk Density of Soils in the study area varied between 1.01– 1.20g/cm^3. The Water Holding Capacity 36.6-42.6% and Porosity of the soil samples is found to be medium i.e. ranging from 31.8– 35.4%.

Chemical Characteristics –

- The nature of soil is slightly alkaline to strongly alkaline with pH range 7.96 to 8.72
- The available Nitrogen content range between 243 to 321kg/ha
- The available Phosphorus content range between 0.71 to 1.34 kg/ha
- The available Potassium range between 28.6 to 36.4 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:

The study area is studded with few tanks that serve as the source of drinking water and also their surplus feeds adjoining tanks. The rainfall over the area is moderate, the rainwater storage in open wells and trenches are in practice over the area and the stored water acts as source of freshwater for couple of months after rainy season.

3.2.2 Ground Water Resources:

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

3.2.3 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

Three (3) surface water and Seven (7) ground water samples were collected from the study area and were analysed for physio-chemical, heavy metals and bacteriological parameters in order to assess the effect of mining and other activities on surface and ground water. The samples were analysed as per the procedures specified by CPCB, IS-10500:2012 and 'Standard methods for the Examination of Water and Wastewater' published by American Public Health Association (APHA). The water sampling locations are given in Table 3.8 and shown as Figure 3.6.

TABLE 3.10: WATER SAMPLING LOCATIONS

S. No	Location code	Monitoring Locations	Distance & Direction	Coordinates
1	**SW-1**	Periyakulam	4.2 km West	9°26'56.96"N 77°47'8.53"E
2	**SW-2**	Vembakottai Dam (Vaippar River)	6.0km South	9°20'6.21"N 77°45'1.48"E
3	**SW-3**	Vadamalapuram River	6.8 km NE	9°30'23.88"N 77°50'30.48"E
4	**WW-1**	Mamsapuram	3.8km North	9°25'41.46"N 77°42'40.13"E

5	**WW-2**	Near Project Area Sudankulam	50m South	9°21'38.14"N 77°40'37.16"E
6	**WW-3**	Appayanaickenpatti	7.34km South	9°17'35.25"N 77°40'38.44"E
7	**BW-1**	Paranayakkanpatti	500m North	9°24'33.57"N 77°46'56.10"E
8	**BW-2**	Valayapatti	4.4km South	9°19'7.07"N 77°39'53.38"E
9	**BW-3**	Naranapuram	300m NE	9°26'52.22"N 77°49'55.08"E
10	**BW-4**	Kansapuram	2km North	9°24'42.29"N 77°43'15.83"E

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

FIGURE 3.11: WATER SAMPLING LOCATIONS AROUND 10 KM RADIUS

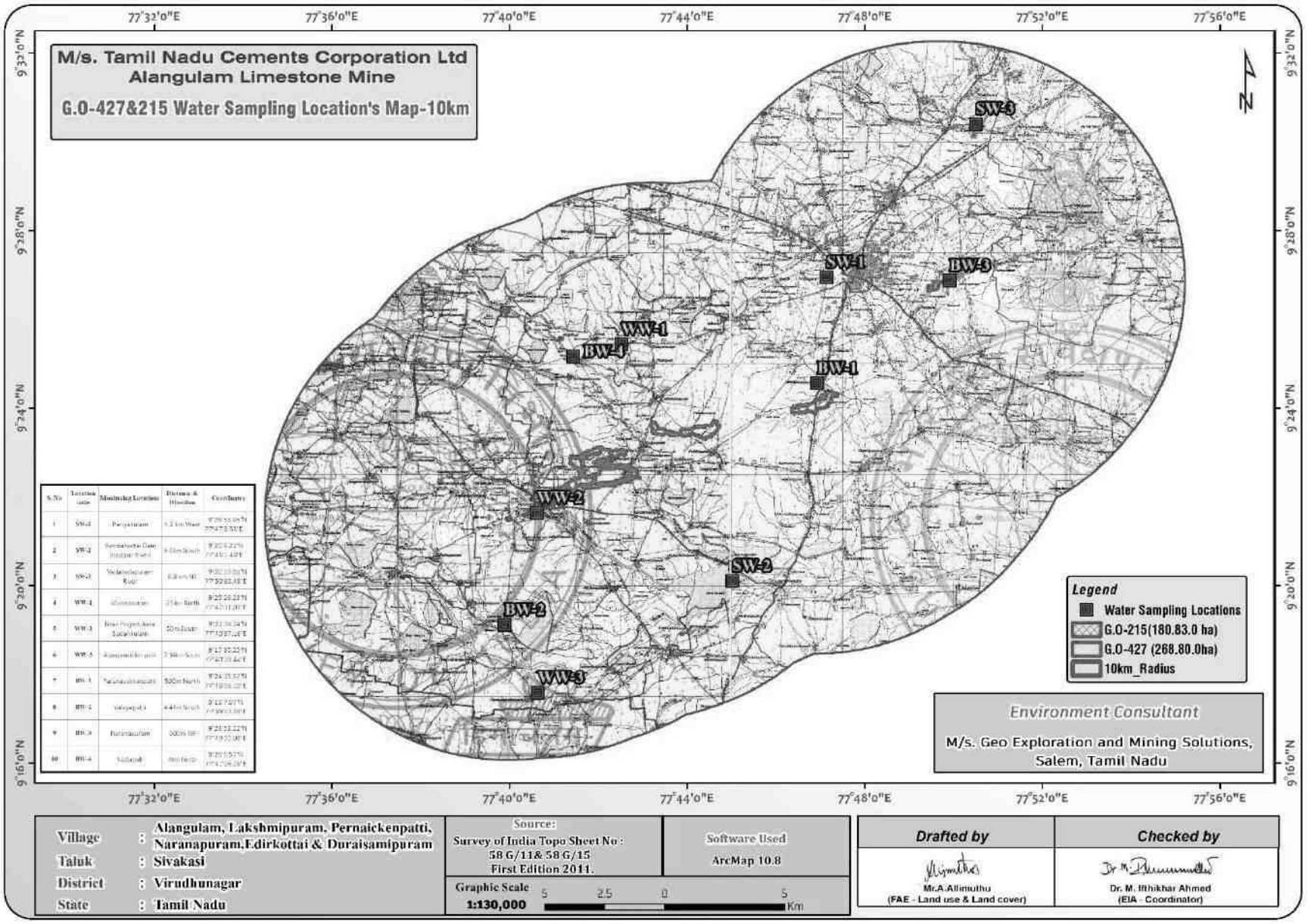


TABLE:3.11 SURFACE WATER SAMPLING RESULTS

S.no	Parameter	UNIT	SW1- Periyakulam	SW2 -Vembakottai Dam (Vaippar River)	SW3- Vadamalapuram River
1	Color	Hazen	7	8	9
2	Odour	-	Agreeable	Agreeable	Agreeable
3	pH@ 25ºC	-	7.72	7.91	7.86
4	Electrical Conductivity @ 25ºC	µs/cm	723	725	855
5	Turbidity	NTU	5.9	6.4	6.9
6	Total Dissolved Solids	mg /l	426	497	504
7	Total Hardness as $CaCO_3$	mg/l	168	180	184
8	Calcium as Ca	mg/l	46.5	49.7	43.2
9	Magnesium as Mg	mg/l	12.6	13.6	25.8
10	Total Alkalinity as $CaCO_3$	mg/l	152	169	173
11	Chloride as Cl^-	mg/l	72.5	88.9	93.4
12	Sulphate as SO_4^-	mg/l	32.1	51.3	56.5
13	Iron as Fe	mg/l	0.23	0.25	0.28
14	Free Residual Chlorine	mg/l	BDL(DL: 2.0)	BDL(DL: 2.0)	BDL(DL: 2.0)
15	Fluoride as F	mg/l	0.13	0.15	0.14
16	Nitrates as NO_3	mg/l	5.8	6.3	7.1
17	Copper as Cu	mg/l	BDL (DL:0.2)	BDL (DL:0.2)	BDL (DL:0.2)
18	Manganese as Mn	mg/l	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)
19	Mercury as Hg	mg/l	(BDL (DL: 0.0005)	(BDL (DL: 0.0005)	(BDL (DL: 0.0005)
20	Cadmium as Cd	mg/l	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)
21	Selenium as Se	mg/l	BDL (DL: 0.05)	BDL (DL: 0.05)	BDL (DL: 0.05)
22	Aluminium as Al	mg/l	BDL (DL: 0.03)	BDL (DL: 0.03)	BDL (DL: 0.03)
23	Lead as Pb	mg/l	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)
24	Zinc as Zn	mg/l	BDL (DL:0.02)	BDL (DL:0.02)	BDL (DL:0.02)
25	Total Chromium	mg/l	BDL (DL: 0.05)	BDL (DL: 0.05)	BDL (DL: 0.05)
26	Boron as B	mg/l	BDL (DL:0.1)	BDL (DL:0.1)	BDL (DL:0.1)
27	Mineral Oil	mg/l	BDL (DL:1.0)	BDL (DL:1.0)	BDL (DL:1.0)
28	Phenolic Compunds as	mg/l	Absent	Absent	Absent
29	Anionic Detergents as	mg/l	BDL (DL:0.1)	BDL (DL:0.1)	BDL (DL:0.1)
30	Cynaide as CN	mg/l	Absent	Absent	Absent
31	Biological Oxygen Demand	mg/l	7.5	9.6	12.8
32	Chemical Oxygen Demand	mg/l	24	28	36
33	Dissolved Oxygen	mg/l	5.8	5.2	4.8
34	Total Coliform	Per 100ml	present	present	present
35	E-Coli	Per 100ml	present	present	present
36	Barium as Ba	mg/l	BDL (DL:0.5)	BDL (DL:0.5)	BDL (DL:0.5)
37	Ammonia-n (as Total	mg/l	3.2	3.7	4.1
38	Sulphide as H_2S	mg/l	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)
39	Molybdenum as Mo	mg/l	BDL (DL:0.5)	BDL (DL:0.5)	BDL (DL:0.5)
40	Total Arsenic as As	mg/l	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)
41	Total Suspended Solids	mg/l	8.6	9.2	9.8

* 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:3.12 GROUND WATER SAMPLING RESULTS

S.NO	Parameter	Unit	WW1 Mamsapuram	WW2 Near Project Area Sudankulam	WW3 Vadamalapuram River	BW1 Paranayakkanpatti	BW2 Valayapatti
1	Color	Hazen	< 5	< 5	< 5	< 5	< 5
2	Odour	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
3	pH@ 25ºC	-	7.53	7.32	7.56	6.98	7.03
4	Electrical Conductivity	µs/cm	624	665	774	721	726
5	Turbidity	NTU	< 1	< 1	< 1	< 1	< 1
6	Total Dissolved Solids	mg /l	368	399	464	425	428
7	Total Hardness as $CaCO_3$	mg/l	124	132	192	156	140
8	Calcium as Ca	mg/l	32.1	28.8	40.1	35.2	30.4
9	Magnesium as Mg	mg/l	10.7	14.6	17.5	16.5	15.6
10	Total Alkalinity	mg/l	109	129	159.6	136.7	133
11	Chloride as Cl^-	mg/l	75.6	83.5	93.4	89.5	84.5
12	Sulphate as SO_4^-	mg/l	39.4	43.6	47.6	40.3	45.3
13	Iron as Fe	mg/l	0.18	0.19	0.21	0.17	0.14
14	Free Residual Chlorine	mg/l	BDL(DL: 2.0)	BDL(DL: 2.0)	BDL(DL: 2.0)	BDL(DL: 2.0)	BDL(DL: 2.0)
15	Fluoride as F	mg/l	0.14	0.17	0.16	0.15	0.18
16	Nitrates as NO_3	mg/l	3.6	4.7	6.3	8.4	8.7
17	Copper as Cu	mg/l	BDL (DL:0.2)	BDL (DL:0.2)	BDL (DL:0.2)	BDL (DL:0.2)	BDL (DL:0.2)
18	Manganese as Mn	mg/l	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)
19	Mercury as Hg	mg/l	(BDL (DL: 0.0005)	(BDL (DL: 0.0005)	(BDL (DL: 0.0005)	(BDL (DL: 0.0005)	(BDL (DL: 0.0005)
20	Cadmium as Cd	mg/l	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)
21	Selenium as Se	mg/l	BDL (DL: 0.05)	BDL (DL: 0.05)	BDL (DL: 0.05)	BDL (DL: 0.05)	BDL (DL: 0.05)
22	Aluminium as Al	mg/l	BDL (DL: 0.03)	BDL (DL: 0.03)	BDL (DL: 0.03)	BDL (DL: 0.03)	BDL (DL: 0.03)
23	Lead as Pb	mg/l	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)
24	Zinc as Zn	mg/l	BDL (DL:0.02)	BDL (DL:0.02)	BDL (DL:0.02)	BDL (DL:0.02)	BDL (DL:0.02)
25	Total Chromium	mg/l	BDL (DL: 0.05)	BDL (DL: 0.05)	BDL (DL: 0.05)	BDL (DL: 0.05)	BDL (DL: 0.05)
26	Boron as B	mg/l	BDL (DL:0.1)	BDL (DL:0.1)	BDL (DL:0.1)	BDL (DL:0.1)	BDL (DL:0.1)
27	Mineral Oil	mg/l	BDL (DL:1.0)	BDL (DL:1.0)	BDL (DL:1.0)	BDL (DL:1.0)	BDL (DL:1.0)
28	Phenolic Compunds	mg/l	Absent	Absent	Absent	Absent	Absent
29	Anionic Detergents	mg/l	BDL (DL:0.1)	BDL (DL:0.1)	BDL (DL:0.1)	BDL (DL:0.1)	BDL (DL:0.1)
30	Cynaide as CN	mg/l	Absent	Absent	Absent	Absent	Absent
31	Total Coliform	Per 100ml	< 2	< 2	< 2	< 2	< 2
32	E-Coli	Per 100ml	< 2	< 2	< 2	< 2	< 2
33	Barium as Ba	mg/l	BDL (DL:0.5)	BDL (DL:0.5)	BDL (DL:0.5)	BDL (DL:0.5)	BDL (DL:0.5)
34	Ammonia (as Total	mg/l	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	mg/l	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)
36	Molybdenum as Mo	mg/l	BDL (DL:0.5)	BDL (DL:0.5)	BDL (DL:0.5)	BDL (DL:0.5)	BDL (DL:0.5)
37	Total Arsenic as	mg/l	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)
38	Total Suspended Solids	mg/l	BDL(DL:2)	BDL(DL:2)	BDL(DL:2)	BDL(DL:2)	BDL(DL:2)

Cont..

S.NO	Parameter	Unit	BW3 Naranapuram	BW4 Kansapuram
1	Color	Hazen	< 5	< 5
2	Odour	-	Agreeable	Agreeable
3	pH@ 25ºC	-	7.23	7.36
4	Electrical Conductivity	µs/cm	621	680
5	Turbidity	NTU	< 1	< 1
6	Total Dissolved Solids	mg /l	366	401
7	Total Hardness as $CaCO_3$	mg/l	128	136
8	Calcium as Ca	mg/l	33.6	35.2
9	Magnesium as Mg	mg/l	10.7	11.7
10	Total Alkalinity	mg/l	110	121.8
11	Chloride as Cl^-	mg/l	68.7	76.4
12	Sulphate as SO_4^-	mg/l	39.7	44.6
13	Iron as Fe	mg/l	0.15	0.16
14	Free Residual Chlorine	mg/l	BDL(DL: 2.0)	BDL(DL: 2.0)
15	Fluoride as F	mg/l	0.12	0.13
16	Nitrates as NO_3	mg/l	5.2	5.6
17	Copper as Cu	mg/l	BDL (DL:0.2)	BDL (DL:0.2)
18	Manganese as Mn	mg/l	BDL (DL:0.05)	BDL (DL:0.05)
19	Mercury as Hg	mg/l	(BDL (DL: 0.0005)	(BDL (DL: 0.0005)
20	Cadmium as Cd	mg/l	BDL (DL:0.01)	BDL (DL:0.01)
21	Selenium as Se	mg/l	BDL (DL: 0.05)	BDL (DL: 0.05)
22	Aluminium as Al	mg/l	BDL (DL: 0.03)	BDL (DL: 0.03)
23	Lead as Pb	mg/l	BDL (DL:0.01)	BDL (DL:0.01)
24	Zinc as Zn	mg/l	BDL (DL:0.02)	BDL (DL:0.02)
25	Total Chromium	mg/l	BDL (DL: 0.05)	BDL (DL: 0.05)
26	Boron as B	mg/l	BDL (DL:0.1)	BDL (DL:0.1)
27	Mineral Oil	mg/l	BDL (DL:1.0)	BDL (DL:1.0)
28	Phenolic Compunds	mg/l	Absent	Absent
29	Anionic Detergents	mg/l	BDL (DL:0.1)	BDL (DL:0.1)
30	Cynaide as CN	mg/l	Absent	Absent
31	Total Coliform	Per 100ml	< 2	< 2
32	E-Coli	Per 100ml	< 2	< 2
33	Barium as Ba	mg/l	BDL (DL:0.5)	BDL (DL:0.5)
34	Ammonia (as Total	mg/l	BDL (DL:0.1)	BDL (DL:0.1)
35	Sulphide as H_2S	mg/l	BDL (DL:0.05)	BDL (DL:0.05)
36	Molybdenum as Mo	mg/l	BDL (DL:0.5)	BDL (DL:0.5)
37	Total Arsenic as	mg/l	BDL (DL:0.01)	BDL (DL:0.01)
38	Total Suspended Solids	mg/l	BDL(DL:2)	BDL(DL:2)

3.2.4 Interpretation& Conclusion

Surface Water

Ph:

The pH 7.72 to 7.91 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 Solid 426-504 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 72.5-93.4mg/l. Nitrates 5.8 – 7.1 mg/l, while sulphate 32.1 – 56.5 mg/l.

Ground Water

The pH of the water samples collected ranged from 6.98– 7.56 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 366-464 mg/l in all samples. The Total hardness varied between 124-192 -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 85-80m. The maximum depth proposed out of proposed project is 89m (1m Topsoil +88m Limestone) Hence there is no possibilities of water table intersection during the entire mine life period besides it is also inferred topographically that there are no major water bodies intersecting the project area. There is no necessity of stream, channel diversion due to these proposed projects.

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

TABLE 3.13: WATER LEVEL OF OPEN WELLS 1 KM RADIUS

S.NO	Name	LONGITUDE	LATITUDE	March-2023	April-2023	May-2023
1	OW-1	77° 40' 51.1043" E	9° 22' 08.2092" N	12.6	13.2	13.8
2	OW-2	77° 41' 01.4140" E	9° 21' 43.4722" N	13.1	13.7	14.3
3	OW-3	77° 40' 37.2069" E	9° 21' 38.2773" N	13	13.6	14.2
4	OW-4	77° 40' 41.4593" E	9° 20' 59.8053" N	12.5	13.1	13.7
5	OW-5	77°39'47.65"E	9°21'16.38"N	12.8	13.4	14
6	OW-6	77° 40' 15.5942" E	9° 21' 47.8139" N	12.3	12.9	13.5
7	OW-7	77° 40' 00.5770" E	9° 21' 59.4028" N	12.4	13	13.6
8	OW-8	77° 41' 20.7907" E	9° 22' 28.5278" N	12.8	13.4	14
9	OW-9	77° 40' 52.4595" E	9° 23' 06.3674" N	12.5	13.1	13.7
10	OW-10	77° 41' 10.4399" E	9° 23' 19.4544" N	12.9	13.5	14.1
11	OW-11	77° 42' 18.5897" E	9° 23' 20.4568" N	13.1	13.7	14.3
12	OW-12	77° 42' 34.8911" E	9° 23' 05.2235" N	12.7	13.3	13.9
13	OW-13	77° 41' 44.3094" E	9° 21' 53.1008" N	12.8	13.4	14

14	OW-14	77° 43' 09.2535" E	9° 23' 49.9691" N	13.3	13.9	14.5
15	OW-15	77° 43' 03.0879" E	9° 24' 08.1173" N	12.4	13	13.6
16	OW-16	77° 44' 33.5944" E	9° 24' 06.2285" N	13.2	13.8	14.4
17	OW-17	77° 44' 27.7103" E	9° 23' 17.4396" N	12.3	12.9	13.5
18	OW-18	77° 44' 17.2299" E	9° 23' 02.1770" N	12.6	13.2	13.8
19	OW-19	77° 43' 07.9300" E	9° 22' 54.7437" N	13.1	13.7	14.3
20	OW-20	77° 46' 53.7484" E	9° 24' 29.2127" N	12.8	13.4	14
21	OW-21	77° 47' 05.8254" E	9° 24' 24.1662" N	12.5	13.1	13.7
22	OW-22	77° 47' 19.1473" E	9° 24' 45.5994" N	13	13.6	14.2
23	OW-23	77° 49' 23.7786" E	9° 26' 10.3414" N	13.1	13.7	14.3
24	OW-24	77° 48' 53.7707" E	9° 26' 32.1963" N	12.7	13.3	13.9
25	OW-25	77° 50' 18.1252" E	9° 27' 13.2921" N	12.8	13.4	14

Source: Onsite monitoring data

TABLE 3.14: WATER LEVEL OF BOREWELLS 1 KM RADIUS

S.NO	Name	LONGITUDE	LATITUDE	March-2023	April-2023	May-2023
1	BW1	77° 40' 33.2873" E	9° 21' 58.9700" N	67.3	67.9	68.5
2	BW2	77° 41' 07.9770" E	9° 21' 44.3323" N	66.3	66.9	67.5
3	BW3	77° 40' 03.5398" E	9° 21' 10.3962" N	66.4	67	67.6
4	BW4	77° 41' 18.6041" E	9° 23' 14.0509" N	67.3	67.9	68.5
5	BW5	77° 41' 53.6138" E	9° 23' 33.2167" N	66.4	67	67.6
6	BW6	77° 42' 34.6165" E	9° 22' 55.9193" N	66.3	66.9	67.5
7	BW7	77° 42' 41.3971" E	9° 23' 25.1485" N	67.1	67.7	68.3
8	BW8	77° 43' 12.0115" E	9° 24' 12.8883" N	67.2	67.8	68.4
9	BW9	77° 44' 24.5517" E	9° 23' 48.7306" N	66.8	67.4	68
10	BW10	77° 44' 55.3396" E	9° 24' 13.8470" N	66.7	67.3	67.9
11	BW11	77° 45' 13.6271" E	9° 23' 18.3735" N	66.9	67.5	68.1
12	BW12	77° 43' 38.9852" E	9° 22' 51.1293" N	66.6	67.2	67.8
13	BW13	77° 45' 59.8031" E	9° 24' 18.2271" N	66.5	67.1	67.7
14	BW14	77° 46' 56.1000" E	9° 24' 33.5700" N	67	67.6	68.2
15	BW15	77° 47' 09.4467" E	9° 24' 56.3085" N	66.8	67.4	68
16	BW16	77° 47' 16.1972" E	9° 23' 30.9594" N	67.5	68.1	68.7
17	BW17	77° 48' 58.9510" E	9° 26' 20.7953" N	67.4	68	68.6
18	BW18	77° 49' 04.3734" E	9° 27' 09.7641" N	66.7	67.3	67.9
19	BW19	77° 49' 55.0800" E	9° 26' 52.2200" N	66.6	67.2	67.8
20	BW20	77° 50' 15.0681" E	9° 27' 05.7348" N	67.1	67.7	68.3

Source: Onsite monitoring data

FIGURE 3.12: PHOTOGRAPH SHOWING WATER SAMPLING LOCATION

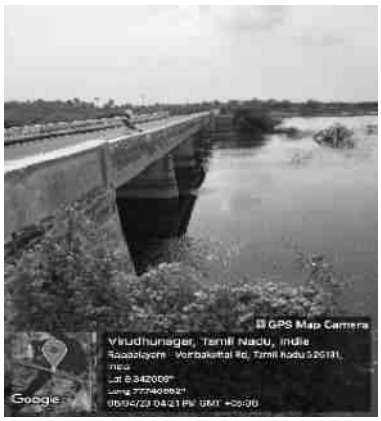


FIGURE 3.13: WATER LEVEL CONTOUR MAP OF OPEN WELLS 1 KM RADIUS – MARCH 2023

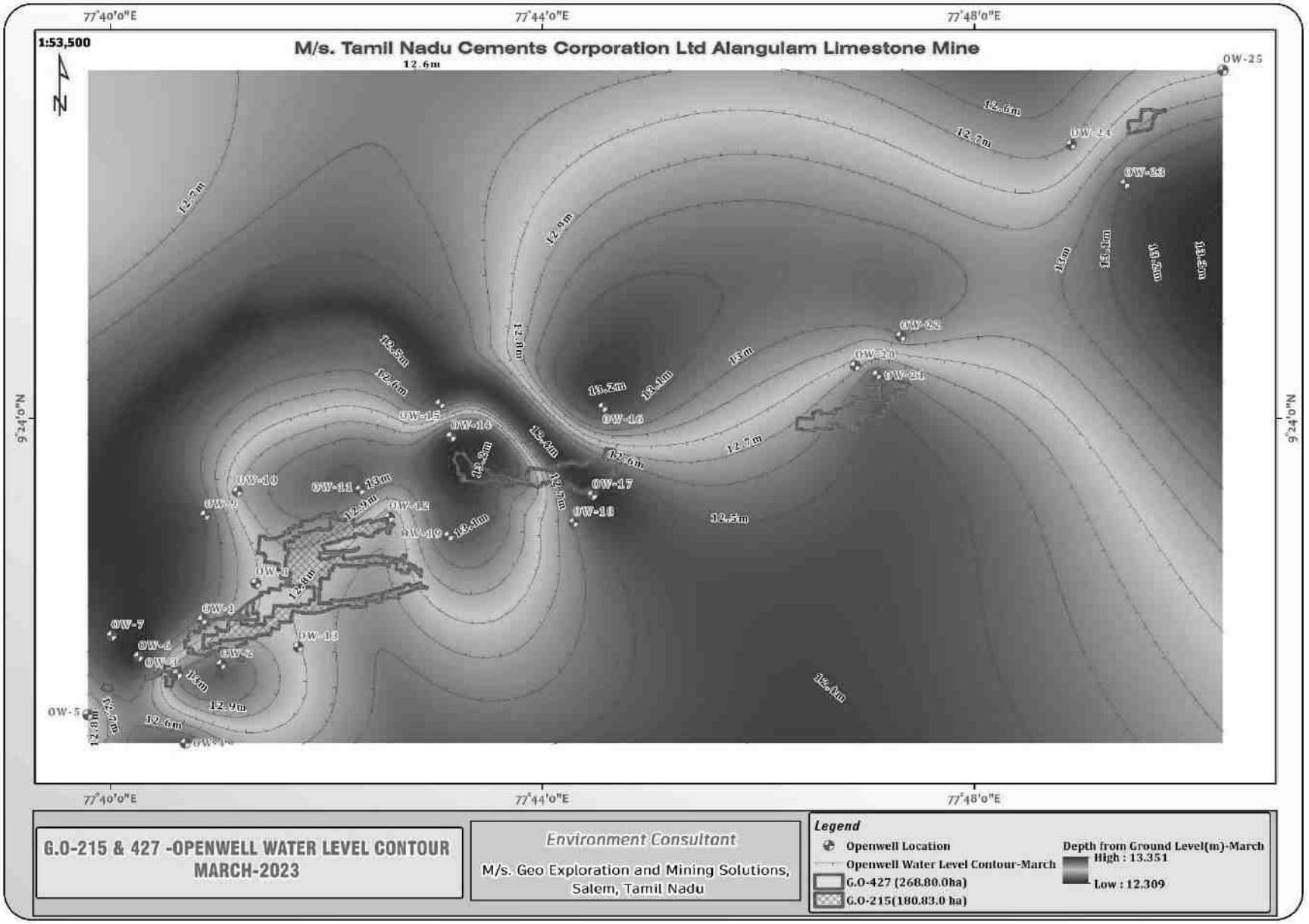


FIGURE 3.14: WATER LEVEL CONTOUR MAP OF OPEN WELLS 1 KM RADIUS – APRIL 2023

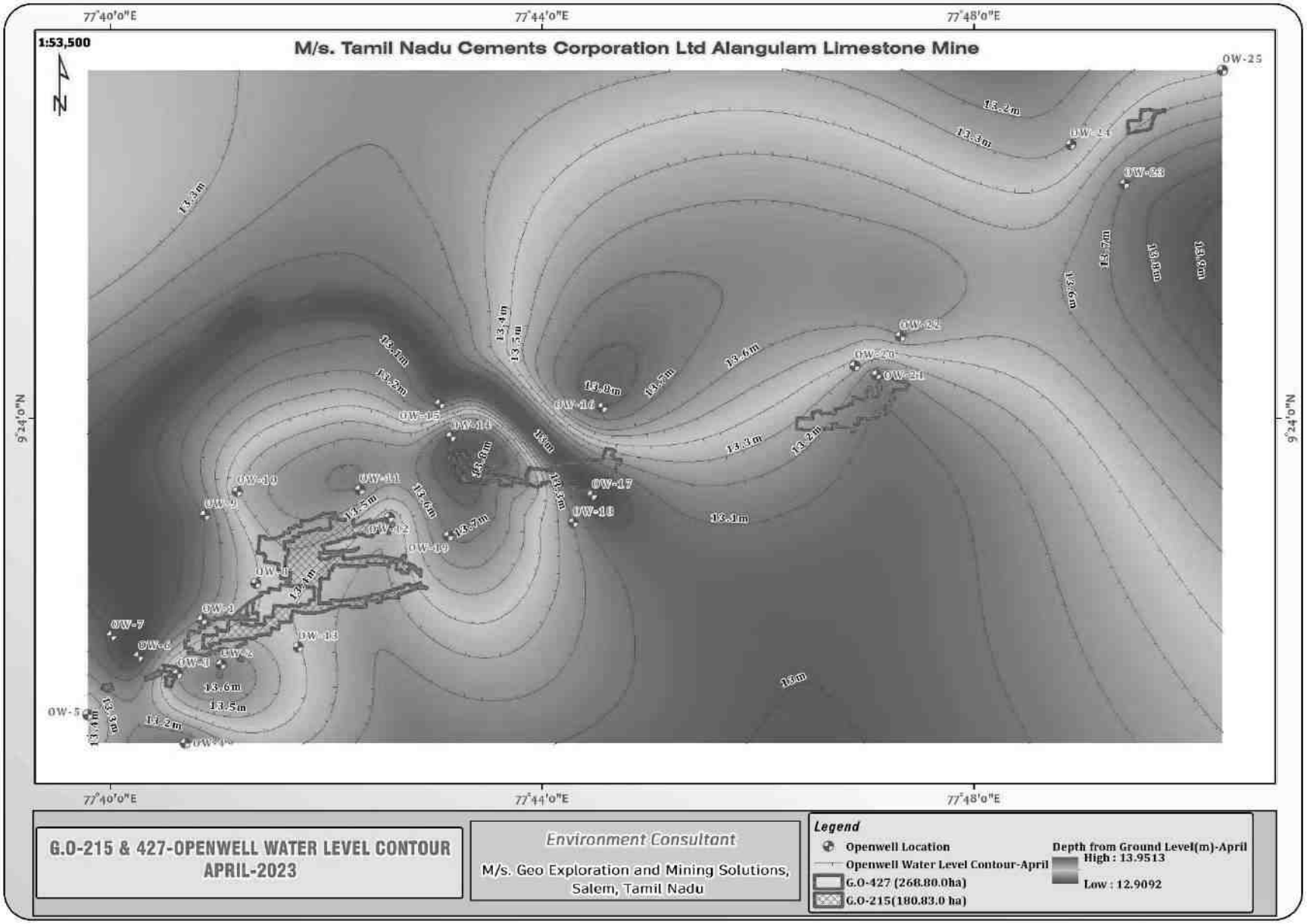


FIGURE 3.15: WATER LEVEL CONTOUR MAP OF OPEN WELLS 1 KM RADIUS – MAY 2023

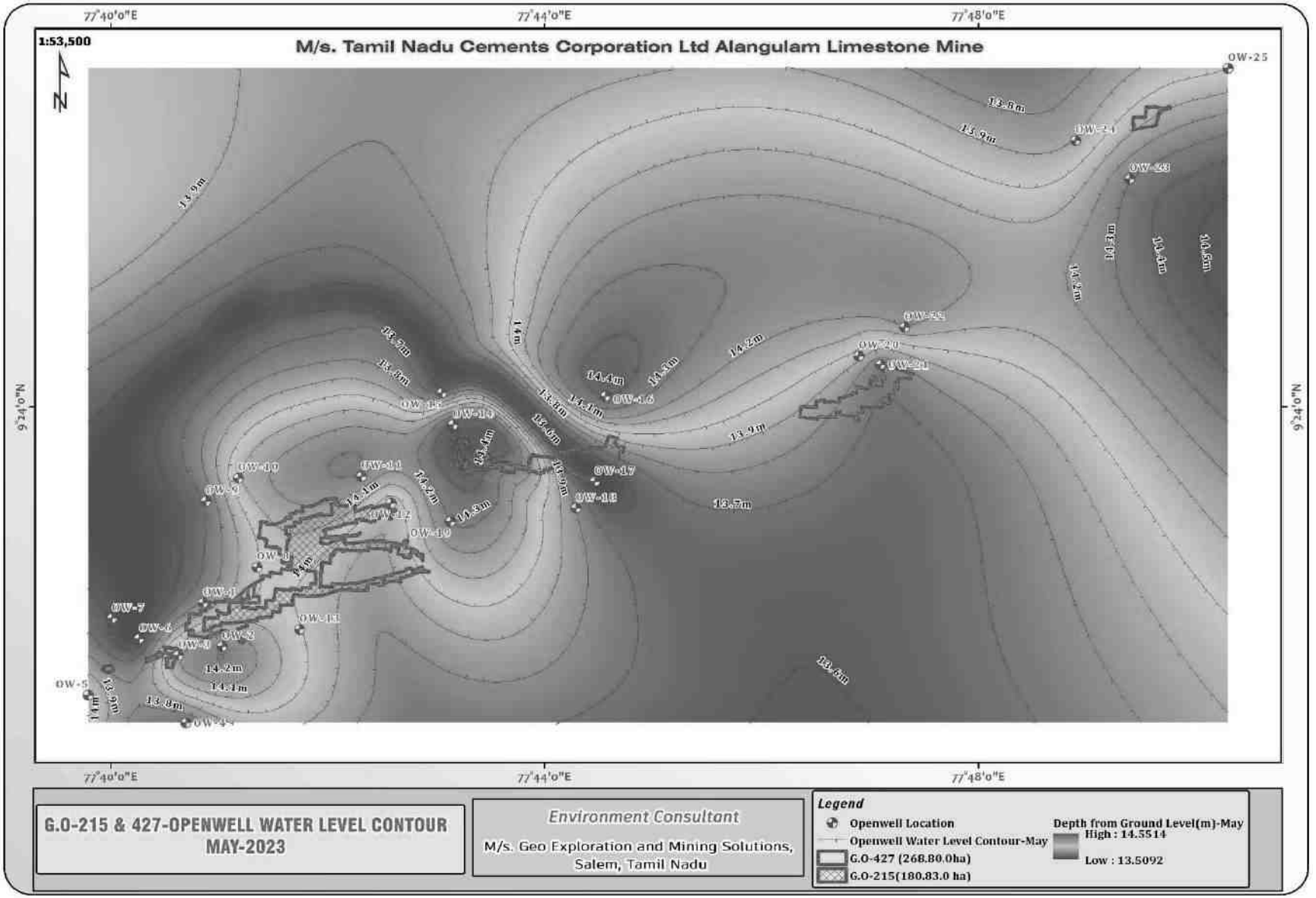


FIGURE 3.16: WATER LEVEL CONTOUR MAP OF BORE WELLS 1 KM RADIUS – MARCH 2023

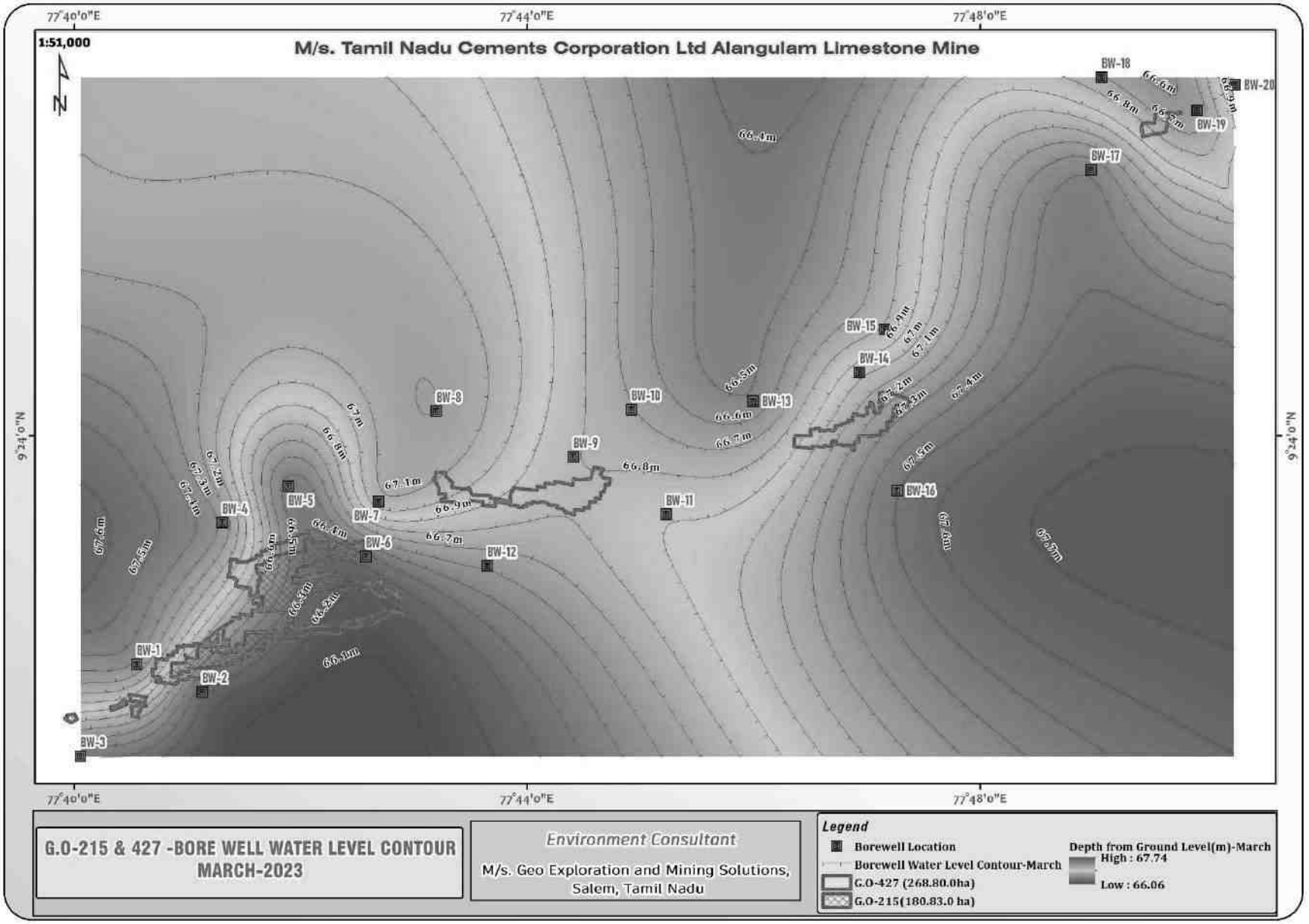


FIGURE 3.17: WATER LEVEL CONTOUR MAP OF BORE WELLS 1 KM RADIUS – APRIL 2023

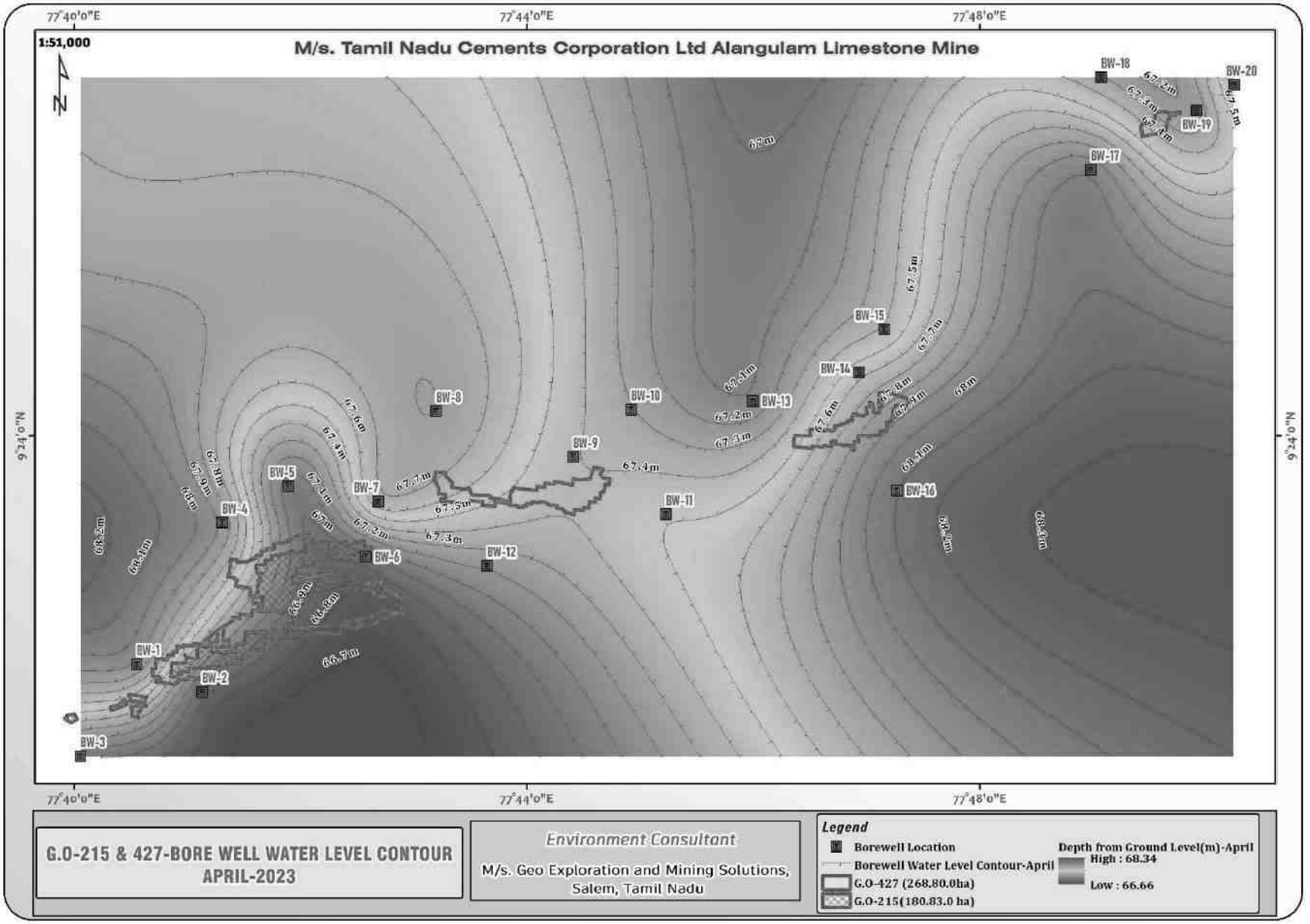


FIGURE 3.18: WATER LEVEL CONTOUR MAP OF BORE WELLS 1 KM RADIUS – MAY 2023

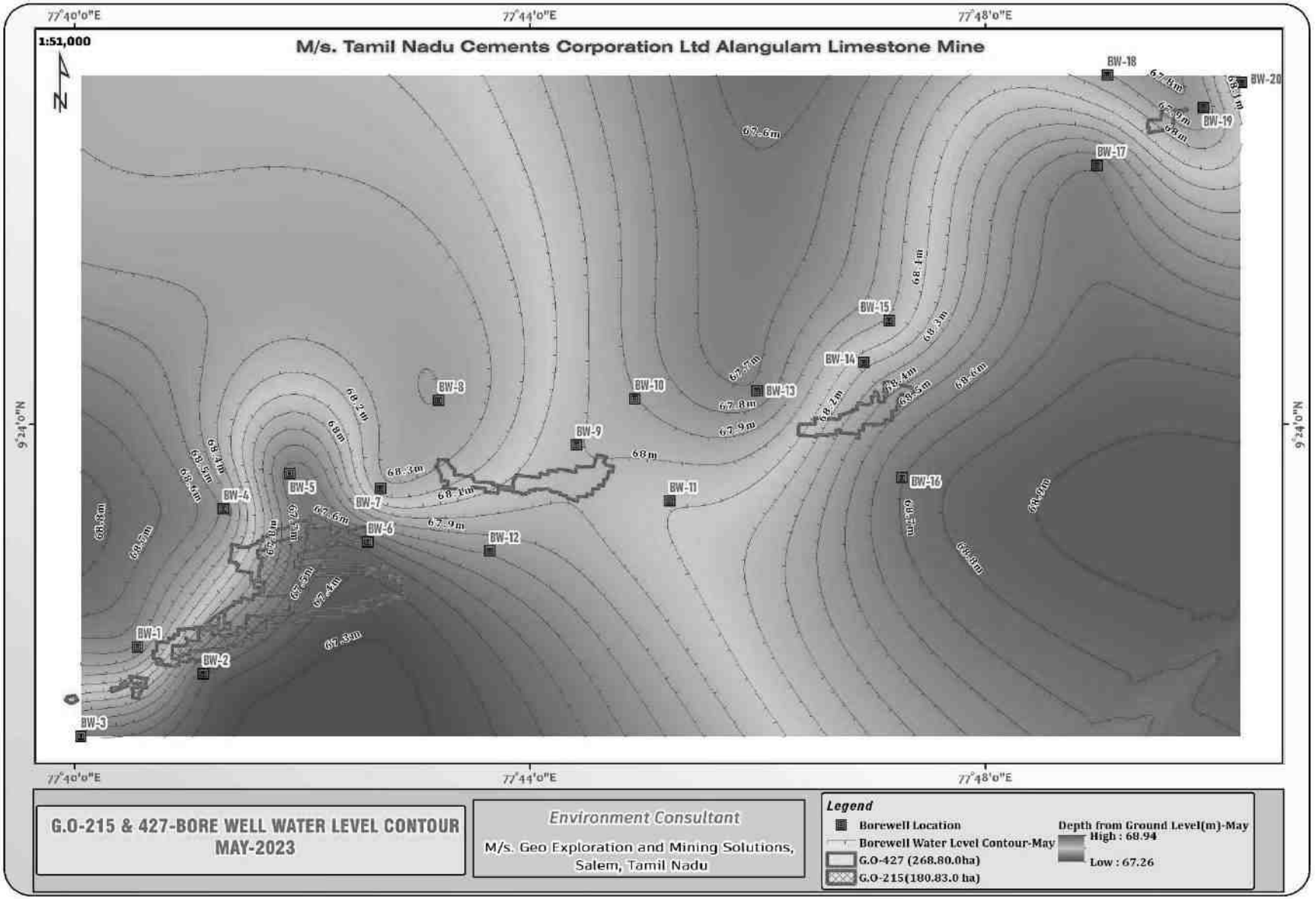


FIGURE 3.19: DRAINAGE MAP AROUND 10 KM RADIUS FROM PROJECT SITE

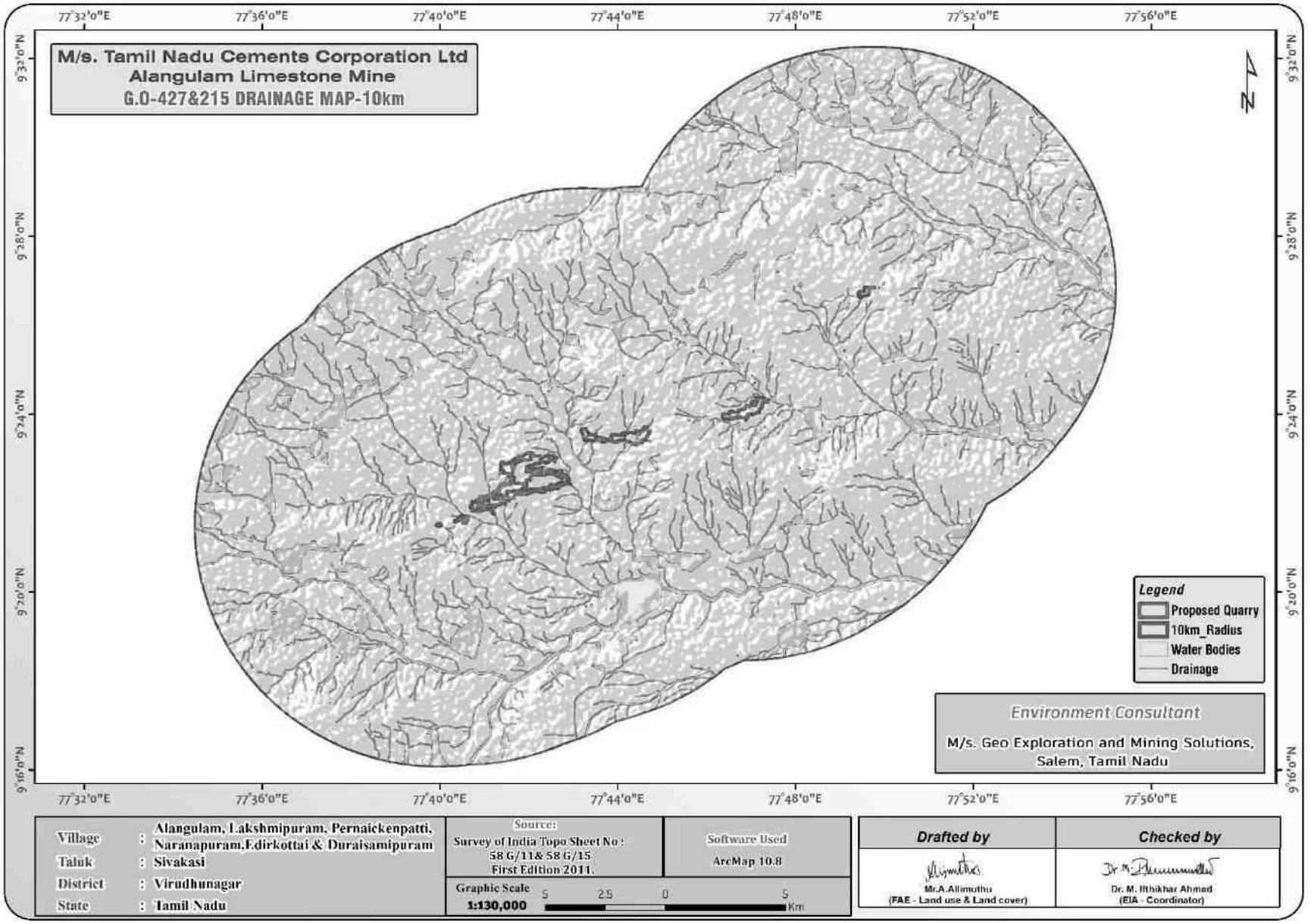
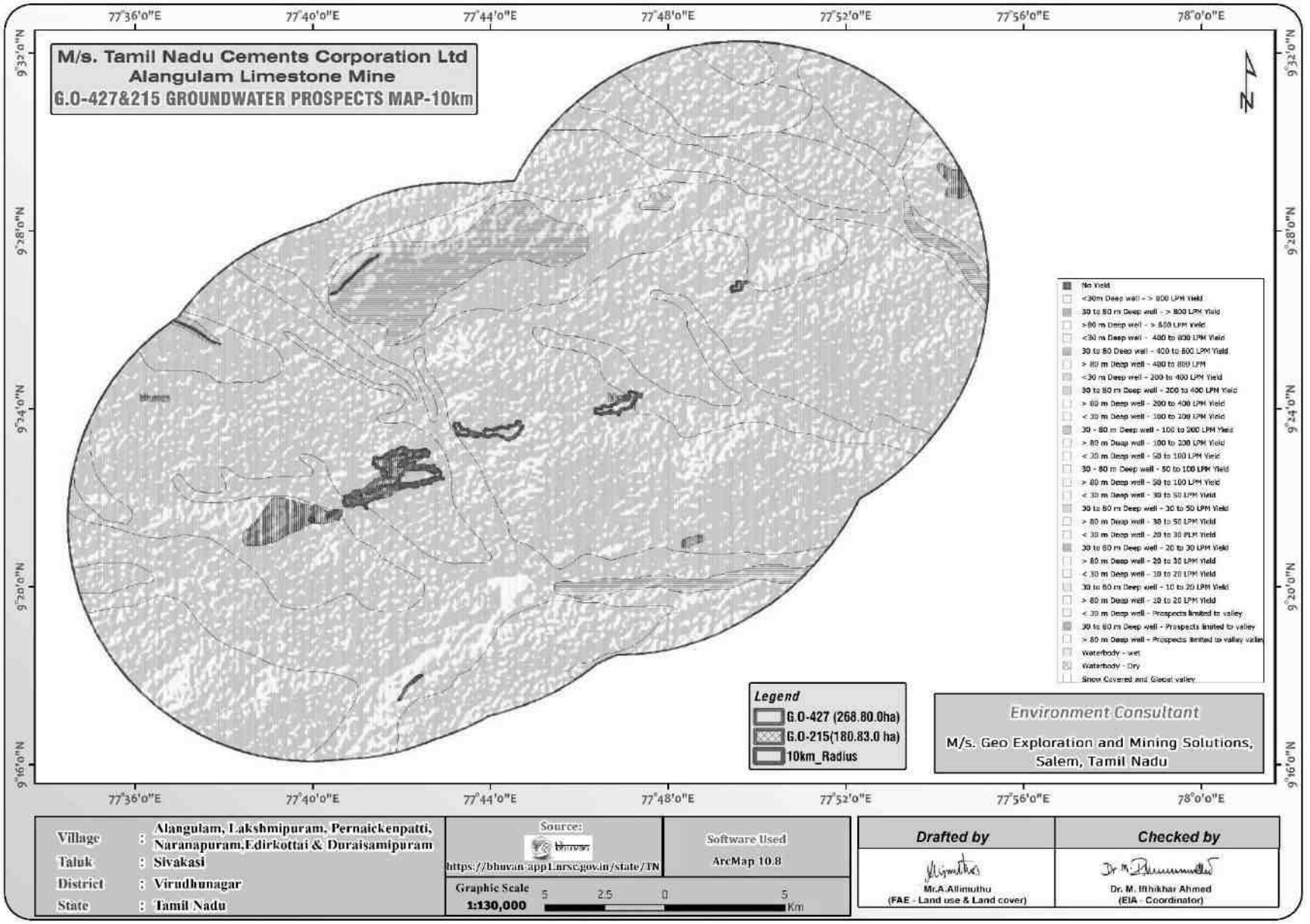


FIGURE 3.20: GROUND WATER PROSPECT MAP



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,

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

ρr = Resistivity of Rocks

ρw = Resistivity of water in pores of rock

F = Formation Factor

$\emptyset$ = Fractional pore volume

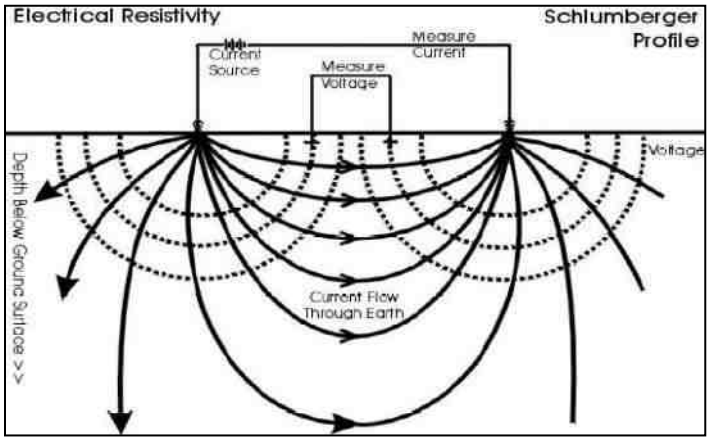
A = Constants with values ranging from 0.5 to 2.5

3.2.5.2 Survey Layout

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

The field equipment deployed for the study is in a deep resistivity meter with a model of SSR – MP – AT. This Signal stacking Resistivity meter is a high-quality data acquisition system incorporating several innovation features for Earth resistivity. In the presence of random earth Noises the signal to nose ration can be enhanced by $\sqrt{N}$ where N is the number of stacked readings. This SSR meter in which running averages of measurements [1, (1+2)/2, (1+2+3)/3 … (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 85-80m. The maximum depth proposed out of proposed projects is P1 - 89m (1m Topsoil +88m Limestone) and P2 - 55m (1.5m Topsoil +53.5m Limestone). 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 Virudhunagar lies on 102m above sea level the climate here is considered to be a local steppe climate. The average annual temperature is 28.6 °C | 83.4 °F.
- The precipitation here is around 829 mm |32.6 inch per year. The driest month is May, with 9 mm |0.4inch. The greatest amount of precipitation occurs in October, with an average of 144 mm | 5.6 inch.
- The warmest month of the year is October, with an average temperature of 32.2°C | 89.9 °F.
- The lowest average temperatures in the year occur in December, when it is around 22°C | 71.6°F.
- The difference in precipitation between the driest month and the wettest month is 107mm | 7inch. The variation in temperatures throughout the year is 3.4°C | 38.1 °F.

Source: **https://en.climate-data.org/asia/india/tamil-nadu/virudhunagar**

TABLE 3.15: RAINFALL DATA

Actual Rainfall in mm					Normal Rainfall in mm
2017	2018	2019	2020	2021	
715.3	468.4	524.5	684.2	919.8	628.9

Source: **https://www.twadboard.tn.gov.in/content/Virudhunagar**

TABLE 3.16: METEOROLOGICAL DATA RECORDED AT SITE

S.No	Parameters		Mar-2023	Apr– 2023	May- 2023
1	Temperature (^{0}C)	Max	29.12	30.73	29.03
		Min	24.77	25.53	24.23
		Avg	26.94	28.13	26.63
2	Relative Humidity (%)	Avg	60.34	65.72	80.40
3	Wind Speed (m/s)	Max	3.09	2.88	2.81
		Min	0.98	1.16	1.03
		Avg	2.03	2.02	1.92
4	Cloud Cover (OKTAS)		0-8	0-8	0-8
5	Wind Direction		ENE,E	ENE,E	WSW,W

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

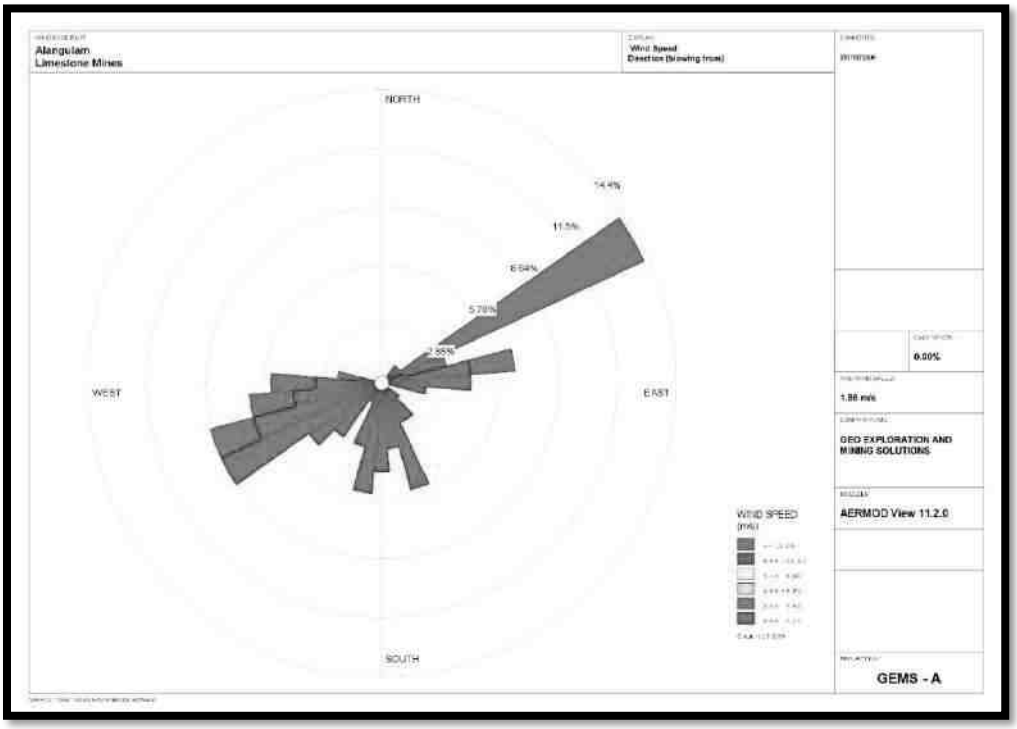
Correlation between Secondary and Primary Data

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

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

Wind rose diagram of the study site is depicted in Figure. 3.21. Predominant downwind direction of the area during study season is North-East to South West.

FIGURE 3.21: 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.3.15 during the monitoring period in the study area

- Predominant winds were from, ENE, E, WSW,W
- Wind velocity readings were recorded between 0.00 to 3.60m/s
- Average Wind speed 1.86 m/s.
- Calm conditions prevail of about 0.00 % of the monitoring period
- Temperature readings ranging from 24.23 to 30.73^{0}C
- Relative humidity ranging from 60.34 to 80.40 %
- 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 3.17: 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 modified method)	Respirable Dust Sampler with gaseous attachment
Free Silica	NIOSH – 7601	Visible Spectrophotometry

Source: Sampling Methodology followed by Laboratories & CPCB Notification

TABLE 3.18: 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 eighteen (18) locations, adopting a continuous 24 hourly (3 shift of 8-hour) schedule for the period March to May, 2023. 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

Eighteen (18) monitoring stations were set up in the study area as depicted in Figure 3.6.1 for assessment of the existing ambient air quality. Details of the sampling locations are as per given below.

TABLE 3.19: AMBIENT AIR QUALITY (AAQ) MONITORING LOCATIONS

S. No	Location Code	Monitoring Locations	Distance & Direction	Coordinates
1	**AAQ-1**	Core Zone	Project Area	9°26'40.55"N 77°49'31.33"E
2	**AAQ-2**	Core Zone	Project Area	9°24'0.91"N 77°46'38.11"E
3	**AAQ-3**	Core Zone	Project Area	9°23'26.78"N 77°44'2.41"E
4	**AAQ-4**	Core Zone	Project Area	9°22'30.36"N 77°41'36.60"E
5	**AAQ-5**	Core Zone	Project Area	9°21'37.85"N 77°40'28.68"E
6	**AAQ-6**	Sundankulam	460m South	9°21'37.60"N 77°40'47.20"E
7	**AAQ-7**	Uppupatti	820m North East	9°23'9.50"N 77°43'0.75"E
8	**AAQ-8**	Jaminepatti	1.4km NE	9°22'41.19"N 77°43'36.73"E
9	**AAQ-9**	Near Project Area	400mWest	9°24'1.25"N 77°46'7.42"E
10	**AAQ-10**	Paranayakkanpatti	470m North	9°24'33.57"N 77°46'55.98"E
11	**AAQ-11**	Near Project Area	320m SW	9°26'28.49"N 77°49'21.64"E
12	**AAQ-12**	Narayanapuram	830m NE	9°26'59.11"N 77°50'12.11"E
13	**AAQ-13**	Vadamalapuram	6.7km NE	9°30'22.24"N 77°50'31.00"E
14	**AAQ-14**	Kakkivadakkanpatti	1km North	9°24'12.28"N 77°43'15.67"E
15	**AAQ-15**	Thayilpatti	3.0km SE	9°22'36.09"N 77°48'0.22"E
16	**AAQ-16**	Mamsapuram	3.8 km North	9°25'35.33"N 77°42'26.36"E
17	**AAQ-17**	Appayanaickenpatti	7.5km South	9°17'29.67"N 77°40'27.33"E
18	**AAQ-18**	Sivalingapuram	3.0 km SW	9°20'46.75"N 77°38'24.98"E

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

FIGURE 3.22: AMBIENT AIR QUALITY LOCATIONS AROUND 10 KM RADIUS

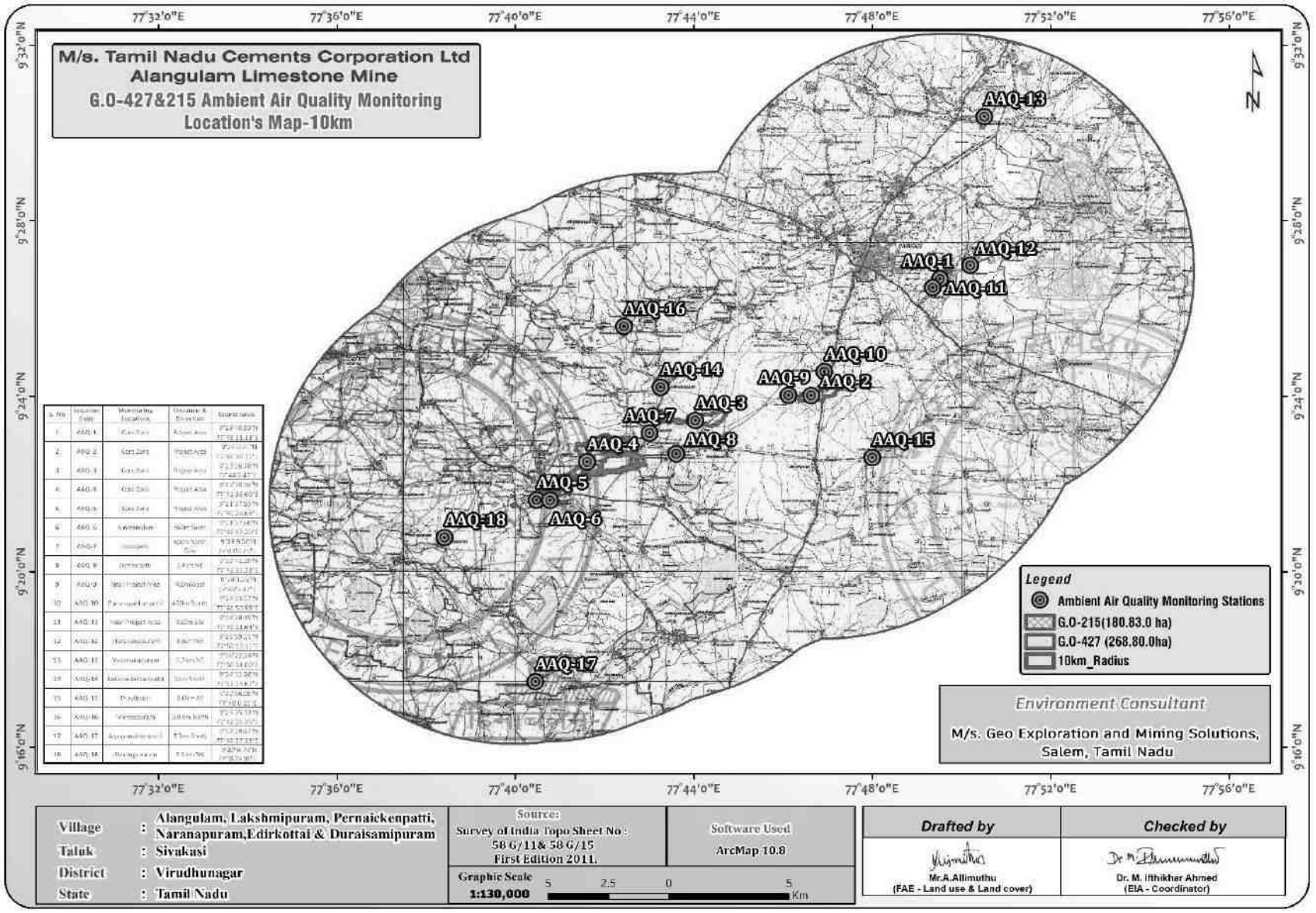


TABLE 3.20: AMBIENT AIR QUALITY DATA LOCATION AAQ1

Period: Mar – May-2023 *Location: AAQ1- 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)
03.03.2023	07.00-07.00	68.3	22.5	44.3	7.2	25.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
04.03.2023	07.15-07.15	67.1	24.3	42.5	7.3	24.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
10.03.2023	07.00-07.00	68.3	25.3	43.6	7.4	26.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
11.03.2023	07.15-07.15	69.2	26.1	45.2	6.2	27.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
17.03.2023	07.00-07.00	67.2	24.6	44.2	6.1	25.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
18.03.2023	07.15-07.15	68.3	25.3	43.0	6.3	26.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
24.03.2023	07.00-07.00	67.0	21.0	41.2	7.6	24.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
25.03.2023	07.15-07.15	69.2	23.4	44.2	7.2	25.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
31.03.2023	07.00-07.00	67.3	22.6	43.6	7.0	26.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
01.04.2023	07.15-07.15	68.2	25.0	42.1	8.3	27.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
07.04.2023	07.00-07.00	67.1	26.8	41.5	8.0	25.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
08.04.2023	07.15-07.15	68.0	24.3	42.0	7.4	26.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
14.04.2023	07.00-07.00	69.4	23.5	43.6	8.2	27.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
15.04.2023	07.15-07.15	67.3	25.1	44.8	7.8	26.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
21.04.2023	07.00-07.00	68.2	26.0	43.0	8.1	25.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
22.04.2023	07.15-07.15	69.3	23.2	41.0	7.2	26.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
28.04.2023	07.00-07.00	67.2	22.0	42.8	8.3	27.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
29.04.2023	07.15-07.15	68.0	21.6	43.5	7.6	26.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
05.05.2023	07.00-07.00	69.3	24.3	44.0	7.0	24.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
06.05.2023	07.15-07.15	67.4	25.6	45.4	8.2	25.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
12.05.2023	07.00-07.00	68.9	26.3	42.3	7.5	27.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
13.05.2023	07.15-07.15	69.0	24.1	43.1	8.2	26.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
19.05.2023	07.00-07.00	69.3	25.0	44.6	8.2	27.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
20.05.2023	07.15-07.15	68.5	24.6	45.8	7.6	25.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
26.05.2023	07.00-07.00	67.2	25.8	42.1	7.4	26.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
27.05.2023	07.15-07.15	68.5	26.8	41.3	8.0	24.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0

TABLE 3.21: AMBIENT AIR QUALITY DATA LOCATION AAQ2

Period: Mar – May-2023 *Location: AAQ2- Core zone* 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)
03.03.2023	07.15-07.15	73.2	25.3	43.5	6.2	23.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
04.03.2023	07.30-07:30	74.2	24.1	45.1	7.0	22.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
10.03.2023	07.15-07.15	73.0	22.0	44.0	6.8	21.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
11.03.2023	07.30-07:30	72.1	24.3	42.3	7.2	20.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
17.03.2023	07.15-07.15	74.5	21.0	41.0	6.2	23.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
18.03.2023	07.30-07:30	73.2	23.2	43.6	7.4	24.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
24.03.2023	07.15-07.15	72.4	22.1	44.5	6.3	22.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
25.03.2023	07.30-07:30	74.6	22.6	45.7	7.5	23.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
31.03.2023	07.15-07.15	72.3	22.1	43.2	6.2	24.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
01.04.2023	07.30-07:30	73.6	21.6	42.1	7.0	25.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
07.04.2023	07.15-07.15	74.5	24.3	41.3	6.8	23.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
08.04.2023	07.30-07:30	73.6	25.3	43.6	7.0	23.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
14.04.2023	07.15-07.15	72.1	22.6	42.1	5.3	23.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
15.04.2023	07.15-07.15	73.4	23.5	44.5	5.0	24.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
21.04.2023	07.00-07.00	74.3	21.3	45.6	5.2	24.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
22.04.2023	07.15-07.15	74.1	22.5	41.0	5.6	25.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
28.04.2023	07.00-07.00	75.3	23.6	42.5	5.8	24.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
29.04.2023	07.15-07.15	73.5	24.5	43.5	6.4	25.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
05.05.2023	07.00-07.00	74.1	22.7	44.8	7.3	22.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
06.05.2023	07.15-07.15	73.5	23.5	45.6	6.8	23.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
12.05.2023	07.00-07.00	72.0	25.6	43.1	5.2	21.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
13.05.2023	07.15-07.15	73.8	24.2	44.2	5.4	25.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
19.05.2023	07.00-07.00	74.1	22.3	45.0	7.3	24.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
20.05.2023	07.15-07.15	73.0	21.2	43.5	6.3	23.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
26.05.2023	07.00-07.00	72.4	22.3	44.2	7.1	21.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
27.05.2023	07.15-07.15	73.8	21.0	41.0	6.9	22.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0

TABLE 3.22: AMBIENT AIR QUALITY DATA LOCATION AAQ3

Period: Mar – May-2023 AAQ3- *Core zone* 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)
03.03.2023	07.15-07.15	68.5	21.3	43.2	7.5	22.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
04.03.2023	07.30-07:30	67.0	24.3	42.1	6.2	24.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
10.03.2023	07.15-07.15	67.2	25.6	44.6	7.0	25.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
11.03.2023	07.30-07:30	69.2	26.1	41.0	6.3	21.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
17.03.2023	07.15-07.15	67.3	22.3	42.3	7.2	22.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
18.03.2023	07.30-07:30	68.0	24.5	43.6	6.4	21.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
24.03.2023	07.15-07.15	69.2	26.1	44.5	7.2	23.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
25.03.2023	07.30-07:30	67.2	25.3	42.8	6.8	23.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
31.03.2023	07.15-07.15	69.4	22.0	43.6	7.1	24.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
01.04.2023	07.30-07:30	68.2	21.3	44.8	6.3	23.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
07.04.2023	07.15-07.15	69.3	22.3	42.6	7.2	22.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
08.04.2023	07.30-07:30	68.4	24.6	43.5	6.5	23.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
14.04.2023	07.15-07.15	69.2	26.3	45.1	7.3	24.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
15.04.2023	07.15-07.15	69.0	25.0	43.0	6.0	25.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
21.04.2023	07.00-07.00	68.2	22.7	44.6	7.4	24.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
22.04.2023	07.15-07.15	67.3	22.0	45.2	6.3	22.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
28.04.2023	07.00-07.00	69.0	23.5	42.0	7.1	23.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
29.04.2023	07.15-07.15	67.1	23.5	44.3	7.0	24.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
05.05.2023	07.00-07.00	68.3	21.0	42.0	6.5	25.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
06.05.2023	07.15-07.15	67.0	23.6	43.6	7.3	24.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
12.05.2023	07.00-07.00	69.3	24.3	42.1	6.8	25.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
13.05.2023	07.15-07.15	68.0	25.3	43.8	7.1	22.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
19.05.2023	07.00-07.00	67.8	26.1	44.6	6.0	21.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
20.05.2023	07.15-07.15	68.4	21.3	42.1	7.3	24.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
26.05.2023	07.00-07.00	69.3	22.3	43.8	7.0	22.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
27.05.2023	07.15-07.15	67.2	23.5	42.5	6.5	23.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0

TABLE 3.23: AMBIENT AIR QUALITY DATA LOCATION AAQ4

Period: Mar – May-2023 Location: AAQ4 – *Core zone* 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)
03.03.2023	07.00-07.00	69.3	22.5	47.2	6.3	22.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
04.03.2023	07.15-07:15	68.2	23.4	47.2	7.0	21.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
10.03.2023	07.00-07.00	69.3	24.0	46.1	6.3	23.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
11.03.2023	07.15-07:15	69.0	23.5	46.6	7.2	21.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
17.03.2023	07.00-07.00	68.1	22.1	46.3	6.5	22.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
18.03.2023	07.15-07:15	67.2	21.3	47.0	7.0	22.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
24.03.2023	07.00-07.00	68.3	24.3	47.5	6.8	23.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
25.03.2023	07.15-07:15	68.0	22.1	47.0	7.2	21.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
31.03.2023	07.00-07.00	69.5	23.0	46.1	6.4	22.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
01.04.2023	07.15-07:15	68.1	24.0	48.3	7.3	23.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
07.04.2023	07.00-07.00	67.3	22.6	48.5	6.5	21.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
08.04.2023	07.15-07:15	68.5	23.5	47.6	7.3	22.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
14.04.2023	07.00-07.00	67.5	21.0	47.1	6.0	23.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
15.04.2023	07.15-07.15	69.3	24.3	46.0	7.1	23.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
21.04.2023	07.00-07.00	68.2	22.5	46.1	7.8	24.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
22.04.2023	07.15-07.15	68.0	23.6	46.6	6.2	22.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
28.04.2023	07.00-07.00	69.3	22.0	47.0	7.3	23.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
29.04.2023	07.15-07.15	67.3	24.3	47.0	6.8	22.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
05.05.2023	07.00-07.00	68.0	23.0	47.1	7.4	22.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
06.05.2023	07.15-07.15	69.0	21.0	48.0	6.9	23.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
12.05.2023	07.00-07.00	68.2	22.6	48.6	7.5	24.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
13.05.2023	07.15-07.15	67.1	23.5	47.8	6.8	23.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
19.05.2023	07.00-07.00	66.2	21.6	47.2	7.3	22.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
20.05.2023	07.15-07.15	69.0	23.0	48.5	6.4	23.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
26.05.2023	07.00-07.00	69.2	24.0	48.1	7.3	22.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
27.05.2023	07.15-07.15	68.2	24.1	47.5	6.0	24.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0

TABLE 3.24: AMBIENT AIR QUALITY DATA LOCATION AAQ5

Period: Mar – May-2023 AAQ5- *Core zone* 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)
03.03.2023	07:30-07:30	65.3	22.5	44.5	5.5	23.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
04.03.2023	07:45-07:45	64.2	23.5	42.3	6.2	21.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
10.03.2023	07:30-07:30	66.3	24.0	44.0	7.2	22.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
11.03.2023	07:45-07:45	68.3	22.3	45.2	6.4	25.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
17.03.2023	07:30-07:30	67.1	23.5	43.1	7.6	24.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
18.03.2023	07:45-07:45	69.2	22.0	43.0	5.0	25.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
24.03.2023	07:30-07:30	66.2	24.0	45.0	6.8	23.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
25.03.2023	07:45-07:45	64.2	21.3	44.2	7.2	22.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
31.03.2023	07:30-07:30	65.3	22.5	45.3	6.3	24.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
01.04.2023	07:45-07:45	66.0	24.5	44.2	7.4	25.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
07.04.2023	07:30-07:30	64.2	23.6	43.2	5.3	24.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
08.04.2023	07:45-07:45	66.0	22.1	44.1	6.5	25.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
14.04.2023	07:30-07:30	62.8	24.3	43.2	7.2	23.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
15.04.2023	07.15-07.15	64.2	23.1	42.0	5.4	25.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
21.04.2023	07.00-07.00	66.3	24.6	43.1	7.6	24.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
22.04.2023	07.15-07.15	67.0	22.3	44.5	6.2	25.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
28.04.2023	07.00-07.00	62.4	22.1	43.0	7.3	23.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
29.04.2023	07.15-07.15	65.0	22.3	44.3	6.8	24.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
05.05.2023	07.00-07.00	67.0	22.1	42.1	7.1	25.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
06.05.2023	07.15-07.15	66.2	23.2	43.2	8.6	24.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
12.05.2023	07.00-07.00	67.2	22.4	44.5	7.0	25.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
13.05.2023	07.15-07.15	64.5	21.3	41.3	6.2	22.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
19.05.2023	07.00-07.00	65.3	22.0	42.0	7.3	24.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
20.05.2023	07.15-07.15	67.0	23.0	43.0	5.4	22.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
26.05.2023	07.00-07.00	65.3	22.5	44.5	6.3	23.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
27.05.2023	07.15-07.15	66.0	22.1	45.3	8.0	24.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0

TABLE 3.25: AMBIENT AIR QUALITY DATA LOCATION AAQ6

Period: Mar – May-2023 Location: AAQ6 – *Sundankulam* 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)
03.03.2023	08:00-08:00	65.3	20.2	40.2	5.5	24.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
04.03.2023	08:15-08:15	64.2	21.2	41.3	6.2	23.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
10.03.2023	08:00-08:00	66.3	19.3	39.2	7.2	24.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
11.03.2023	08:15-08:15	67.2	20.0	40.0	8.2	23.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
17.03.2023	08:00-08:00	68.3	21.3	41.8	6.3	25.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
18.03.2023	08:15-08:15	69.2	20.5	41.6	5.2	24.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
24.03.2023	08:00-08:00	65.2	21.6	40.3	7.1	25.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
25.03.2023	08:15-08:15	64.0	22.4	40.8	6.0	25.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
31.03.2023	08:00-08:00	66.3	21.3	41.5	5.8	24.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
01.04.2023	08:15-08:15	67.2	21.0	40.3	7.2	23.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
07.04.2023	08:00-08:00	68.3	22.5	39.0	8.2	25.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
08.04.2023	08:15-08:15	69.2	20.3	40.8	7.3	24.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
14.04.2023	08:00-08:00	65.0	22.3	41.2	6.4	25.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
15.04.2023	07.15-07.15	66.3	20.1	40.3	7.0	23.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
21.04.2023	07.00-07.00	67.1	21.6	41.5	8.6	24.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
22.04.2023	07.15-07.15	68.2	21.0	41.6	6.3	24.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
28.04.2023	07.00-07.00	68.0	20.6	39.4	8.3	23.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
29.04.2023	07.15-07.15	69.3	21.8	41.3	5.2	25.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
05.05.2023	07.00-07.00	66.4	21.9	40.5	6.3	42.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
06.05.2023	07.15-07.15	67.3	21.3	41.0	7.2	25.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
12.05.2023	07.00-07.00	68.2	19.3	39.2	8.2	26.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
13.05.2023	07.15-07.15	69.6	20.3	41.6	5.3	24.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
19.05.2023	07.00-07.00	65.3	21.5	39.2	6.4	25.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
20.05.2023	07.15-07.15	66.4	22.3	40.6	8.1	24.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
26.05.2023	07.00-07.00	67.3	21.5	39.5	6.0	25.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
27.05.2023	07.15-07.15	68.2	22.6	41.3	8.3	24.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0

TABLE 3.26: AMBIENT AIR QUALITY DATA LOCATION AAQ7

Period: Mar – May-2023 *Location: AAQ7– Uppupatti* 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)
03.03.2023	08:00-08:00	67.2	22.2	44.5	7.2	24.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
04.03.2023	08:15-08:15	68.2	21.0	45.2	7.0	25.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
10.03.2023	08:00-08:00	66.0	20.3	44.2	7.3	22.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
11.03.2023	08:15-08:15	67.2	21.0	46.0	6.2	21.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
17.03.2023	08:00-08:00	68.4	22.8	45.6	7.3	25.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
18.03.2023	08:15-08:15	66.3	22.3	46.6	6.1	24.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
24.03.2023	08:00-08:00	67.2	21.5	45.0	7.0	25.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
25.03.2023	08:15-08:15	68.5	22.6	46.2	6.4	22.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
31.03.2023	08:00-08:00	67.3	20.3	44.0	7.3	24.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
01.04.2023	08:15-08:15	68.2	21.6	46.6	6.8	21.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
07.04.2023	08:00-08:00	66.4	22.5	45.2	7.2	22.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
08.04.2023	08:15-08:15	67.2	21.8	44.5	6.3	22.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
14.04.2023	08:00-08:00	68.3	22.8	46.0	7.5	23.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
15.04.2023	07.15-07.15	66.0	22.0	47.3	6.4	21.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
21.04.2023	07.00-07.00	68.3	21.6	47.5	7.0	23.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
22.04.2023	07.15-07.15	67.1	22.0	45.6	6.5	24.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
28.04.2023	07.00-07.00	68.3	21.8	46.0	7.2	25.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
29.04.2023	07.15-07.15	67.2	20.6	46.6	6.0	25.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
05.05.2023	07.00-07.00	66.0	21.2	45.2	7.5	24.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
06.05.2023	07.15-07.15	67.0	22.5	45.5	6.2	22.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
12.05.2023	07.00-07.00	68.0	21.0	46.6	7.8	21.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
13.05.2023	07.15-07.15	67.3	22.8	45.1	6.3	22.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
19.05.2023	07.00-07.00	68.2	22.1	45.5	7.4	24.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
20.05.2023	07.15-07.15	66.0	20.9	46.0	6.8	25.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
26.05.2023	07.00-07.00	68.0	21.0	45.5	7.3	24.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
27.05.2023	07.15-07.15	67.2	22.4	46.5	6.5	23.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0

TABLE 3.27: AMBIENT AIR QUALITY DATA LOCATION AAQ8

Period: Mar – May-2023 Location: AAQ8– *Jaminepatti* 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)
03.03.2023	08:00-08:00	69.5	20.2	40.2	5.5	23.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
04.03.2023	08:15-08:15	68.2	21.3	39.2	6.2	21.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
10.03.2023	08:00-08:00	65.2	22.4	41.2	7.2	22.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
11.03.2023	08:15-08:15	64.3	20.3	41.0	6.0	24.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
17.03.2023	08:00-08:00	66.3	21.0	40.2	7.4	22.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
18.03.2023	08:15-08:15	65.8	22.3	39.5	5.5	21.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
24.03.2023	08:00-08:00	64.2	21.4	40.3	6.2	22.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
25.03.2023	08:15-08:15	65.3	22.0	41.6	7.3	21.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
31.03.2023	08:00-08:00	63.0	22.4	39.1	5.4	22.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
01.04.2023	08:15-08:15	64.5	22.3	40.5	6.3	23.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
07.04.2023	08:00-08:00	63.3	21.1	41.6	7.2	24.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
08.04.2023	08:15-08:15	65.0	22.0	41.0	5.2	23.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
14.04.2023	08:00-08:00	63.4	22.3	39.5	6.3	22.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
15.04.2023	07.15-07.15	64.3	21.0	41.3	7.1	24.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
21.04.2023	07.00-07.00	63.2	22.5	40.1	5.2	23.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
22.04.2023	07.15-07.15	64.0	21.6	41.5	6.4	24.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
28.04.2023	07.00-07.00	63.3	22.3	39.2	7.2	21.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
29.04.2023	07.15-07.15	65.1	22.0	41.0	6.3	22.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
05.05.2023	07.00-07.00	65.2	21.5	39.0	7.0	23.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
06.05.2023	07.15-07.15	64.0	22.3	40.2	5.2	24.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
12.05.2023	07.00-07.00	64.4	22.0	39.5	6.8	22.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
13.05.2023	07.15-07.15	65.3	21.5	41.6	7.0	24.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
19.05.2023	07.00-07.00	64.4	22.6	39.8	5.8	22.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
20.05.2023	07.15-07.15	66.3	21.1	40.2	6.3	21.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
26.05.2023	07.00-07.00	62.4	22.4	41.3	7.4	23.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
27.05.2023	07.15-07.15	64.3	20.3	39.8	6.2	24.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0

TABLE 3.28: AMBIENT AIR QUALITY DATA LOCATION AAQ9-:

Period: March 2023 – May 2023 *Location: AAQ9 – Near Project Area* 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)
03.03.2023	08:00-08:00	62.3	23.2	42.3	6.2	23.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
04.03.2023	08:15-08:15	61.2	21.2	43.1	5.3	24.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
10.03.2023	08:00-08:00	63.0	24.3	44.2	6.0	25.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
11.03.2023	08:15-08:15	64.2	22.5	45.2	5.4	23.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
17.03.2023	08:00-08:00	65.3	23.6	42.3	6.3	24.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
18.03.2023	08:15-08:15	66.2	21.2	45.6	7.2	25.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
24.03.2023	08:00-08:00	62.3	24.2	45.3	8.0	24.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
25.03.2023	08:15-08:15	63.1	23.5	44.2	8.1	25.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
31.03.2023	08:00-08:00	64.2	21.3	42.0	6.4	24.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
01.04.2023	08:15-08:15	65.1	22.5	43.2	7.2	25.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
07.04.2023	08:00-08:00	66.2	23.6	44.3	8.3	24.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
08.04.2023	08:15-08:15	63.1	24.2	45.2	6.2	25.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
14.04.2023	08:00-08:00	62.1	21.2	42.3	8.1	23.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
15.04.2023	07.15-07.15	63.0	23.6	44.5	6.4	24.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
21.04.2023	07.00-07.00	61.4	24.1	41.2	8.0	25.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
22.04.2023	07.15-07.15	65.3	22.3	42.0	6.3	24.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
28.04.2023	07.00-07.00	66.2	24.5	43.5	7.0	25.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
29.04.2023	07.15-07.15	61.4	23.6	44.1	6.8	23.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
05.05.2023	07.00-07.00	63.2	22.1	45.6	8.2	24.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
06.05.2023	07.15-07.15	65.2	21.3	43.0	8.6	25.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
12.05.2023	07.00-07.00	64.3	23.5	44.5	5.1	24.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
13.05.2023	07.15-07.15	66.1	24.1	42.3	6.9	25.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
19.05.2023	07.00-07.00	64.3	22.3	41.2	7.2	23.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
20.05.2023	07.15-07.15	63.5	24.1	40.2	8.3	25.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
26.05.2023	07.00-07.00	62.5	21.3	43.5	8.2	23.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
27.05.2023	07.15-07.15	64.5	22.5	44.1	7.2	23.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0

TABLE 3.29: AMBIENT AIR QUALITY DATA LOCATION AAQ10-:

Period: March 2023 – May 2023 *Location: AAQ10 – Paranayakkanpatti* 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)**
03.03.2023	08:00-08:00	73.2	23.5	43.2	5.5	21.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
04.03.2023	08:15-08:15	71.2	22.1	42.0	6.0	20.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
10.03.2023	08:00-08:00	72.6	24.3	41.0	7.3	23.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
11.03.2023	08:15-08:15	73.2	25.0	44.3	8.2	21.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
17.03.2023	08:00-08:00	74.6	23.2	45.2	6.5	22.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
18.03.2023	08:15-08:15	72.1	24.2	46.1	5.5	23.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
24.03.2023	08:00-08:00	71.3	25.3	47.6	7.4	21.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
25.03.2023	08:15-08:15	70.2	22.0	44.2	8.3	22.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
31.03.2023	08:00-08:00	69.2	25.3	46.2	7.1	23.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
01.04.2023	08:15-08:15	66.3	23.1	47.3	8.2	20.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
07.04.2023	08:00-08:00	67.3	24.2	44.0	5.3	22.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
08.04.2023	08:15-08:15	68.2	25.3	42.1	6.1	21.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
14.04.2023	08:00-08:00	69.3	22.0	43.6	7.4	23.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
15.04.2023	07.15-07.15	60.2	24.3	44.5	5.8	22.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
21.04.2023	07.00-07.00	67.3	25.0	45.3	6.2	20.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
22.04.2023	07.15-07.15	68.2	22.0	46.1	7.2	22.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
28.04.2023	07.00-07.00	66.4	23.1	47.5	8.3	23.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
29.04.2023	07.15-07.15	65.2	24.5	45.3	5.5	22.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
05.05.2023	07.00-07.00	67.0	25.6	44.2	6.4	23.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
06.05.2023	07.15-07.15	66.4	24.1	41.0	7.3	22.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
12.05.2023	07.00-07.00	65.2	25.3	43.5	8.4	23.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
13.05.2023	07.15-07.15	67.3	22.1	44.6	6.4	21.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
19.05.2023	07.00-07.00	68.2	24.0	45.2	7.3	22.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
20.05.2023	07.15-07.15	69.2	25.3	46.1	8.3	23.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
26.05.2023	07.00-07.00	67.3	24.5	47.2	7.3	22.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
27.05.2023	07.15-07.15	69.3	23.2	45.3	5.6	23.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0

TABLE 3.30: AMBIENT AIR QUALITY DATA LOCATION AAQ11-:

Period: March 2023 – May 2023 *Location: AAQ11 – Near Project Area* 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)
03.03.2023	08:00-08:00	67.3	23.2	43.2	6.2	22.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
04.03.2023	08:15-08:15	68.3	21.0	42.1	7.3	21.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
10.03.2023	08:00-08:00	67.1	24.2	44.5	8.2	23.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
11.03.2023	08:15-08:15	67.3	25.3	45.6	7.4	24.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
17.03.2023	08:00-08:00	68.2	22.0	46.7	5.5	22.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
18.03.2023	08:15-08:15	68.3	21.3	47.2	5.3	23.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
24.03.2023	08:00-08:00	68.3	23.0	45.0	6.0	21.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
25.03.2023	08:15-08:15	67.5	24.1	46.3	7.2	22.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
31.03.2023	08:00-08:00	66.3	25.3	47.1	8.2	23.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
01.04.2023	08:15-08:15	67.5	24.1	44.3	6.4	23.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
07.04.2023	08:00-08:00	66.2	22.3	45.2	7.5	22.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
08.04.2023	08:15-08:15	65.1	23.5	46.0	8.8	21.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
14.04.2023	08:00-08:00	66.0	25.0	47.2	7.3	23.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
15.04.2023	07.15-07.15	67.3	22.1	45.6	8.2	21.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
21.04.2023	07.00-07.00	67.1	23.4	46.2	5.6	22.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
22.04.2023	07.15-07.15	66.2	24.5	45.5	8.3	23.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
28.04.2023	07.00-07.00	65.3	25.6	43.6	5.4	21.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
29.04.2023	07.15-07.15	65.1	22.1	44.2	8.2	23.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
05.05.2023	07.00-07.00	67.3	23.5	42.5	6.3	22.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
06.05.2023	07.15-07.15	66.3	24.5	44.3	7.4	23.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
12.05.2023	07.00-07.00	66.2	25.6	45.6	6.0	20.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
13.05.2023	07.15-07.15	67.0	23.2	46.2	7.5	21.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
19.05.2023	07.00-07.00	65.0	24.1	47.5	8.2	22.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
20.05.2023	07.15-07.15	64.2	25.6	42.3	6.5	23.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
26.05.2023	07.00-07.00	65.3	23.1	44.5	7.4	24.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
27.05.2023	07.15-07.15	66.2	22.0	45.0	8.5	23.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0

TABLE 3.31: AMBIENT AIR QUALITY DATA LOCATION AAQ12-:

Period: March 2023 – May 2023 *Location: AAQ12 – Narayanapuram* 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)**
03.03.2023	08:00-08:00	65.2	24.0	44.2	5.2	22.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
04.03.2023	08:15-08:15	64.3	23.1	45.3	5.5	21.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
10.03.2023	08:00-08:00	63.0	25.5	46.2	6.2	22.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
11.03.2023	08:15-08:15	62.1	22.0	47.2	5.2	23.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
17.03.2023	08:00-08:00	61.0	21.3	48.3	6.3	22.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
18.03.2023	08:15-08:15	62.3	24.3	46.2	6.0	23.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
24.03.2023	08:00-08:00	64.5	25.6	47.3	5.1	21.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
25.03.2023	08:15-08:15	63.0	22.1	45.2	6.2	22.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
31.03.2023	08:00-08:00	62.1	24.3	44.2	5.3	23.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
01.04.2023	08:15-08:15	61.2	23.5	48.3	6.4	22.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
07.04.2023	08:00-08:00	63.5	21.0	44.0	5.0	21.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
08.04.2023	08:15-08:15	62.5	22.5	45.2	5.2	23.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
14.04.2023	08:00-08:00	63.5	23.5	43.1	6.3	22.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
15.04.2023	07.15-07.15	64.5	24.1	46.2	5.4	24.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
21.04.2023	07.00-07.00	63.0	25.3	47.3	6.0	23.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
22.04.2023	07.15-07.15	62.1	24.0	48.2	5.2	21.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
28.04.2023	07.00-07.00	64.2	23.5	46.3	6.3	22.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
29.04.2023	07.15-07.15	62.5	22.1	44.5	5.6	24.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
05.05.2023	07.00-07.00	61.3	25.3	42.3	6.3	23.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
06.05.2023	07.15-07.15	62.0	23.0	41.1	5.4	21.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
12.05.2023	07.00-07.00	63.4	24.5	43.1	6.2	22.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
13.05.2023	07.15-07.15	65.0	25.3	44.5	5.3	23.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
19.05.2023	07.00-07.00	62.4	24.1	45.6	6.4	22.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
20.05.2023	07.15-07.15	61.3	25.6	46.2	5.2	23.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
26.05.2023	07.00-07.00	62.4	25.0	47.2	6.8	21.0	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
27.05.2023	07.15-07.15	60.2	23.1	45.5	5.3	22.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0

TABLE 3.32: AMBIENT AIR QUALITY DATA LOCATION AAQ13-:

Period: March 2023 – May 2023 *Location: AAQ13 – Vadamalapuram* 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)**
03.03.2023	08:00-08:00	63.5	23.1	49.5	6.2	26.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
04.03.2023	08:15-08:15	62.1	22.1	48.3	6.3	25.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
10.03.2023	08:00-08:00	64.3	24.5	47.2	7.0	25.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
11.03.2023	08:15-08:15	65.1	25.5	48.2	6.5	26.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
17.03.2023	08:00-08:00	66.0	26.3	48.1	6.3	26.9	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
18.03.2023	08:15-08:15	64.3	24.0	49.5	7.2	26.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
24.03.2023	08:00-08:00	63.2	25.1	47.3	7.3	25.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
25.03.2023	08:15-08:15	61.0	26.3	47.2	6.5	25.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
31.03.2023	08:00-08:00	62.5	25.0	48.1	7.2	26.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
01.04.2023	08:15-08:15	63.4	24.1	48.1	7.3	26.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
07.04.2023	08:00-08:00	64.5	26.3	48.5	6.8	26.9	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
08.04.2023	08:15-08:15	65.3	25.5	47.2	7.2	25.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
14.04.2023	08:00-08:00	64.0	24.3	47.0	7.5	25.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
15.04.2023	07.15-07.15	63.2	23.0	49.3	6.3	25.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
21.04.2023	07.00-07.00	62.0	22.1	47.5	7.4	27.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
22.04.2023	07.15-07.15	61.0	24.0	47.2	6.3	27.9	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
28.04.2023	07.00-07.00	65.0	25.0	48.6	7.4	27.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
29.04.2023	07.15-07.15	64.2	23.2	49.0	6.2	27.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
05.05.2023	07.00-07.00	63.5	24.1	48.5	7.2	27.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
06.05.2023	07.15-07.15	62.1	25.6	47.1	6.8	25.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
12.05.2023	07.00-07.00	60.2	24.1	48.5	7.1	26.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
13.05.2023	07.15-07.15	64.2	22.3	47.0	6.3	26.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
19.05.2023	07.00-07.00	65.3	21.5	48.0	7.8	26.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
20.05.2023	07.15-07.15	64.2	22.5	48.2	6.1	25.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
26.05.2023	07.00-07.00	63.1	23.5	47.0	7.0	25.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
27.05.2023	07.15-07.15	62.2	24.6	49.0	7.1	25.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0

TABLE 3.33: AMBIENT AIR QUALITY DATA LOCATION AAQ14-:

Period: March 2023 – May 2023 *Location: AAQ14 – Kakkivadakkanpatti* 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)**
03.03.2023	08:00-08:00	67.5	23.2	45.3	6.2	26.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
04.03.2023	08:15-08:15	66.3	24.5	44.2	7.0	25.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
10.03.2023	08:00-08:00	69.1	22.3	46.0	6.3	25.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
11.03.2023	08:15-08:15	68.2	21.3	42.3	7.2	26.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
17.03.2023	08:00-08:00	69.0	22.3	44.5	6.4	26.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
18.03.2023	08:15-08:15	67.1	24.5	46.1	7.5	26.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
24.03.2023	08:00-08:00	68.3	25.5	42.3	6.0	25.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
25.03.2023	08:15-08:15	69.1	26.0	41.2	7.3	25.9	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
31.03.2023	08:00-08:00	69.3	23.4	42.0	6.2	25.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
01.04.2023	08:15-08:15	69.0	24.5	43.5	7.4	25.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
07.04.2023	08:00-08:00	68.1	22.1	44.6	7.2	25.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
08.04.2023	08:15-08:15	68.3	24.3	45.1	6.8	26.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
14.04.2023	08:00-08:00	67.0	25.5	46.3	6.4	26.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
15.04.2023	07.15-07.15	67.4	26.2	44.0	7.1	25.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
21.04.2023	07.00-07.00	67.5	25.0	42.3	6.5	25.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
22.04.2023	07.15-07.15	66.1	24.3	45.1	7.3	25.9	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
28.04.2023	07.00-07.00	65.0	23.6	43.0	6.8	24.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
29.04.2023	07.15-07.15	65.5	22.5	44.6	7.4	24.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
05.05.2023	07.00-07.00	65.1	23.5	451	6.3	24.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
06.05.2023	07.15-07.15	66.1	24.5	46.2	7.4	24.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
12.05.2023	07.00-07.00	64.3	26.3	45.3	6.2	24.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
13.05.2023	07.15-07.15	67.4	25.0	44.2	6.0	24.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
19.05.2023	07.00-07.00	67.2	24.3	45.3	7.3	25.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
20.05.2023	07.15-07.15	68.3	25.0	46.1	6.4	25.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
26.05.2023	07.00-07.00	68.3	26.1	43.8	7.3	25.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
27.05.2023	07.15-07.15	66.5	25.4	44.0	6.4	26.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0

TABLE 3.34: AMBIENT AIR QUALITY DATA LOCATION AAQ15-:

Period: March 2023 – May 2023 *Location: AAQ15 – Thayilpatti* 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)
03.03.2023	08:00-08:00	62.3	23.5	43.2	6.2	25.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
04.03.2023	08:15-08:15	61.2	24.3	44.1	7.3	25.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
10.03.2023	08:00-08:00	62.3	25.1	45.3	8.2	24.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
11.03.2023	08:15-08:15	64.3	26.2	46.2	6.3	23.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
17.03.2023	08:00-08:00	65.5	22.0	43.2	8.2	24.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
18.03.2023	08:15-08:15	62.3	21.3	44.2	7.4	24.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
24.03.2023	08:00-08:00	64.3	23.5	45.1	6.3	25.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
25.03.2023	08:15-08:15	62.1	24.5	46.3	8.2	25.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
31.03.2023	08:00-08:00	63.0	25.6	43.1	7.3	23.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
01.04.2023	08:15-08:15	64.0	26.2	44.0	6.5	24.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
07.04.2023	08:00-08:00	65.2	24.0	45.2	7.3	24.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
08.04.2023	08:15-08:15	63.0	25.3	46.0	6.4	24.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
14.04.2023	08:00-08:00	62.1	26.7	45.1	7.3	23.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
15.04.2023	07.15-07.15	64.2	25.3	44.2	6.0	23.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
21.04.2023	07.00-07.00	60.0	22.3	46.3	7.0	22.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
22.04.2023	07.15-07.15	65.5	24.1	44.1	6.3	23.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
28.04.2023	07.00-07.00	62.3	22.0	45.2	7.4	24.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
29.04.2023	07.15-07.15	63.1	23.4	46.3	6.5	23.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
05.05.2023	07.00-07.00	62.1	25.5	44.1	7.3	22.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
06.05.2023	07.15-07.15	63.0	26.2	46.2	6.1	24.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
12.05.2023	07.00-07.00	65.0	24.2	45.2	7.3	22.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
13.05.2023	07.15-07.15	64.2	25.3	45.1	6.2	23.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
19.05.2023	07.00-07.00	63.2	26.1	46.3	7.3	22.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
20.05.2023	07.15-07.15	62.1	25.3	44.1	6.3	23.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
26.05.2023	07.00-07.00	60.2	22.3	45.2	7.2	24.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
27.05.2023	07.15-07.15	62.3	23.5	46.3	6.5	23.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0

TABLE 3.35: AMBIENT AIR QUALITY DATA LOCATION AAQ16-:

Period: March 2023 – May 2023 *Location: AAQ16 –Mamsapuram* 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)**
03.03.2023	08:00-08:00	63.4	23.4	44.5	6.0	24.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
04.03.2023	08:15-08:15	62.1	22.1	42.3	7.2	25.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
10.03.2023	08:00-08:00	61.0	21.0	43.6	6.3	24.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
11.03.2023	08:15-08:15	63.5	22.5	41.0	7.4	26.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
17.03.2023	08:00-08:00	64.3	24.6	45.2	7.8	24.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
18.03.2023	08:15-08:15	65.5	25.0	46.3	6.2	25.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
24.03.2023	08:00-08:00	63.2	26.3	47.2	7.3	25.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
25.03.2023	08:15-08:15	64.0	27.2	45.0	6.1	24.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
31.03.2023	08:00-08:00	65.2	28.5	46.3	7.5	23.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
01.04.2023	08:15-08:15	66.0	29.0	47.1	6.4	24.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
07.04.2023	08:00-08:00	67.2	26.2	45.2	7.0	23.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
08.04.2023	08:15-08:15	63.2	24.3	46.3	6.2	22.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
14.04.2023	08:00-08:00	64.5	27.5	44.5	7.3	24.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
15.04.2023	07.15-07.15	65.2	28.6	43.2	6.4	25.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
21.04.2023	07.00-07.00	67.0	29.3	42.1	7.5	25.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
22.04.2023	07.15-07.15	64.3	24.1	43.0	6.4	25.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
28.04.2023	07.00-07.00	63.2	26.3	44.5	7.0	24.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
29.04.2023	07.15-07.15	65.2	27.5	45.6	6.5	25.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
05.05.2023	07.00-07.00	66.0	28.2	46.2	7.0	23.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
06.05.2023	07.15-07.15	67.2	29.0	47.3	6.3	24.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
12.05.2023	07.00-07.00	66.3	25.3	44.1	7.5	24.6	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
13.05.2023	07.15-07.15	64.3	24.6	45.3	6.4	24.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
19.05.2023	07.00-07.00	65.2	26.5	46.2	7.2	24.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
20.05.2023	07.15-07.15	66.3	27.3	47.1	6.3	24.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
26.05.2023	07.00-07.00	67.1	28.2	45.2	7.4	25.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
27.05.2023	07.15-07.15	68.2	29.0	46.3	6.2	25.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0

TABLE 3.36: AMBIENT AIR QUALITY DATA LOCATION AAQ17-:

Period: March 2023 – May 2023 *Location: AAQ17 –Appayanaickenpatti* 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)**
03.03.2023	08:00-08:00	65.9	23.8	48.2	7.6	24.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
04.03.2023	08:15-08:15	66.7	24.6	47.6	7.4	24.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
10.03.2023	08:00-08:00	62.9	25.7	45.7	7.5	25.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
11.03.2023	08:15-08:15	62.4	23.6	45.5	6.8	25.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
17.03.2023	08:00-08:00	63.5	23.1	42.8	7.2	23.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
18.03.2023	08:15-08:15	63.6	24.7	44.9	7.1	24.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
24.03.2023	08:00-08:00	62.4	25.9	46.5	8.2	24.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
25.03.2023	08:15-08:15	63.8	23.9	44.4	8.8	24.9	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
31.03.2023	08:00-08:00	66.4	24.3	45.7	7.6	23.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
01.04.2023	08:15-08:15	65.8	25.1	43.6	7.7	24.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
07.04.2023	08:00-08:00	65.5	25.3	42.8	7.2	23.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
08.04.2023	08:15-08:15	64.9	24.7	45.4	7.1	22.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
14.04.2023	08:00-08:00	63.7	23.2	46.7	7.9	24.9	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
15.04.2023	07.15-07.15	64.8	25.8	46.9	6.6	24.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
21.04.2023	07.00-07.00	62.8	23.6	45.7	6.4	24.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
22.04.2023	07.15-07.15	63.5	24.9	45.9	6.2	25.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
28.04.2023	07.00-07.00	64.7	22.8	42.7	6.3	25.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
29.04.2023	07.15-07.15	65.2	23.7	43.6	6.9	25.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
05.05.2023	07.00-07.00	65.9	21.6	43.5	6.6	25.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
06.05.2023	07.15-07.15	64.4	22.5	43.6	7.7	24.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
12.05.2023	07.00-07.00	63.2	23.6	42.5	6.6	25.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
13.05.2023	07.15-07.15	65.8	25.4	44.6	7.1	23.9	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
19.05.2023	07.00-07.00	65.2	25.8	46.8	7.0	25.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
20.05.2023	07.15-07.15	63.4	22.9	45.3	7.5	24.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
26.05.2023	07.00-07.00	64.2	15.2	44.2	6.2	23.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
27.05.2023	07.15-07.15	63.2	23.0	43.2	6.5	21.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0

TABLE 3.37: AMBIENT AIR QUALITY DATA LOCATION AAQ18-:

Period: March 2023 – May 2023 *Location: AAQ18 – Sivalingapuram* 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)
03.03.2023	08:00-08:00	69.9	23.8	48.2	7.6	24.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
04.03.2023	08:15-08:15	69.7	24.6	47.6	7.4	24.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
10.03.2023	08:00-08:00	69.9	25.7	45.7	7.5	25.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
11.03.2023	08:15-08:15	68.4	23.6	45.5	6.8	25.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
17.03.2023	08:00-08:00	68.5	23.1	42.8	7.2	23.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
18.03.2023	08:15-08:15	68.6	24.7	44.9	7.1	24.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
24.03.2023	08:00-08:00	67.4	25.9	46.5	8.2	24.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
25.03.2023	08:15-08:15	68.8	23.9	44.4	8.8	24.9	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
31.03.2023	08:00-08:00	68.4	24.3	45.7	7.6	23.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
01.04.2023	08:15-08:15	68.8	25.1	43.6	7.7	24.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
07.04.2023	08:00-08:00	67.5	25.3	42.8	7.2	23.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
08.04.2023	08:15-08:15	68.9	24.7	45.4	7.1	22.4	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
14.04.2023	08:00-08:00	69.7	23.2	46.7	7.9	24.9	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
15.04.2023	07.15-07.15	68.8	25.8	46.9	6.6	24.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
21.04.2023	07.00-07.00	68.8	23.6	45.7	6.4	24.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
22.04.2023	07.15-07.15	67.5	24.9	45.9	6.2	25.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
28.04.2023	07.00-07.00	67.7	22.8	42.7	6.3	25.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
29.04.2023	07.15-07.15	67.2	23.7	43.6	6.9	25.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
05.05.2023	07.00-07.00	68.9	21.6	43.5	6.6	25.3	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
06.05.2023	07.15-07.15	68.4	22.5	43.6	7.7	24.7	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
12.05.2023	07.00-07.00	68.2	23.6	42.5	6.6	25.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
13.05.2023	07.15-07.15	68.8	25.4	44.6	7.1	23.9	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
19.05.2023	07.00-07.00	68.2	25.8	46.8	7.0	25.8	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
20.05.2023	07.15-07.15	68.4	22.9	46.7	7.5	24.2	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
26.05.2023	07.00-07.00	67.0	24.1	43.2	7.3	23.5	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0
27.05.2023	07.15-07.15	68.5	25.3	42.1	7.2	24.1	<5	<5	<1.0	<0.01	<5	<3	<1.0	<3.0

FIGURE 3.23: PHOTOGRAPHS SHOWING AIR SAMPLING LOCATIONS

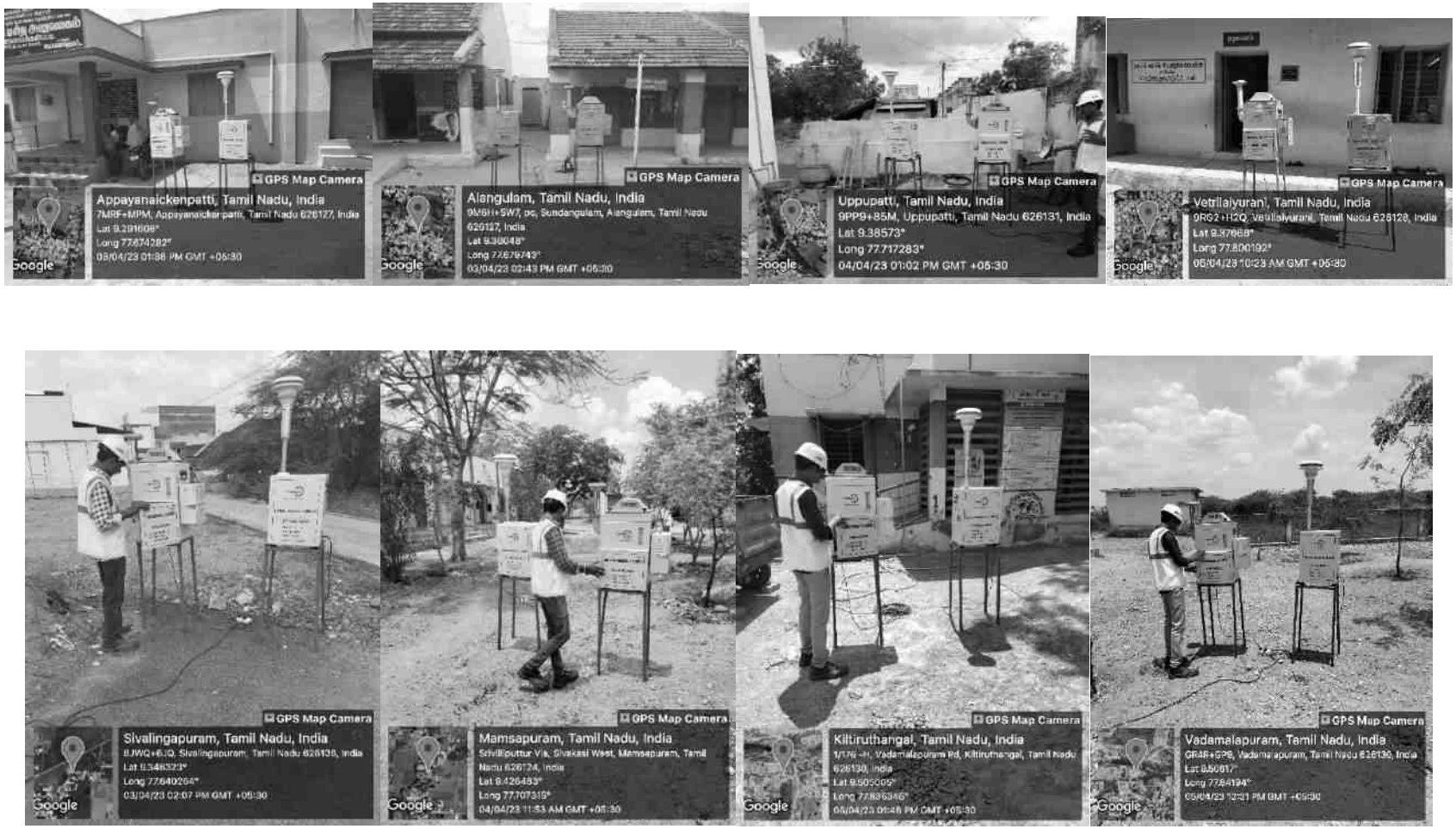


TABLE 3.38: ABSTRACT OF AMBIENT AIR QUALITY DATA

1	**Parameter**	**PM25**	**PM10**	**SO_2**	**NO_2**
2	No. of Observations	260	260	260	260
3	10th Percentile Value	21.0	40.2	5.6	21.8
4	20th Percentile Value	21.3	41.2	6.2	22.4
5	30th Percentile Value	21.8	41.9	6.3	23.0
6	40th Percentile Value	22.1	42.7	6.5	23.4
7	50th Percentile Value	22.4	43.5	7.0	24.0
8	60th Percentile Value	22.6	44.2	7.1	24.3
9	70th Percentile Value	23.4	45.0	7.2	24.6
10	80th Percentile Value	24.1	45.6	7.3	25.1
11	90th Percentile Value	24.6	47.0	7.8	25.6
12	95th Percentile Value	25.6	47.5	8.2	26.2
13	98th Percentile Value	26.3	48.3	8.3	27.3
14	Arithmetic Mean	23.2	44.3	7.0	24.3
15	Geometric Mean	23.1	44.2	7.0	24.3
16	Standard Deviation	1.8	2.7	0.9	1.7
17	Minimum	21.0	40.2	5.6	21.8
18	Maximum	26.3	48.3	8.3	27.3
19	**NAAQ Norms***	**60.0**	**100.0**	**80.0**	**80.0**
	% Values exceeding Norms*	0.0	0.0	0.0	0.0

Legend: $PM_{2.5}$-Particulate Matter size less than 2.5 µm; PM_{10}-Respirable Particulate Matter size less than 10 µm; SO_2-Sulphur dioxide; NO_x-Oxides of Nitrogen; CO-Carbon monoxide; O_3-Ozone; NH_3-Ammonia;

Pb-Particulate Lead; As-Particulate Arsenic; Ni-Particulate Nickel; C_6H_6-Benzene &BaP- Benzo (a) pyrene in particulate phase levels were monitored below their respective detectable limits

* NAAQ Norms-National Ambient Air Quality Norms-Revised as per GSR 826(E) dated 16.11.2009 for Industrial, Residential, Rural and other Areas.

TABLE 3.39: SUMMARY OF AMBIENT AIR QUALITY DATA (AAQ1-AAQ18)

PM2.5	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8	AAQ9
Arithmetic Mean	24.4	23.0	23.7	23.0	22.8	22.8	21.7	21.7	22.92
Minimum	21.0	21.0	21.0	21.0	21.3	19.3	20.3	20.2	21.2
Maximum	26.8	25.6	26.3	24.3	24.6	22.6	22.8	22.6	24.5
NAAQ Norms	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0

AAQ10	AAQ11	AAQ12	AAQ13	AAQ14	AAQ15	AAQ16	AAQ17	AAQ18
23.35	23.60	23.75	24.14	24.27	24.37	26.21	23.80	24.23
23.2	21	21	21.5	21.3	21.3	21	15.2	21.6
23.5	25.6	25.6	26.3	26.3	26.7	29.3	25.9	25.9
60.0	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	AAQ9
Arithmetic Mean	43.3	43.5	43.4	47.2	22.8	21.1	45.7	40.4	43.42
Minimum	41.0	41.0	41.0	46.0	41.3	39.0	44.0	39.0	40.2
Maximum	45.8	45.7	45.2	48.6	45.3	41.8	47.5	41.6	45.6
NAAQ Norms	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

AAQ10	AAQ11	AAQ12	AAQ13	AAQ14	AAQ15	AAQ16	AAQ17	AAQ18
44.25	45.13	45.49	48.04	59.93	44.98	45.02	44.93	44.91
41	42.1	41.1	47	41.2	43.1	41	42.5	42.1
47.6	47.5	48.3	49.5	45.1	46.3	47.3	48.2	48.2
100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

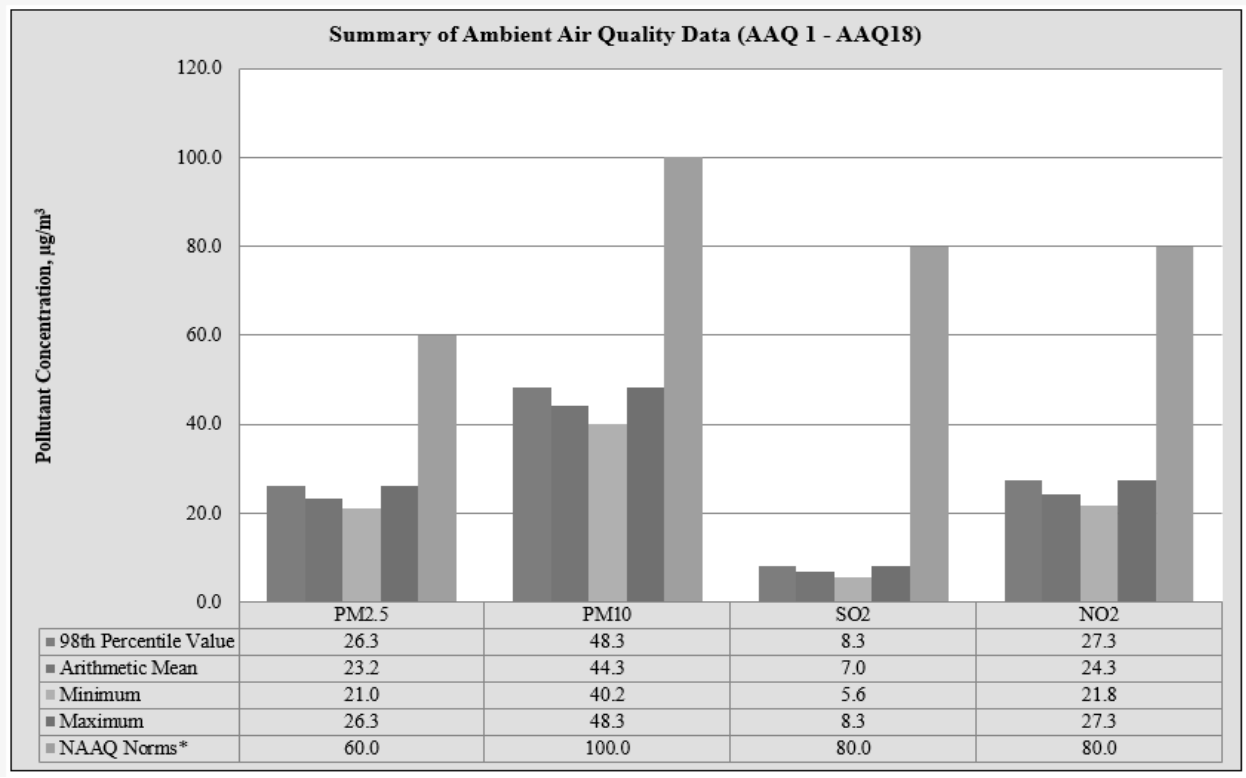
SO_2	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8	AAQ9
Arithmetic Mean	7.5	6.4	6.8	6.9	6.7	6.8	6.9	6.4	7.0
Minimum	6.1	5.0	6.0	6.0	5.0	5.2	6.0	5.2	5.1
Maximum	8.3	7.5	7.5	7.8	8.6	8.6	7.8	7.4	8.6
NAAQ Norms	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0

AAQ10	AAQ11	AAQ12	AAQ13	AAQ14	AAQ15	AAQ16	AAQ17	AAQ18
6.9	7.11	5.74	6.86	6.78	6.93	6.80	7.14	7.21
5.3	5.3	5.0	6.1	6.0	6.0	6.0	6.2	6.2
8.4	8.8	6.8	7.8	7.5	8.2	7.8	8.8	8.8
80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0

NO_2	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8	AAQ9
Arithmetic Mean	25.9	23.3	23.5	22.7	24.0	25.2	23.5	22.9	24.4
Minimum	24.1	20.0	21.2	21.0	21.2	23.2	21.0	21.0	23.0
Maximum	27.5	25.6	25.8	24.6	25.8	42.3	25.3	24.6	25.8
NAAQ Norms	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0

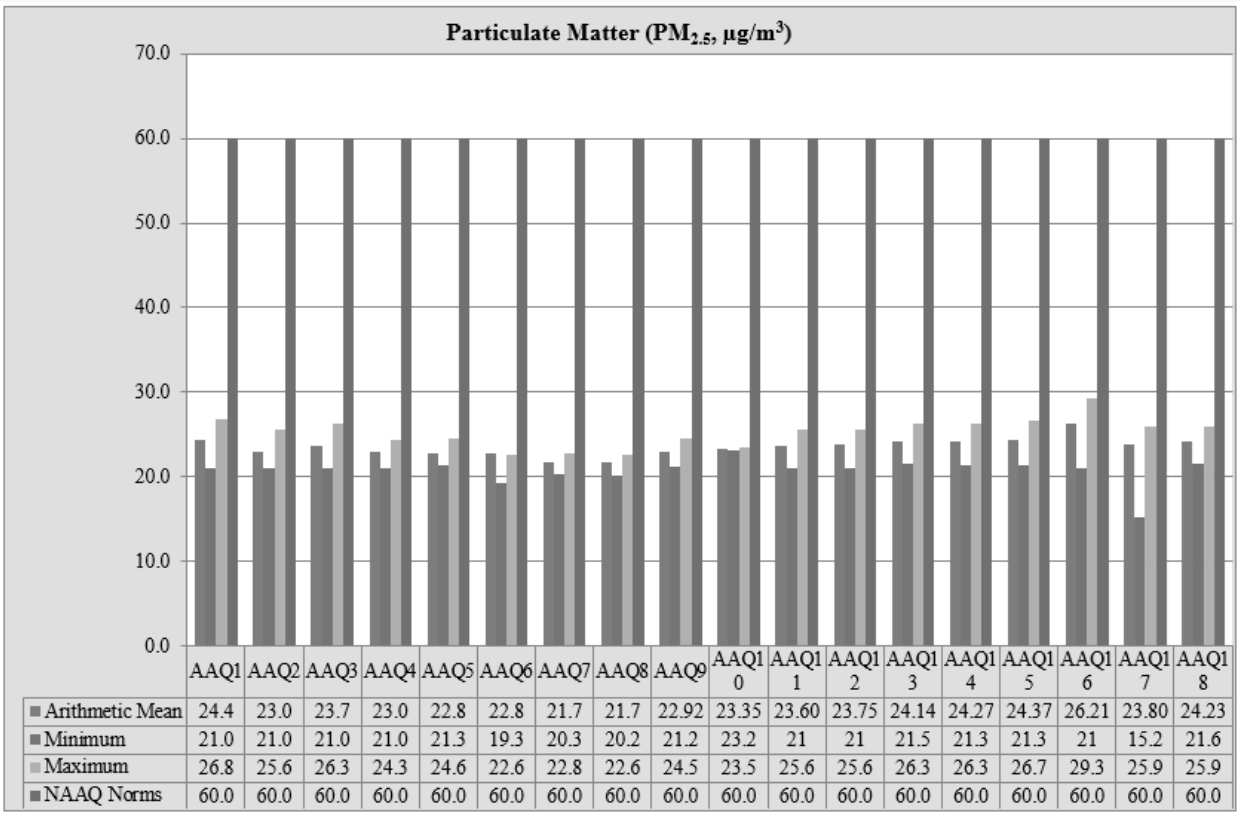
AAQ10	AAQ11	AAQ12	AAQ13	AAQ14	AAQ15	AAQ16	AAQ17	AAQ18
22.3	22.6	22.6	26.3	25.5	23.8	24.6	24.4	24.5
20.2	20.2	21.0	25.1	24.1	22.1	22.4	21.2	22.4
23.6	24.5	24.7	27.9	26.8	25.7	26.2	25.8	25.8
80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0

FIGURE 3.24: BAR DIAGRAM OF SUMMARY OF AAQ 1 – AAQ18



Source: Table 3.17 to 3.27

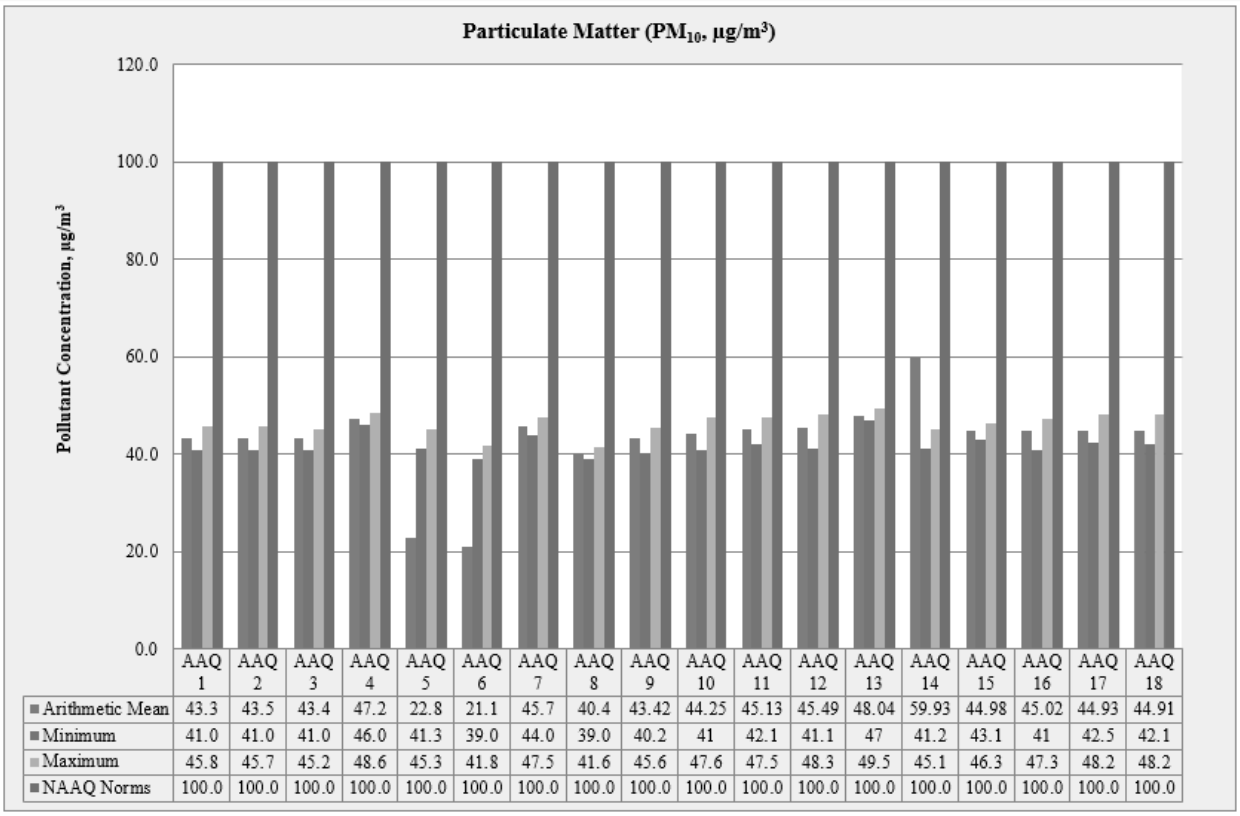
FIGURE 3.25: BAR DIAGRAM OF PARTICULATE MATTER $PM_{2.5}$



	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8	AAQ9	AAQ10	AAQ11	AAQ12	AAQ13	AAQ14	AAQ15	AAQ16	AAQ17	AAQ18
Arithmetic Mean	24.4	23.0	23.7	23.0	22.8	22.8	21.7	21.7	22.92	23.35	23.60	23.75	24.14	24.27	24.37	26.21	23.80	24.23
Minimum	21.0	21.0	21.0	21.0	21.3	19.3	20.3	20.2	21.2	23.2	21	21	21.5	21.3	21.3	21	15.2	21.6
Maximum	26.8	25.6	26.3	24.3	24.6	22.6	22.8	22.6	24.5	23.5	25.6	25.6	26.3	26.3	26.7	29.3	25.9	25.9
NAAQ Norms	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0

Source: Table 3.17 to 3.27

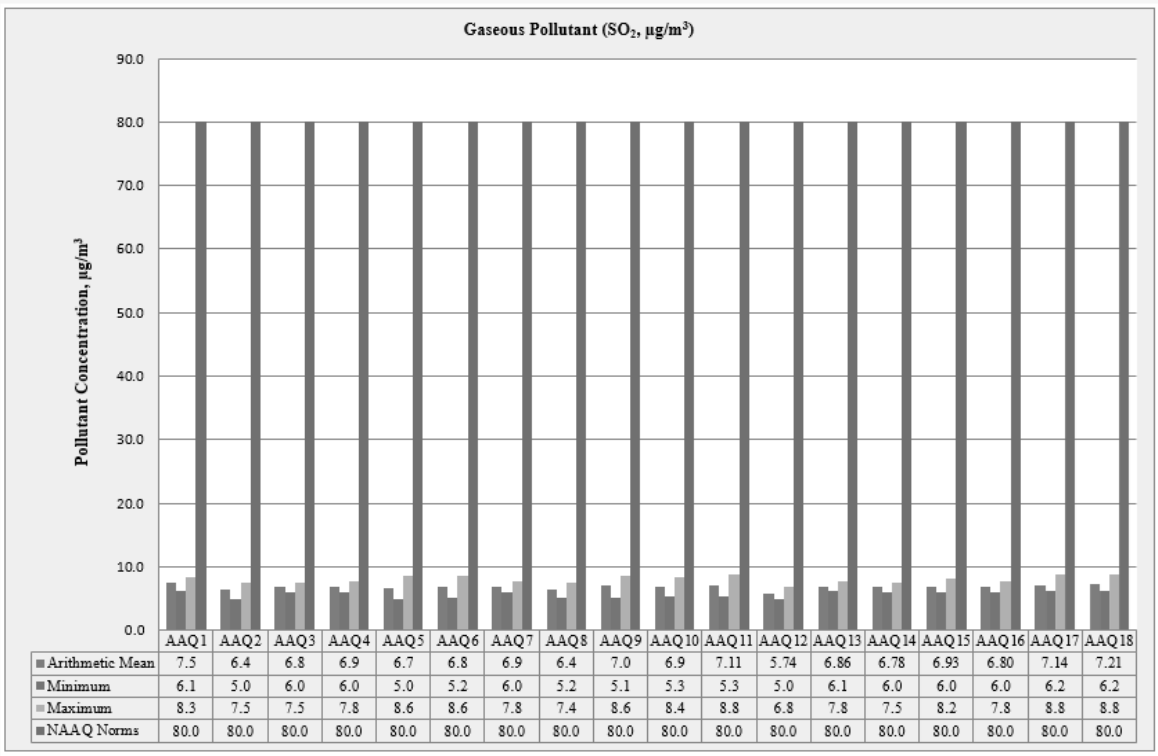
FIGURE 3.26: BAR DIAGRAM OF PARTICULATE MATTER PM_{10}



	AAQ 1	AAQ 2	AAQ 3	AAQ 4	AAQ 5	AAQ 6	AAQ 7	AAQ 8	AAQ 9	AAQ 10	AAQ 11	AAQ 12	AAQ 13	AAQ 14	AAQ 15	AAQ 16	AAQ 17	AAQ 18
Arithmetic Mean	43.3	43.5	43.4	47.2	22.8	21.1	45.7	40.4	43.42	44.25	45.13	45.49	48.04	59.93	44.98	45.02	44.93	44.91
Minimum	41.0	41.0	41.0	46.0	41.3	39.0	44.0	39.0	40.2	41	42.1	41.1	47	41.2	43.1	41	42.5	42.1
Maximum	45.8	45.7	45.2	48.6	45.3	41.8	47.5	41.6	45.6	47.6	47.5	48.3	49.5	45.1	46.3	47.3	48.2	48.2
NAAQ Norms	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Table 3.17 to 3.27

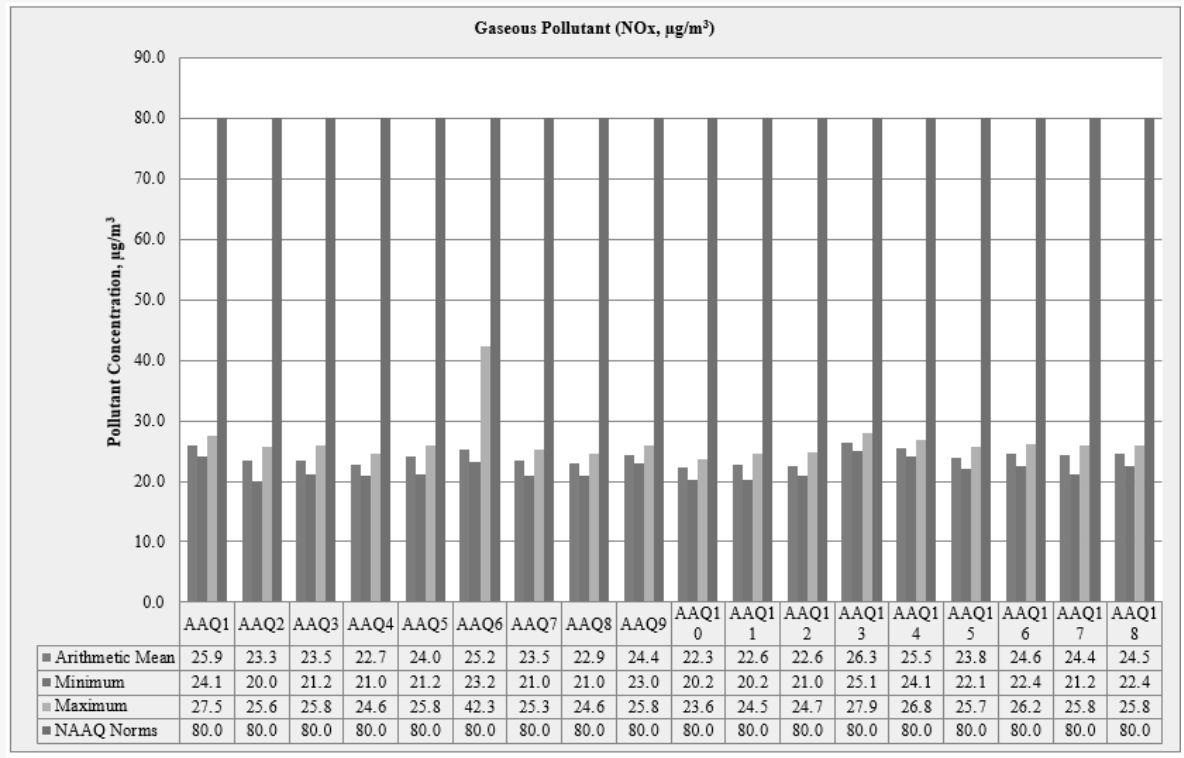
FIGURE 3.27: BAR DIAGRAM OF GASEOUS POLLUTANT SO_2



	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8	AAQ9	AAQ10	AAQ11	AAQ12	AAQ13	AAQ14	AAQ15	AAQ16	AAQ17	AAQ18
Arithmetic Mean	7.5	6.4	6.8	6.9	6.7	6.8	6.9	6.4	7.0	6.9	7.11	5.74	6.86	6.78	6.93	6.80	7.14	7.21
Minimum	6.1	5.0	6.0	6.0	5.0	5.2	6.0	5.2	5.1	5.3	5.3	5.0	6.1	6.0	6.0	6.0	6.2	6.2
Maximum	8.3	7.5	7.5	7.8	8.6	8.6	7.8	7.4	8.6	8.4	8.8	6.8	7.8	7.5	8.2	7.8	8.8	8.8
NAAQ Norms	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0

Source: Table 3.17 to 3.27

FIGURE 3.28: BAR DIAGRAM OF GASEOUS POLLUTANT NO_x



	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8	AAQ9	AAQ10	AAQ11	AAQ12	AAQ13	AAQ14	AAQ15	AAQ16	AAQ17	AAQ18
Arithmetic Mean	25.9	23.3	23.5	22.7	24.0	25.2	23.5	22.9	24.4	22.3	22.6	22.6	26.3	25.5	23.8	24.6	24.4	24.5
Minimum	24.1	20.0	21.2	21.0	21.2	23.2	21.0	21.0	23.0	20.2	20.2	21.0	25.1	24.1	22.1	22.4	21.2	22.4
Maximum	27.5	25.6	25.8	24.6	25.8	42.3	25.3	24.6	25.8	23.6	24.5	24.7	27.9	26.8	25.7	26.2	25.8	25.8
NAAQ Norms	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0

Source: Table 3.239

3.3.6 Interpretations & Conclusion

As per monitoring data, PM_{10} ranges from 39.0 µg/m^3 to 45.1µg/m^3, $PM_{2.5}$ data ranges from 15. µg/m^3 to 29.2 µg/m^3, SO_2 ranges from 5.0 µg/m^3 to 8.8 µg/m^3 and NO_2 data ranges from 20.0 µg/m^3 to 42.3 µg/m^3. The concentration levels of the above criteria pollutants were observed to be well within the limits of NAAQS prescribed by CPCB.

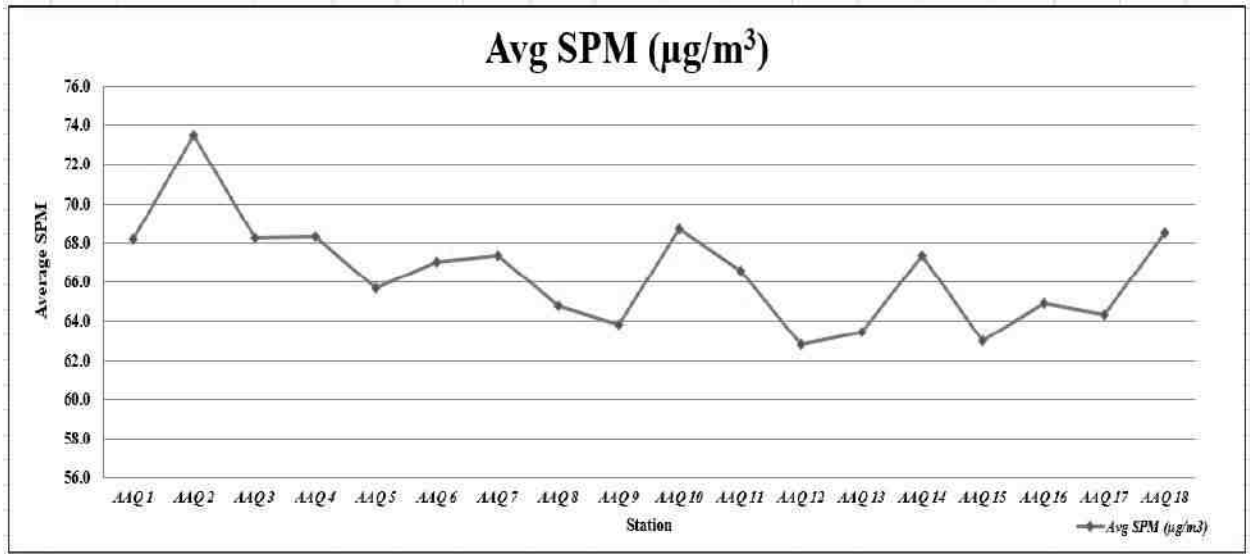
3.3.7 FUGITIVE DUST EMISSION –

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

TABLE 3.40: AVERAGE FUGITIVE DUST SAMPLE VALUES

AAQ Locations	Avg SPM (µg/m3)
AAQ 1	68.2
AAQ 2	73.5
AAQ 3	68.2
AAQ 4	68.3
AAQ 5	65.7
AAQ 6	67.1
AAQ 7	67.3
AAQ 8	64.8
AAQ 9	63.8
AAQ 10	68.7
AAQ 11	66.6
AAQ 12	62.8
AAQ 13	63.4
AAQ 14	67.3
AAQ 15	63.0
AAQ 16	64.9
AAQ 17	64.4
AAQ 18	68.5

FIGURE 3.29: LINE DIAGRAM OF AVERAGE SPM VALUES



Source: Table 3.30

TABLE 3.41: FUGITIVE DUST SAMPLE VALUES IN µg/m^3

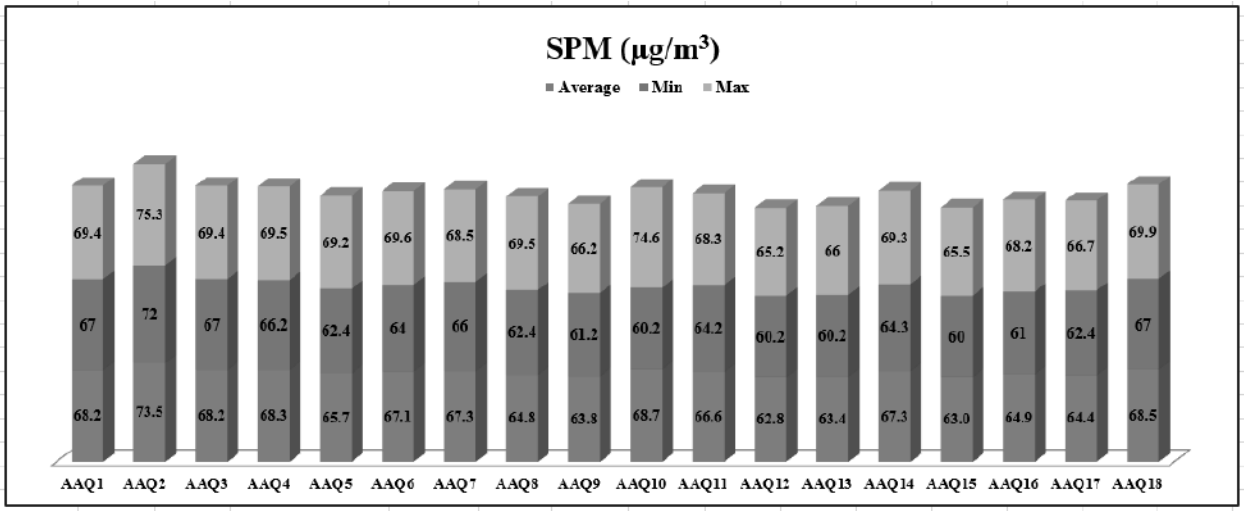
SPM (µg/m3)	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8	AAQ9	AAQ10
Average	68.2	73.5	68.2	68.3	65.7	67.1	67.3	64.8	63.8	68.7

Min	67	72	67	66.2	62.4	64	66	62.4	61.2	60.2
Max	69.4	75.3	69.4	69.5	69.2	69.6	68.5	69.5	66.2	74.6

AAQ11	AAQ12	AAQ13	AAQ14	AAQ15	AAQ16	AAQ17	AAQ18
66.6	62.8	63.4	67.3	63.0	64.9	64.4	68.5
64.2	60.2	60.2	64.3	60	61	62.4	67
68.3	65.2	66	69.3	65.5	68.2	66.7	69.9

Source: Calculations from Lab Analysis Reports

FIGURE 3.30: BAR DIAGRAM OF SPM VALUES



Source: Table 3.31

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 Eighteen 18 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 3.42 DETAILS OF SURFACE NOISE MONITORING LOCATIONS

S. No	Location code	Monitoring Locations	Distance & Direction	Coordinates
1	N-1	Core Zone	Project Area	9°26'40.55"N 77°49'31.33"E
2	N-2	Core Zone	Project Area	9°24'0.91"N 77°46'38.11"E
3	N-3	Core Zone	Project Area	9°23'26.78"N 77°44'2.41"E
4	N-4	Core Zone	Project Area	9°22'30.36"N 77°41'36.60"E
5	N-5	Core Zone	Project Area	9°21'37.85"N 77°40'28.68"
6	N-6	Sundankulam	460m South	9°21'37.60"N 77°40'47.20"E
7	N-7	Near Uppupatti	650m NE	9°23'9.50"N 77°43'0.75"E
8	N-8	Near Ethirikottai Area	1.2 km North	9°22'41.19"N 77°43'36.73"E
9	N-9	Near Project Area	400m SW	9°24'1.25"N 77°46'7.42"

10	N-10	Paranayakkanpatti	680m NE	9°24'33.57"N 77°46'55.98"E
11	N-11	Near Project Area	350m SW	9°26'28.49"N 77°49'21.64"E
12	N-12	Near Project Narayanapuram Area	820m North East	9°26'59.11"N 77°50'12.11"E
13	N-13	Vadamangalapuram	6.7km NE	9°30'22.24"N 77°50'31.00"E
14	N-14	Kakkivadakkanpatti	0.98 m NW	9°24'12.28"N 77°43'15.67"E
15	N-15	Thayilpatti	3.0km SE	9°22'36.09"N 77°48'0.22"E
16	N-16	Mamsapuram	3.78 km North	9°25'35.33"N 77°42'26.36"E
17	N-17	Appayanaickenpatti	7.5km South	9°17'29.67"N 77°40'27.33"E
18	N-18	Sivalingapuram	3.9 km West	9°20'46.75"N 77°38'24.98"E

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

3.4.2 Method of Monitoring

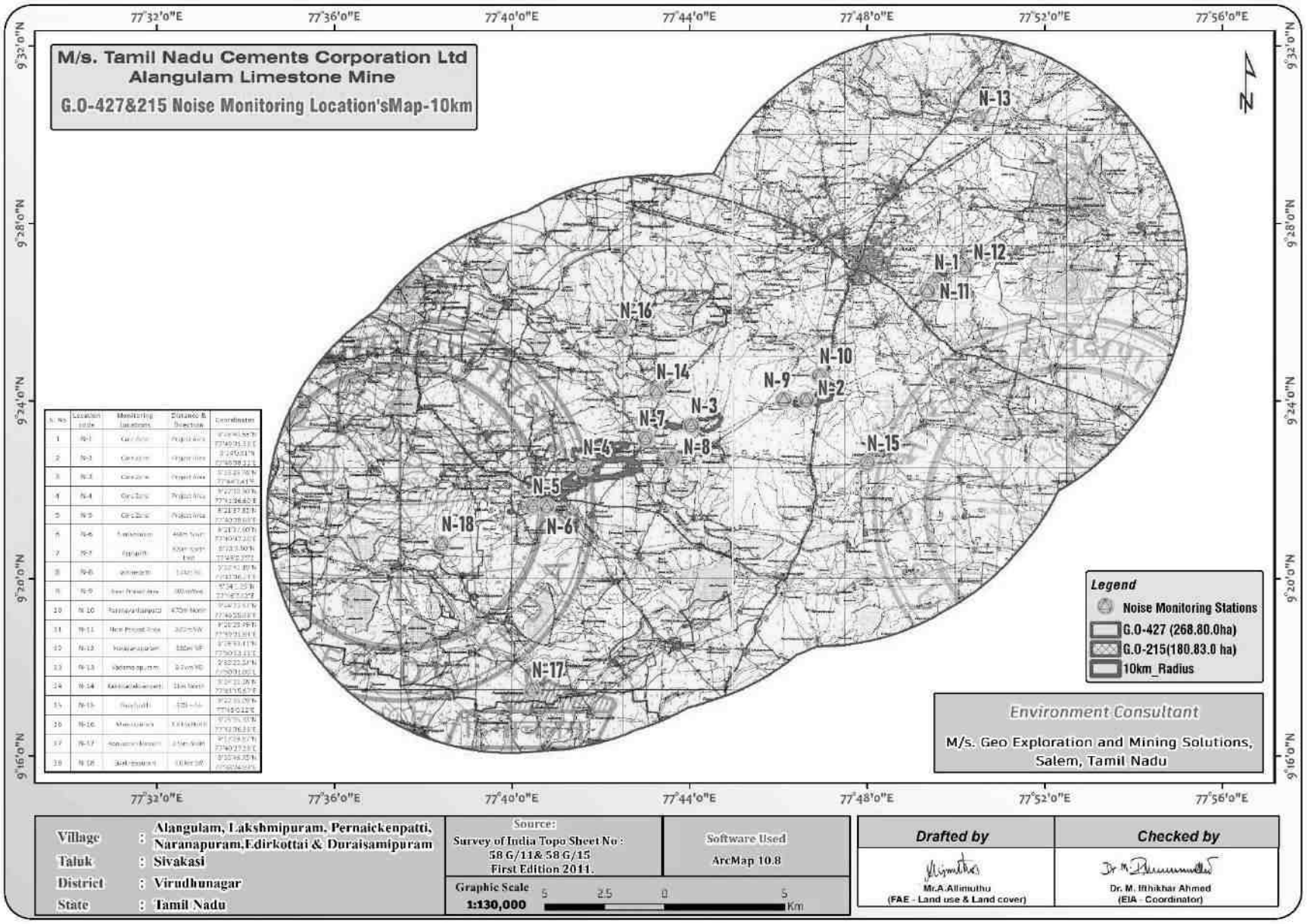
Digital Sound Level Meter was used for the study. All reading was taken on the 'A-Weighting' frequency network, at a height of 1.5 meters from ground level. The sound level meter does not give a steady and consistent reading and it is quite difficult to assess the actual sound level over the entire monitoring 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 60minutes are computed for equivalent noise levels. Equivalent noise level is a single number descriptor for describing time varying noise levels.

Leq = 10 Log L / T∑ (10Ln/10)

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

FIGURE 3.31: 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 3.30

Day time: 6:00 hours to 22.00 hours.

Night time: 22:00 hours to 6.00 hours.

TABLE 3.43: AMBIENT NOISE QUALITY RESULT

S. No	Locations	Noise level (dB (A) Leq)		Ambient Noise Standards
		Day Time	Night Time	
1	Core Zone	41.6	35.9	**Industrial Day Time- 75 dB (A) Night Time- 70 dB (A)**
2	Core Zone	40.8	35.8	
3	Core Zone	39.4	35.1	
4	Core Zone	41.4	36.8	
5	Core Zone	40.4	35.4	
6	Sundankulam	39.9	34.8	**Residential Day Time– 55 dB (A) Night Time- 45 dB (A)**
7	Near Uppupatti	40.0	36.8	
8	Near Ethirikottai Area	38.5	35.2	
9	Near Project Area	38.6	35.2	
10	Paranayakkanpatti	39.0	35.6	
11	Near Project Area	39.4	37.9	
12	Near Project Narayanapuram Area	38.8	34.6	
13	Vadamangalapuram	39.7	35.2	
14	Kakkivadakkanpatti	38.2	35.0	
15	Thayilpatti	37.1	35.0	
16	Mamsapuram	39.2	37.1	
17	Appayanaickenpatti	38.6	35.5	
18	Sivalingapuram	38.0	35.5	

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

FIGURE 3.32: PHOTOGRAPHS SHOWING NOISE SAMPLING STATION

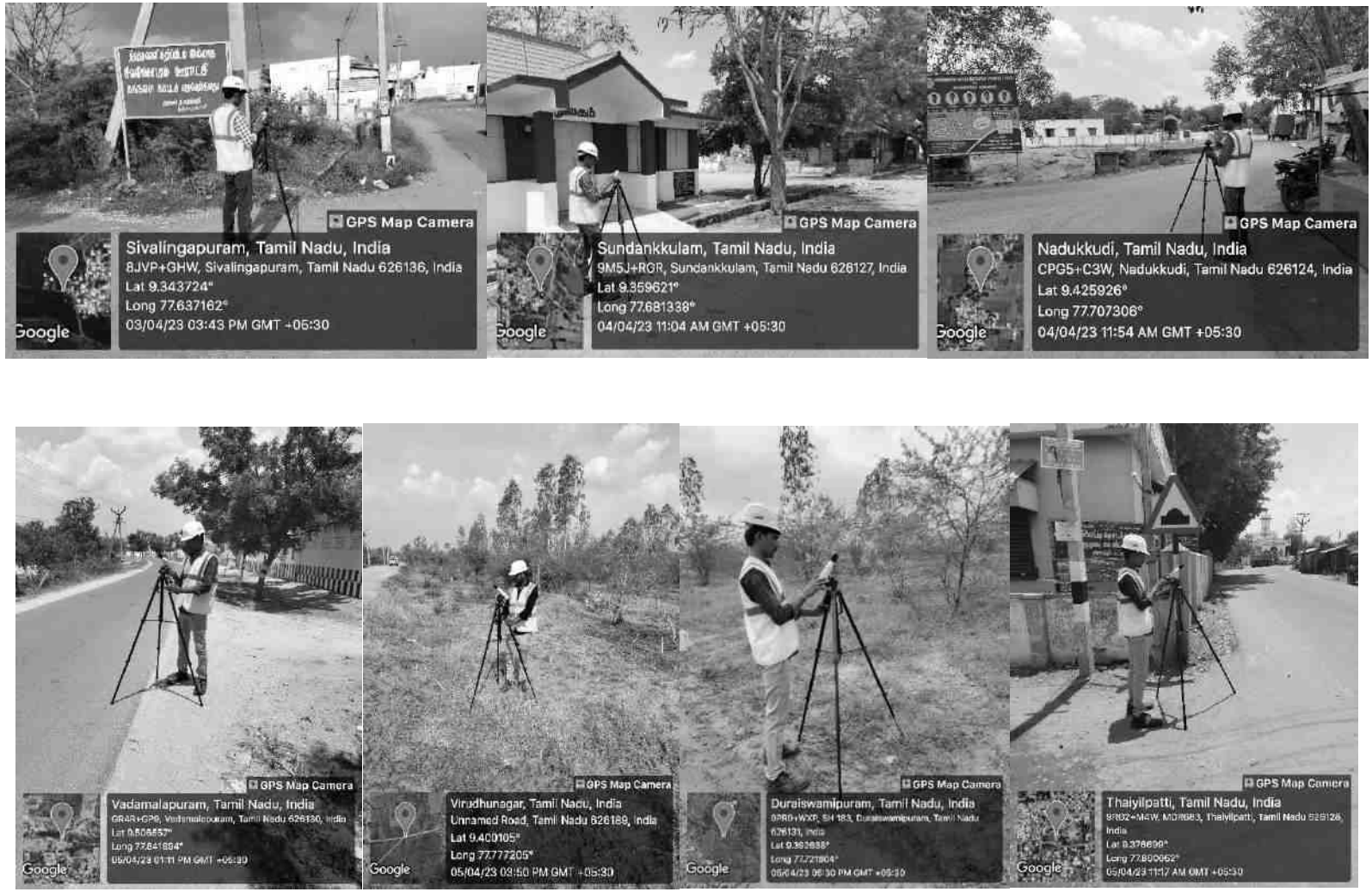


FIGURE 3.33: DAY TIME NOISE LEVELS IN CORE AND BUFFER ZONE

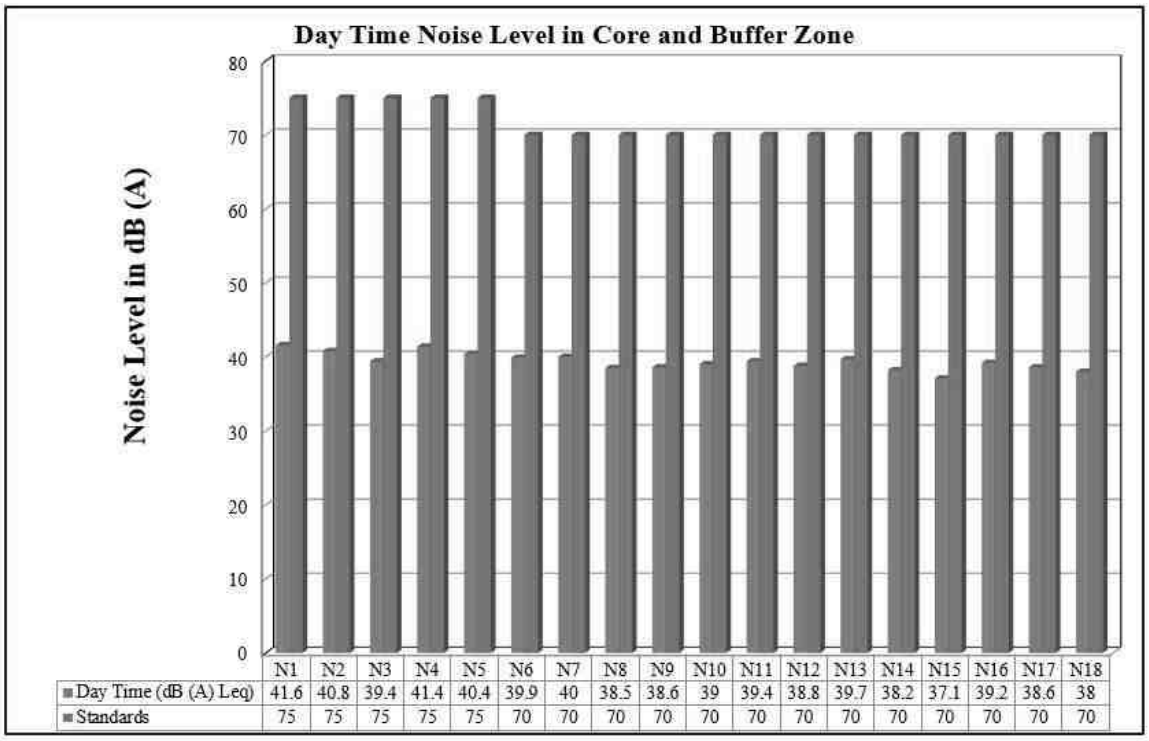
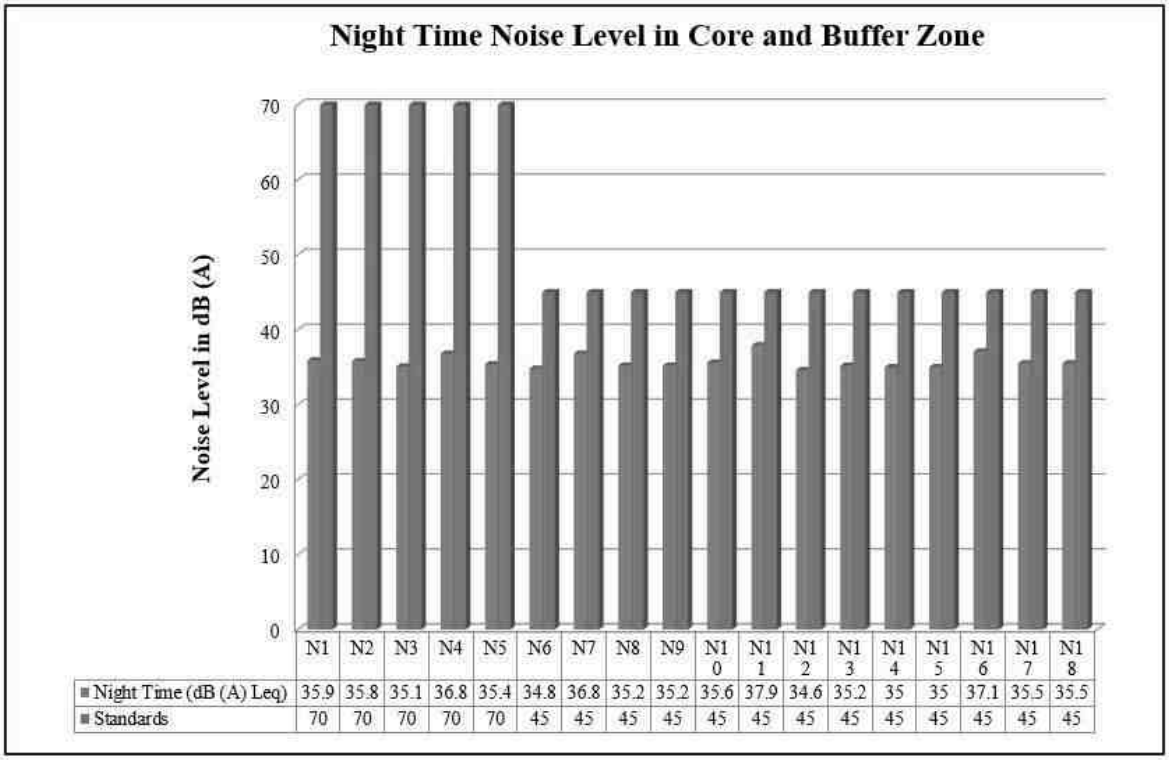


FIGURE 3.34: NIGHT TIME NOISE LEVELS IN CORE AND BUFFER ZONE



3.4.4 Interpretation & Conclusion:

Ambient noise levels were measured at 18 (Eighteen) locations around the proposed project area. Noise levels recorded in core zone during day time were from 40.4 – 41.6 dB (A) Leq and during night time were is 35.1-36.8dB (A) Leq. Noise levels recorded in buffer zone during day time were from 37.1 – 40.0 dB (A) Leq and during night time were from 34.6 – 37.9 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 that dealing the relations and interactions between organisms and their environment. An ecological survey of the study area was conducted, particularly with reference to the listing of species and assessment of the existing baseline ecological conditions in the study area. The main objective of the biological study is to collect the baseline data regarding flora and fauna in the study area. Data has been collected through extensive surveys of the area with reference to flora and fauna. Information is also collected from different sources i.e. government departments such as the 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.

The main objective of the present study is to assess the current ecology & and biodiversity scenario during primary field survey carried out within 10 km radius impact zone in and around the TANCEM Alangulam Limestone mines-I (ML Area: 449.63 ha) to understand the presence and behaviour of the floral and faunal diversity of the study area with respect to terrestrial flora and fauna with special emphasis on Rare, Endangered and Threatened species & carry out Environmental Management Plan. The plan will identify and address the impacts, where these are adverse in nature, and thereafter design mitigation measures to manage such impacts in a manner as to conserve the environment and ecology of the area.

3.5.1. Scope of Work

The scope of work for this Ecology and biodiversity study includes the identification of ecologically sensitive receptors, based on literature survey, field investigations, and their mitigation with conservation action plan. The study was carried out for proposed expansion mining projects in surrounding areas. The study area does not fall in any Wildlife Sanctuary and National Park as per divisional forest officer, District Forest Office, Government of Tamil Nadu. 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 the assessment of general habitat type, and vegetation patterns, and the preparation of an inventory of flora and fauna for terrestrial and aquatic ecosystems in core and buffer zones. A biological assessment of the study area was done to identify ecologically sensitive areas and whether there are any rare, endangered, endemic, or threatened (REET) species of flora & and fauna in the core area as well as its buffer zone to be impacted. The study is also designed to suggest suitable mitigation measures if necessary for the protection of wildlife habitats and conservation of REET species if any.

The biological study was undertaken as a part of the EIA study report to understand the present status of the ecosystem prevailing in the study area and to study the floristic and faunal diversity of the terrestrial environment of the study area. The Biological Study has been conducted during the summer season (March2023 to May 2023).

3.5.2. Objectives of the Study:

The present study was undertaken with the following objectives:

a. Identification of floral habitats and species, delineation of sensitive habitats, endangered species, and forest land falling within the determined study area (core + buffer zone).
b. Identification and assessment of aquatic ecological resources within the study area.
c. Assessment of any impacts of the plant activities on natural habitats and species.
d. Preparation of Wildlife Conservation Plan for Schedule- I Species, if any.
e. Identification of impact on flora & and fauna due to mining activity & and preparation of mitigation plan.
f. Identification of flora for any endangered or protected species or endemic floral species prevailing in the study area based on field surveys.
g. Identification of fauna (specifically amphibians, birds, mammals, and reptiles) based on direct sightings, calls, pug marks, droppings, nests, etc.
h. Identification and classification of any species recognized as threatened (in accordance with the International Union for the Conservation of Nature [IUCN] Red List or according to the schedules of the Wildlife (Preservation) Act 1972 and amendments).

3.5.3. Project Study Area

The core area extent of **449.63.0** of TANCEM Limestone mines has an impact on the diversity of flora and fauna of the surrounding area. But present work was carried out on detailed study of the impacts of TANCEM Limestone mines on the ecology and biodiversity of the core lease area with the proper mitigation and sustainable

management plan. The proposed mine lease area is exhibiting almost plain topography. The following methods were applied during the baseline study of flora, fauna and diversity assessment. No National Park, Wild Life Sanctuaries, Biosphere Reserves, Wildlife Corridors, Tiger/ Elephant Reserves etc. Exist within the study area. The following methods were applied during the baseline study of flora, fauna, and diversity assessment.

3.5.4 Methodology

3.5.4.1. Basic Framework for data collection

The prediction of impacts on flora, fauna, and wildlife depends upon the activities related to the mining& and its effects on the existing ecology.

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). Each of the quartiles has been examined for representative flora on randomly sampled quadrats for trees (10x10-m), shrubs (10x10-m), and herbs (1x1-m) depending upon prevailing geographical conditions and bio-diversity aspects of the study area.

Collection of comprehensive baseline information on flora and fauna is therefore a pre-requisite for assessment of impacts of development activities. It would also help in advance planning to mitigate the impacts and ultimately manage the natural habitats and resources. The approach to achieve the stated objectives within the defined scope of work includes field surveys, interviews, reviews of literature, and consultation with experts.

3.5.4.2. Field surveys

The field visit was carried out to understand and assess the impacts of existing mining activities on flora & and fauna and natural habitats and prediction after the enhancement of the production capacity of the mine. We evaluated the distribution and abundance of flora and fauna in the study area through primary and secondary data sources.

3.5.4.3. Study of flora & and fauna

In order to study the flora and fauna, several field visits were done in the study area and the team prepared a qualitative checklist of the plants species and fauna found in the study area. Checklists of flora fauna were prepared during the field survey by functional area experts & and confirmed with secondary sources like consultation with local villagers, available literature, reference books, internet sources & and previous authenticated flora fauna data which was approved by SPCB Tamil Nadu.

A. Floral Study

- The floral survey of the project area is based on field survey of the area.
- The local flora was identified by their morphological observation, such as the size and shape of the leaf, flowers, fruits, and their bark features of the stem, and also documented their habitat viz. Trees, Shrubs, Herbs, Grasses, Climbers etc.
- After surveying the core and the buffer areas, a detailed floral inventory has been compiled. A list of all plants from the study area was prepared and their habitats were recorded.
- In all, 10 locations were selected in 10 km radius study area for study on biological aspects (Plant diversity). A list of 10 sampling locations is given below in Table No.3.53
- Selection of sampling locations was made with reference to topography, land use, vegetation pattern, wind pattern, etc. The observations were taken on natural vegetation, roadside plantations, and non-forest areas (agricultural fields, in plain areas, village wasteland, etc.) for quantitative representation of different species.
- Comparative analysis of the outcome of the Quadrat Sampling was done to understand the Frequency, Dominance, and Abundance of species observed in the study area.
- Quantitative assessment of tree/herb/shrub species diversity was selected in fifteen locations for quadrate which is given below.

Table No.: 3.44. Sampling Locations for biological study in the buffer zone

S. No.	Sampling Location	Approx Distance and direction from the mine site
1	Naranapuram (Part)	1km-W
2	Paranayakkanpatti	1.28km-NE

3	Tayilupatti	3.0km-SE
4	Edirkottai	1.3km-NE
5	Kongankulam	1.4km-NW
6	Kundayiruppu	3.3km-SE
7	Lakshmipuram	1.4km-S
8	Alangulam (CT)	0.5km-E,W
9	T.Karisalkulam	0.93km-N
10	Duraiswamipuram	3.3km-NE

Source: Field Study

3.5.5. Ecological Assessment

3.5.5.1. General Ecological Assessment

The observations and assessment of the overall ecological scenario presented in this chapter include details of flora, fauna, natural habitats, and Wildlife in the study area. Such information provides better understanding of the situation and overall ecological importance of the area. This information viewed against project activities helps in predicting their impacts on the wildlife and their habitats in the region.

3.5.5.2. The vegetation in the RF / PF areas, ecologically sensitive areas

There are neither reserved (RF) nor protected (PF) forests either in the mine lease area or in the buffer zone. Thus, no forest land is involved in any manner. Hence, no certificate from the Forest department is required.

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

3.5.5.3. Ecological Sensitive Areas and Ecosystems in the study area

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

3.5.5.4 Floral diversity

The study is carried out to assess the existing and future scenarios of mining projects; specifically in terrestrial and aquatic areas. After surveying the core and the buffer areas, a detailed floral inventory has been compiled. A list of all plants from the study area was prepared and their habitats were recorded.

3.5.5.5. Terrestrial Vegetation

According to the Primary Field Survey, the flora is highly varied with includes vegetation of the species of Herbs, Shrubs, Climbers, Trees, and Major agricultural crops, were documented during this baseline survey. The dominant plant species growing in this area were Prosopis juliflora, Azadirachta indica, Calotropis gigantea, Cissus quadrangularis, Vachellia leucophloea etc.

3.5.5.6 Quadrat Sampling Method

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

FIG NO: 3.35 NESTED QUADRAT SAMPLING PLOTS

Table No: 3.45. Inventory of Floral Diversity in the Core Zone

SI.No	English Name	Vernacular Name	Scientific Name	Family Name
Trees				
1.	Velvet mesquite	Velikatthaan	*Prosopis juliflora*	Fabaceae
2.	Neem or Indian lilac	Vembu maram	*Azadirachta indica*	Meliaceae
3.	White Bark Acacia	Vela maram	*Vachellia leucophloea*	Fabaceae
4.	Madras thorn	Kudukapuli	*Pithecellobium dulce*	Fabaceae
5.	River tamarind	Savundal maram	*Leucaena leucocephala*	Fabaceae
6.	Jamun Fruit Plant	Naval maram	*Syzygium cumini*	Myrtaceae
7.	Jujube Trees	Elantha Pazham	*Ziziphus Mauritiana*	Rhamnaceae
8.	Millettia Pinnata	Pongam oiltree	*Pongamia pinnata*	Fabaceae
9.	Wild Date Palm	Icham	*Phoenix sylvestris*	Arecaceae
10.	Peepal	Asoka maram	*Ficus religiosa*	Legume
11.	Mango	Manga	*Mangifera indica*	Anacardiaceous
12.	Indian mulberry	Nuna maram	*Morinda tinctoria*	Rubiaceae
13.	Malayan Cherry	Ten Pazham	*Muntingia calabura*	Muntingiaceae
Shrubs				
14.	West Indian Lantana	Unni chedi	*Lantana camara*	Verbenaceae
15.	Avaram	Avarai	*Senna auriculata*	Fabaceae
16.	Indian mallow	Thuthi	*Abutilon indicum*	Meliaceae
17.	Jackal jujube	Surai Ilantai	*Ziziphus oenoplia*	Rhamnaceae
18.	Devil's trumpet	Umathai	*Datura metel*	Solanaceae
19.	Tanner's cassia	Avaram	*Senna auriculata*	Fabaceae

20.	Triangular spruge	Chaturakalli	*Euphorbia antiquorum*	Euphorbiaceae
21.	Malabar catmint	Pei veratti	*Anisomeles malabarica*	Lamiaceae
22.	Milk Weed	Erukku	*Calotropis gigantea*	Apocynaceae
23.	Indian Oleander	Arali	*Nerium indicum*	Apocynaceae
24.	Black-Honey Shrub	Ink pazham	*Phyllanthus reticulatus*	Phyllanthaceae
25.	Castor bean	Amanakku	*Ricinus communis*	Euphorbiaceae
26.	Triangular spruge	Chaturakalli	*Euphorbia antiquorum*	Euphorbiaceae
27.	Puriging nut	Kattamanakku	*Jatropha curcas*	Euphorbiaceae
Herbs				
28.	Indian nettle	Nayuruvi	*Achyranthes aspera*	Amaranthaceae
29.	Cleome viscosa	Nai kadugu	*Celome viscosa*	Capparidaceae
30.	Mountain knotgrass	Sirukan Peelai	*Aerva lanata*	Amaranthaceae
31.	Common leucas	Thumbai	*Leucas aspera*	Lamiaceae
32.	Dwarf morning-glory	Vishnukranti	*Evolvulus alsinoides*	Convolvulaceae
33.	Coat buttons	Thatha poo	*Tridax procumbens*	Asteraceae
34.	Holy basil	Thulasi	*Ocimum tenuiflorum*	Lamiaceae
35.	Indian doab	Arugampul	*Cynodon dactylon*	Poaceae
36.	Fish poison	Kolinchi	*Tephrosia purpurea*	Fabaceae
Climber				
37.	Stemmed vine	Perandai	*Cissus quadrangularis*	Vitaceae
38.	Stinking passionflower	Poonai puduku chedi	*Passiflora foetida*	Passifloraceae
39.	Ivy gourd	Kovai	*Coccinia grandis*	Cucurbitaceae
40.	Cucumis maderaspatanus	Musumusukkai	*Mukia maderaspatana*	Cucurbitaceae
41.	Wild bitter	Pavarkai	*Momordica charantia*	Cucurbitaceae
42.	Rosary Pea	Gundumani	*Abrus precatorius*	Fabaceae
Grasses				
43.	Narrow leaf cattail	Sambu	*Typha angustifolia*	Typhaceae
44.	Giant reed	Elephant grass	*Arundo donax*	Poaceae
45.	Windmill grass	Chevvarakupul	*Chloris barbata*	Amaranthaceae
46.	Eragrostis	Pullu	*Eragrostis ferruginea*	Poaceae
Cactus				
47.	Prickly pear	Nagathali	*Opuntia dillenii*	Cactaceae

3.5.5.7. Invader or exotic species:

Our study showed that Prosopis juliflora is one of the most dominant weed terrestrial species and is widespread in the buffer areas of the project site. Our observation during the field visit suggests Mesosphaerum suaveolens, Lantana camara, and Ipomoea carnea & Mesosphaerum suaveolensare fast growing in the area.

3.5.5.8. Endangered/Threatened/Protected Species

Our field survey in the project area suggests that there are no Endangered, Endemic, and Rare Plants species present in the study area.

3.5.5.9 Inventory List of floral diversity

After surveying the core and the buffer areas, a detailed floral inventory has been compiled. A list of all plants from the study area was prepared and their habitats were recorded.

The species of Herbs, Shrubs, Climbers, Trees, and Major agricultural crops, were documented during this base line survey. The dominant plant species growing in this area were Morinda tinctoria, Tectona grandis, Cassia siamea, Ziziphus mauritiana, etc.

3.5.6. Analysis of Flora (Core Zone)

The species of Herbs, Shrubs, Climbers, and Trees were documented during this baseline survey. The core zone was fully dominated by species like Prosopis juliflora, Azadirachta indica, Abutilon indicum and Calotropis gigantea. In the core zone total of 13 tree species with 9 families followed by 14 Shrub species with 10 families, 9 Herb Species with 8 families, 6 Climber species with 4 families, 4 grasses with 3 families and 1

Cactus with 1 family. According to the survey, no endemic, endangered and rare species of flora recorded in study area. (Table No-3.35).

a. Prosopis juliflora

b. Cissus quadrangularis

c. Ziziphus Mauritiana

d.Calotropis gigantea

e. Morinda tinctoria

f. Tephrosia purpurea

FIG NO: 3.36. FLORA SPECIES OBSERVATION IN THE CORE ZONE AREA

3.5.7 Analysis of Flora (Buffer Zone)

Similar habitats may be found in the buffer area as well, although there is a wider variety of plants there than in the core zone area. The buffer zone was fully dominated by species like Prosopis juliflora, Azadirachta indica, Jatropha curcas, Pongamia pinnata, Calotropis gigantea, and Morinda tinctoria, etc. The buffer zone study area contains a total of 179 species that have been recorded from the buffer zone. The floral (179) varieties among them Trees 53, Herbs 57, Shrubs 46, Climbers/ Creepers 11, Grasses 11, and Cactus 1 were identified. The result of the buffer zone of flora studies shows that Fabaceae and Solanaceae, Euphorbiaceae is the main dominating

species in the study area mentioned in Table No.3.34. There are no impacts due to this mining activity. There are no Rare, Endangered, and Threatened Flora species in the mining area and their surrounding study area. Apart from the proposed project area, there is agricultural land. Horticulture and agricultural land are untouched. There are no Rare, Endangered, and Threatened Flora species in the mining area and their surrounding study area. A list of floral species has been prepared based on primary survey (site observations) and discussion with local people. The total number of different plant life forms under trees, shrubs, herbs, and climbers is shown in Table 3.35 and their % distribution is shown in Figure 3.37..

Table 3.46 Number of floral life forms in the Study Area

S. No	Plant Life Form	Number of Species
1	Trees	53
2	Shrubs	46
3	Herbs	57
4	Climber	11
6	Grass	11
7	Cactus	1
Total No. of Species		**179**

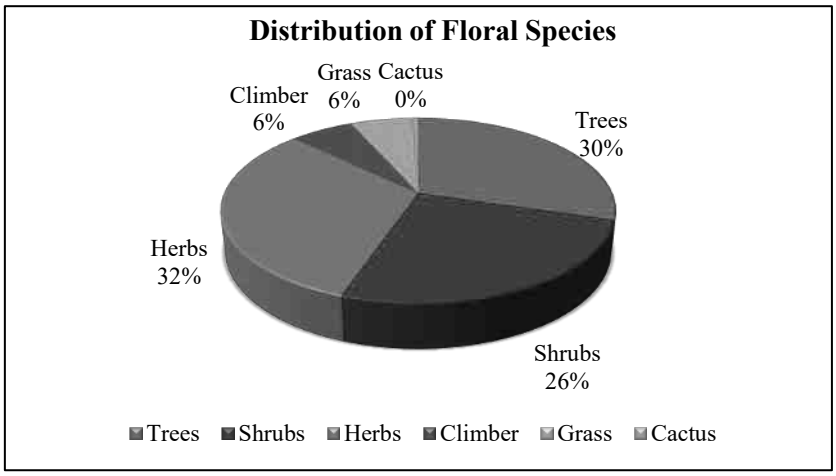


Fig No. 3.37: Graph showing % distribution of floral life forms


Azadirachta indica


Thespesia Populnea


Clitoria ternatea


Jatropagossypifolia


Borassus flabellifer


Lantana camara


Heliotropium indicum


Calotropis gigante


Morinda tinctoria


Abrus precatorius


Celome viscosa


Abutilon indicum


Phyllanthus reticulatus


Phoenix sylvestris


Parthenium hysterophorus

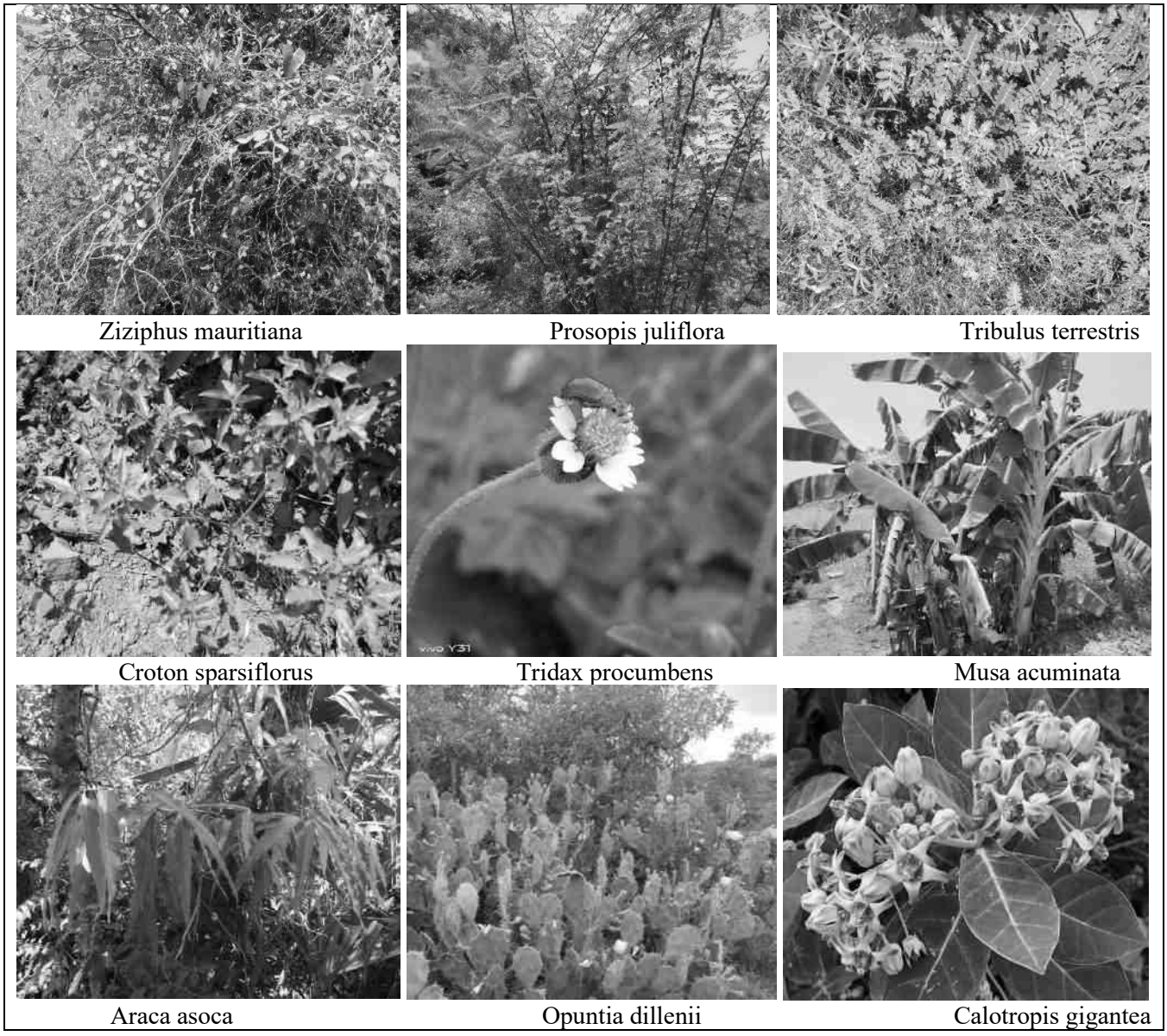


Fig No: 3.38. Flora species observation in the Core zone area

Table No: 3.47. Inventory of Floral Diversity in the Buffer Zone

SI.No	English Name	Vernacular Name	Scientific Name	Family Name
Trees				
1.	Phoenix sylvestris	Pereatchai	*Phoenix sylvestris*	Arecaceae
2.	Velvet mesquite	Velikatthaan	*Prosopis juliflora*	Fabaceae
3.	Coconut	Thennai maram	*Cocos nucifera*	Arecaceae
4.	Neem or Indian lilac	Vembu	*Azadirachta indica*	Meliaceae
5.	Indian mulberry	Nuna maram	*Morinda tinctoria*	Rubiaceae
6.	Indian plum	Elanthai maram	*Ziziphus mauritiana*	Rhamnaceae
7.	Pongamia pinnata	Pongam	*Millettia pinnata*	Fabaceae
8.	Oil cake tree	Wunja	*Albizia amara*	Fabaceae
9.	Eucalyptus	Thailam maram	*Eucalyptus tereticornis*	Myrtaceae
10.	Asian Palmyra palm	Panai maram	*Borassus flabellifer*	Arecaceae
11.	River tamarind	Savunda	*Leucaenaleucocephala*	Fabaceae
12.	Indian rosewood	Shisham	*Dalbergia sissoo*	Fabaceae
13.	Sacred Tree	Flame of Forest	*Butea monosperma*	Fabaceae
14.	Madras thorn	Kudukapuli	*Pithecellobium dulce*	Fabaceae
15.	Portia tree	Poovarasan	*Thespesia Populnea*	Malvaceae
16.	Royal poinciana	Cemmayir Konra	*Delonix regia*	Fabaceae
17.	Lemon	Ezhumuchaipalam	*Citrus lemon*	Rutaceae
18.	Jamun Fruit Plant	Naval maram	*Syzygium cumini*	Myrtaceae
19.	Gum arabic tree	Karuvelam	*Acacia nilotica*	Fabaceae
20.	Kassod Tree	Manjal Konrai	*Cassia siamea*	Fabaceae
21.	Butterfly Tree	Mandarai	*Bauhinia purpurea*	Fabaceae
22.	Common guava	Koyya	*Psidium guajava*	Myrtaceae
23.	Ava olive tree	Kuthiraipidukkan	*Sterculiafoetida*	Malvaceae
24.	Monkey pod tree	Kondraimaram	*Samaneasaman*	Fabaceae
25.	Senna siamea	Manjal Konnai	*Sennasiamea*	Fabaceae
26.	Indian cork tree	Maramalli	*Millingtoniahortensis*	Bignoniaceae
27.	Frywood	Vaagai	*Albizia lebbeck*	Mimosaceae
28.	Bamboo	Moongil	*Bambusoideae*	Poaceae
29.	Indian-almond	Vadamaram	*Terminaliacatappa*	Fabaceae
30.	Teak	Thekku	*Tectona grandis*	Verbenaceae
31.	The umbrella thorn	Kodaivelam	*Acacia planiforns*	Mimosoideae
32.	Singapore Cherry	Ten pazham	*Muntingia calabura*	Malvaceae
33.	Curry tree	Karuveppilai	*Murraya koenigii*	Rutaceae

34.	Sudu	Kalli	*Euphorbia antiquorum*	Euphorbiaceae
35.	Otaheite Gooseberry	Nellai	*Phyllanthus acidus*	Phyllanthaceae
36.	Yellow Flame	Iyalvagai	*Peltophorumpterocarpum*	Fabaceae
37.	Common fig	Athi Maram	*Ficus Carica*	Anacardiaceae
38.	Mango	Manga	*Mangifera indica*	Anacardiaceae
39.	Banyan	Alamaram	*Ficus benghalensis*	Moraceae
40.	Moringa	Murungai Maram	*Moringa oleifera*	Moringaceae
41.	Horsetail She-oak	Savukku maram	*Casuarina equisetifolia*	Casuarinaceae
42.	Creamy peacock flower	Perungondrai	*Delonix elata*	Fabaceae
43.	Sapodilla	Sappotta	*Manilkarazapota*	Sapotaceae
44.	Indian bael	Vilvam	*Aegle marmelos*	Rutaceae
45.	Indian gooseberry	Nelli	*Phyllanthus emblica*	Phyllanthaceae
46.	Guava	Koyya	*Psidium guajava*	Myrtaceae
47.	Kapok tree	Ilavamaram	*Ceibapentandra*	Malvaceae
48.	Sugar apple	Sitapalam	*Annona squamosal*	Annonaceae
49.	White-bark acacia	Velvelam	*Acacia leucophloea*	Mimosaceae
50.	Papaya	Pappali maram	*Carica papaya*	Caricaceae
51.	Banana tree	Vazhaimaram	*Musa acuminata*	Musaceae
52.	Jack fruit	Palamaram	*Artocarpus heterophyllus*	Moraceae
53.	Tamarind	Puliyamaram	*Tamarindus indica*	Legumes
Shrubs				
1.	Avaram	Avarai	*Senna auriculata*	Fabaceae
2.	Common Wireweed	Arivalmanai poondu	*Sida acuta*	Malvaceae
3.	Bush Morning Glory	Neiveli Kattamani	*Ipomoea carnea*	Convolvulaceae
4.	Roundleaf Burr-Bush	Adayoti	*Triumfetta rotundifolia*	Malvaceae
5.	Chinese chastetree	Nochi	*Vitex negundo*	Lamiaceae
6.	Bellyache bush	Kaatamanaku	*Jatropagossypifolia*	Euphorbiaceae
7.	Malabar nut	Adhatoda	*Justicia adhatoda*	Acanthaceae
8.	Fish poison	Kolinchi	*Tephrosia purpurea*	Fabaceae
9.	Jackal jujube	Surai Ilantai	*Ziziphus oenoplia*	Rhamnaceae
10.	Milk Weed	Erukku	*Calotropis gigantea*	Apocynaceae
11.	Peacock Flower	Mayil Kontai	*Caesalpinia pulcherrima*	Fabaceae
12.	Solanum pubescens	Malaisundai	*Solanum pubescens Willd*	Solanaceae
13.	Coffee Senna	Nattam Takarai	*Cassia occidentalis*	Fabaceae
14.	Henna Tree	Maruthani	*Lawsonia inermis*	Lythraceae
15.	Sicklepod	Oosithagarai	*Cassia tora*	Fabaceae
16.	Night shade plan	Sundaika	*Solanum torvum*	Solanaceae

17.	Mesquite	Seemai karuvelam	*Prosopis juliflora*	Fabaceae
18.	Triangular spruge	Chaturakalli	*Euphorbia antiquorum*	Euphorbiaceae
19.	Yellow elder	Manjarali Sonnapatti	*Tecoma stans*	Bignoniaceae
20.	Pinwheelflower	Nandiar vattai	*Tabernaemontana coronaria*	Apocynaceae
21.	Rough cocklebur	Ottarchedi	*Xanthium indicum*	Asteraceae
22.	Martynia annua	Thael kodukkukaai	*Martynia annua*	Martyniaceae
23.	Great bougainvillea	Kaakithapoo	*Bougainvillea spectabilis*	Nyctaginaceae
24.	Scarlet jungle flame	Sinduram	*Ixora coccinea*	Rubiaceae
25.	Devil's trumpet	Umathai	*Datura metel*	Solanaceae
26.	Jhahrberi	Narielandai	*Ziziphus nummularia*	Rhamnaceae
27.	Castor bean	Amanakku	*Ricinus communis*	Euphorbiaceae
28.	Tabasco pepper	Mulaga	*Capsicum frutescense*	Solanaceae
29.	Shoe flower	Chemparuthi	*Hibiscu rosa-sinensis*	Malvaceae
30.	Nalta jute	Perattikkirai	*Corcorus olitorius*	Tiliaceae
31.	Firecracker Flower	kanak Ambaram	*Crossandra infundibuliformis*	Acanthaceae
32.	Plumeria alba	Malaiarali	*Plumeria alba*	Appocynaceae
33.	Blue snakeweed	Seemai nayaroovi	*Stachytarpheta indica*	Verbenaceae
34.	Touch-me-not	Thottalchinungi	*Mimosa pudica*	Mimosaceae
35.	Rough cocklebur	Marul-umattai	*Xanthium strumarium*	Asteraceae
36.	Indian mallow	Thuthi	*Abutilon indicum*	Meliaceae
37.	Tomato	Thakkali	*Lycopersicon esculentum*	Solanaceae
38.	Apple of sodom	Vellerukku	*Calotropis procera*	Asclepiadaceae
39.	Indian shot	Kalvalai	*Canna indica*	Cannaceae
40.	Pignut	Wild thulasi	*Hyptis suaveolens*	Lamiacea
41.	Wild jujube	Nari-y-ilantai	*Zizyphus nummularia*	Rhamnaceae
42.	Wild caper bush	Kattukkathir	*Capparis sepiaria*	Capparaceae
43.	Indian Oleander	Arali	*Nerium indicum*	Apocynaceae
44.	Pencil cactus	Thirukalli	*Euphorbia tirucalli*	Euphorbiaceae
45.	West Indian Lantana	Unni chedi	*Lantana camara*	Verbenaceae
46.	Kapok Bush	Seiyanavruvi	*Aerva javanica*	Amaranthaceae
Herbs				
1.	Tickweed	Nai kadugu	*Celome viscosa*	Capparidaceae
2.	Indian Mercury	Kuppamani	*Acalypha indica*	Euphorbiaceae
3.	Purple pitcher plant	Kavali	*Tephrosia purpurea*	Fabaceae
4.	Septicweed	Kattuttakarai	*Senna occidentalis*	Fabaceae
5.	Red Pea Eggplant	Vellai tuduvalai	*Solanum trilobatum*	Solanaceae
6.	Bladder Cherry	Kupanti	*Physalis minima*	Solanaceae

7.	Shaggy Button Weed	Nattai-churi	*Borreria hispida*	Rubiaceae
8.	Chamber bitter	Malai Kizhanelli	*Phyllanthus urinaria L.*	Euphorbiaceae
9.	Carrot grass	Vishapoondu	*Parthenium hysterophorus*	Asteraceae
10.	Porcupine flower	Kundan	*Barleria prionitis*	Acanthaceae
11.	Egyptian senna	Mayurkondrai	*Cassia tora*	Caesalpiniacea
12.	Billygoat weed	Pumpillu	*Ageratum conyzoides*	Asteraceae
13.	Green amaranth	Kuppaikeerai	*Amaranthus viridis*	Amaranthaceae
14.	Aloe barbadensis	Katrazhai	*Aloe vera*	Asphodelaceae
15.	Billygoat weed	Aappakkoti	*Ageratum conyzoides*	Asteraceae
16.	False daisy	Karisalankanni	*Eclipta prostrata*	Asteraceae
17.	Arrowleaf sida	Jelly Leaf	*Sida rhombifolia*	Malvaceae
18.	Monarch redstem	Kal-l-uruvi	*Ammania buccifera*	Lythraceae
19.	Indian doab	Arugampul	*Cynodon dactylon*	Poaceae
20.	Rough cocklebur	Marul-umattai	*Xanthium strumarium*	Asteraceae
21.	Bell Weed	Pottakanchi	*Dipterocanthus prostratus*	Acanthaceae
22.	Monarch redstem	Kalluruvi	*Ammannia baccifera*	Lythraceae
23.	Riceweeds	Seruppadai	*Coldenia procumbens*	Boraginaceae
24.	Goatweed	Kallurukki	*Scoparia dulcis*	Plantaginaceae
25.	Cracker plant	Kiranti nayan	*Ruellia tuberosa*	Acanthaceae
26.	East Indian globe thistle	kottai-k-karantai	*Sphaeranthus indicus*	Asteraceae
27.	Benghal dayflower	Kanavachai	*Commelina benghalensis*	Commelinacea
28.	Mexican prickly poppy	Kudiyotti	*Argemone mexicana*	Papaveraceae
29.	Mountain knotgrass	Sirupulai	*Aerva lanata*	Amaranthaceae
30.	Indian Turnsole	Thel kodukku	*Heliotropium indicum*	Boraginaceae
31.	Frog fruit	Poduthalai	*Phyla nodiflora*	Poduthalai
32.	Common leucas	Thumbai	*Leucas aspera*	Lamiaceae
33.	Fish poison	Kollukkai Vela	*Tephrosia purpurea*	Fabaceae
34.	Painted euphorbia	Pal perukki	*Euphorbia heterophyla*	Euphorbiaceae
35.	Pig weed	Mukkarattai Keerai	*Boerheavia diffusa*	Nyctaginaceae
36.	Asthma-plant	Amman pacharisi	*Euphorbia hirta*	Euphorbiaceae
37.	Rushfoil	Reilpoondu	*Croton sparsiflorus*	Euphorbiaceae
38.	Poor land lasted	Kunnakora	*Cyperus compressus*	Cyperaceae
39.	Marsh Barbel	Neermulli	*Hygrophila auriculata*	Acanthaceae
40.	Bhringaraj	Karisalankanni	*Eclipta alba*	Asteraceae
41.	Slender dwarf morning-glory	Vishnukranthi	*Evolvulus alsinoides*	Convolvulaceae
42.	Spiny amaranth	Mullukkirai	*Amaranthus spinosus*	Amaranthaceae
43.	Lady's Fingers	Vendaka	*Abelmoschus esculentus*	Malvaceae

44.	Holy basil	Thulasi	*Ocimum tenuiflorum*	Lamiaceae
45.	Woolly-Winged Milkwort	Paruppu chedi	*Polygala erioptera*	Polygalaceae
46.	Tridax daisy	Thatha poo	*Tridax procumbens*	Asteraceae
47.	Indian Turnsole	Tetkotukki	*Indian heliotrope*	Boraginaceae
48.	Cleome gynandra	Kattu Kadugu	*Cleome gynandra*	Cleomaceae
49.	Globe Amaranth	Vaadamalli	*Gomphrena globosa*	Amaranthaceae
50.	Dwarf morning-glory	Vishnukranti	*Evolvulus alsinoides*	Convolvulaceae
51.	Indian nettle	Nayuruvi	*Achyranthes aspera*	Amaranthaceae
52.	Negro Coffee	Payaverai	*Cassia occidentalis*	Caesalpiniacea
53.	Gale of the wind	Keelaneeli	*Phyllanthus niruri*	Phyllanthaceae
54.	Red Morning Glory	Kanavalikkodi	*Ipomea hederfolia*	Convolvulaceae
55.	Obscure Morning Glory	Chirutali	*Ipomea obscura*	Convolvulaceae
56.	Threelobe False Mallow	Pinnaku keerai	*Malvastrum coromandelianum*	Malvaceae
57.	Indian Whitehead	Vella ragu	*Enicostema axillare*	Gentianaceae
Climber				
1.	Madras Pea Pumpkin	Musumuskkai	*Mukia mederaspatna*	Cucurbitaceae
2.	Rosary pea	Kundumani	*abrus precatorius*	Fabaceae
3.	Bitter apple	Peikkumatti	*Citrullus colocynthis*	Cucurbitaceae
4.	Wild water lemon	Poonai puduku chedi	*Passiflora foetida*	Passifloraceae
5.	Stemmed vine	Perandai	*Cissus quadrangularis*	Vitaceae
6.	Bottle gourd	Churakka	*Lagenaria siceraria*	Cucurbitaceae
7.	Butterfly pea	Sangu poo	*Clitoria ternatea*	Fabaceae
8.	Bitter melon	Paagarkaai	*Momordica charantia*	Cucurbitaceae
9.	Balloon vine	Mudakathan	*Cardiospermum halicacabum*	Sapindaceae
10.	Stinking passionflower	Poonai puduku chedi	*Passiflora foetida L*	Passifloraceae
11.	Ivy gourd	Kovai	*Coccinia grandis*	Cucurbitaceae
Grass				
1.	Great brome	Thodappam	*Bromus diandrus*	Poaceae
2.	Umbrella-sedge	Vattakorai	*Cyperus difformis*	Cyperaceae
3.	Finger grass	Kuruthupillu	*Chloris dolichostachya*	Poaceae
4.	Windmill grass	Chevvarakupul	*Chloris barbata*	Amaranthaceae
5.	Purple love grass	Bunchgrass	*Eragrostis spectabilis*	Poaceae
6.	Narrowleaf cattail	Sambu	*Typha angustifolia*	Typhaceae
7.	Watergrass	Mukkutikorei	*Bulbostylis barbatta*	Cyperaceae
8.	Eragrostis	Pullu	*Eragrostis ferruginea*	Poaceae
9.	Marvel grass	Marvel grass	*Dichanthium annulatum*	Poaceae
10.	Tropical crabgrass	Crab grass	*Digetaria adscendens*	Poaceae

11.	Common needle grass	-	*Aristida adscensionis*	Poaceae
Cactus				
1.	Prickly pear	Nagathali	*Opuntia*	Cactaceae

Source:

- Nair.N.C and A.N. Henry, Flora of Tamil Nadu 1983, Series 1, Botanical Survey of India, Southern Circle.
- Species observation in the field study and secondary data.

3.5.8 Flora Composition in the Buffer Zone

3.5.8.1 Calculation of species diversity by Shannon – wiener Index, Evenness and richness

The biodiversity index is a quantitative measure that reflects how many different types of species, there are in a dataset, and simultaneously takes into account how evenly the basic entities (such as individuals) are distributed among those types of species. The value of the biodiversity index increases both when the number of types increases and when evenness increases. For a given number of types of species, the value of a biodiversity index is maximized when all types of species are equally abundant. Interpretation of Vegetation results in the study area is given below.

3.5.8.2 Species Diversity

Shannon Diversity Index has been used for estimating the diversity among the eight sampling sites to highlight the most diverse site, and calculate the Shannon Wiener diversity index of each site using the formula:

$$H = - \sum Pi. \ln Pi.$$

Where, H' = Shannon index of diversity

$$Pi = \frac{S = \text{Number of individuals of one species}}{N = \text{Total number of all individuals in the sample}}$$

Table No: 3.48 Trees

H (Shannon Diversity Index) =3.34

Vernacular Name	Scientific Name	No of Species	Pi	In Pi	Pi x In (Pi)
Pereatchai	*Phoenix sylvestris*	16	0.036951501	-1.432367914	-0.052928145
Velikatthaan	*Prosopis juliflora*	51	0.11778291	-0.92891772	-0.109410632
Thennai maram	*Cocos nucifera*	10	0.023094688	-1.636487896	-0.037794178
Vembu	*Azadirachta indica*	15	0.034642032	-1.460396637	-0.050591108
Nuna maram	*Morinda tinctoria*	35	0.080831409	-1.092419852	-0.088301836
Elanthai maram	*Ziziphus mauritiana*	9	0.020785219	-1.682245387	-0.034965839
Pongam	*Millettia pinnata*	13	0.030023095	-1.522544544	-0.045711499
Wunja	*Albizia amara*	5	0.011547344	-1.937517892	-0.022373186
Thailam maram	*Eucalyptus tereticornis*	14	0.032332564	-1.490359861	-0.048187155
Panai maram	*Borassus flabellifer*	12	0.027713626	-1.55730665	-0.043158614
Savunda	*Leucaenaleucocephala*	8	0.018475751	-1.733397909	-0.032025827
Shisham	*Dalbergia sissoo*	2	0.004618938	-2.335457901	-0.010787334
Flame of Forest	*Butea monosperma*	9	0.020785219	-1.682245387	-0.034965839
Kudukapuli	*Pithecellobium dulce*	10	0.023094688	-1.636487896	-0.037794178
Poovarasan	*Thespesia Populnea*	6	0.013856813	-1.858336646	-0.025750623
Cemmayir Konra	*Delonix regia*	3	0.006928406	-2.159366642	-0.01496097
Ezhumuchaipalam	*Citrus lemon*	2	0.004618938	-2.335457901	-0.010787334
Naval maram	*Syzygium cumini*	11	0.025404157	-1.595095211	-0.040522049
Karuvelam	*Acacia nilotica*	26	0.060046189	-1.221514548	-0.073347294
Manjal Konrai	*Cassia siamea*	8	0.018475751	-1.733397909	-0.032025827
Mandarai	*Bauhinia purpurea*	5	0.011547344	-1.937517892	-0.022373186
Koyya	*Psidium guajava*	5	0.011547344	-1.937517892	-0.022373186
Kuthiraipidukkan	*Sterculiafoetida*	2	0.004618938	-2.335457901	-0.010787334
Kondraimaram	*Samaneasaman*	5	0.011547344	-1.937517892	-0.022373186
Manjal Konnai	*Sennasiamea*	10	0.023094688	-1.636487896	-0.037794178
Maramalli	*Millingtoniahortensis*	2	0.004618938	-2.335457901	-0.010787334
Vaagai	*Albizia lebbeck*	4	0.009237875	-2.034427905	-0.018793791
Moongil	*Bambusoideae*	9	0.020785219	-1.682245387	-0.034965839
Vadamaram	*Terminaliacatappa*	4	0.009237875	-2.034427905	-0.018793791
Thekku	*Tectona grandis*	14	0.032332564	-1.490359861	-0.048187155
Kodaivelam	*Acacia planiforns*	8	0.018475751	-1.733397909	-0.032025827

Ten pazham	*Muntingia calabura*	6	0.013856813	-1.858336646	-0.025750623
Karuveppilai	*Murraya koenigii*	1	0.002309469	-2.636487896	-0.006088887
Kalli	*Euphorbia antiquorum*	5	0.011547344	-1.937517892	-0.022373186
Nellai	*Phyllanthus acidus*	2	0.004618938	-2.335457901	-0.010787334
Iyalvagai	*Peltophorumpterocarpum*	2	0.004618938	-2.335457901	-0.010787334
Athi Maram	*Ficus Carica*	12	0.027713626	-1.55730665	-0.043158614
Manga	*Mangifera indica*	8	0.018475751	-1.733397909	-0.032025827
Alamaram	*Ficus benghalensis*	7	0.016166282	-1.791389856	-0.028960113
Murungai Maram	*Moringa oleifera*	2	0.004618938	-2.335457901	-0.010787334
Savukku maram	*Casuarina equisetifolia*	3	0.006928406	-2.159366642	-0.01496097
Perungondrai	*Delonix elata*	4	0.009237875	-2.034427905	-0.018793791
Sappotta	*Manilkarazapota*	4	0.009237875	-2.034427905	-0.018793791
Vilvam	*Aegle marmelos*	6	0.013856813	-1.858336646	-0.025750623
Nelli	*Phyllanthus emblica*	3	0.006928406	-2.159366642	-0.01496097
Koyya	*Psidium guajava*	3	0.006928406	-2.159366642	-0.01496097
Ilavamaram	*Ceibapentandra*	4	0.009237875	-2.034427905	-0.018793791
Sitapalam	*Annona squamosal*	2	0.004618938	-2.335457901	-0.010787334
Velvelam	*Acacia leucophloea*	3	0.006928406	-2.159366642	-0.01496097
Pappali maram	*Carica papaya*	5	0.011547344	-1.937517892	-0.022373186
Vazhaimaram	*Musa acuminata*	7	0.016166282	-1.791389856	-0.028960113
Palamaram	*Artocarpus heterophyllus*	3	0.006928406	-2.159366642	-0.01496097
Puliyamaram	*Tamarindus indica*	8	0.018475751	-1.733397909	-0.032025827
Total		**433**			**-1.567446836**

Table No: 3.49 Shrubs

H (Shannon Diversity Index) =3.26

Vernacular Name	Scientific Name	No of Species	Pi	In Pi	Pi x In (Pi)
Avarai	*Senna auriculata*	7	0.014373717	-1.842430921	-0.02648258
Arivalmanai poondu	*Sida acuta*	37	0.075975359	-1.119327237	-0.085041289
Neiveli Kattamani	*Ipomoea carnea*	17	0.034907598	-1.45708004	-0.050863164
Adayoti	*Triumfetta rotundifolia*	6	0.012320329	-1.909377711	-0.023524161
Nochi	*Vitex negundo*	6	0.012320329	-1.909377711	-0.023524161
Kaatamanaku	*Jatropagossypifolia*	24	0.049281314	-1.30731772	-0.064426335
Adhatoda	*Justicia adhatoda*	2	0.004106776	-2.386498966	-0.009800817
Kolinchi	*Tephrosia purpurea*	30	0.061601643	-1.210407706	-0.074563103
Surai Ilantai	*Ziziphus oenoplia*	10	0.020533881	-1.687528961	-0.034651519
Erukku	*Calotropis gigantea*	34	0.069815195	-1.156050044	-0.080709859
Mayil Kontai	*Caesalpinia pulcherrima*	3	0.006160164	-2.210407706	-0.013616475
Malaisundai	*Solanum pubescens Willd*	2	0.004106776	-2.386498966	-0.009800817
Nattam Takarai	*Cassia occidentalis*	11	0.022587269	-1.646136276	-0.037181723
Maruthani	*Lawsonia inermis*	1	0.002053388	-2.687528961	-0.00551854
Oosithagarai	*Cassia tora*	11	0.022587269	-1.646136276	-0.037181723
Sundaika	*Solanum torvum*	6	0.012320329	-1.909377711	-0.023524161
Seemai karuvelam	*Prosopis juliflora*	11	0.022587269	-1.646136276	-0.037181723
Chaturakalli	*Euphorbia antiquorum*	6	0.012320329	-1.909377711	-0.023524161
Manjarali Sonnapatti	*Tecoma stans*	2	0.004106776	-2.386498966	-0.009800817
Nandiar vattai	*Tabernaemontana coronaria*	2	0.004106776	-2.386498966	-0.009800817
Ottarchedi	*Xanthium indicum*	11	0.022587269	-1.646136276	-0.037181723
Thael kodukkukaai	*Martynia annua*	15	0.030800821	-1.511437702	-0.046553523
Kaakithapoo	*Bougainvillea spectabilis*	4	0.008213552	-2.08546897	-0.017129109
Sinduram	*Ixora coccinea*	1	0.002053388	-2.687528961	-0.00551854

Umathai	*Datura metel*	9	0.018480493	-1.733286452	-0.032031988
Narielandai	*Ziziphus nummularia*	7	0.014373717	-1.842430921	-0.02648258
Amanakku	*Ricinus communis*	8	0.016427105	-1.784438974	-0.029313166
Mulaga	*Capsicum frutescense*	5	0.01026694	-1.988558957	-0.020416416
Chemparuthi	*Hibiscu rosa-sinensis*	4	0.008213552	-2.08546897	-0.017129109
Perattikkirai	*Corcorus olitorius*	28	0.057494867	-1.24037093	-0.071314961
kanakAmbaram	*Crossandra infundibuliformis*	1	0.002053388	-2.687528961	-0.00551854
Malaiarali	*Plumeria alba*	2	0.004106776	-2.386498966	-0.009800817
Seemai nayaroovi	*Stachytarpheta indica*	15	0.030800821	-1.511437702	-0.046553523
Thottalchinungi	*Mimosa pudica*	9	0.018480493	-1.733286452	-0.032031988
Marul-umattai	*Xanthium strumarium*	5	0.01026694	-1.988558957	-0.020416416
Thuthi	*Abutilon indicum*	33	0.067761807	-1.169015021	-0.07921457
Thakkali	*Lycopersicon esculentum*	2	0.004106776	-2.386498966	-0.009800817
Vellerukku	*Calotropis procera*	6	0.012320329	-1.909377711	-0.023524161
Kalvalai	*Canna indica*	2	0.004106776	-2.386498966	-0.009800817
Wild thulasi	*Hyptis suaveolens*	40	0.082135524	-1.08546897	-0.089155562
Nari-y-ilantai	*Zizyphus nummularia*	8	0.016427105	-1.784438974	-0.029313166
Kattukkathir	*Capparis sepiaria*	2	0.004106776	-2.386498966	-0.009800817
Arali	*Nerium indicum*	3	0.006160164	-2.210407706	-0.013616475
Thirukalli	*Euphorbia tirucalli*	2	0.004106776	-2.386498966	-0.009800817
Unni chedi	*Lantana camara*	10	0.020533881	-1.687528961	-0.034651519
seiyanavruvi	*Aerva javanica*	27	0.055441478	-1.256165197	-0.069643656
Total		**487**			**-1.476432718**

Table No: 3.50 Herbs

H (Shannon Diversity Index) =3.4

Vernacular Name	Scientific Name	No of Species	Pi	In Pi	Pi x In (Pi)
Nai kadugu	*Celome viscosa*	18	0.030201342	-1.519973755	-0.045905248
Kuppamani	*Acalypha indica*	24	0.040268456	-1.395035018	-0.056175907
Kavali	*Tephrosia purpurea*	18	0.030201342	-1.519973755	-0.045905248
Kattuttakarai	*Senna occidentalis*	8	0.013422819	-1.872156273	-0.025129614
Vellai tuduvalai	*Solanum trilobatum*	6	0.010067114	-1.997095009	-0.020104983
Kupanti	*Physalis minima*	8	0.013422819	-1.872156273	-0.025129614
Nattai-churi	*Borreria hispida*	24	0.026845638	-1.571126277	-0.042177887
Malai Kizhanelli	*Phyllanthus urinaria*	16	0.026845638	-1.571126277	-0.042177887
Vishapoondu	*Parthenium hysterophorus*	42	0.070469799	-1.151996969	-0.081180994
Kundan	*Barleria prionitis*	7	0.011744966	-1.93014822	-0.022669526
Mayurkondrai	*Cassia tora*	6	0.010067114	-1.997095009	-0.020104983
Pumpillu	*Ageratum conyzoides*	5	0.008389262	-2.076276255	-0.017418425
Kuppaikeerai	*Amaranthus viridis*	27	0.045302013	-1.343882496	-0.060880583
Katrazhai	*Aloe vera*	3	0.005033557	-2.298125005	-0.011567743
Aappakkoti	*Ageratum conyzoides*	5	0.008389262	-2.076276255	-0.017418425
Karisalankanni	*Eclipta prostrata*	32	0.013422819	-1.872156273	-0.025129614
Jelly Leaf	*Sida rhombifolia*	8	0.013422819	-1.872156273	-0.025129614
Kal-l-uruvi	*Ammania buccifera*	9	0.015100671	-1.82100375	-0.027498379
Arugampul	*Cynodon dactylon*	32	0.053691275	-1.270096281	-0.068193089
Marul-umattai	*Xanthium strumarium*	12	0.020134228	-1.696065014	-0.03414896
Pottakanchi	*Dipterocanthus prostratus*	5	0.008389262	-2.076276255	-0.017418425
Kalluruvi	*Ammannia baccifera*	8	0.013422819	-1.872156273	-0.025129614
Seruppadai	*Coldenia procumbens*	12	0.020134228	-1.696065014	-0.03414896
Kallurukki	*Scoparia dulcis*	10	0.016778523	-1.77524626	-0.029786011

Kiranti nayan	*Ruellia tuberosa*	12	0.020134228	-1.696065014	-0.03414896
kottai-k-karantai	*Sphaeranthus indicus*	3	0.005033557	-2.298125005	-0.011567743
Kanavachai	*Commelina benghalensis*	2	0.003355705	-2.474216264	-0.008302739
Kudiyotti	*Argemone mexicana*	3	0.005033557	-2.298125005	-0.011567743
Sirupulai	*Aerva lanata*	8	0.013422819	-1.872156273	-0.025129614
Thel kodukku	*Heliotropium indicum*	16	0.026845638	-1.571126277	-0.042177887
Poduthalai	*Phyla nodiflora*	5	0.008389262	-2.076276255	-0.017418425
Thumbai	*Leucas aspera*	24	0.040268456	-1.395035018	-0.056175907
Kollukkai Vela	*Tephrosia purpurea*	18	0.030201342	-1.519973755	-0.045905248
Pal perukki	*Euphorbia heterophyla*	2	0.030201342	-1.519973755	-0.045905248
Mukkarattai Keerai	*Boerheavia diffusa*	3	0.005033557	-2.298125005	-0.011567743
Amman pacharisi	*Euphorbia hirta*	8	0.013422819	-1.872156273	-0.025129614
Reilpoondu	*Croton sparsiflorus*	24	0.040268456	-1.395035018	-0.056175907
Kunnakora	*Cyperus compressus*	4	0.006711409	-2.173186268	-0.014585143
Neermulli	*Hygrophila auriculata*	2	0.003355705	-2.474216264	-0.008302739
Karisalankanni	*Eclipta alba*	5	0.008389262	-2.076276255	-0.017418425
Vishnukranthi	*Evolvulus alsinoides*	3	0.005033557	-2.298125005	-0.011567743
Mullukkirai	*Amaranthus spinosus*	8	0.013422819	-1.872156273	-0.025129614
Vendaka	*Abelmoschus esculentus*	3	0.005033557	-2.298125005	-0.011567743
Thulasi	*Ocimum tenuiflorum*	20	0.033557047	-1.474216264	-0.049470344
Paruppu chedi	*Polygala erioptera*	7	0.011744966	-1.93014822	-0.022669526
Thatha poo	*Tridax procumbens*	23	0.038590604	-1.413518424	-0.05454853
Tetkotukki	*Indian heliotrope*	5	0.008389262	-2.076276255	-0.017418425
Kattu Kadugu	*Cleome gynandra*	3	0.005033557	-2.298125005	-0.011567743
Vaadamalli	*Gomphrena globosa*	2	0.003355705	-2.474216264	-0.008302739
Vishnukranti	*Evolvulus alsinoides*	5	0.008389262	-2.076276255	-0.017418425
Nayuruvi	*Achyranthes aspera*	7	0.011744966	-1.93014822	-0.022669526
Payaverai	*Cassia occidentalis*	5	0.008389262	-2.076276255	-0.017418425
Keelaneeli	*Phyllanthus niruri*	6	0.010067114	-1.997095009	-0.020104983
Kanavalikkodi	*Ipomea hederfolia*	4	0.006711409	-2.173186268	-0.014585143
Chirutali	*Ipomea obscura*	5	0.008389262	-2.076276255	-0.017418425
Pinnaku keerai	*Malvastrum coromandelianum*	4	0.006711409	-2.173186268	-0.014585143
Vella ragu	*Enicostema axillare*	2	0.003355705	-2.474216264	-0.008302739
	Total	**596**			**-1.596754037**

3.5.9. Interpretation

From the below, it can be interpreted that herb community has higher diversity. While the Shrubs community shows less diversity. It is also observed that most of the quadrates have controlled generation of plant species with older strands. Higher herb species diversity can be interpreted as a greater number of successful species and a more stable ecosystem where more ecological niches are available, environmental change is less likely to be damaging to the ecosystem as a whole. Species richness is high for herb community when compared with tree and shrubs. In Table No. 3.50,3.51 the overall Shannon diversity index result is given.

There are no Rare, Endangered, and Threatened Flora species in the mining area and their surrounding study area. Apart from the proposed project area, there is agricultural land. Horticulture and agricultural land are untouched. There are no Rare, Endangered, and Threatened Flora species in the mining area and their surrounding study area. A list of floral species has been prepared based on a primary survey (site observations) and discussion with local people (Secondary data).

Table No: 3.51 Overall Shannon's diversity index

Details	Shannon diversity index	Evenness	Average population size
Trees	3.34	0.904	9.45
Shrubs	3.26	0.885	10.9
Herbs	3.4	0.921	12.1

3.5.10 Rare and endangered floral species

According to the Botanical Survey of India No endemic, Rare, Endangered and Threatened (RET) species of flora were found in the study area.

3.5.11. Economically important Flora of the study area

3.5.11.1 Agricultural crops: Paddy, Maize is the main crop grown. Different fruits like Banana, papaya, mangoes, guava and vegetables like brinjal, drumsticks, onion, Coriander also grown by the local people.
Reference: District Agriculture Plan – Virudhunagar District

3.5.11.2. Medicinal species: The nearby area is also endowed with the several medicinal species which are commonly available in the shrub forest and waste lands. The common medicinal species of the region are Asparagus racemosus (satamulli), Aegle marmelos (golden apple), Azadirachta indica (Neem) etc.

3.5.12 Faunal Study

- Ground survey for fauna has been carried out by trekking and Line Transect method for identification of animals. Patch sampling was used for Amphibians, visual encountered methods were used for reptiles, and Aerial net was used for butterflies.
- For Avifauna, the Visual Encounter Survey (VES) technique was used in the Morning (05:30 to 09:30 hrs.) and Evening (16:30 to 19:00 hrs.) for the study of diversity.
- For Mammals, Reptiles, Amphibians, etc., species have been recorded by calls, droppings, burrows, pug marks, indirect species-specific evidence, inquiring from local people, and actual sightings.
- The survey was conducted just before dusk time to 10:30 hours for Nocturnal Animals. The light trap method was used to determine the insect diversity.
- Data on fishery were obtained from secondary sources in the study area visit to the local Fish market to conduct 'Basket Survey' to understand Ichthyofaunal diversity.

3.5.13. Part I Field Sampling Techniques

3.5.13.1 Transect walk – Birds

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

3.5.13.2 Modified Pollard Walk – for Butterflies

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

3.5.13.3 Visual Encounter Survey (VES) - reptiles and amphibians

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

3.5.13.4 Observational methods- Mammals

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

3.5.14 Fauna Composition in the Core Zone

During the study, it was found that the faunal diversity in the core site was limited to Butterflies, insects, and some species of mammals & and reptiles among them numbers of Insects 10, Reptiles 5, Mammals 3, and Avian 14. The core site has avifauna species like crow, Black drongo, White-breasted kingfisher, Koel, etc. None of these species are threatened or endemic in the study area and surroundings. There is no Schedule I species and 20 species are under Schedule IV according to the Indian Wildlife Act 1972. There are no critically endangered, endangered, vulnerable, and endemic species were observed.

Table No: 3.52 Inventory of Faunal Diversity in the Core Zone

SI. No	Common Name	Scientific Name	Schedule list WLPC 1972
Insects			
1.	Common Tiger	*Danaus genutia*	NL
2.	Red-veined darter	*Sympetrum fonscolombii*	NL
3.	Tawny coster	*Danaus chrysippus*	Schedule IV
4.	House fly	*Musca domestica*	-
5.	Dragonfly	*Agriansp*	-
6.	Striped tiger	*Danaus plexippus*	Schedule IV
7.	Indian domino cockroach	*Therea petiveriana*	-
8.	Blue bug	*Chrysocoris purpureus*	-
9.	Grey pansy	*Junonia atlites*	LC
10.	Common Tiger	*Danaus genutia*	LC
Reptiles			
1.	Oriental garden lizard	*Calotes versicolor*	NL
2.	Indian forest skink	*Sphenomorphus indicus*	NL
3.	House lizards	*Hemidactylus flaviviridis*	Schedule IV
4.	Common Green Whip Snake	*Ahaetulla nasuta*	Schedule IV
5.	Mabuya carinata	*Brahminy skink*	-
Mammals			
1.	Indian Field Mouse	*Mus booduga*	Schedule IV
2.	Asian Small Mongoose	*Herpestes javanicus*	Schedule (Part II)
3.	Squirrel	*Funambulus palmarum*	Schedule IV
Aves			
1.	Rose-ringed parkeet	*Psittacula krameri*	Schedule IV
2.	Black drongo	*Dicrurus macrocercus*	Schedule IV
3.	Common myna	*Acridotheres tristis*	Schedule IV
4.	Blue-rock pigeon	*Colombalivia*	Schedule IV
5.	Small-blue kingfisher	*Alcedoatthis*	Schedule IV
6.	Pond heron	*Ardeolagrayii*	Schedule IV
7.	Common quail	*Coturnix coturnix*	Schedule IV
8.	Asian koel	*Eudynamysscolopacea*	Schedule IV
9.	Shikra	*Accipiter badius*	Schedule IV
10.	Koel	*Eudynamys*	Schedule IV
11.	Cattle egret	*Bubulcus ibis*	Schedule IV
12.	House crow	*Corvussplendens*	Schedule IV
13.	White-breasted kingfisher	*Halcyon smyrnensis*	Schedule IV
14.	Black-rumped flameback	*Dinopium benghalense*	Schedule IV

*NL- Not listed, LC- Least Concern

(Sources: Species observation in the field study)

3.5.14 Inventory of Faunal Diversity in the Buffer Zone

As animals, especially vertebrates move from place to place in search of food, shelter, mate or other biological needs, separate lists for core and buffer areas are not feasible however, a separate list of fauna pertaining to core and

buffer zone are listed separately. Though there are no reserved forests in the buffer zone. As such there are no chances of occurrence of any rare or endangered or endemic or threatened (REET) species within the core or buffer area.

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

The list of Mammals (*directly sighted animals & Secondary data) is given in table No.3.43. The list of bird species recorded during the field survey and literature from the study area are given in Table 3.44. The list of reptilian species recorded during the field survey and literature from the study area is given in Table 3.45. The list of insect species recorded during the field survey and literature from the study area are given in Table 3.46. The list of Butterflies species recorded during the field survey and literature from the study area are given in Table 3.47. It is apparent from the list that none of the species either spotted or reported is included in Schedule I of the Wildlife Protection Act. Similarly, none of them comes under the REET category.

Taxonomically a total of 103 species recorded were from the buffer zone area. Based on habitat classification the majority of species were birds 40, followed by Butterflies 20, Reptiles 16, Insects 16, Mammals 8, and Amphibians 4. There are five Schedule II species, one species is under the schedule III and seventy-one species are under Schedule IV according to the Indian Wildlife Act 1972. A total of 40 species of bird were sighted in the study area. There are no critically endangered, endangered, vulnerable, and endemic species were observed. There are no impacts on nearby fauna species.

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

Table 3.53. List of Fauna & Their Conservation Status,
Mammals: (*directly sighted animals & Secondary data)

S.No	Scientific name	Common name	Family	IUCN/WPA Schedule
1.	*Rattus rattus*	House rat	Murids	LC – IV
2.	*Funambulus palmarum*	Indian Palm squirrel	Squirrel	LC – IV
3.	*Herpertes edwardrii*	Indian grey mongoose	Mongoose	LC – IV
4.	*Lepus nigricollis*	Hare	Leporids	LC – IV
5.	*Rattus norvegicus*	Field mouse	Murids	LC – IV
6.	*Sorex caerulescens*	Common mush shrew	Soricidae	LC – IV
7.	*Sus scrofa*	Wild boar	Suidae	LC – III
8.	*Indian fox*	Vulpus benfhalensis	Canidae	LC – II

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

Table 3.54. Listed birds

SI. No	Scientific Name	Common Name	Family	Schedule list WLP 1972
1.	*Psittaculakrameria*	Rose-ringed Parakeet	Psittaculidae	Schedule IV
2.	*Tachybaptusruficollis*	Little grebe	Podicipedidae	Schedule IV
3.	*Pycnonotus cafer*	Red-vented Bulbul	Pycnonotidae	Schedule IV
4.	*Alcedo atthis*	Small blue Kingfisher	Alcedinidae	Schedule IV
5.	*Leptocoma zeylonica*	Purple Sunbird	Nectariniidae	Schedule IV
6.	*Leptocoma zeylonica*	Purple-rumped Sunbird	Nectariniidae	Schedule IV
7.	*Dicrurus macrocercus*	Two-tailed Sparrow	Dicruridae	Schedule IV
8.	*Ardeacineria*	Grey heron	Ardeidae	Schedule IV
9.	*Bubulcus ibis*	Cattle egret	Ardeidae	Schedule IV
10.	*Acridotheres tristis*	Common myna	Sturnidae	Schedule IV

11.	*Coracias benghalensis*	Indian roller	Coraciidae	Schedule IV
12.	*Nycticorax nycticorax*	Night heron	Ardeidae	Schedule IV
13.	*Centropus sinensis*	Greater Coucal	Cuculidae	Schedule IV
14.	*Anthus rufulus*	Paddyfield Pipit	Motacillidae	Schedule IV
15.	*Pycnonotus jocosus*	Red-whiskered Bulbul	Pycnonotidae	Schedule IV
16.	*Egretta garzetta*	Little Egret	Ardeidae	Schedule IV
17.	*Merops orientalis*	Green Bee-eater	Meropidae	Schedule IV
18.	*Francolinus pondicerianus*	Grey Francolin	Phasianidae	Schedule IV
19.	*Tringa ochropus*	Green Sandpiper	Scolopacidae	Schedule IV
20.	*Motacilla cinerea*	Grey Wagtail	Motacillidae	Schedule IV
21.	*Aegithina tiphia*	Common Iora	Aegithinidae	Schedule IV
22.	*Motacilla flava*	Yellow wagtail	Motacillidae	Schedule IV
23.	*Athene brama*	Spotted owlet	Strigidae	Schedule IV
24.	*Passer domesticus*	House Sparrow	Passeridae	Schedule IV
25.	*Butastur teesa*	White-eyed Buzzard	Accipitridae	Schedule IV
26.	*Dicrurus macrocercus*	Black Drongo	Dicruridae	Schedule IV
27.	*Lanius cristatus*	Brown Shrike	Laniidae	Schedule IV
28.	*Prinia inornata*	Plain Prinia	Cisticolidae	Schedule IV
29.	*Streptopeliachinensis*	Spotted dove	Columbidae	Schedule IV
30.	*Accipiter badius*	Shikra	Accipitridae	Schedule IV
31.	*Lanius vittatus*	Bay-backed Shrike	Laniidae	Schedule IV
32.	*Eudynamysscolopacea*	Asian koel	Cuculidae	Schedule IV
33.	*Halcyon smyrnensis*	White-breasted kingfisher	Alcedinidae	Schedule IV
34.	*Dicrurus leucophaeus*	Ashy Drongo	Dicruridae	Schedule IV
35.	*Dinopium benghalense*	Black-rumped flameback	Picidae	Schedule IV
36.	*Corvussplendens*	House crow	Corvidae	Schedule IV
37.	*Corvusmacrorhynchos*	Jungle crow	Corvidae	Schedule IV
38.	*Copsychussaularis*	Robin	Muscicapidae	Schedule IV
39.	*Ardeolagrayii*	Pond heron	Ardeidae	Schedule IV
40.	*Coturnix coturnix*	Common quail	Phasianidae	Schedule IV

Reference: Biodiversity of Birds in Vembakottai Water Reservoir, Virudhunagar District, Tamil Nadu

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

Table 3.55. List of Reptiles either spotted or reported from the study area

SI. No	Scientific Name	Common Name	Family	Schedule list WLP 1972
1.	*Calotes versicolor*	Common Garden lizard	Agamid lizards	LC – IV
2.	*Bangarus caeruleus*	Common krait	Elapidae	LC – II
3.	*Gongylophis conicus*	Rough tailed Sand boa	Boidae	LC – IV
4.	*Hemidactylus flaviviridis*	House gecko	Geckos	LC – IV
5.	*Ahaetulla nasuta*	Common Green Whip Snake	Colubridae	LC – IV
6.	*Boiga spp*	Cat snake	Colubridae	---
7.	*Chameleon zeylanicus*	Indian chamaeleon	Chameleons	LC – II
8.	*Daboia russelii*	Russels viper	Viperidae	LC – III
9.	*Lissemys punctata*	Indian mud turtle	Softshell turtles	LC – IV
10.	*Naja naja*	Indian Cobra	Elapid snakes	LC – II
11.	*Basiliscus vittatus*	Brown basilisk	Corytophanidae	-
12.	*Opheodrys vernalis*	Smooth green snake	Colubridae	LC – IV
13.	*Ptyas mucosus*	Common rat snake	Colubrid Snakes	LC – IV
14.	*Dendrelaphis*	Common Bronzeback	Colubrid Snakes	LC – IV
15.	*Brahminy skink*	Mabuya carinata	Scincidae	LC – II
16.	*Varanus benegaiensis*	Udumbu	Varanidae	LC – IV

Table 3.56. List of insects either spotted or reported from the study area

SI. No	Scientific Name	Common Name	Family	Schedule list WLP 1972
1.	*Agrion sp & Petalura sp*	Dragon fly	Anisoptera	LC - IV
2.	*Apis indica*	Honey bee	Apidae	LC - IV
3.	*Aranea sp*	Spider	Crambidae	LC - IV
4.	*Carausius sp*	Stick insect	Lonchodinae	LC - IV
5.	*Coccinella septenpunctata*	Lady bird beetle	Coccinellidae	LC - IV
6.	*Coccinella septempunctat*	Seven-spot ladybird	Coccinellidae	LC - IV
7.	*Therea petiveriana*	Indian domino cockroach	Corydiidae	-
8.	*Hamitermes silvestri*	Termite	----	LC – IV
9.	*Hieroglyphus sp*	Grasshopper	Acrididae	LC – IV
10.	*Praying mantis*	Mantis religiosa	Mantids	LC – IV
11.	*Chrysocoris purpureus*	Blue bug	Scutelleridae	LC – IV
12.	*Scorpion*	Palamnaeus swammerdam	Scorpionoidea	LC – IV
13.	*Centipede*	Scolopendra	House Centipedes	LC – IV
14.	*Cicada sp*	Cicade	Cicadidae	LC – IV
15.	*Coenagrion sp & ischnura*	Damsel fly	Coenagrionidae	LC – IV

Table 3.57. List of Butterflies identified from the project site and their conservation status

SI. No	Scientific Name	Common Name	IUCN Conservation Status
1.	*Junonia iphita*	Chocolate pansy	LC
2.	*Junonia orythia*	Blue pansy	LC
3.	*Phalantaphalantha*	Common Leopard	LC
4.	*Acraea terpsicore*	Tawny Coster	LC
5.	*Papiliopolytespolytes*	Common Mormon	LC
6.	*Papiliopolytesromulus*	Common Mormon	LC
7.	*Junonia lemonias*	Lime pansy	LC
8.	*Hypolimnasmisippus*	Danaid Egg fly	LC
9.	*Junoniahierta*	Yellow Pansy	LC
10.	*Junonialemonias*	Lemon Pansy	LC
11.	*Euchrysops pandava*	Plain cupid	LC
12.	*Papiliodemoleusdemoleus*	Lime Butterfly	LC
13.	*Eurema hecabe*	Common grass yellow	LC
14.	*Danaus genutia*	Striped Tiger	LC
15.	*Evereslacturnus*	Indian Cupid	LC
16.	*Euploea core*	Common Crow	LC
17.	*Melanitisledaleda*	Common Evening Brown	LC
18.	*Jamidescelenoceleno*	Common Cerulean	LC
19.	*Danaus chrysippuschrysippus*	Plain Tiger	LC
20.	*Pachlioptaaristolochiae*	Common Rose	LC

(Sources: Species observation in the field study)

Phalanta phalantha

Junonia lemonias

Danaus chrysippus

Junonia iphita

Euploea core

Catopsilia pomona

Hypolimnas misippus

Eurema hecabe

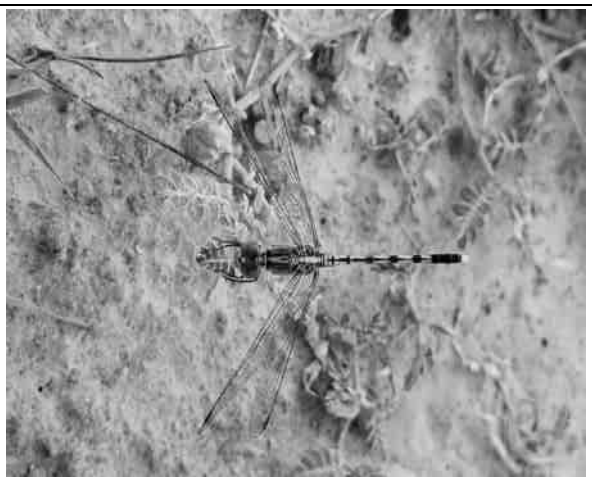
Calotes versicolor

Therea petiveriana

Acridotheres tristis

Alcedo atthis

Basiliscus vittatus



Ceratogomphus pictus

(Sources: Species observation in the field study)

Fig No: 3.39. Fauna species observation in the buffer zone area

3.5.15 Aquatic Ecology

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

3.5.15.1. Objectives of Aquatic Studies

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

3.5.15.2. Macrophytes

The macrophytes observed within the study area are tabulated in Table 3.66

Table No.3.58 Description of Macrophytes

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.	*Typha angustifolia*	Sambu	Narrowleaf cattail	LC
5.	*Carex cruciata*	Cross Grass	Koraipullu	NA
6.	*Cyperus exaltatus*	Tall Flat Sedge	Koraikizhangu	LC

Sources: Species observation in the field study

a. Cross Grass ***b. Sambu***

c. Blue water lily ***d.Water hyacinth***

(Sources: Species observation in the field study)

Fig No: 3.40 List of aquatic plants in the study area

3.5.16. Aquatic Faunal Diversity

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

Table 3.59. Amphibians Observed/Recorded from the Study Area

SI. No	Common Name/English Name	Family Name	Scientific Name	Schedule list WLPA 1972	IUCN Red List data
1.	Indian Burrowing frog	Dicroglossidae	*Sphaerotheca breviceps*	Schedule IV	LC
2.	Green pond frog	Dicroglossidae	*Euphlyctis hexadactylus*	Schedule IV	LC
3.	Indian Toad	Bufonidae	*Bufomelanostictus*	Schedule IV	LC
4.	Skipper	Dicroglossidae	*Euphlyctiscynophlyctis*	Schedule IV	LC

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

3.5.17 Other Aquatic Fauna

3.5.17.1 Fishes

The study area has low aquatic diversity, with few types of fish living. The species of fish reported during the primary visit are Rohu, Catla, Catfish, Snakehead murrel, etc. Species of fish reported in the study area are given in table 3.68.

Table 3.60 Based on Actual Sighting, based on inputs from locals and Perused from Secondary Data

S.No	Common name	Scientific name	Family
1.	Ponthia	*Puntius sophore*	Cyprinidae
2.	Catla	*Catla Catla*	Cyprinidae
3.	Silver scabbardfish	*Lepidopus caudatus*	Trichiuridae

4.	-	*Cyprinus carpio*	Cyprinidae
5.	Catfish	*Siluriformes*	-
6.	Rohu	*Labeo rohita*	Cyprinidae
7.	Eel fish	*Electrophorus electricus*	Gymnotidae
8.	Snakehead murrel	*Channa striata*	-

3.5.18 Conclusion

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

3.6 SOCIO ECONOMIC ENVIRONMENT

The major developmental activities in mining /Industrial sector are required for economic development as well as creation of employment opportunities (direct and indirect) and to meet the basic/modern needs of the society, which ultimately results in overall improvement of the quality of life through upliftment of social, economic, health, education and nutritional status in the project region, state as well as the country. In this manner all developmental projects have direct as well as indirect relationships with socioeconomic aspects, which also include public acceptability for new developmental projects. Thus, the study of socioeconomic component incorporating various facets related to prevailing social and cultural conditions and economic status of limestone mine region is an important part of EIA study. The study of these parameters helps in identification, prediction and evaluation of the likely impacts on the socio economics and parameters of human interest due to the project.

3.6.1 Objectives of the Study

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

a) To study the socio-economic status of the people living in the study area of the project.
b) To identify the basic needs of the nearby villages within the study area.
c) To assess the impact on socio-economic environment due to the project.
d) To provide the employment and improved living standards.
e) To study the socio-economic status of the people living in the study area.
f) To assess the impact on socio-economic environment due to limestone region.
g) To analysis of impact of socio economic and Environmental Infrastructure facilities and road accessibility.

3.6.2 Scope of Work

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

3.6.3 Methodology

The methodology adopted for the socio-economic impact assessment is as follows:
a) The details of the activities and population structure have been obtained from Census 2001 and 2011 and analysed.
b) Based on the above data, impacts due to plant operation on the community have been assessed and recommendations for further improvement have been made.

3.6.4 Sources of Information and Data Base

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

3.6.5 Primary Survey

The primary data collection includes the collection of data through a structured interview schedule by direct observation method. The questionnaire survey includes both open and closed methods. The sample size is limited respondents, who were selected on the basis of simple random sampling from sampling from Alangulam & Lakshmipuram villages, Sivakasi Taluk, Virudhunagar District, Tamil Nadu State. in the field survey has been divided into three major segments namely Primary Zone (0 - 3 km), Secondary Zone (3 - 7 km) and tertiary Zone (7 - 10 km).

The questionnaires were designed to suit the subjects considering their rural background enabling to furnish correct information and data as far as possible. Data were collected at village level and household level by questionnaires and focused group discussions.

The study area for the field survey has been divided into three major segments namely Primary Zone (0 - 3 km), Secondary Zone (3 - 7 km) and Outer Zone (7 - 10 km).

a) Sample size selection

Sample size refers to a number to a number of factors including the purposed of study

$$n = \frac{n_0 \times N}{n_0 + (N - 1)}$$

Here

n = Sample size of known population

n_0 = proportion of unknown population

N = Known population size

We first calculate the proportion and then use the formula for correction factor to calculate the exact sample size

$$n_0 = \frac{Z^2 \times P\,(1 - P)}{e^2}$$

Z= Critical value of desired level of confidence (here 95% confidence taken and Z value of it 1.96)

e = Margin of error / desired level of precision (That is ± 5% or 0.05)

P = Maximum probability of variation in distribution (that can be 50% maximum)

For socio economic survey sample size has been calculated 383 household out of 113338 total household (as per census 2011) in 10 km study area.

The study was carried out with a participatory approach by involving the stakeholders, particularly the project beneficiaries and probable affected persons through a series of consultative process. The population groups that were consulted include beneficiary group of people in the project influence area, particularly the shopkeepers, farmers, Gram Panchayat members, village elders etc.

3.6.6 Collection of Data from Secondary Sources

Data from secondary sources were collected on following aspects:

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

Table 3.61 Type of Information and Sources

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

b) Data Presentation and Analysis

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

3.7 Background Information of the Area

Tamil Nadu is the 11th largest states in India in terms of area. The state is the seventh most populous state in the country and its main language Tamil has origins that date back to 500 BC. Chennai is the capital of Tamil Nadu and lies on the eastern coast line of India. Tamil Nadu is famous for its wonderful temples and monuments that have been built 1000s of years ago and has places that have been marked as heritage sites by the United Nations. In a 180-degree paradigm shift, this state with a rich historical importance is also one of the fastest developing centres for technology and trade.

The State can be divided broadly into two natural divisions (a) the Coastal plains of South India and (b) the hilly western area. Parallel to the coast and gradually rising from it is the broad strip of plain country. It can further be subdivided into Coromandal plains comprising the districts of Kancheepuram, Thoothukudi, Cuddalore and Vellore. The alluvial plains of the Cauvery Delta extending over Thanjavur and part of Tiruchirappalli districts and dry southern plains in Madurai, Dindigul, Ramanathapuram, Sivaganga, Virudhunagar, Tirunelveli and Tuticorin districts. It extends a little beyond Western Ghats in Kanyakumari District. The Cauvery Delta presents some extremely distinctive physical and human features, its power being a main factor in the remarkable growth, the towns of Tamil Nādu have witnessed.

3.8 Geography of the Area

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

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

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

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

3.9 Population Growth Rate

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

Year	Tamil Nadu	India
1941	11.91	14.22
1951	14.66	13.31
1961	11.85	21.51
1971	22.30	24.80
1981	17.50	24.66
1991	15.39	23.86

2001	11.19	21.34
2011	15.61	5.96
2021	5.96	1.0

3.10 Virudhunagar District

Virudhunagar District was formerly called Karmavirer Kamarajar District. The district is situated in the southern portion of Tamil Nadu State. The Virudhunagar district is bounded on north by Madurai and Sivagangai district, south by Tirunelveli and Tuticorin district, east by Ramanathapuram, west by Kerala state and northwest by Theni district. The administrative headquarters of Virudhunagar district is located at Virudhunagar town. Virudhunagar district consists of 3 Revenue divisions, 9 Taluks, 39 Firkas and 600 Revenue Villages.

Virudhunagar District consists of three Revenue Divisions viz., Aruppukottai, Sivakasi and Sattur, Ten Taluks viz., Rajapalayam, Srivilliputtur, Sattur, Sivakasi, Virudhunagar, Aruppukottai, Tiruchuli, Kariapatti, Vembakottai and Watrap (Vembakottai Taluk is formed as per G.O.(Ms) No. 321 Revenue Department dated: 31-08-2015) comprising of 600 Revenue Villages. The district has one Corporation, five Municipalities, nine Town Panchayats, eleven blocks and 450 Village Panchayats.

3.11 Study Area

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

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

Table 3.62 Shows the socio-economic profile of the study area as compared to district, state and national level socio-economic profile

Particular	India	Tamil Nadu	Virudhunagar District	Study Area (10km Radius)
Area (in sq. km.)	3,287,263	130058	4,288	759
Population Density/ sq. Km.	368	554	453	557
No. of Households	249454252	13357027	537748	113338
Population	1210569573	72147030	1942288	422704
Male	623121843	36137975	967709	210009
Female	587447730	36009055	974579	212695
Scheduled Tribes	104281034	794697	2294	753
Scheduled Castes	201378086	14438445	399831	76882
Literacy Rate	**72.99%**	**80%**	**72%**	**80%**

Particular	India	Tamil Nadu	Virudhunagar District	Study Area (10km Radius)
Sex Ratio (Females per 1000 Males)	**943**	**996**	**1007**	**1013**

Source: Census of India, 2011

Table no 3.12.1 show demographic pattern of India, Tamil Nadu, Virudhunagar District & Study area (10km Radius). In India had total area of 3.2 sqkm, State of Tamil Nadu area was 130058 sqkm, District of Virudhunagar area was 4,288 sqkm and study area is about 759 sqkm. Population density is total population per sqkm. So, India population density was 368 sqkm, state of Tamil Nadu density was 554 sqkm, District had density about 453 sqkm and study area density is about 557 sqkm. As per Census 2011, about 5.96 percent of population in the state lives in areas. Virudhunagar had comparing state wise 2.69 percent of population lives in the district. In study area has 24% around 10km radius. State, District and study area. In Tamil Nadu state SC categories people had about 19 %, district of Virudhunagar about 21% it has decreasing to Study area about 18% increasing in the total population Similarly ST population is about 1.10%, 0.11% and 0.18% of the total population in the study area. State level Literacy rate is 80%, district level is 72% but study area has increased about 80%. There is literacy rate is study area is an increase comparing district level decreased. Sex ratio female per thousand males about state level is 996, District level is 1007 and study area is 1013.

The study area has population density 557 persons per sq.km of total population about 422704 as per census 2011. There were about 49.68 percent male and 50.32% female population. Study area has literate rate is about 80%, District had about 72% of literate rate as per census 2011.

3.13 Population Projection of the Study Area

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

A population projection gives a picture of what the future size and structure of the population by sex and age might look like. It is based on knowledge of the past trends, and, for the future, on assumptions made for three components: fertility, mortality and migration.

Table 3.63 Total Population of Study Area

Sl No.	Population in 2001	Population in 2011
1	377974	422704

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

Table 3.64 Population Projection of Study Area

S. No	Year	Projected Population (Approximately)
1.	2021	467434
2.	2031	512164

3.	2041	556894
4.	2051	601624

Source: Calculated by SPSS 23

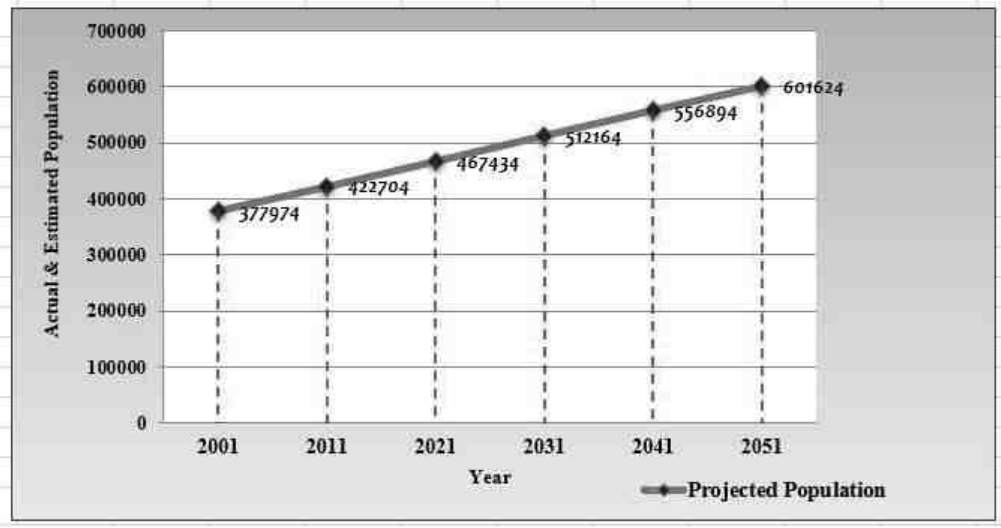


Fig 3.41 Graph Showing Population Projection

Following formula has been used for the projection of population.

$$Y=a+b_t$$

Where: Y= Dependent variable (Population)

a=Intercept

b=Slope

t=Interdependent variables (Time)

Above formula is applied to project population for the years (2021, 2031,2041,2051). Due to avoid the errors in manual calculation the statistical software SPSS (demo version 23) is used to calculate the intercept and the slope.

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

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

3.14 Population Growth of the Study Area

Table 3.65 Population Growth rate in Study area

Year	Actual Population	Growth Rate %
2001	377974	-
2011	422704	11.18
2021	467434	11.06
2031	512164	10.96
2041	556894	10.87

2051	601624	10.80

Source: Compiled by Author-2023

above table no 3.14.1 is showing the growth rate of population since 2001, as per census in 2001 the population of study area was 377974 and 2011 it was 422704 if the population growth rate is 11.18%, it will approximately gradually an increase about 467434 in year 2021 and 601624 in the year of 2051. It has approximately population growth rate decline will be 10.80%.

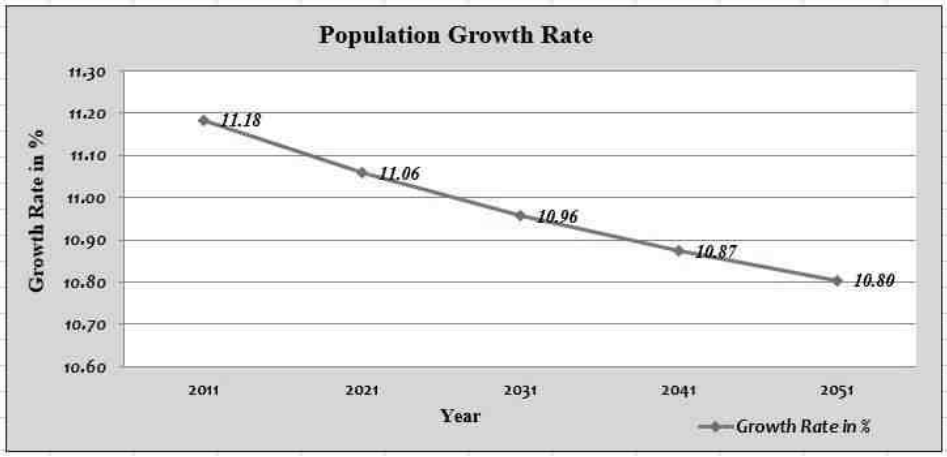


Fig.3.42 Graph Showing Population Growth Rate

Planning Analysis:

Calculating Growth Rates

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

Where:

PR=Percent Rate

$V_{Present}$ =Present or Future Value

V_{Past} = Past or Present Value

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

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

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

3.15 Population Distribution and Composition of Study Area

The population as per 2011 Census records is 422704 (for 10 km radius buffer zone). Total no. of household is 48256, 44244 and 20838 respectively, in primary, secondary and tertiary zone. Sex ratio is 1014, 1012 and 1011 (females per 1000 males) observed in primary, secondary and tertiary zone respectively. SC population distribution is 19368, 37883 and 19631 respectively in primary, secondary and tertiary zone. ST population distribution is very less 351,183 and 219 respectively in primary, secondary and tertiary. Average household size is 4. Zone wise Demographic profile of study area is given in the table 3.15.1 below:

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

Table 3.66 Zone wise Demographic Profile of Study Area

Zone	No. of Villages	Total Household	Total Population	Male Population	%	Female Population	%
Primary Zone (0 - 3 Km)	13	48256	175490	87130	49.65	88360	50.35
Secondary Zone (3 - 7 Km)	17	44244	161221	80118	49.69	81103	50.31
Tertiary Zone (7 - 10 km)	27	20838	85993	42761	49.73	43232	50.27
Study Area (0-10 km)	**57**	**113338**	**422704**	**210009**	**49.68**	**212695**	**50.32**

Source: Census of India, 2011

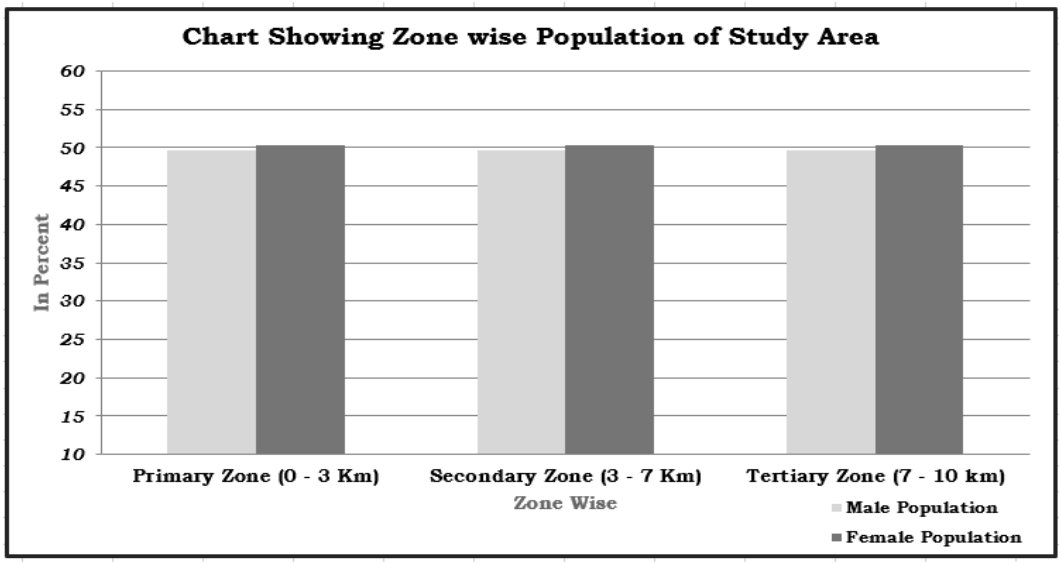


Figure 3.43 Population of study area

- ✓ Above table identifies the presence of villages and their subsequent population divided under three zones from plant boundary (i.e., Primary, secondary and tertiary zone).
- ✓ Primary zone has 13 villages where as much as 48256 households with 175490 population are located. Mostly lying on Built-up land for their livelihood and substance.
- ✓ Secondary and tertiary zone both comprise of 17 and 27 villages having a total population of 161221 and 85993 respectively.

Table 3.67 Village wise Demographic Profile of the Study Area (Core and Buffer Zone)

Sno	Name	No Household	Total Population	Male Population	Female Population	Person 0-6 yrs	Male 0-6 yrs	Female 0-6yrs	SC Persons	ST Person	Literate Person	Male Literate	Female Literate	Total Workers	Main Workers	Marginal workers	Non Workers
0-3km																	
1	Naranapuram (Part)	609	2031	987	1044	253	140	113	591	0	1217	666	551	1096	1064	32	935
2	Paranayakkanpatti	783	2715	1351	1364	274	151	123	554	0	1900	1066	834	1500	1461	39	1215
3	Tayilupatti	2704	9684	4797	4887	953	498	455	1338	111	6527	3636	2891	5419	5309	110	4265
4	Edirkottai	1203	4329	2129	2200	465	254	211	331	0	3086	1656	1430	2327	2014	313	2002
5	Kongankulam	318	1050	507	543	87	44	43	138	0	761	409	352	595	591	4	455
6	Kundayiruppu	1846	6812	3365	3447	852	424	428	1677	0	4602	2498	2104	3584	3113	471	3228
7	Lakshmipuram	1603	5610	2771	2839	577	251	326	1327	5	3847	2156	1691	2948	2768	180	2662
8	Sivakasi (M)	18952	71040	35356	35684	6963	3474	3489	5933	180	56565	29574	26991	29342	28774	568	41698
9	Alangulam (CT)	1364	4930	2475	2455	456	236	220	807	1	3809	2052	1757	2183	1968	215	2747
10	T. Karisalkulam	128	438	222	216	43	25	18	0	0	223	141	82	257	257	0	181
11	Viswanatham (CT)	7134	25555	12773	12782	2770	1410	1360	3672	10	18040	9843	8197	12703	12399	304	12852
12	Sithurajapuram (CT)	4728	16860	8337	8523	1748	875	873	858	36	12567	6665	5902	8086	7199	887	8774
13	Anaiyur (CT)	6884	24436	12060	12376	2620	1349	1271	2142	8	17469	9344	8125	11510	10702	808	12926
	Total	**48256**	**175490**	**87130**	**88360**	**18061**	**9131**	**8930**	**19368**	**351**	**130613**	**69706**	**60907**	**81550**	**77619**	**3931**	**93940**
3-7km																	
1	Injar	1901	7386	3637	3749	739	377	362	1028	0	5068	2754	2314	3221	3072	149	4165
2	Thiruthangal (Part)	2604	9504	4743	4761	1012	495	517	1505	17	7115	3810	3305	4459	4286	173	5045
3	Kiltiruthangal (Part)	1525	5439	2698	2741	631	317	314	2102	0	3576	1966	1610	2855	2696	159	2584
4	Duraiswamipuram	2332	8642	4270	4372	901	442	459	3028	0	5597	3111	2486	4788	4101	687	3854
5	Nadukkudi	1348	4797	2383	2414	575	296	279	2439	0	3122	1717	1405	2752	2483	269	2045
6	Vettilaiyurani	1285	4773	2352	2421	531	255	276	1979	0	3357	1822	1535	2509	2041	468	2264
7	Subramaniyapuram	544	1879	914	965	209	111	98	222	0	1166	636	530	997	853	144	882
8	Vijayarengapuram	793	2977	1471	1506	400	197	203	1455	0	1832	1036	796	1768	1734	34	1209
9	Kangaraseval	429	1627	790	837	180	96	84	408	0	1047	561	486	919	891	28	708
10	Vembakottai	1196	4478	2225	2253	573	285	288	756	0	3128	1714	1414	2353	2046	307	2125
11	Vijayakarisalkulam	1055	3981	2023	1958	485	255	230	298	0	2492	1441	1051	2188	2129	59	1793
12	Kilanmarinadu	637	2388	1190	1198	252	116	136	525	0	1614	914	700	1226	1065	161	1162
13	Thiruthangal (M)	15424	55362	27676	27686	5918	3046	2872	11567	103	39800	21660	18140	27159	25291	1868	28203
14	Anuppankulam (CT)	3679	13526	6753	6773	1431	740	691	4301	7	9377	5146	4231	7272	6954	318	6254
15	Naranapuram (CT)	3303	11665	5766	5899	1376	685	691	1372	2	7979	4336	3643	6268	6160	108	5397
16	Sengamalanachiarpatti (CT)	3614	13811	6740	7071	1443	721	722	2579	14	10509	5408	5101	6221	6024	197	7590
17	Keelrajakularaman	2575	8986	4487	4499	817	413	404	2319	40	6302	3459	2843	4306	3878	428	4680
	Total	**44244**	**161221**	**80118**	**81103**	**17473**	**8847**	**8626**	**37883**	**183**	**113081**	**61491**	**51590**	**81261**	**75704**	**5557**	**79960**
7-10km																	
1	Vendurayapuram	661	2383	1195	1188	285	155	130	528	0	1445	837	608	1293	1232	61	1090
2	Sindapalli	690	2481	1225	1256	311	159	152	1676	0	1651	929	722	1413	1355	58	1068
3	Salvarpatti	1029	3563	1776	1787	453	232	221	340	0	2067	1192	875	2098	2041	57	1465
4	Panaiyadippatti	848	3005	1507	1498	299	156	143	873	0	2111	1177	934	1783	1723	60	1222
5	Appanayakkanpatti	1017	4594	2135	2459	379	202	177	1086	0	3291	1620	1671	2382	2222	160	2212
6	Anaikkuttam	394	1292	629	663	147	71	76	108	0	837	459	378	781	751	30	511
7	A. Meenachipuram	377	1359	695	664	149	90	59	248	0	914	513	401	751	694	57	608
8	Kariseri	652	2409	1194	1215	296	132	164	565	0	1470	829	641	1347	1280	67	1062
9	Thlukkankurichchi	655	2294	1116	1178	269	135	134	143	0	1409	781	628	1398	1263	135	896
10	Sevalpatti	1316	4806	2438	2368	569	288	281	579	21	3098	1795	1303	2702	2633	69	2104
11	Pandappuli	1585	5954	2950	3004	540	278	262	2306	0	4351	2378	1973	3299	3069	230	2655

12	Kalingappatti (Subhaiapuram)	1775	6537	3242	3295	641	330	311	1573	24	4347	2429	1918	3374	3048	326	3163
13	Tenkarai	272	918	454	464	93	49	44	296	0	683	363	320	572	567	5	346
14	Korukkampatti	521	1935	997	938	196	103	93	1470	0	1156	663	493	1100	1064	36	835
15	Nathampatti	590	2143	1093	1050	209	117	92	467	0	1460	853	607	1018	873	145	1125
16	Vadagarai	992	3454	1720	1734	316	156	160	91	0	2539	1413	1126	1749	1710	39	1705
17	Gopalapuram	423	1461	708	753	128	61	67	385	0	1051	572	479	806	370	436	655
18	Varagunaramapuram	385	1357	696	661	142	67	75	97	0	823	489	334	787	781	6	570
19	Kuruchiyarpatti	205	741	361	380	62	30	32	115	0	588	315	273	413	380	33	328
20	Melarajakularaman (Part)	5238	16652	8394	8258	1617	843	774	2978	96	12060	6744	5316	8945	8490	455	7707
21	Rajagopalapuram	201	919	469	450	120	74	46	31	0	692	377	315	577	477	100	342
22	Vadapatti	1012	3459	1698	1761	377	186	191	11	0	2293	1301	992	1866	1836	30	1593
23	Rengasamudram	119	388	192	196	36	24	12	14	0	182	97	85	225	222	3	163
24	Chattrappatti	403	1420	699	721	151	69	82	800	0	1020	562	458	846	846	0	574
25	Kulasekarapperi	171	645	327	318	53	25	28	0	0	416	239	177	401	389	12	244
26	Ramalingapuram	501	1487	707	780	161	71	90	570	0	1046	566	480	838	518	320	649
27	Thiruvenkadam (TP)	2368	8337	4144	4193	865	454	411	2281	78	5866	3234	2632	4183	3697	486	4154
	Total	**24400**	**85993**	**42761**	**43232**	**8864**	**4557**	**4307**	**19631**	**219**	**58866**	**32727**	**26139**	**46947**	**43531**	**3416**	**39046**
	G.Total	**116900**	**422704**	**210009**	**212695**	**44398**	**22535**	**21863**	**76882**	**753**	**302560**	**163924**	**138636**	**209758**	**196854**	**12904**	**212946**

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

3.16 Gender and Sex Ratio

Sex ratio is used to describe the number of females per 1000 of males. Sex ratio is a valuable source for finding the population of women in India and what is the ratio of women to that of men in India. In the Population Census of 2011, it was revealed that the population ratio in India 2011 is 940 females per 1000 of males. The study area has 1013 females per 1000 males. Gender and sex ratio determine the Human Development Index (HDI) of an area thereby understanding the status of women in that region. Following table entails information about sex ratio of 57 villages lying in study area (buffer zone) as primary, secondary and tertiary zone.

Table 3.68 Sex ratio of the study area

S. No.	Buffer Zone	Sex Ratio of Study area Female/ 1000 Male
1	Primary Zone (0-3 km)	1014
2	Secondary zone (3-7 km)	1012
3	Tertiary Zone (7-10 km)	1011

Source: Census of India, 2011

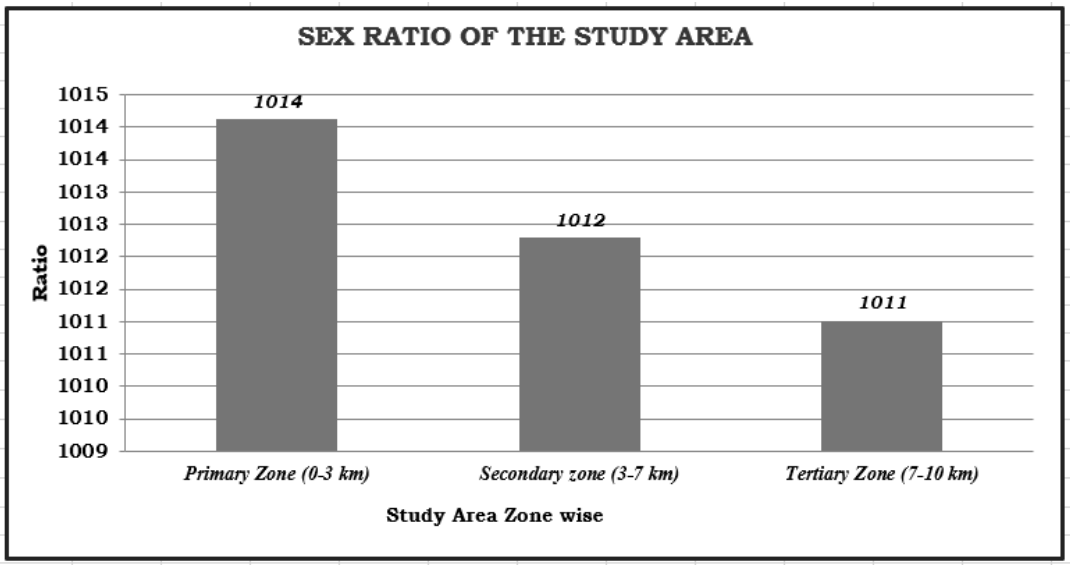


Figure 3.44 Sex Ratio within 10 Km study area

Table 3.69 Child Sex ratio of the study area

S. No.	Buffer Zone	Sex Ratio of Study area Female/ 1000 Male
1	Primary Zone (0-3 km)	978
2	Secondary zone (3-7 km)	975
3	Tertiary Zone (7-10 km)	945

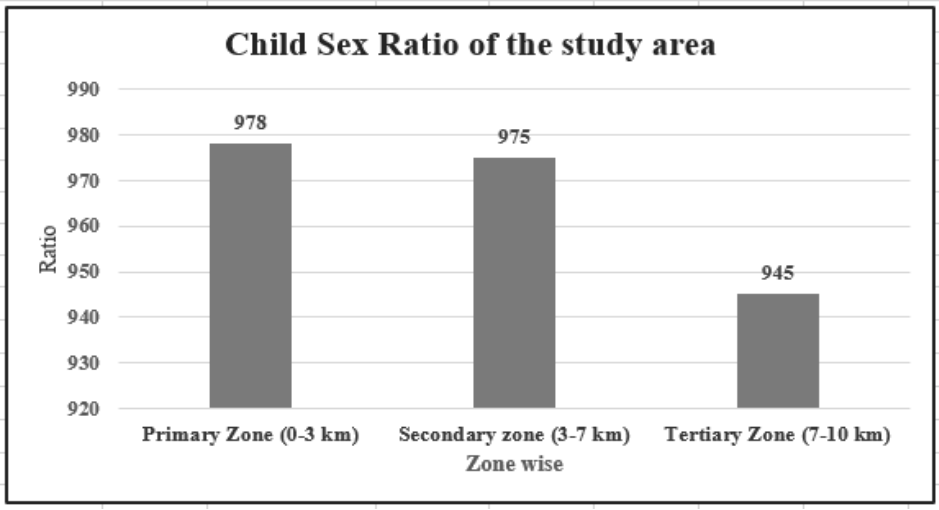


Figure 3.45 Child Sex Ratio within 10 Km study area

3.17 Literacy Rate in Study Area

Literacy Rate is the percentage of people in a country with the ability to read and write. The analysis of the literacy levels is done in the study area. The 10 km radius of study area demonstrates a literacy rate of 80% as per census data 2011. The male literacy rate in the study area indicates 87% whereas the female literacy rate, which is an important indicator for social change, is observed to be 73% as per the census data 2011. This needs to focus on the study area and enhance further development focusing on education. (Table no 3.60).

Table 3.70 Literacy Rate of the Study Area

Zone	No. of Villages	Male Literacy Population	Male literacy Rate	Female Literacy Population	Female literacy Rate	Total Literacy	Total Literacy Rate
Primary Zone (0 - 3 Km)	13	**69706**	89.37	**60907**	76.68	**130613**	82.97
Secondary Zone (3 - 7 Km)	17	**61491**	86.28	**51590**	71.18	**113081**	78.67
Tertiary Zone (7 - 10 Km)	27	**32727**	85.66	**26139**	67.15	**58866**	76.32
Study Area (0-10km)	**57**	**163924**	**87.44**	**138636**	**72.65**	**302560**	**79.98**

Source: Census of India, 2011

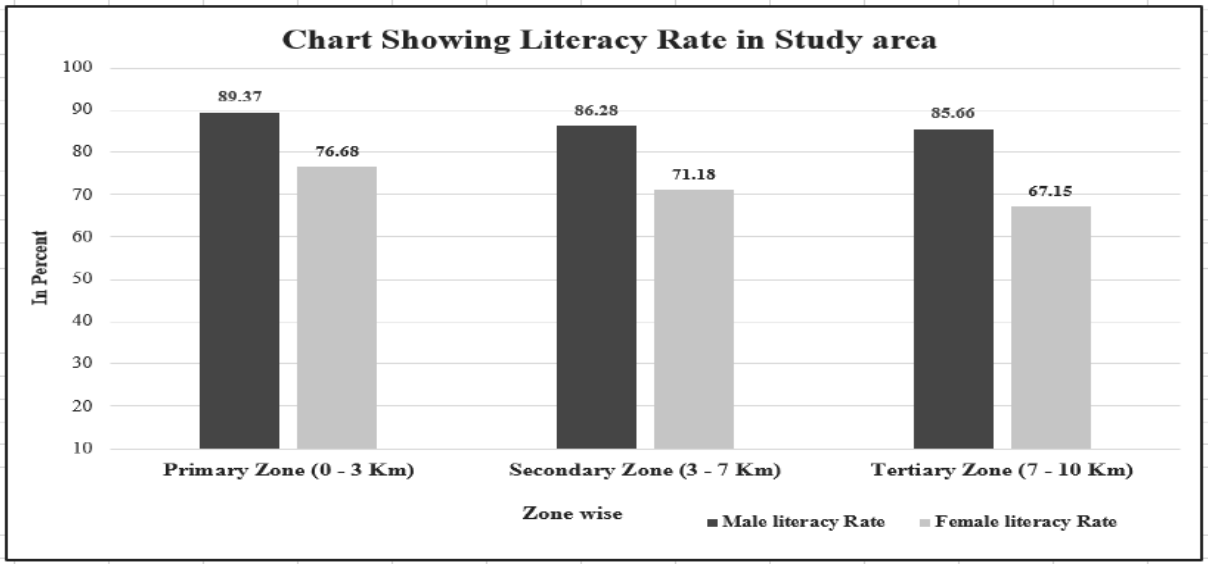


Figure 3.46 Gender wise Literacy Rate in the study area

3.18 Family Size

Size of family also describes about family functioning, resource consumption, total income generated and their expenditure pattern. Census 2011 data suggests that most of these households have a family size of up to 4 members, knowing the size of family also give fair understanding of relating how much resource consumption is being incurred, and annual income being generated and spent.

3.19 Vulnerable Group

While developing an action plan, it is very important to identify the population who fall under the marginalized and vulnerable groups and special attention has to be given towards these groups while making action plans. Special provisions should be made for them. In the observed villages schedule caste (SC) population is 18.19% and Schedule Tribe population 0.18 %, Other Population is 82% in total study area.

Table 3.71 Vulnerable groups of the study area

Zone	No. of Villages	Vulnerable Groups					
		SC Population	%	ST Population	%	Other Population	%
Primary Zone (0 - 3 Km)	13	19368	11.04	351	0.20	155771	88.76
Secondary Zone (3 - 7 Km)	17	37883	23.50	183	0.11	123155	76.39
Tertiary Zone (7 - 10 Km)	27	19631	22.83	219	0.25	66143	76.92
Total area (10km)	**57**	**76882**	**18.19**	**753**	**0.18**	**345069**	**81.63**

Source: Census of India, 2011

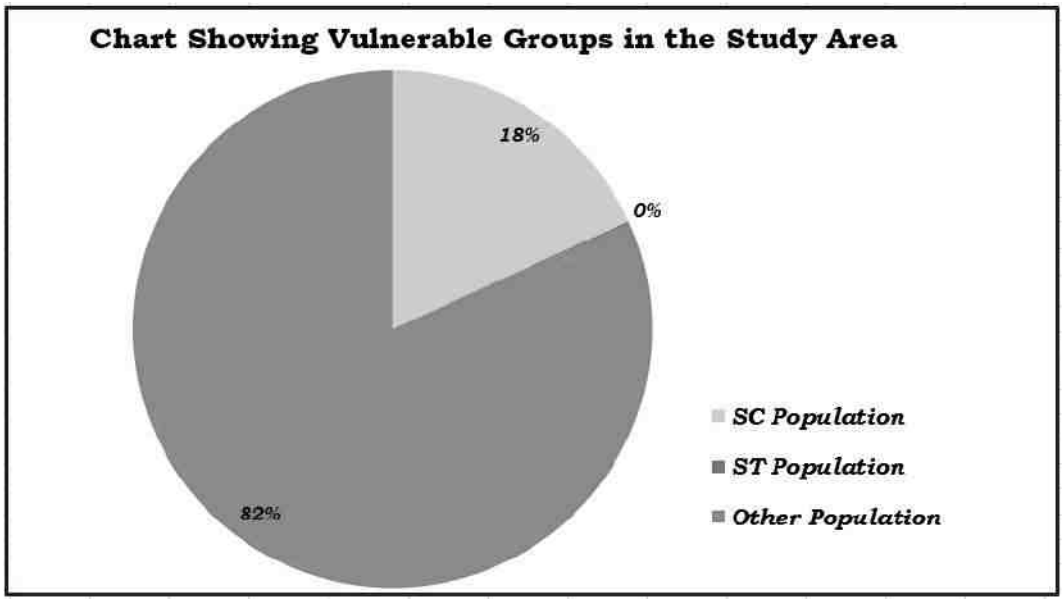


Figure 3.47 vulnerable groups

3.20 Economic Activities

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

Table 3.72 Shows the work force of the study area

Zone	No. of Villages	Total Workers	%	Main Workers	%	Marginal Workers	%	Non-Workers	%
Primary Zone (0 - 3 Km)	13	81550	46.47	77619	44.23	3931	2.24	93940	53.53
Secondary Zone (3 - 7 Km)	17	81261	50.40	75704	46.96	5557	3.45	79960	49.60
Tertiary Zone (7 - 10 Km)	27	46947	54.59	43531	50.62	3416	3.97	39046	45.41
Study Area (10 Km)	**57**	**209758**	**49.62**	**196854**	**46.57**	**12904**	**3.05**	**212946**	**50.38**

Source: Census of India, 2011

The above table shows that out of the total working population, the percentage of main workers is 47% while 3 % are marginal workers. Number of working populations is 50% and non-working population is 50% in the study area. As per the data obtained from the survey (as mentioned previously in occupational structure) most of these people are employed for major period of the year. Also, to mention the natural environment also restricts the people in finding stable business is performed for only certain months. Thus, proposed project will act as possible exposure for them to get enrol and earn sustain livelihood.

Figure 3.48 Working population in the study area

3.21 Infrastructure Base

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

The significant features of these important parameters for each study area are discussed as follows:

(a) **Education Facilities**: In the study area, education is available from Primary School to Degree collage. Higher education facilities including colleges and other diploma courses are available at Virudhunagar and Sivakasi taluks a distance of 10-15 km respectively from the project site.

(b) **Medical Facilities**: There are only 20 villages had health facilities e.g., Community Health Centre, PHC, sub health centers, Maternity and Child Welfare Centre within the study area. Hospitals and other better medical facilities were available at Sivakasi city.

(c) **Drinking Water**: The main water supply in the surveyed villages is through tap water, hand pump, well and tube well is the main sources of drinking water in the region.

(d) **Power Supply**: All villages are accessed with electricity supply.

(e) **Transportation**: For transportation purpose Government bus Auto and Taxi Service are available in the study area. Transportation facilities were not frequently available in the region. Private vehicles like Bicycles and Motor cycles were mostly used by villagers for transportation purpose.

(f) **Communication Facilities**: For communication purpose mainly Sub post office, Telephone, Mobile phones and newspaper are available in most of the villages.

(g) **Agriculture**: Most of the respondents are engaged in labour work, agriculture, and livestock activities.; a few respondents service in government sectors. Most of the respondents are labours and others are trying to migrate towards other city places.

(h) **Houses**: Most of the houses are pakka and Semi pakka with good construction in the study area.

(i) **Employment**: Main occupations of the people in the study area are labour work and agriculture. The labours were getting daily wage in the range of Rs. 500-600, depending on the type of work involved

(j) **Fuel**: The primary source of cooking fuel is LPG and wood. Kerosene is also been as per the requirement.

(k) **Main Crops**: The principal crops grown in agricultural farm are paddy, corn, chili, cotton etc.

(l) **Language**: The official language of Tamil Nadu is Tamil. The most widely spoken language within the study area is Tamil and English

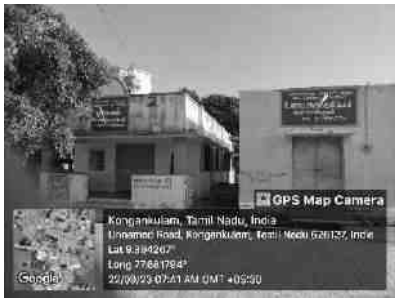
(m) **Migration**: During survey it was found that local population were migrating maximum towards the Virudhunagar city as a purpose of employment and some to other states.

(n) **Sanitation**: Systems of individual and combined septic tanks are in use at some places of this Study area. Toilet facility is one of the most basic facilities required in a house. Most of the households were having toilet facilities in their houses. There was no proper drainage line in the villages

(o) **Road Connectivity**: Most of the roads are tar and connects to the villages. Both tar and gravel roads were commonly seen in the villages.

(p) **Market Facility**: Study area was predominantly semi urban type. In villages, small shops were available for daily needs. Weekly market facility was available in some villages. Wholesale markets were available at town place. Virudhunagar and Sivakasi main centre for all type of facilities in the area.

(q) **Recreation**: Temples, Samaj Bhawan, Television are the main recreation facilities in the study area. Newspaper/Magazine is also used by the villagers.



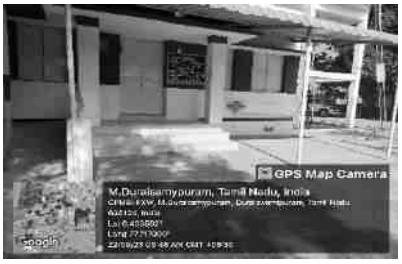


FIGURE. 3.49 INFRASTRUCTURE FACILTIES IN THE STUDY AREA

3.22 Basic amenities

Table 3.73 Educational Facilities in the Surveyed Area

Zone	No. of Ward/Villages	Govt Primary School	Private Primary School	Govt Middle School	Private Middle School	Govt Secondary School	Private Secondary School	Govt Senior Secondary School	Govt Arts and Science Degree College (Numbers)
Primary Zone (0 - 3 Km)	13	34	25	14	12	9	8	5	0
Secondary Zone (3-7km)	17	59	23	35	13	19	8	8	0
Tertiay Zone (7-10km)	27	61	25	20	4	9	3	6	0
Study Area (10 Km)	**57**	**154**	**73**	**69**	**29**	**37**	**19**	**19**	**0**

Source: DCHP Census 2011, Tamil Nadu

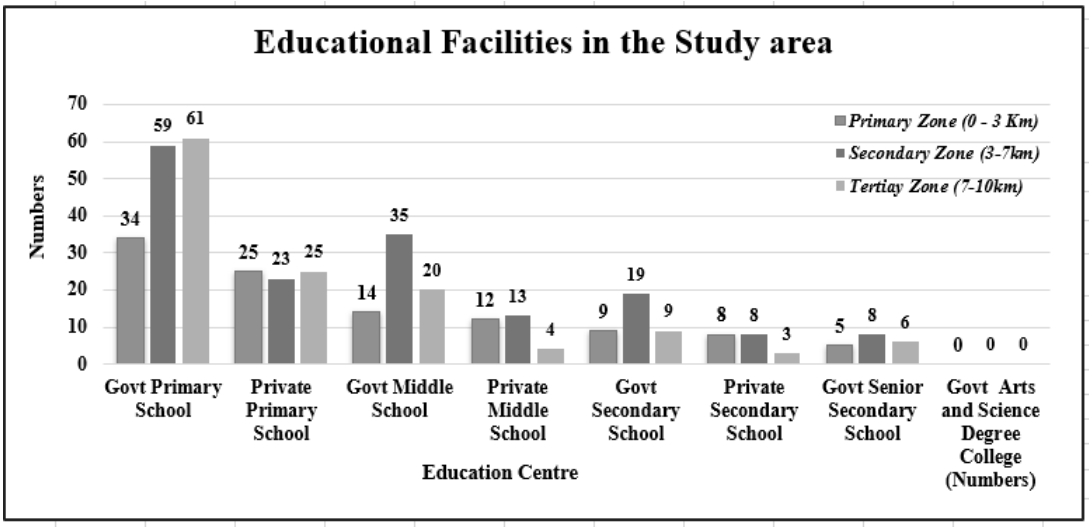


Fig.3.49 Educational facilities in the study area

Figure. 3.50 Photo showing Educational facilties in the study area

Table.3.74 Health/ Medical Facilities in the Surveyed Area

Health/ Medical Facilities in the Surveyed Area										
Zone	**No. of Villages**	**Community Healthcare Centre**	**PHC/GH**	**Primary Health Sub Centre**	**Maternity Child welfare Centre**	**Hospital Allopathic**	**Dispensary/Health centres**	**Vetrinary Hospital**	**Family welfare centres**	**Non-Government Medical Shop**
Primary Zone (0 - 3Km)	13	0	1	8	4	1	**4**	3	2	72
Secondary Zone (3-7Km)	17	1	2	13	7	1	**5**	5	4	28
Tertiay Zone (7-10km)	27	0	0	3	16	6	**1**	4	4	7
Study Area (10 Km)	**57**	**1**	**3**	**24**	**27**	**8**	**10**	**12**	**10**	**107**

Source: DCHP Census 2011, Tamil Nadu

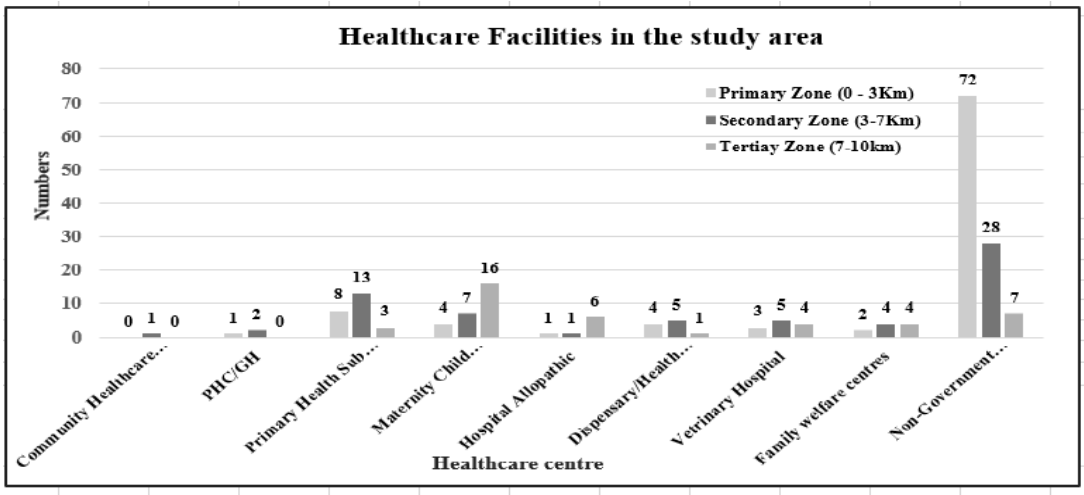


Fig.3.51 Healthcare facilities in the study area

Figure. 3.52 Photo showing Medical facilties in the study area

Table.3.75 Drinking Water Facilities in the Surveyed Area

Drinking Water Facilities in the Surveyed Area										
Zone	**No of Villages**	**TWTS**	**TWUS**	**Covered well**	**Uncovered Well**	**Handpump**	**Tubewell/Borehole**	**Spring**	**R/C**	**T/P/L**
Primary Zone (0 - 3 Km)	13	8	8	2	3	5	6	0	1	1
Secondary Zone (3 - 7 Km)	17	13	13	2	6	11	12	2	0	0
Outer Zone (7 - 10 Km)	27	30	29	7	11	15	22	3	1	0
Study Area (10 km)	**57**	**51**	**50**	**11**	**20**	**31**	**40**	**5**	**2**	**1**

Source: DCHP Census 2011, Tamil Nadu. Index: TWTS- Tap Water-Treated, TWUS- Tap Water Untreated, R/C-River/Canal, T/P/L- Tank/Pond/Lake

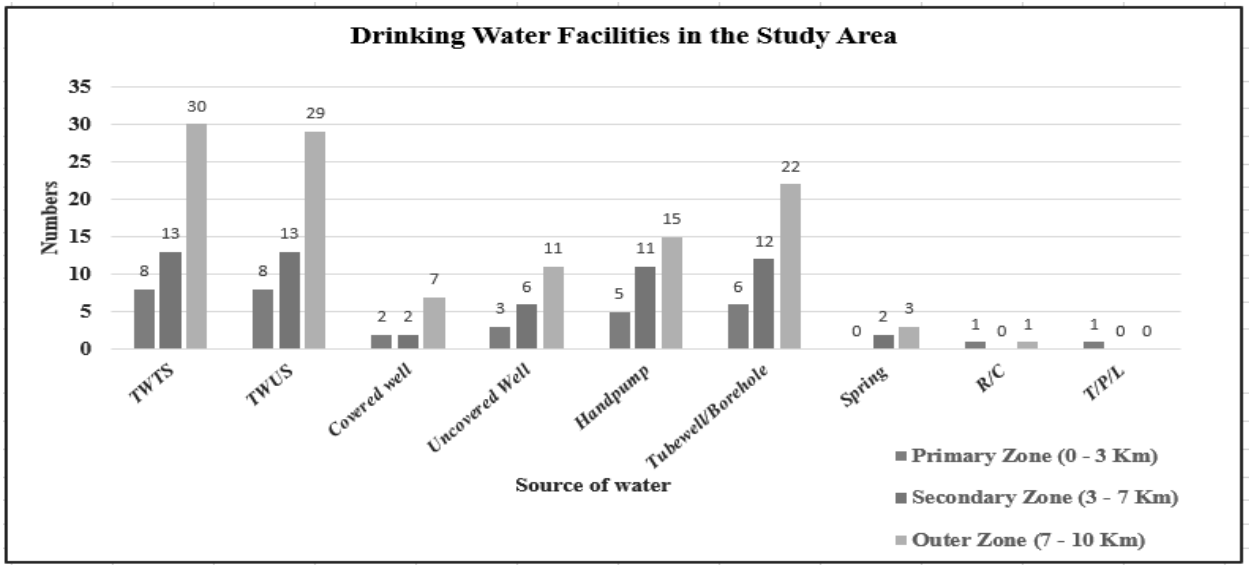


Fig.3.53 Drinking water facilities in the study area

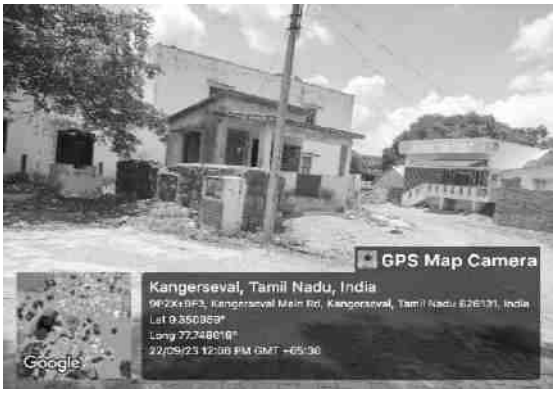


Table. 3.76 Drainage Pattern the Surveyed Area

Drainage Pattern the Surveyed Area							
Zone	**No of Villages**	**Closed Drainage**	**Open Drainage**	**No Drainage**	**Open Pucca Drainage Covered with Tiles Slabs**	**Open Pucca Drainage Uncovered**	**Open Kuccha Drainage**
Primary Zone (0 - 3 Km)	13	7	7	8	0	7	4
Secondary Zone (3 - 7 Km)	17	13	13	13	1	13	6
Outer Zone (7 - 10 Km)	27	24	26	26	0	27	14
Study Area (10 km)	**57**	**44**	**46**	**47**	**1**	**47**	**24**

Source: DCHP Census 2011, Tamil Nadu.

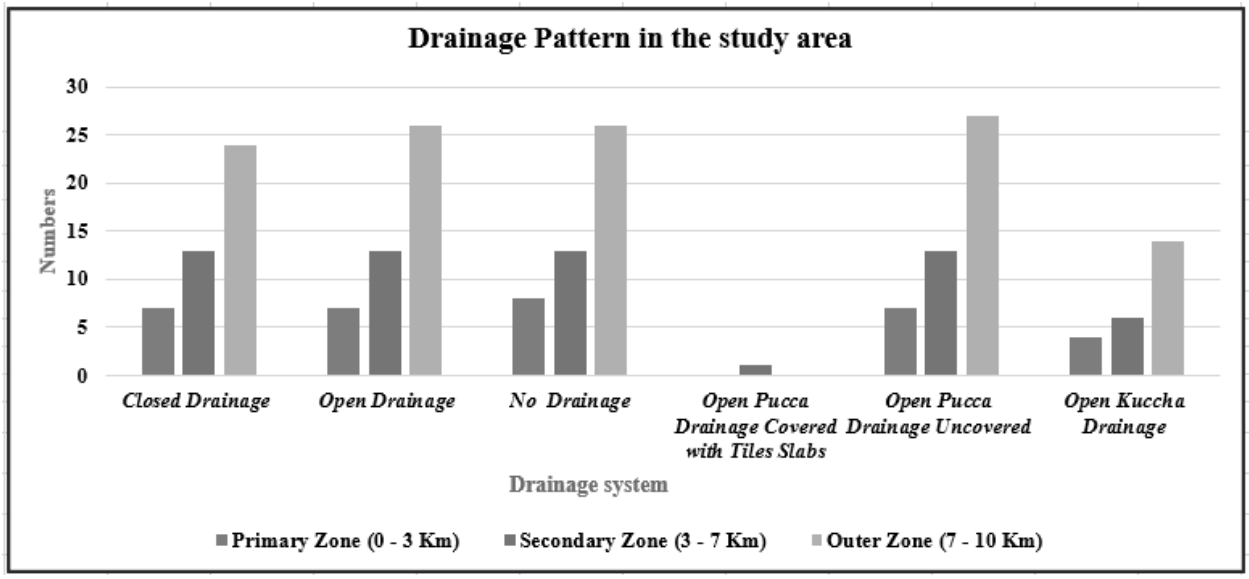
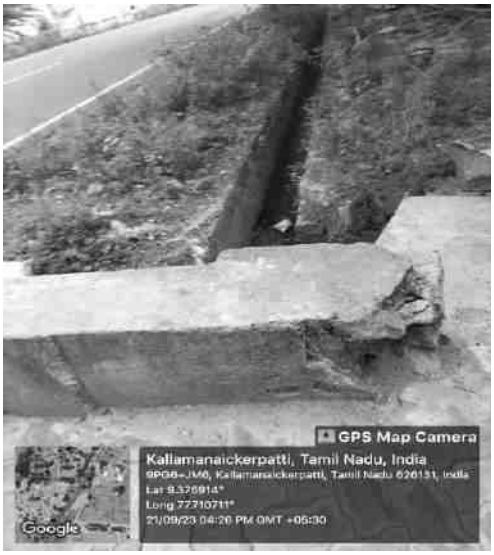
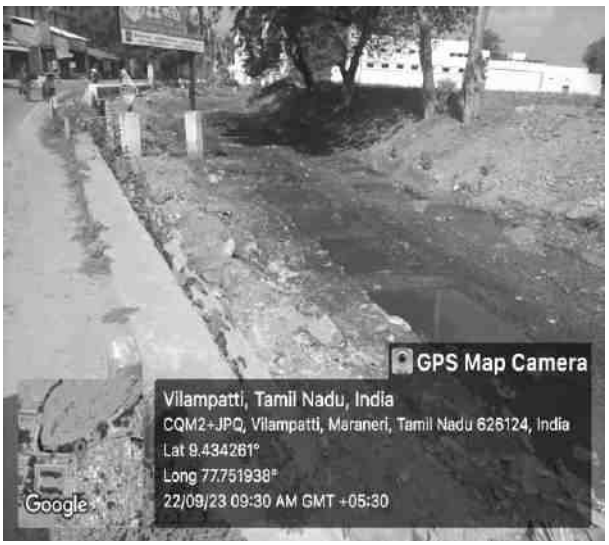


Fig. 3.54 Drainage status in the study area





3.22. Other Issues in the Study Area

1. Deforestation of Land (Cutting Trees or Plant etc.)
2. Agriculture Land decreases
3. Lack of awareness among vulnerable groups for their welfare
4. Medical/Clinic facilities and PHC need for the Core area
5. Environmental clean with solid wastage pin each village.
6. Proper functioning of Hospital facilities in the study area.
7. Need Highschool facilities in the study area.
8. Need proper drainage system with public toilet men and women separately.
9. Avoid Road damage during carriage by mine vehicles (tipper Lorry).
10. Use sprinkler water when loading mine materials, to avoid water pollution during dust emission.

3.23 Interpretation

Based on the data, following inferences could be drawn:

- Total literacy rate in the study area is 80%.

- The study area had average educational facilities. The overall status depicts that the education is limited to primary and middle level.
- The schedule tribe community forms 0.18% and Scheduled Caste forms 18% of the total population of study area.
- The Other Population forms 82% of the total population of study area.
- The study area is well connected by Taluk/Village Road.
- The study area not well health facilities of primary level.
- Considering the above facts, the proposed project will boost the socio-economic development activities in the area and hence will leave positive impact.
- The study area has mobile connectivity.

3.24 Conclusion

The socio-economic study of surveyed villages gives a clear picture of its population, average household size, literacy rate and sex ratio etc. It is also found that a part of population is suffering from lack of permanent job to run their day-to-day life. Their expectation is to earn some income for their sustainability on a long-term basis. The proposed project will aim to provide preferential employment to the local people there by improving the employment opportunity in the area and in turn the social standards will improve. The nearby villages within 5kms radius have PHC, Anganwadi school, post office, telegram, Government and Private school, bus connectivity besides. Hence it can be concluded that the present baseline environment status of the study area will not be affected by the proposed project.

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

4. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

4.0 GENERAL

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

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

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

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

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

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

4.1 LAND ENVIRONMENT

4.1.2 Anticipated Impact from Proposed Project

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

4.1.3 Common Mitigation Measures for Proposed Project

- The mining activity will be gradual confined in blocks and excavation will be undertaken progressively along with other mitigative measures like phase wise development of greenbelt etc.
- Construction of garland drains all around the quarry pits and construction of check dam at strategic location in lower elevations to prevent erosion due to surface runoff during rainfall and also to collect the storm water for various uses within the proposed area
- Green belt development along the boundary within safety zone. The small quantity of water stored in the mined-out pit will be used for greenbelt
- Thick plantation will be carried out on unutilized area, top benches of mined out pits, on safety barrier, etc.,
- At conceptual stage, the land use pattern of the quarry will be changed into Greenbelt area and temporary reservoir
- In terms of aesthetics, natural vegetation surrounding the quarry will be retained (such as in a buffer area i.e., 7.5 m safety barrier and other safety provided) so as to help minimise dust emissions.
- Proper fencing will be carried out at the conceptual stage, Security will be posted round the clock, to prevent inherent entry of the public and cattle.

4.1.4 Soil Environment

P1 - The topsoil is black soil and it occurs to a depth of 1m. Topsoil generated is about 4560 Ts will be generation during the present plan period. Topsoil generated during present plan period will be utilized for afforestation purposes.

P2 – There is no topsoil generated during this plan period.

4.1.5 Impact on Soil Environment from Proposed Project

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

4.1.6 Common Mitigation Measures for Proposed Project

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

4.1.7 Waste Dump Management

The generated total Mineral rejects are about 4,61,853 Ts (P1-211023 ts & p2- 4,61,853 ts) during this RoMP period. The waste will be loaded manually into tippers and occasionally loaded by excavators for transporting it to the dump yard and backfill area. Labors will be provided with mine helmet, safety shoes and respirator. During rainy seasons mine workings will be restricted in the top benches, the seepage water and rain water will be drained by 5HP portable pumps.

4.2 WATER ENVIRONMENT

4.2.1 Anticipated Impact from Proposed Project

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

Detail of water requirements in KLD as given below:

TABLE 4.1: WATER REQUIREMENTS P1-P2

Purpose	Fresh water	Waste water	Disposal
Dust Suppression	3.0 KLD	1.6	Rainwater accumulated in Mine Pit
Green Belt development	15.0 KLD	0	Rainwater accumulated in Mine Pit
Domestic purpose	5.0 KLD	0	Rainwater accumulated in Mine Pit
Total	**23.0 KLD**	**1.6 KLD**	

Source: Pre-Feasibility Report.

4.2.2 Common Mitigation Measures for Proposed Projects

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

4.3 AIR ENVIRONMENT

4.3.1. Anticipated Impact from Proposed Projects

- During mining, at various stages activities 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.

4.3.2 Modelling of Incremental Concentration from Proposed Projects

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 Limestone, 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 projects 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 limestone, 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 two proposed quarries. Air environment and net increase in emissions by Open pit source modelling in AERMOD Software.

4.3.3 Emission Estimation

An emissions factor is a representative value that attempts to relate the quantity of a pollutant released to the atmosphere with an activity associated with the release of that pollutant.
The general equation for emissions estimation is:

E = A x EF x (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 Limestone. These activities have been analysed systematically basing on USEPA-Emission Estimation Technique Manual, for Mining AP-42, to arrive at possible emissions to the atmosphere and estimated emissions are given in Table 4-2.

TABLE 4.2: ESTIMATED EMISSION RATE FOR PM_{10}-P1

Activity	Source type	Value	Unit
Drilling	Point Source	0.156718100	g/s
Blasting	Point Source	0.022867055	g/s
Mineral Loading	Point Source	0.051158147	g/s
Haul Road	Line Source	0.002546379	g/s
Overall Mine	Area Source	0.382346586	g/s
So2	Area Source	0.006135127	g/s
Nox	Area Source	0.018304265	g/s

TABLE 4.3: ESTIMATED EMISSION RATE FOR PM_{10}-P2

Activity	Source type	Value	Unit
Drilling	Point Source	0.166037279	g/s
Blasting	Point Source	0.030524074	g/s
Mineral Loading	Point Source	0.051987651	g/s
Haul Road	Line Source	0.002557585	g/s
Overall Mine	Area Source	0.464705364	g/s
So2	Area Source	0.007353627	g/s
Nox	Area Source	0.032157611	g/s

4.3.4 Frame work of Computation & Model details

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

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

FIGURE 4.1: AERMOD TERRAIN MAP

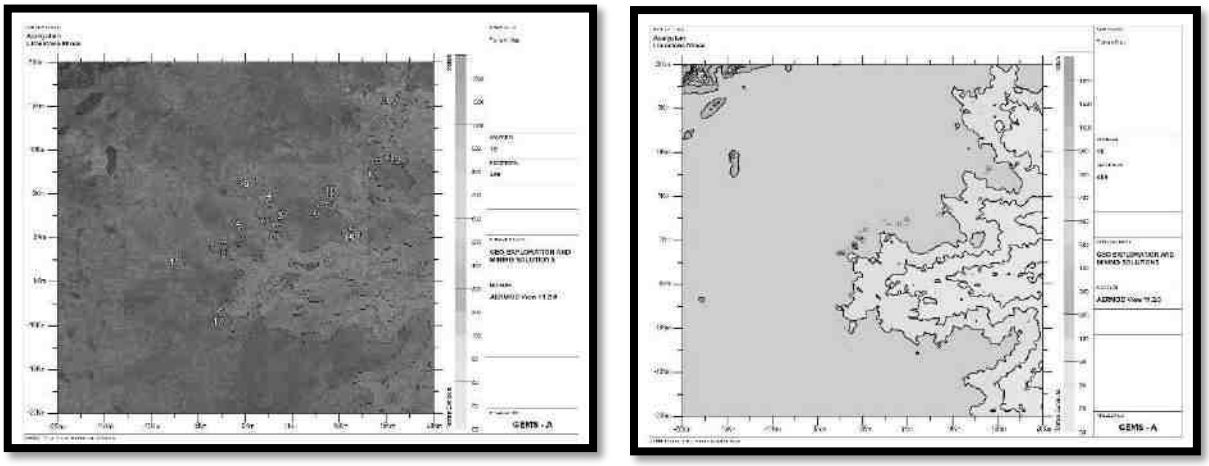


FIGURE 4.2: PREDICTED INCREMENTAL CONCENTRATION OF PM_{10}

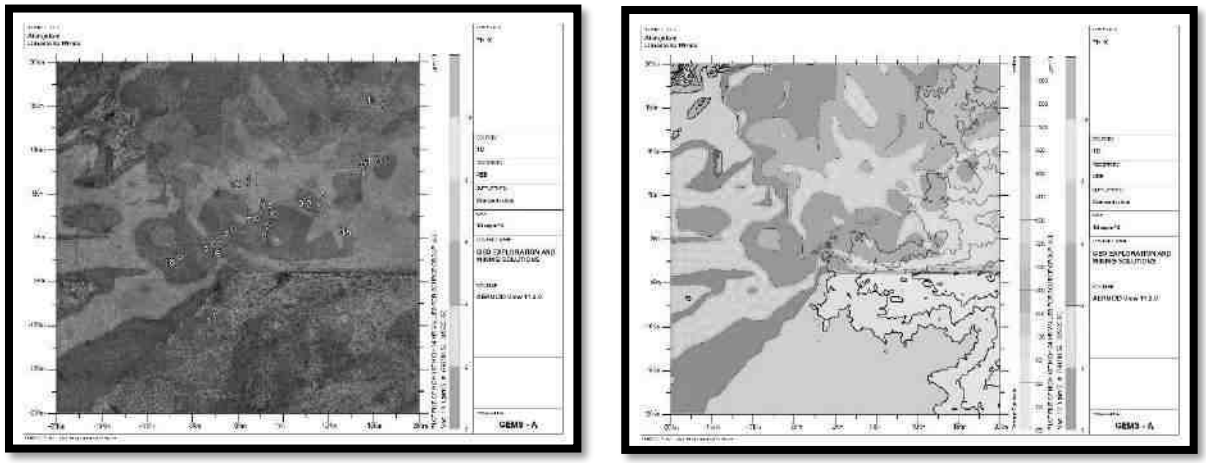


FIGURE 4.3: PREDICTED INCREMENTAL CONCENTRATION OF SO_2

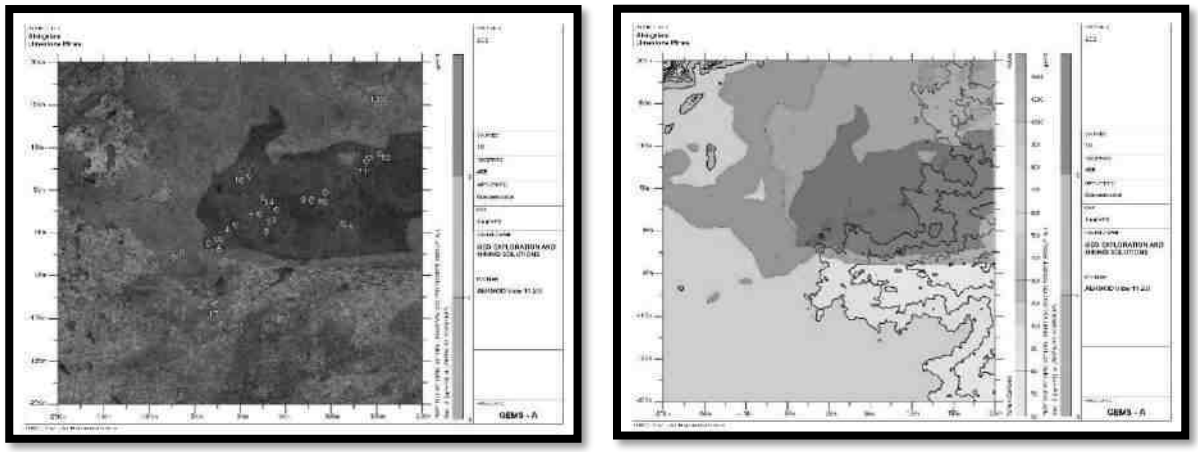


FIGURE 4.4: PREDICTED INCREMENTAL CONCENTRATION OF NO_X

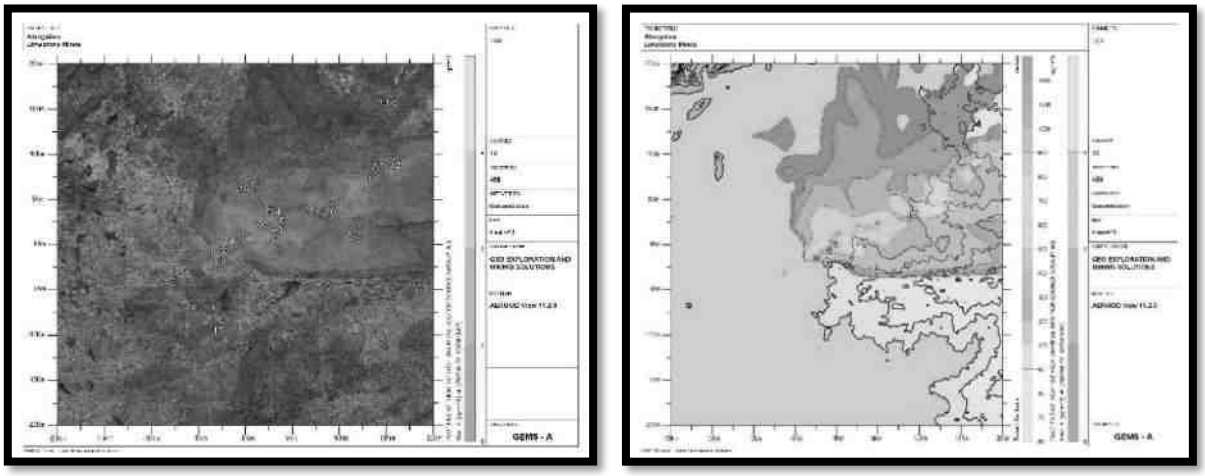
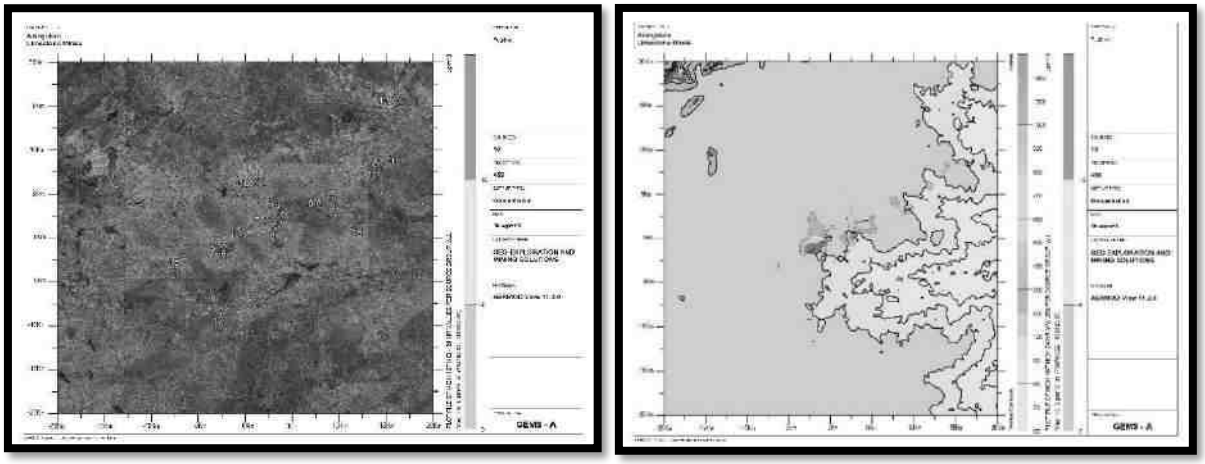


FIGURE 4.5: PREDICTED INCREMENTAL CONCENTRATION OF FUGITIVE DUST



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

TABLE 4.4: INCREMENTAL & RESULTANT

Particular	Concentration (µg/m³)			CPCB NAAQS Standards (µg/m³)
	Baseline	Incremental	Resultant	
PM10	43.0	10.47	53.47	100
PM2.5	23.5	6.23	29.73	60
SO_2	6.8	2.12	8.92	80
NOx	24.0	4.35	28.35	80

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, 60,80 & 80 µg/m³ for PM_{10}, PM_{25} SO_2 & NO_X respectively. By adopting suitable mitigation measures, the pollutant levels in the atmosphere can be further being controlled.

4.3.6 Common Mitigation Measures for Proposed Project

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 Impact from Proposed Project

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

- Source data
- Receptor data
- Attenuation factor

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

TABLE 4.10: ACTIVITY AND NOISE LEVEL PRODUCED BY MACHINERY

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

*50 feet from source = 15.24 meters

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

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

TABLE 4.5: PREDICTED NOISE INCREMENTAL VALUES

Location ID	**N1**	**N2**	**N3**	**N4**	**N5**	**N6**	**N7**	**N8**	**N9**	**N10**
Maximum Monitored Value (Day) dB(A)	45.6	44.5	46.3	49.7	45.2	46.30	45.90	43.20	44.9	47.3
Incremental Value dB(A)	66.1	62.6	60.1	60.1	58.2	59.3	41.8	37.2	48.1	46.7
Total Predicted Noise level dB(A)	66.2	62.7	60.3	60.5	58.4	59.5	47.3	44.17	49.8	50.0

Location ID	**N11**	**N12**	**N13**	**N14**	**N15**	**N16**	**N17**	**N18**
Maximum Monitored Value (Day) dB(A)	47.1	45.3	45.6	43.6	42.3	43.6	43.6	43.1
Incremental Value dB(A)	-55.0	-63.3	-81.4	-64.9	-74.4	-76.5	-82.4	-74.4
Total Predicted Noise level dB(A)	47.1	45.3	45.6	43.6	42.3	43.6	43.6	43.1

The incremental noise level is found within the range of 58.2– 66.1 dB (A) in Core Zone and 37.2-48.1 47.1 dB (A) in Buffer zone. The noise level at different receptors in buffer zone is lower due to the distance involved and other topographical features adding to the noise attenuation. The resultant Noise level due to monitored values and calculated values at the receptors are based on the mathematical formula considering attenuation due to Green Belt as 4.9 dB (A) the barrier effect. From the above table, it can be seen that the ambient noise levels at all the locations are within permissible limits of Industrial area (core zone) & Residential area (buffer zone) as per THE NOISE POLLUTION (REGULATION AND CONTROL) RULES, 2000 (The Principal Rules were published in the Gazette of India, vide S.O. 123(E), dated 14.2.2000 and subsequently amended vide S.O. 1046(E), dated 22.11.2000, S.O. 1088(E), dated 11.10.2002, S.O. 1569 (E), dated 19.09.2006 and S.O. 50 (E) dated 11.01.2010 under the Environment (Protection) Act, 1986.).

4.4.2 Common Mitigation Measures for Proposed Projects

The following noise mitigation measures are proposed for control of Noise

- Usage of sharp drill bits while drilling which will help in reducing noise;
- Secondary blasting will be totally avoided and hydraulic rock breaker will be used for breaking boulders;
- Controlled blasting with proper spacing, burden, stemming and optimum charge/delay will be maintained;
- The blasting will be carried out during favourable atmospheric condition and less human activity timings by using nonelectrical initiation system;
- Proper maintenance, oiling and greasing of machines will be done every week to reduce generation of noise;
- Provision of sound insulated chambers for the workers working on machines (HEMM) producing higher levels of noise;
- Silencers / mufflers will be installed in all machineries;
- Green Belt/Plantation will be developed around the project area and along the haul roads. The plantation minimizes propagation of noise;

- Personal Protective Equipment (PPE) like ear muffs/ear plugs will be provided to the operators of HEMM and persons working near HEMM and their use will be ensured though training and awareness.
- Regular medical check–up and proper training to personnel to create awareness about adverse noise level effects.

4.5 ECOLOGY AND BIODIVERSITY

4.5. Impact on the Biological Environment

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

4.5.1. Impact Identification and Evaluation

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

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

4.5.2. Impact on Flora

The proposed projects areas are undulated terrain and it is not fit for cultivation. It is mostly devoid of any considerable vegetation. The proposed projects area (core zone) does not encompass any designated forest land within it. The vegetation is very sparse and scanty. So, there will be no impact on flora from the mining operation. There will not be much contamination of soil or any other materials from the mining operation. No threatened plant species were reported in the core and buffer study area during the field survey.

4.5.2.1. Anticipated Impact on agricultural land associated with flora

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

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

4.5.3 Mitigation Measures

4.5.3.1. General Guidelines for Green Belt Development

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

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

4.5.3.2. Proposed Green Belt

Extensive green belt development will be started during the construction phase, which will continue till the operation of the plant. About 500-750 trees will be planted per hectare all around the plant, approach roads, and township premises. Locally available types of trees that are resistant to pollutants will be planted. In addition to the

above, all open spaces available within the premises will be developed as nurseries, parks, gardens, and other forms of greenery. 5 m wide greenbelt will be developed along the plant premises, as per land available.

4.5.3.3. Guidelines & Techniques for Green Belt Development

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

4.5.3.4. Development of Green Belt

Table No 4.6. List of plant species proposed for Greenbelt development

(*Source: Term of Reference-ToR)

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

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

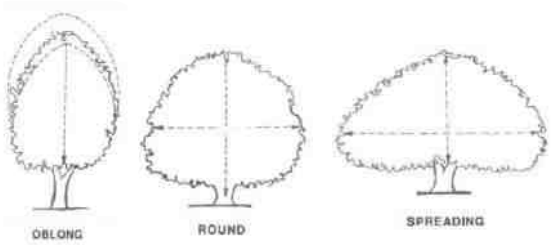
A greenbelt is a set of rows of trees planted in such a fashion, to create an effective barrier between the project and its surroundings. The greenbelt helps to capture fugitive emissions, attenuate the noise levels in the existing project, and simultaneously improve aesthetics of the surroundings.

4.5.3.5. Design of Green Belt

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

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

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



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

Table No 4.7. Species suitable for abatement of noise and dust pollution

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

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

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

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

Some of the important aspects to be considered are:

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

4.5.4. Anticipated Impact on Fauna

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

4.5.4.1. Measures for protection and conservation of wildlife species

- Topsoil has a large number of seeds of native plant species in the mining area.
- Topsoil will be used for restoration and suitable surfaces for planted seedlings.
- Checks and controls the movement of vehicles in and out of the mine.
- Undertaking mitigative measures for a conducive environment to the flora and fauna in consultation with Forest Department.
- A dust suppression system will be installed within the mine and periphery of the mine.

- Plantation around the mine area will help in creating habitats for small faunal species and create a better environment for various fauna. Creating and developing awareness for nature and wildlife in the adjoining villages.

4.5.3. Impact on Aquatic Biodiversity

Mining activities will not disturb the aquatic ecology as there is no effluent discharge proposed/Existing from the TANCEM Limestone mine. There is no natural perennial surface water body within the mine lease area, like wetlands, rivers streams, lakes, and farmer sites. There are few water bodies located in the study area. There are a few Odai and Canals located in the study area. There is no impact on fish habitats and the food WEB/ food chain in the water body and Reservoir. Kindly refer the clause no 3.10. Aquatic biodiversity is observed in the study area.

4.5.4. Impacts on Bird Fauna:

The project does not involve any tree felling or removal of vegetation. Therefore, there may not be loss of nesting and roosting habitat of avian fauna.

4.5.5. Impacts on wildlife

There is no National Park, Wildlife Sanctuary, Biosphere Reserve, Wildlife corridors, and Tiger/Elephant Reserve found within 10 km radius of the project site.

Table No. 4.8. Overall Ecological impact assessments of TANCEM G.O 215, Alangulam & Lakshmipuram Limestone mines Extent (180.83.0 Ha) at Sivakasi Taluk, Virudhunagar district.

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

12	Forestland is to be diverted, has carbon high sequestration.	'No 'There was no forest land diverted.
13	The project is likely to affect wetlands, Fish breeding grounds, and marine ecology.	'No'. Wetland was not present in the near core Mining lease area. No breeding and nesting ground is present in the core mining area.

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

4.6 SOCIO ECONOMIC IMPACT

4.6.1 Construction Phase

Anticipated Impacts:

♣ No. of people will get employment during the construction stage resulting in the ancillary development and growth. Nearby Local people will be given preference for employment on the basis of their skill and experience.

♣ Further due to proposed project, influx of working community will also generate an indirect employment through development of nearby market/ shops, trade centers, activities, transportation etc.

♣ Population influx during the construction phase can introduce various water and vector borne diseases which can lead to various unhygienic health problems in the area by disturbing the existing sanitation infrastructure.

♣ Rapid diverse population influx at the project site can create unusual behavioural activity such as worker-community conflicts, increase violence such as theft/stabbing and increased consumption of drugs/alcohol within the area.

♣ Impacts on the health of nearby villagers can be envisaged due to the transportation activities leading to short term exposure of fugitive dust, resulting in various acute diseases such as increased eye irritation, nausea, headache etc.

Mitigation measures:

♣ Deploying of mobile toilets or the construction of temporary toilets will be done near to the construction site with the adequate water supply.

♣ Awareness programme will be conducted before the monsoon season regarding the spread of water borne/ vector diseases.

♣ Mosquito repellents will be provided in the nearby villages and at construction site to avoid the spread of diseases.

♣ To overcome behavioural impact, proper site in charge with timely supervision will be done. In advance, facilities with equipped medical and safety services will be provided to take a control over the incident/violence if any caused.

♣ To overcome behavioural impact, supervision will be done by site in charge. In advance, emergency cell will be formed with fully equipped communication system, medical and safety services to take control over the incident/violence caused.

4.6.2 Operation Phase:

Anticipated Impacts:

♣ Long term exposure to the pollutants such as PM, SO2 and NO2 Cement dust have a potential to create health impacts such as risk of cardiovascular and respiratory disease, eye irritation, bronchitis, lung damage, increased heart ailments, etc.

♣ Other impacts, associated with the applied for Limestone mine Project will create a positive impact as it will result in the overall development of the area in respect to the infrastructure development, educational growth, health facilities etc., as a part of the CSR activity.

Mitigation Measures:

♣ In order to mitigate the long-term health impacts, efficient Air Pollution Control Equipment (APCE) like Bag House / Bag Filter / ESP will be installed at all major stacks to keep the emissions within the permissible limits. To reduce the gaseous emission, Pyro-process itself acts as a long SO2 scrubber and De - NOx system will be installed for fuel burning along with calciner for low NOx formation. To reduce fugitive emission from vehicles and machineries will be regularly monitored and maintained.

♣ For emergency, proposed to develop an occupational health centre for its employees and nearby villagers.

4.6.3 Impact Evaluation:

Table 4.9 Socio economics Impact Evaluation

Impact Evaluation Element	Impact on socio economics due to the applied for Alangulam & Lakshmipuram Limestone mines Extent (180.83.0 Ha) both Government poramboke and Patta land.			
Potential Effect/ Concern	Proposed project will provide direct & indirect employment opportunities to the local residents, which will help to increase their earning and better living standard as well as further up-liftment of socio-economic status of the area.			
Characteristics of Impacts				
Nature	Positive		Nagative	Netural
	✓			
Type	Direct	Indirect	Cumulative	
			✓	
Extent	Project area	Local	Zonal	Regional
		✓		
Duration	Short time		Long term	
			✓	
Intensity	Low		Medium	High
			✓	
Frequency	Remote (R)	Occasional (O)	Periodic (P)	Continuous (C)
			✓	
Significance of Impact				
Significance	Insignificant	Minor	Moderate	Major
			✓	

IMPACT ON HUMAN SETTLEMENT

There is no human settlement in or adjacent to the cluster area of Limestone mine. Nearest human settlement from cluster area as Alangulam village – above 0.5km – W, there will not be any impact on the human settlement in the area. The operation of the Limestone mine and associated activities will improve the economic development, civic amenities, and educational facilities in the project vicinity. Overall, due to employment generation and economic progress, there will be positive changes in the socio-economic condition of the people residing in the vicinity of the project site.

EMPLOYMENT

This is a Limestone projects. The projects will provide total manpower cumulatively for 80nos of persons for mine management and another for activities such as excavation, transportation etc. Mostly local persons will be employed in the mine. Additional manpower requirement in the mine will be employed from the nearby villages. Thus, there will not be any population growth in the area due to the Limestone projects.

IMPACT ON CIVIC AMENITIES

The existing infrastructure facilities are sufficient to provide the needs of the Limestone projects. However, the quarry management will take efforts as a part of CER for improvement in civic amenities like sanitation, drinking water facilities, transport road, etc in the nearby villages.

IMPACT ON HEALTH CARE FACILITIES

There are primary health care facilities in the nearby villages and hospital is available in Rajapalayam town. Mine management will also conduct periodic medical camps in the nearby villages as a part of CER.

IMPACT ON ECONOMIC ASPECTS

The quarry will have fulltime (80 nos.) for mine management such as excavation, transportation etc. Mostly local persons will be employed in the mine. The local population will be given preference in employment. The employment potential will improve economic conditions of these families directly and provide employment to many other families indirectly who are involved in business and service-oriented activities. This will, in-turn improve the quality of life in the region.

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.

CSR ACTIVITIES PROPOSED TO BE CARRIED OUT.

With reference to the above subject, the Socio – Economic assessment study was carried out to identify Corporate Environmental Responsibility (CER) for M/s Tamilnadu cements corporation Limited (TANCEM)

The identified CER activities are given below: -

The CER cost works out around 2% of the total project cost proponent intends to carryout the following CSR activities during the remaining period.

Code	CER Cost 2% Project cost (Rs in lakhs)
P1	0.3226

TABLE 4.10 CSR ACTIVITIES PROPOSED

S.No	Description	Amount in Rs/ year	Type of expenses
1	2023-2028. A geo-hydrological study was made to assess ground eater and to identify proper dewatering plan. The report recommended proper dewatering plan and supply of 5 KLD of water for drinking purpose to the people for neighbouring villages as the water in mines was potable and did not affect the ground water of neighbouring area due to its elevation of water table. Based on the report, a proposal for the supply of drinking water from TANCEM Mines to 1 Lakh people in 20 neighbouring villages of the mines was submitted to the Government of Tamil Nadu and is likely to be implemented.	18,00,000/-	Recurring
2	Providing solar lamps to the nearby schools and village.	Rs 4,25,000/-	Recurring
3	Treatment support for cancer, renal, cardio – vescular and other chronic diseases for patients from BPL families in Alangulam, Lakshmipuram village.	Rs 5,00,000/-	Recurring
4	Conducting sports activities once in a year in Alangulam, Lakshmipuram, Peranaickenpatti, Naranapuram, Edirkottai and Duraisamypuram village in consultation with the local panchayat	Rs 5,00,000/-	Recurring
5	**Total**	**Rs 32,25,000/-**	

TABLE 4.11 EXISTING DUMP DIMENSION-P1

Band	Pit No.	Length	Width	Depth	Area In Ha.
1	ALQ Mines	200	54	10	3.08
2	Als Pit-1	340	160	40	5.44
3	Als Pit-II	760	160	40	12.16
4	Als Pit-III	700	20	10	1.40
5	HSK-S	435	230	45	10.01

6	HSL-N	220	150	13	3.30
7	K2-Pit1	750	32	8	2.40
8	K2-Pit2	260	30	11	0.78
9	K3-Pit1	825	45	12	3.71
10	K3-Pit2	330	60	7	1.98
11	K3-Pit3	200	50	11	1.00
12	K4-Pit1	160	25	8	0.40
13	K4-Pit2	160	30	8	0.48
14	K4-Pit3	150	15	2	0.23

Mining parameters are fixed based on maximum targeted production of 98477.6 for P1 limestone @ 70% recovery per year and total waste of 2,43,641.8 Ts for P1 during the present plan period [2023-24 to 2027-28].

The generated mineral rejects for the proposed plan period will be temporarily dumped over the existing mineral rejects dump situated in the Southwest side of the area. After the deposit has been exploited upto the ultimate pit depth proposed to be backfilled the excavated area and the topsoil will be spreading over the top of the backfilled area.

The generated top soil during the proposed plan period will also be temporarily dumped over ion the existing topsoil dump in the Southwest side of the area. The spilled out and fly rocks of Limestone during production will be collected manually and cleared periodically. There is no impact on the surrounding agriculture land or haulage roads.
Anticipated impact:

- Impact of run off from dump and other stock pile.
- Impact on surrounding agriculture land.
- Sliding of waste dump.

Mitigation measures:

- The slope of the dump is not exceeding 37^0.
- Dumps are properly terraced
- Retaining wall will be constructed around the dumps with weep holes to prevent run off siltation.

4.8 MINE CLOSURE

After complete exploitation of the Limestone mineral from the lease area, the mined-out pit will be partially backfilled and partially allowed to collect the rain water which will act as a temporary reservoir, this temporary storage of water will act as an artificial recharge pond which will enhance the near ground water level and the static level of the nearby wells.

Barbed wire fencing will be constructed along the lease boundary to prevent inherent entry of public and cattle's. Security will be appointed in the entrance to prevent inherent entries. The water in the mined-out pits will have used for maintenance of greenbelt and domestic use for the nearby villages. The mine office complex will be demolished and restored to original ground profile. The soak pits will be filled with sand to avoid degradation. Native species will be planted as much as possible in the left-out area during the conceptual stage, as vegetation cover is the best long-term method of stabilizing the site. The closure of the mine will be in accordance to the final mine closure plan approved by the Indian Bureau of Mines. The proponent is instructed to obtain final mine closure certificate from the Indian Bureau of Mines and fulfill all the statutory condition stipulated by the MoEF during the mine closure.

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.

5.1.1 ALTERNATIVE FOR MINE LEASE

During the scoping process, various alternatives were considered. A detailed study of alternatives to determine the optimum method of achieving the project objectives with minimum environmental impacts was carried out and the most environmentally compatible alternative was selected, details of which are given in table 5.1.

Table No: 5.1 - PROCESS FLOW SHEET

Activities	Possibilities Finalized	Finalized
Open cast mine development (Pit Formation)	Technologies / equipment	Open cast mechanized with excavator dumper on O/B excavation and surface miner for mineral production.
Bench parameters	6m (G.O.215) high benches	6m (G.O.215) wide benches
Approaches to the mine benches	Road with proper gradient one way traffic/two-way traffic	7.139Km Haul Road already available as this is an existing mine
Use of inter burden generated	To reduce the wastage & increase mineral recovery	To reduce wastage, mineralized zone / surface miner is proposed to excavate mineral in layers to avoid mixing with waste.
Loading of mineral	Surface miner /Excavator	Surface miner/ Excavator
Transportation of mineral from pits to processing plant	Dumpers	Dumpers for direct transportation to destination.
Land reclamation	Land reclamation by plantation / / water reservoir	Green belt development
Plantation	Green belt development surrounding ML boundary, waste dumps.	Green belt development surrounding ML boundary.
Employment	Local persons	Local persons as per availability

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

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

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

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

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

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

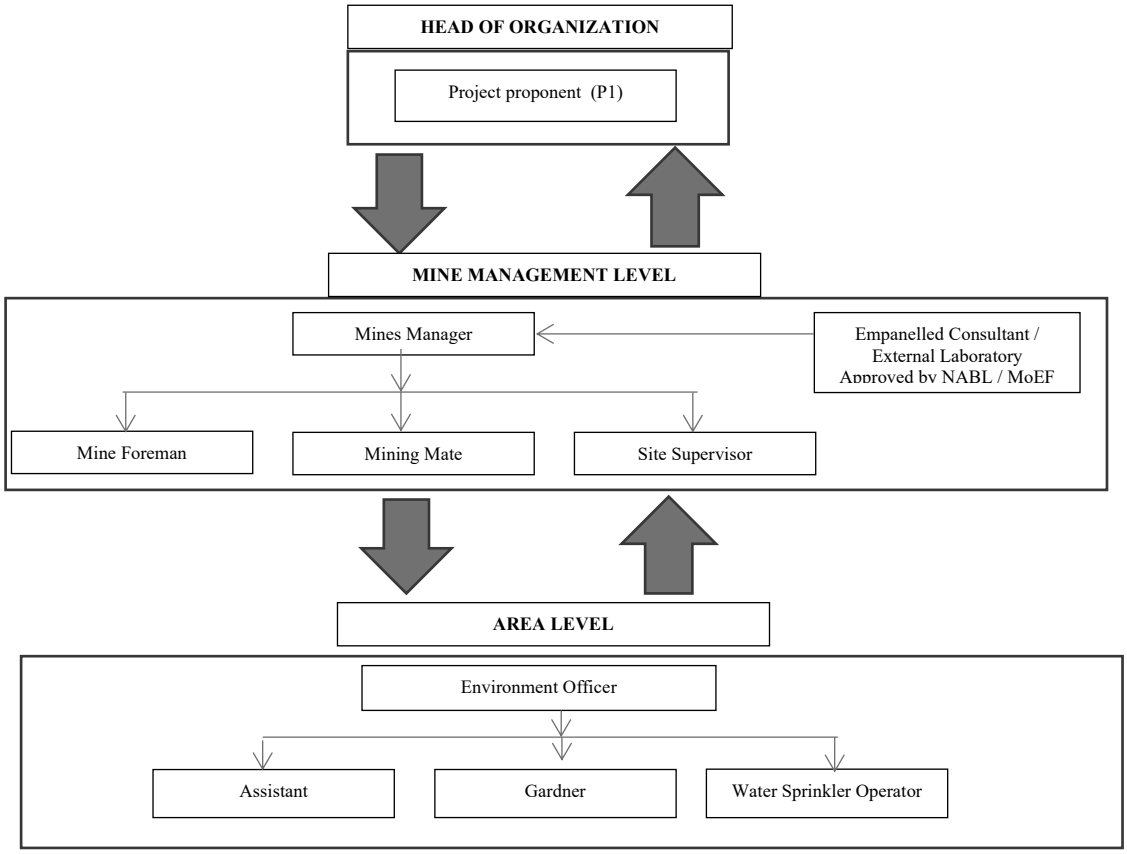


FIGURE 6.1: PROPOSED ENVIRONMENTAL MONITORING CELL PROPOSAL

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

6.2 IMPLEMENTATION SCHEDULE OF MITIGATION MEASURES

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

TABLE 6.1 IMPLEMENTATION SCHEDULE FOR PROPOSED PROJECTS

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

6.3 MONITORING SCHEDULE AND FREQUENCY

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

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

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

The details of monitoring are detailed in Table 6.2

TABLE 6.2: PROPOSED MONITORING SCHEDULE POST EC FOR MINES

S. No.	Environment Attributes	Location	Monitoring		Parameters
			Duration	Frequency	
1	Air Quality	2 Locations (1 Core & 1 Buffer)	24 hours	Once in 6 months	Fugitive Dust, $PM_{2.5}$, PM_{10}, SO_2 and NO_x.
2	Meteorology	At mine site before start of Air Quality Monitoring & IMD Secondary Data	Hourly / Daily	Continuous online monitoring	Wind speed, Wind direction, Temperature, Relative humidity and Rainfall
3	Water Quality Monitoring	2 Locations (1 SW & 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

Reporting Schedule during Operation of Mine

After completion of analysis, copies of all the analysis reports will be sent to MoEF&CC Regional Office and SPCB. Copies of the reports will be maintained in the office and will be made available to the concerned inspecting authorities.

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 for each Proposed Projects.

TABLE 6.3 ENVIRONMENT MONITORING BUDGET

Sl.No.	Parameter	Capital Cost	Recurring Cost per annum
1	Air Quality	Rs. 80 Lakhs	Rs. 80 Lakhs
2	Meteorology		
3	Water Quality		
4	Hydrology		
5	Soil Quality		
6	Noise Quality		
7	Vibration Study		
Total		**Rs. 80 Lakhs**	**Rs. 80 Lakhs**

Source: PFR

6.5 REPORTING SCHEDULES OF MONITORED DATA

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

Periodical reports to be submitted to: -

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

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

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

6.6 SUMMARY

In order to maintain the environmental quality within the stipulated standards, regular monitoring of various environmental components is necessary which will be complied as per conditions. For this lessee **M/s TANCEM** has taken decision to formulate an Environment Policy of the mine and constitute an Environmental Management Cell and committed to operate the proposed mine with the objectives mentioned in approved Environment Policy. EMP may also require measurement of ambient environmental quality in the vicinity of a sit using ecological/biological, physical and chemical indicators. Monitoring may include socio-economic interaction, through local liaison activities or even assessment of complaints. Regular Monitoring of all the environmental parameters *viz.*, air, water, noise and soil as per the formulated program based on CPCB and MoEF&CC guidelines will be carried out every year. The location of the monitoring stations was selected on the basis of prevailing micro meteorological conditions of the area like; wind direction and wind speed, relative humidity, temperature. A budget for monitoring of Air, water, Noise and Soil will be near about cumulatively Rs. 2.Crores to be incurred by the project proponent for undertaking pollution prevention measures during the mining activity.

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

Public hearing is very significant part of the process of public participation envisaged under the guidelines issued by MoEF&CC, Government of India. it facilates involvement of all the stake holders of the project which is essential for ensuring smooth running of project and benefiting all sections of society in the process of economic developement of the region. The Proposed projects are required to obtain Environmental Clearance as these projects are covered under amended EIA Notification dated 14th September 2006.

7.2 RISK ASSESSMENT

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

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

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

TABLE 7.1 RISK ASSESSMENT& CONTROL MEASURES

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

			▪ Maintenance and testing of all mining equipment as per manufacturer ‘s guidelines.
2	Drilling	Improper and unsafe practices Due to high pressure of compressed air, hoses may burst Drill Rod may break	▪ Safe operating procedure established for drilling (SOP) will be strictly followed. ▪ Only trained operators will be deployed. ▪ No drilling shall be commenced in an area where shots have been fired until the blaster/blasting foreman has made a thorough Examination of all places, ▪ Drilling shall not be carried on simultaneously on the benches at places directly one above the other. ▪ Periodical preventive maintenance and replacement of worn-out accessories in the compressor and drill equipment as per operator manual. ▪ All drills unit shall be provided with wet drilling shall be maintained in efficient working in condition. ▪ Operator shall regularly use all the personal protective equipment.
4	Blasting	Fly rock, ground vibration, Noise and dust. Improper charging, stemming & Blasting/ fining of blast holes 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 III. The area is far away from the sea hence the disaster due to heavy floods and tsunamis are not anticipated.

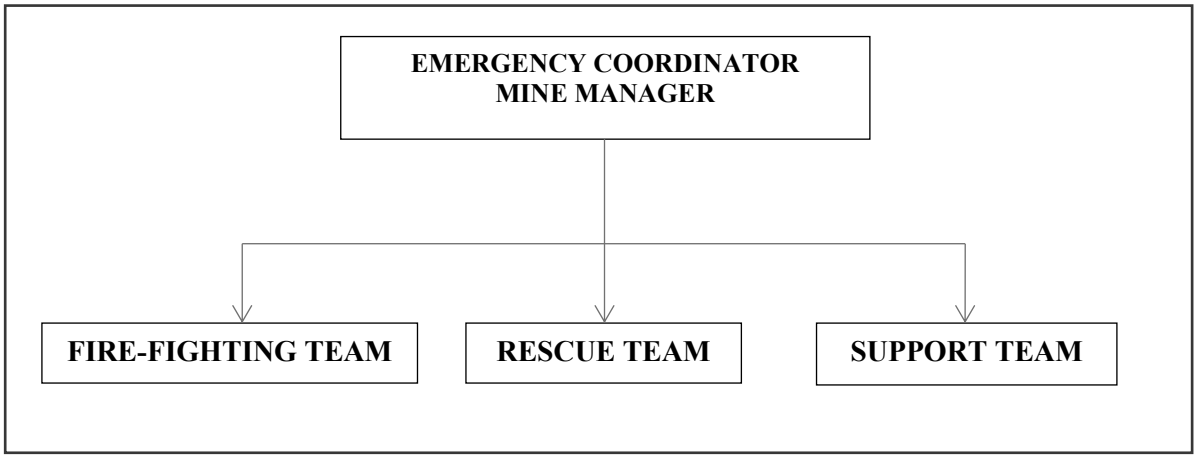
The Disaster Management Plan is aimed to ensure safety of life, protection of environment, protection of installation, restoration of production and salvage operations in this same order of priorities.

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

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

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

FIGURE 7.1: DISASTER MANAGEMENT TEAM LAYOUT



The emergency organization shall be headed by emergency coordinator who will be qualified competent mine manager. In his absence senior most people available at the mine shall be emergency coordinator till arrival of mine manager. There would be three teams for taking care of emergency situations – Fire-Fighting Team, Rescue Team and Support Team. The proposed composition of the teams is given in Table 7.1.

TABLE 7.2: PROPOSED TEAMS TO DEAL WITH EMERGENCY SITUATION

DESIGNATION	QUALIFICATION
FIRE-FIGHTING TEAM	
Team Leader/ Emergency Coordinator (EC)	Mines Manager
Team Member	Mines Foreman
Team Member	Mining Mate
RESCUE TEAM	
Team Leader/ Emergency Coordinator (EC)	Mines Manager

Team Member/ Incident Controller (IC)	Environment Officer
Team Member	Mining Foreman
SUPPORT TEAM	
Team Leader/ Emergency Coordinator (EC)	Mines Manager
Assistant Team Leader	Environment Officer
Team Member	Mining Mate
Security Team Leader/ Emergency Security Controller	Mines Foreman

Once the mine becomes operational, the above table along with names of personnel will be prepared and made easily available to workers for proposed quarry. 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 EMERGENCY ORGANIZATION (EO):

It is recommended to setup an emergency organization. A senior executive (mine manager) who has control over the affairs of the mine would be heading the emergency organization. He would be designated as site controller. As per the general organization chart, in the mines, the mines manager would be designated as the Incident Controller (IC). The incident controller would be reporting to the site controller. Each incident controller, for him-self, organizes a team responsible for controlling the incidence with the personnel under his control. Shift In-charge would be the reporting officer, who would bring the incidence to the notice of the incidence controller and site controller.

Emergency coordinators would be appointed who would undertake the responsibilities like firefighting, rescue, rehabilitation, transport and provide essential and support services. For this purposes, Security in-charge, personnel department, essential services personnel would be engaged. All these personnel would be designated as key personnel.

In each shift, electrical supervisor, electrical fitters, pump house in-charge and other maintenance staff would be drafted for emergency operations. In the event of power or communication system failure, some of staff members in the mine offices would be drafted and their services would be utilized as messengers for quick passing of communications. All these personnel would be declared as essential personnel.

7.4.1 EMERGENCY COMMUNICATION (EC):

Whoever notices an emergency situation such as fire, growth of fire etc. would inform his immediate superior and Emergency Control Center (ECC). The person on duty in the emergency control center would appraise the site controller. Site Controller verifies the situation from the incident controller of that area or the Shift In-charge and takes a decision

about an impending on site emergency. This would be communicated to the entire incident controllers, emergency coordinators. Simultaneously, the emergency warning system would be activated on the instructions of the site controller.

7.4.2 EMERGENCY RESPONSIBILITIES:

The responsibilities of the key personnel are appended below:

7.4.2.1 Site Controller

On receiving information about emergency, he would rush to emergency control center and take charge of ECC and the situations which all are given below:

Assesses the magnitude of the situation on the advice of incident controller and decides;

- Whether the affected area needs to be evacuated;
- Whether personnel who are at assembly points need to be evacuated;
- Declares Emergency and orders for operation of emergency siren;
- Organizes announcement by public address system about location of emergency;
- Assesses which areas are likely to be affected, or need to be evacuated or are to be alerted;
- Maintains a continuous review of possible development and assesses the situation in consultation with Incident Controller and other Key Personnel as to whether shutting the mine operation required and if evacuation of persons is required;
- Directs personnel for Rescue, rehabilitation, transport, fire, brigade, medical and other designated mutual support systems locally available, for meeting emergencies;
- Control's evacuation of affected areas, if the situation is likely to go out of control or effects are likely to go beyond the mine boundary, informs to District Emergency Authority, Police, Hospital and seeks their intervention and help;
- Informs the statutory authorities;

7.4.2.2 Incident Controller:

- Assembles the incident control team;
- Directs operations within the affected areas with the priorities for safety to personnel; minimize damage to property and environment and minimize the loss of materials;
- Directs the shutting down the operations and areas likely to be adversely affected by the emergency;
- Ensures that all key personnel help is sought;
- Provides advice and information to the Fire and Security Officer and the Local Fire Services as and when they arrive;
- Ensures that all non-essential workers/staff of the affected areas evacuated to the appropriate assembly points, and the areas are searched for causalities;
- Has regard to the need for preservation of evidence so as to facilitate any inquiry into the cause and circumstances which caused or escalated the emergency;
- Co-ordinates with emergency services at the site;
- Provides tools and safety equipment to the team members;
- Keeps in touch with the team and advise them regarding the method of control to be used; and
- Keeps the Site Controller of Emergency informed of the progress being made

7.4.2.3 Emergency Coordinator - Rescue, Fire Fighting

- On knowing about emergency, rushes to ECC;
- Helps the incident Controller in containment of the emergency;
- Ensure fire pumps in operating conditions and instructs pump house operator to ready for any emergency with standby arrangement;
- Guides the fire fighting crew i.e., firemen, trained mine personnel and security staff;
- Organizes shifting the fire fighting facilities to the emergency site, if required;
- Takes guidance of the Incident Controller for firefighting as well as assesses the
- requirements of outside help;
- Arranges to control the traffic at the incident area;

- Directs the security staff to the incident site to take part in the emergency operations under his guidance and supervision;
- Evacuates the people in the mine or in the nearby areas as advised by Site Controller;
- Searches for casualties and arranges proper aid for them;
- Assembles search and evacuation team;

7.4.3 GENERAL RESPONSIBILITIES OF EMPLOYEES DURING AN EMERGENCY:

During an emergency, it becomes more enhanced and pronounced when an emergency warning is raised, the workers in-charge, should adopt safe and emergency shut down and attend any prescribed duty as essential employee. If no such responsibility is assigned, he should adopt a safe course to assembly point and await instructions. He should not resort to spread panic. On the other hand, he must assist emergency personnel towards objectives of Disaster Management Plan.

7.4.4 EMERGENCY FACILITIES:

Emergency Control Center (ECC): The Mine Office Block is identified as Emergency Control Center. It would have external Telephone, Fax, and Telex facility. All the Site Controller/ Incident Controller Officers, Senior Personnel would be located here. Also, it would be an elevated place

The following information and equipment are to be provided at the Emergency:

Control Center (ECC):

- Intercom, telephone;
- Safe contained breathing apparatus;
- Fire suit/gas tight goggles/gloves/helmets;
- Hand tools, wind direction/velocities indications;
- Public address megaphone, hand bell, telephone directories;
- Mine layout, site plan;
- Emergency lamp/torch light/batteries;
- Plan indicating locations of hazard inventories, sources of safety equipment, work road plan, assembly points, rescue location vulnerable zones, escape routes;
- Hazard chart;
- Emergency shut-down procedures;
- Nominal roll of employees;
- List of key personnel, list of essential employees, list of Emergency Coordinators;
- Duties of key personnel;
- Address with telephone numbers and key personnel, emergency coordinator, essential employees; and
- Important address and telephone numbers including Government agencies, neighbouring industries and sources of help, outside experts, population details around the Mine.

7.4.5 Assembly Point:

Number of assemblies depending upon the mine location would be identified wherein employees who are not directly connected with the disaster management would be assembled for safety and rescue. Emergency breathing apparatus, minimum facilities like water etc. would be organized. In view of the size of mine, different locations should be ear marked as assembly points. Depending upon the location of hazard, the assembly points are to be used.

7.4.6 Emergency Power Supply:

Mine facilities are connected to power supply from the SEB. In the event of any grid supply failure, Diesel Generator will be provided at the mine, which is operated as soon as any power failure occurs. Thus, water pumps, mine lighting and emergency control center, administrative building and other auxiliary services are connected to emergency power supply. In all the blocks flame proof type emergency lamps would be provided.

7.4.7 Fire Fighting Facilities:

First aid firefighting equipment suitable for emergency should be maintained in each operation areas of the mine as per statutory requirements.

7.4.8 Location of Wind Sock:

On the top of the administration block, windsocks would be installed to indicate direction of wind for emergency escape.

7.4.9 Emergency Medical Facilities:

Stretchers, gas masks and general first aid materials for dealing with chemical burns, fire burns etc. would be maintained in the medical center as well as in the emergency control room. Private medical practitioners help would be sought. Government hospital would be approached for emergency help.

7.4.10 Ambulance:

An ambulance with driver availability in all the shifts, emergency shift vehicle would be ensured and maintained to transport injured or affected persons. Number of persons would be trained in first aid so that, in every shift first aid personnel would be available.

7.4.11 EMERGENCY ACTIONS:

Emergency Warning:

Communication of emergency would be made familiar to the personnel inside the mine and people outside. An emergency warning system would be established.

Evacuation of Personnel:

In the event of an emergency, unconnected personnel have to escape to assembly point. Operators have to take emergency shutdown procedure and escape. Time Office maintains a copy of deployment of employees in each shift. If necessary, persons can be evacuated by rescue teams.

All Clear Signal:

Also, at the end of an emergency, after discussing with Incident Controllers and Emergency coordinators, the Site Controller orders an all-clear signal. When it becomes essential, the site controller communicates to the district emergency authority, police and fire service personnel regarding help required or development of the situation into an Off-Site Emergency.

7.4.12 GENERAL:

Employee Information:

During an emergency, employees would be warned by raising siren in specific pattern. Employees would be provided with information related to fire hazards, antidotes and first aid measures. Those who would designate as key personnel and essential employees should be given training to emergency response.

Co-ordination with Local Authorities:

Keeping in view of the nature of emergency, two levels of coordination are proposed. In the case of an On-Site Emergency, resources within the organization would be mobilized and, in the event, extreme emergency local authorities help should be sought.

Mutual Aid:

Mutual aid in the form of technical personnel, runners, helpers, special protective equipment, transport vehicles, communication facility etc. should be sought from the neighbouring industrial management's.

Mock Drills:

Emergency preparedness is an important aspect of planning in Industrial Disaster Management. Personnel would be trained suitably and prepared mentally and physically in emergency response through carefully planned, simulated procedures. Similarly, the key personnel and essential personnel should be trained in the operations.

Important Information -

Important information such names and addresses of key personnel, essential employees, medical personnel transporters address, address of those connected with off Site Emergency such as Police, Local Authorities, Fire Services, District Emergency Authority should be prepared and maintained.

Care and maintenance during temporary discontinuance:

In case, of any temporary closure or discontinuous of mining operations, the following steps are proposed.

a. Notice to be served to all concerned authority.

b. The mining pit area shall be covered by temporary fencing.

c. Watchman will be posted round the clock to prevent any unauthorized or inadvertent entry of public.

d. Works on stabilization of dumps to provided vegetal cover would be taken up.

e. Construction of garland or retaining walls around the dumps will be attempted.

f. Watering of plants in the afforested area will be considered.

All safety precautions shall be taken care off as per rule.

7.4.13 Occupational Health and Safety at Mine Site

Occupational health and safety (OHS) is a cross disciplinary area concerned with protecting the safety, health and welfare of people engaged in work or employment. *DGFASLI* working under the Ministry of Labor provides assistance to the State enforcing agencies, training and educating them in the field of occupational health and safety in the industries.

A. Occupational Health

Pre-Placement and Periodical Health Status

- Pre /post-employment checkup will be carried out and following test will be conducted:
- Hematological Test
- Biochemical Test
- Urine
- E CG
- Spirometer
- Audiometry Color Vision
- Health Review System
- Medical Fitness from FMO
- Medical Record of Each Employee will be maintained and updated with finding

B. FREQUENCY OF MEDICAL EXAMINATION

- For Mines Employee= Once in three Years

C.PERSONAL PROTECTIVE DEVICES AND MEASURES

- Mask for prevention of dust
- Ear Muff
- Safety Helmets
- Safety Belts
- Leather Hand Gloves
- Safety Shoes/Gum boots

D.Anticipated Occupational & Safety Hazards

- Musculoskeletal disorder
- Noise Induced Hearing Losses
- TheHealth impact due to diesel particulates from emission of diesel operated vehicles and equipment
- Physical Activity
- Silicosis due to mining
- Dehydration
- Skin Disorder
- Dust Exposure

7.4.14 The Occupational Health Surveillance Program

A team of qualified doctors and nurses will visit periodically for health check-up of all the workers, team and its record will be maintained properly.

7.4.15 Impact on Human Health

This project will have an impact on the human health due to limestone, increased dust, creation of breeding grounds for disease vectors, population influx which might introduce new diseases in the area, and inadequate sanitation facilities may result in severe health Impact. Following measures can be taken to eradicate Impact of the project.

7.4.16 Implementation of Occupational Health and Safety Measures

Occupational Health & Safety measures result in improving the conditions under which workers are employed and work. It improves not only their physical efficiency, but also provides protection to their life and limb. Management will consider the following safety measures:

- Safety clauses in contract order
- Dedicated safety team
- Inspection and maintenance of equipment's and accessories
- Pre placement and periodic health check up
- Removal of unsafe conditions and prevention of unsafe acts

- Detailed analysis of each and every incident
- To provide standard PPEs and ensure its uses for mining safety
- Periodic inspection by internal and external safety experts
- Celebrations of various safety events for awareness
- Medical facilities & first aid boxes will be established in the mine premises.
- Pits, Sumps, openings in floor, etc. which may be a source of danger, will be either securely covered or securely fenced. Securely fencing a pit means covering or fencing it in such a way that it ceases to be a source of danger.
- Health Awareness Programs and camps will be organized
- The mine workers will be provided all necessary PPE, especially dust masks for their safeguard from dust, Ear Plugs/Ear Muffs for noise, boots etc. and measures for other hazards.
- Under initial vocational training, the workers will be given training related to all safety and health aspects.

TABLE 7.4: BUDGET OF OHS REQUIREMENT

S. No	OHS Requirement	Budget
1.	Health awareness Program and Training	50,000
2.	PPE	30,000
3.	Mine Safety Training to Workers	50,000
4.	First Aid Training	50,000
5.	EHS Audit	50,000
	Total	**2,30,000**

7.4.17 Conclusion

Occupational Hazard due to Proposed Mining Activity may result in Physical Injury and Dust Exposure. Site Specific HIRA shall be prepared and shall be carried out at regular basis to reduce risk to occupational Hazard at site. A well-developed Safety Management is implemented and will be complied for Proposed Expansion at the site also due care will be taken to avoid any Minor/Major Incidents. Occupational Health Monitoring Program will be implemented to Monitor Health of Employees and Workers.

7.4.18 Diesel Cosumption and measures to reduce the consumption

In our Alangulam Limestone Mines-I G.O 215 & 427 the Fuel cost is the main part of our operating cost. Day by day the diesel cost reaching near to petrol cost which reflects the huge variation in operating cost than the decade before. Fuel consumption has always been one of the primary operating costs for the Heavy Earth Moving Machinery such as Hydraulic Rock Breaker, Hydraulic Excavator and Tippers/ Taurus for entire mining operation.

7.4.19 Measures to be taken to reduce the diesel consumption

1. Cycle time shall be taken in to consideration for reduction of distance.
2. Rehandling of limestone will be reduced.
3. New machinery will be deployed.
4. Periodical maintenance will be strictly followed.
5. Proper gradient will be maintained as 1in 16 as per DGMS.
6. Maintenance of haulroad is essential for reduction of fuel.
7. High-capacity machinery will be deployed.
8. Load carrying capacity will be properly maintained through better supervision.
9. Proper combination of excavator and tipper will be adopted through proper planning.
10. Number of tippers will be reduced as soon the capacity of machinery is increased.

7.4.20 PLASTIC WASTE MANAGEMENT PLAN FOR PROPOAL

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

Objective –

- To investigate the actual supply chain network of plastic waste.
- To identify and propose a sustainable plastic waste management by installing bins for collection of recyclables with all the plastic waste

- Preparation of a system design layout, and necessary modalities for implementation and monitoring.

TABLE 7.5: ACTION PLAN TO MANAGE PLASTIC WASTE

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

Source: Proposed by FAE's and EC

7.4.21 RECLAMATION AND REHABILITATION

No reclamation and rehabilitation are proposed and hence neither reclamation nor rehabilitation was carried out during the previous mining activity. Hence reclamation and rehabilitation does not arise.

7.4.22 SUMMARY

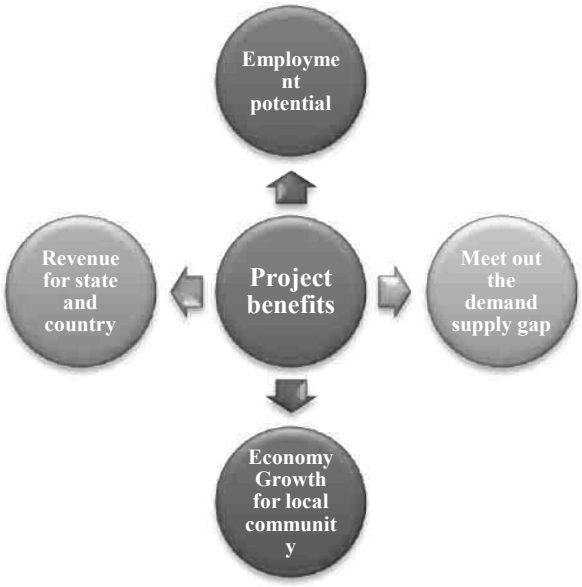
The public hearing will be conducted and the final minutes will be incorporated in the Final EIA/EMP Report. Risk assessments will help mine operators to identify high, medium and low risk levels. There is no displacement of the population within the project area and adjacent nearby area. This mining project has a positive impact on social and economic well-being of the community because this project provides employment opportunities to local people and many social welfares works done by project proponents.

8.PROJECT BENEFITS

8.0 GENERAL

Various benefits are envisaged for the mining of Limestone of TANCEM. The project will be beneficial and important to the Community, local & regional economy.

This will enhance the socio-economic activities in the adjoining areas and will result in the following benefits



This chapter gives a comprehensive description of various advantages and benefits anticipated from the project to the locality, neighborhood, region and nation as a whole. Lime stone is very important chemical mineral and is the principal raw material for the production of soda ash and clinker for cement, etc., the need for mining of the chemical grade Magnesite from the project (mine lease area) has arisen to meet the current situation of demand supply gap faced by the proponent.

8.1 EMPLOYMENT POTENTIAL

It is proposed to provide employment about 48 persons for carrying out mining operations and give preference to the local people in providing employment in this cluster. In addition, there will be opportunity for indirect employment to many people in the form of contractual jobs, business opportunities, service facilities etc. the economic status of the local people will be enhanced due to mining project.

8.2 SOCIO-ECONOMIC WELFARE MEASURES PROPOSED

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

8.3 IMPROVEMENT IN PHYSICAL INFRASTRUCTURE

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

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

8.4 IMPROVEMENT IN SOCIAL INFRASTRUCTURE

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

8.5 OTHER TANGIBLE BENEFITS

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

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

8.6 CORPORATE SOCIAL RESPONSIBILITY

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

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

8.7 CSR ACTIVITIES PROPOSED TO BE CARRIED OUT.

- With reference to the above subject, the Socio – Economic assessment study was carried out to identify Corporate Environmental Responsibility (CER) for M/s Tamilnadu cements corporation Limited (TANCEM).

The identified CER activities are given below

- The CER cost works out around 2% of the total project cost which is about Rs. 0.32lakhs the proponent intends to carryout the following CSR activities during the remaining period.

TABLE 8.1 CSR ACTIVITIES PROPOSED

S.No	Description	Amount in Rs/ year	Type of expenses
1	2023-2028. A geo-hydrological study was made to assess ground eater and to identify proper dewatering plan. The report recommended proper dewatering plan and supply of 5 KLD of water for drinking purpose to the people for neighbouring villages as the water in mines was potable and did not affect the ground water of neighbouring area due to its elevation of water table. Based on the report, a proposal for the supply of drinking water from TANCEM Mines to 1 Lakh people in 20 neighbouring villages of the mines was submitted to the Government of Tamil Nadu and is likely to be implemented.	18,00,000/-	Recurring
2	Providing solar lamps to the nearby schools and village.	Rs 4,25,000/-	Recurring

3	Treatment support for cancer, renal, cardio – vescular and other chronic diseases for patients from BPL families in Alangulam, Lakshmipuram village.	Rs 5,00,000/-	Recurring
4	Conducting sports activities once in a year in Alangulam, Lakshmipuram, Peranaickenpatti, Naranapuram, Edirkottai and Duraisamypuram village in consultation with the local panchayat	Rs 5,00,000/-	Recurring
5	**Total**	**Rs 32,25,000/-**	

9. ENVIRONMENTAL COST BENEFIT ANALYSIS

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

10. ENVIRONMENTAL MANAGEMENT PLAN

10.0 GENERAL

The environmental management plan consists of a set of mitigation, management, monitoring and institutional measures to be taken during mining operation.

The main activities in the proposed mining projects involves

1. Drilling and blasting (occasionally)
2. Excavation,
3. Transportation of mineral.

The environmental management plan has been developed with a view to bring down the levels of impacts as discussed as above within limits. In each of the areas of impact, measures have to be taken to reduce potentially significant adverse impacts and where these are beneficial in nature, such impacts are to be enhanced/augmented so that the overall adverse impacts are reduced to as low level as possible. Measures to be taken for each of the impact areas are detailed in the following Para's:

10.1 AIR POLLUTION MANAGEMENT AND CONTROL

TABLE 10.1: AIR POLLUTION MANAGEMENT AND CONTROL

Potential impact	Action	Parameters for monitoring	Timing
Air emission	Use certified drill bits for drilling holes and wet drilling shall be practiced.	Random check of equipment used for drilling	During short hole drilling.
	All equipment's are operated within specified design parameters with trained and qualified operators.	Random checks of equipment logs/ manuals	During mining operation. And maintainance stage
	Vehicle should be loaded optimum loads to minimized to the extent possible	Vehicle logs / optimum capacity of vehicle	During operational phase.
	Ambient air quality within the premises of the proposed unit to be monitored.	The ambient air quality will conform to the standards for SPM, SO_2 and NO_X	As per CPCB and TNPCB requirement.

Controlling of Air Environment.

- Wet drilling shall be practiced to control the dust, pits and rods are regularly checked as per the manufacturer's guidelines.
- Overcharging of blast holes avoided to prevent the fly rocks and dust emission
- Periodically water will be sprinkled in the haul roads to wet the surface
- Overloading of material is avoided to prevent spillage.
- The material is transported to the needy customers after covering by the tarpaulin to avoid spillage on the haul roads.
- Vehicles will be regularly checked and maintained as per the RTO and TNPCB Norms.

10.2 NOISE AND VIBRATION MITIGATION:

TABLE 10.2: NOISE AND VIBRATION MITIGATION

Potential impact	Action	Parameters for monitoring	Timing
Noise	List of all noise generating machinery onsite along with age to be prepared. Equipment to be maintained by certified mechanics for good working order.	Equipment logs, noise reading	During mining operation.
	Implement good working practices (equipment selection and siting) to minimize noise and also reduce its impacts	Site working practices records, noise reading	During short hole drilling.

	on human health (ear muffs, safe distances and enclosures). Adopt good blasting practices to reduce impact on flora and fauna. Muffling will be done at the time of blasting		
	Noise to be monitored in ambient air near blasting shelter and at the lease boundaries.	Noise reading	As per TNPCB/ MoEF & CC norms.
Ground vibration due to blasting	Controlled customized blasting techniques will be implemented. With the supervision of qualified blaster.	Vibrations to be Modeled and customized.	At the time of Blasting.

Control of Noise, Vibration and fly rock during blasting:

- Drilling shall be carried out with sharp drill bits, which reduces generation of noise during Drilling.
- Controlled Blasting shall be carried out to minimize noise generation.
- Hydraulic Rock breaker shall be used to avoid secondary blasting.
- In order to reduce the effect of noise pollution, earmuffs will be provided to all operators and employees working at mining site as a safety measure.
- Proper maintenance, oiling and greasing of machines at regular intervals will be done to reduce generation of noise.
- Periodical monitoring of noise level near vicinity of operating mining machines and at some locations in the surrounding area of mine working will be done with the help of sound level meter & records will be maintained.
- Silencers and mufflers on mining equipment, wherever required, will be properly fitted and maintained.

10.3 WATER MANAGEMENT & POLLUTION CONTROL

SURFACE WATER MANAGEMENT

Stream passing within the lease area in in G.O.No.215. During rains some natural drains may form in the area. For that, garland drains all along the quarry surface edge keeping a barrier from the mine surface will be constructed to arrest incoming water to and from the mine. The surface run off during the rainy season will be prevented from entering into the active pits by constructing garland drains.

GROUND WATER MANAGEMENT

The maximum level within the lease area is 112m RL. The water table in the area is 85-90m BGL (Below ground during post monsoon season. The mining operation is proposed to carried out below the water table.

The Limestone mine activity is being carried out G.O 215 it is in progress and the depth of mine 89m (1m Topsoil +88m Limestone) for G.O 215. The mining activity will reach the water table during the ensuing plan period and dewatering will become a challenge to the mining operation.

According to the MOEF guidelines, mining activity below water table requires clearance from the Ground water Authority. Central Ground Water Authority has formulated guidelines for the withdrawal of ground water for mining sector and in recent years, NOC for ground water withdrawal is vested by state Ground Water Authority in 13 states including Tamil Nadu. In the instance of Mine water management, it is planned to prepare a mining plan with dewatering proposal and to get required clearances from State surface and Ground water Resources Data centre, Taramani, Chennai. Accordingly, comprehensive hydrogeological investigations were carried out to find the quantum of water to be pumped in different seasons, pump capacity required and preparation of ground water model with regime monitoring and simulations for future scenario.

DETAILS OF WATER CONSERVATION MEASURES PROPOSED

The rain water and seepage water collected in the pits after spell of rain will be used for plantation and dust suppression.

A geo-hydrological study was made to assess ground eater and to identify proper dewatering plan. The report recommended proper dewatering plan and supply of 5 KLD of water for drinking purpose to the people for neighbouring villages as the water in mines was potable and did not affect the ground water of neighbouring area due to its elevation of

water table. A proposal for the supply of drinking water from TANCEM Mines neighbouring villages of the mines was submitted to the Government of Tamil Nadu and is likely to be implemented. NOC for dewatering ground water already applied, Expected Project implementation period is 3 years.

10.4 LAND RECLAMATION AND WASTE MANAGEMENT

The anticipated waste is cumulatively about 461854Ts for this plan period (2023-2029). The generated mineral rejects for the proposed plan period will be temporarily dumped over the existing mineral rejects dump situated in the Southwest side of the area. The generated top soil during the proposed plan period will also be temporarily dumped over ion the existing topsoil dump in the Southwest side of the area, after the deposit has been exploited upto the ultimate pit depth proposed to be backfilled the excavated area and the topsoil will be spreading over the top of the backfilled area.

10.5 BIOLOGICAL ENVIRONMENT

Green Belt Development

- A well-planned Green Belt with multi rows (Three tier) preferably with long canopy leaves shall be developed with dense plantations around the boundary and haul rods to prevent air, dust noise propagation to undesired places. Efforts will be taken for the enhancement of survival rate since the soil is alkaline in nature.

Species Recommended for Plantation

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 bio-diversity.
- Fast growing, thick canopy cover, perennial and evergreen large leaf area,
- Efficient in absorbing pollutants without major effects on natural growth.
- The following species may be considered primarily for plantation best suited for the prevailing climatic condition in the area.

TABLE 10.3: RECOMMENDED SPECIES TO PLANT IN THE GREENBELT

SI.No	English Name	Vernacular Name	Scientific Name	Family Name
1	White-bark acacia	Velvelam	*Acacia leucophloea*	Mimosaceae
2	Coconut	Thennai maram	*Cocos nucifera*	Arecaceae
3	Neem or Indian lilac	Vembu	*Azadirachta indica*	Meliaceae
4	Frywood	Vaagai	*Albizia lebbeck*	Mimosaceae
5	Indian plum	Elanthai maram	*Ziziphus mauritiana*	Rhamnaceae
6	Pongamia pinnata	Pongam	*Millettia pinnata*	Fabaceae
7	Portia tree	Poovarasan	*Thespesia Populnea*	Malvaceae
8	Lemon	Ezhumuchaipalam	*Citrus lemon*	Rutaceae
9	Jamun Fruit Plant	Naval maram	*Syzygium cumini*	Myrtaceae
10	Gum arabic tree	Karuvelam	*Acacia nilotica*	Fabaceae
11	Common guava	Koyya	*Psidium guajava*	Myrtaceae
12	Asian Palmyra palm	Panai maram	*Borassus flabellifer*	Arecaceae
13	Indian-almond	Vadamaram	*Terminaliacatappa*	Fabaceae
14	Teak	Thekku	*Tectona grandis*	Verbenaceae

10.6 OCCUPATIONAL HEALTH SAFETY:

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

- Provision of rest shelters for mine workers with amenities like drinking water, fans, toilets etc.,
- Providing of personal protection equipment's to the workers during the course of mining operation.
- Rotation of workers exposed to noisy areas.
- Periodical dust suppression on haul roads to prevent dust emission into the air.
- First-aid facilities in the mining area.

FIGURE 10.1: PERSONAL PROTECTIVE EQUIPMENT TO THE MINE WORKERS

Additionally, 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 details medical examination at the time of employment. The medical examination covers the following tests.

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

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

11. SUMMARY AND CONCLUSION

The Draft EIA report prepared for TANCEM Alangulam Mines-I (Cluster Extent: 449.63 ha) falls under Violation "A" category as per MoEF & CC Notification (S.O. 1886 (E) dated 20th April 2022).

The Environmental Impact Assessment study was conducted for one season (Summer) period of March – May 2023. M/s. Tamil Nadu Cement Corporation Limited had operated the mines without obtaining prior Environment Clearance (EC) as per MoEFCC and ToR are obtained from MoEF&CC,

F.No.23-167/2018-1A.III (V) dated 26th July 2021

The mining operation was stopped from 01.07.2017 since the project attracts violation as per MoEF & CC gazette notification S.O No 804 (E) Dated: 14.03.2017. This Mining project is involving Mining in >250 Ha are kept under Category 'A' as per MoEF & CC gazette notification S.O No 1886 (E) Dated: 20.04.2022. And Sl. No. 1(a) of EIA Notification 14th September, 2006 (as amended) and needs the Environmental Clearance (EC) from MoEfcc, New Delhi). A detailed Draft EIA EMP Report is prepared for public and other stakeholders' suggestions and prepare 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 Mar to May 2023 for various environmental components so as to assess the anticipated impacts of 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 Limestone mine as per market demand.

Sustainable and modern mining leads us to see positive impact of mining operation and providing consistent employment for cumulatively about 48 people directly in the cluster and indirectly around 100 people.

12. DISCLOSURE OF CONSULTANT

The Proponent Tamil Nadu Cements Corporation Ltd has engaged M/s Geo Exploration and Mining Solutions, an Accredited Organization under Quality Council of India – National Accreditation Board for Education & Training, New Delhi, for carrying out the EIA Study as per the ToR Issued and Standard ToR.

Name and address of the consultancy:

GEO EXPLORATION AND MINING SOLUTIONS
No 17, Advaitha Ashram Road,
Alagapuram, Salem – 636 004
Tamil Nadu, India
Email:infogeoexploration@gmail.com
Web: **www.gemssalem.com**
Phone: 0427 2431989.

The Accredited Experts and associated members who were engaged for this EIA study as given below –

Sl.No.	Name of the expert	In house/ Empanelled	EIA Coordinator		FAE	
			Sector	Category	Sector	Category
1	**Dr. M. Ifthikhar Ahmed**	**In-house**	**1** **38**	**A** **B**	WP GEO SC	B A A
2	Dr. P. Thangaraju	In-house	-	-	HG GEO	A A
3	Mr. A. Jagannathan	In-house	-	-	AP NV SHW	B A B
4	Mrs. Jisha parameswaran	In-house	-	-	SW	B
5	Mr. Govindasamy	In-house	-	-	WP	B
6	Mrs. K. Anitha	In-house	-	-	SE	A
7	Mrs. Amirtham	In-house	-	-	EB	B
8	Mr. A. Allimuthu	In-house	-	-	LU	B
9	Mr. N. Senthilkumar	Empanelled	**38** **28**	**B** **B**	AQ WP RH	B B A
10	Mr. Alagappa Moses	Empanelled	-	-	EB	A
11	Mr. S. Pavel	Empanelled	-	-	RH	B
12	Mr. J. R. Vikram Krishna	Empanelled	**1** **38**	**A** **B**	SHW RH	A A

Abbreviations

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

DECLARATION BY EXPERTS CONTRIBUTING TO THE EIA/EMP

Declaration by experts contributing to the EIA/EMP for M/s. Tami Nadu Cements Corporation Ltd, Alangulam & Lakshmipuram Limestone mines over an Extent of (180.83.0Ha) in Alangulam & Lakshmipuram Village, Sivakasi Taluk, Virudhunagar District, 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:

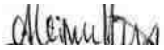
Period of Involvement: **January 2023 to till date**

EIA COORDINATORS IN THE ORGANIZATION

Sno	Name	Sector	Cate A/B	Signature
1	Dr. M. Ifthikhar Ahmed	1, 38	A	
2	Dr. P. Thangaraju	1	A	
3	Mr.Vikram Krishna JR	1 & 38	A & B	
4	Mr. S. Nagamani	1	B	
5	Mr.N. Senthilkumar	28,38 & 31	B	

FUNCTIONAL AREA EXPERTS ENGAGED IN THE PROJECT

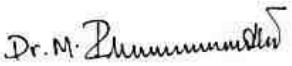
Sl. No.	Functional Area	Involvement	Name of the Expert/s	Signature
1	AP	▪ Identification of different sources of air pollution due to the proposed mine activity ▪ Prediction of air pollution and propose mitigation measures / control measures	Mr. A. Jagannathan	
2	WP	▪ Suggesting water treatment systems, drainage facilities ▪ Evaluating probable impacts of effluent/waste water discharges into the receiving environment/water bodies and suggesting control measures.	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 local geology of the area. ▪ Preparation of mineral and geological maps. ▪ Geology and Geo morphological analysis/description and Stratigraphy/Lithology.	Dr. M. Ifthikhar Ahmed	
5	SE	▪ Revision in secondary data as per Census of India, 2011. ▪ Impact Assessment & Preventive Management Plan	Mr.A.Allimuthu	

		▪ Corporate Environment Responsibility.		
6	EB	▪ Collection of Baseline data of Flora and Fauna. ▪ Identification of species labelled as Rare, Endangered and threatened as per IUCN list. ▪ Impact of the project on flora and fauna. ▪ Suggesting species for greenbelt development.	Mr..D.Devanathan	
7	RH	▪ Identification of hazards and hazardous substances ▪ Risks and consequences analysis ▪ Vulnerability assessment ▪ Preparation of Emergency Preparedness Plan ▪ Management plan for safety.	Mr. J. R. Vikram Krishna	
8	LU	▪ Construction of Land use Map ▪ Impact of project on surrounding land use ▪ Suggesting post closure sustainable land use and mitigative measures.	Mr. A. Allimuthu	
9	NV	▪ Identify impacts due to noise and vibrations ▪ Suggesting appropriate mitigation measures for EMP.	Mr. A. Jagannathan	
10	AQ	▪ Identifying different source of emissions and propose predictions of incremental GLC using AERMOD. ▪ Recommending mitigations measures for EMP	Mr. N. Senthilkumar	
11	SC	▪ Assessing the impact on soil environment and proposed mitigation measures for soil conservation	Dr. M. Ifthikhar Ahmed	
12	SHW	▪ Identify source of generation of non-hazardous solid waste and hazardous waste. ▪ Suggesting measures for minimization of generation of waste and how it can be reused or recycled.	Mr. J. R. Vikram Krishna	

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 EIA Coordinators, Functional Area Experts and Team Members prepared the Draft EIA/EMP for M/s. Tami Nadu Cements Corporation Ltd, Alangulam & Lakshmipuram Limestone mines over an Extent of (180.83.0Ha) in Alangulam & Lakshmipuram Village, Sivakasi Taluk, Virudhunagar District, Tamil Nadu. It is also certified that information furnished in the EIA study are true and correct to the best of our knowledge.

Signature& Date:



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

Designation: **Managing Partner**

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

NABET Certificate No & Issue Date: **NABET/EIA/2225/RA0276 Dated: 20.2.2023**

Validity: **August 06, 2025**

13. ASSESSMENT OF ECOLOGICAL DAMAGE, REMEDIATION PLAN AND NATURAL AND COMMUNITY RESOURCE AUGMENTATION PLAN

13.0 BACKGROUND OF THE PROJECT

Alangulam Limestone Mines-I Project operated by M/s.Tami Nadu Cements Corporation Ltd by opencast mechanized method in Alangulam & Lakshmipuram Limestone mines over an Extent of (180.83.0Ha) in Alangulam & Lakshmipuram Village, Sivakasi Taluk, Virudhunagar District, Tamil Nadu..

As on the date of MoEF & CC Notification S.O. 804 (E) Dated: 14.03.2017, the project had no Environmental Clearance and it was clearly communicated by order to apply for environmental clearance under this notification. Therefore, the project proponent applied for environmental clearance vide online proposal no. **IA/TN/MIN/65890/2017 Dated: 03.07.2017**

Later, as on the date of MoEF & CC Notification S.O. 1533 (E) Dated: 14.09.2006, Violation projects of Category A - All projects or activities included as Category 'A' in the Schedule, including expansion and modernization of existing projects or activities and change in product mix, shall require prior environmental clearance from the Central Government in the Ministry of Environment and Forests (MoEF) on the recommendations of an Expert Appraisal Committee (EAC) to be constituted by the Central Government for the purposes of this notification.

The project proponent submitted that the mining plan was approved by IBM/DMG vide letter no TN/VRD/MP/LST-1290-SZ dated 29.03.2001. the leated scheme of mining for the scheme peiod 2014-2015 to 2018-2019 was approved wide letter no TN/VRD/LST/MS/1269-MDS dated 16.11.2015. the present review of mining plan is prepared for the next five years 1st Dec 2019 to 31st March 2024. The method of mining opencast fully mechanized utilizing heavy earth moving equipment (HEME) and drilling and blasting.

The scheme of mining for the scheme period 2013-2014 to 2017-2018 was approved wide letter no TN/VRD/LST/MS-843 SZ/1456 dated 11.09.2013. the present review of mining plan is prepared for the next five years 2018-2019 to 2022-2023. Vide letter no TN/VRD/LST/ROMP-1558 MDS dated 29.08.2019. The method of mining opencast fully mechanized utilizing heavy earth moving equipment (HEME) and drilling and blasting.

13.1 METHOD OF MINING

OPENCAST MINING –

- Hydraulic Excavator coupled with tippers is deployed for the formation of benches and loading
- Benches of **6 m Height** & **6m Width,** with bench slope maintained at 60° in mineral.
- Gradient of Haulage Roads are maintained not less than 1:16
- Hydraulic Excavators are deployed for removal of waste
- The method of mining is Open cast mechanized method categorized as "Opencast category "A" other than fully mechanized"; Hydraulic Excavator coupled with tippers is deployed for the formation of benches and loading.
- The limestone will be loaded into tippers by Excavators attached with bucket
- Spoil waste are loaded into the tippers with the help of hydraulic excavator and are dumped in the earmarked area for the backfilling purpose

13.2 BASED ON SITE SPECIFIC FEATURES AND NATURE OF MINING INVOLVED, THE FOLLOWING ARE ADDRESSED IN THIS CHAPTER

a) Damage Assessment
b) Remediation plan
c) Natural and community resource augmentation
d) Benefits derived out of violation

AIMS AND OBJECTIVES –

The objectives of the study are –

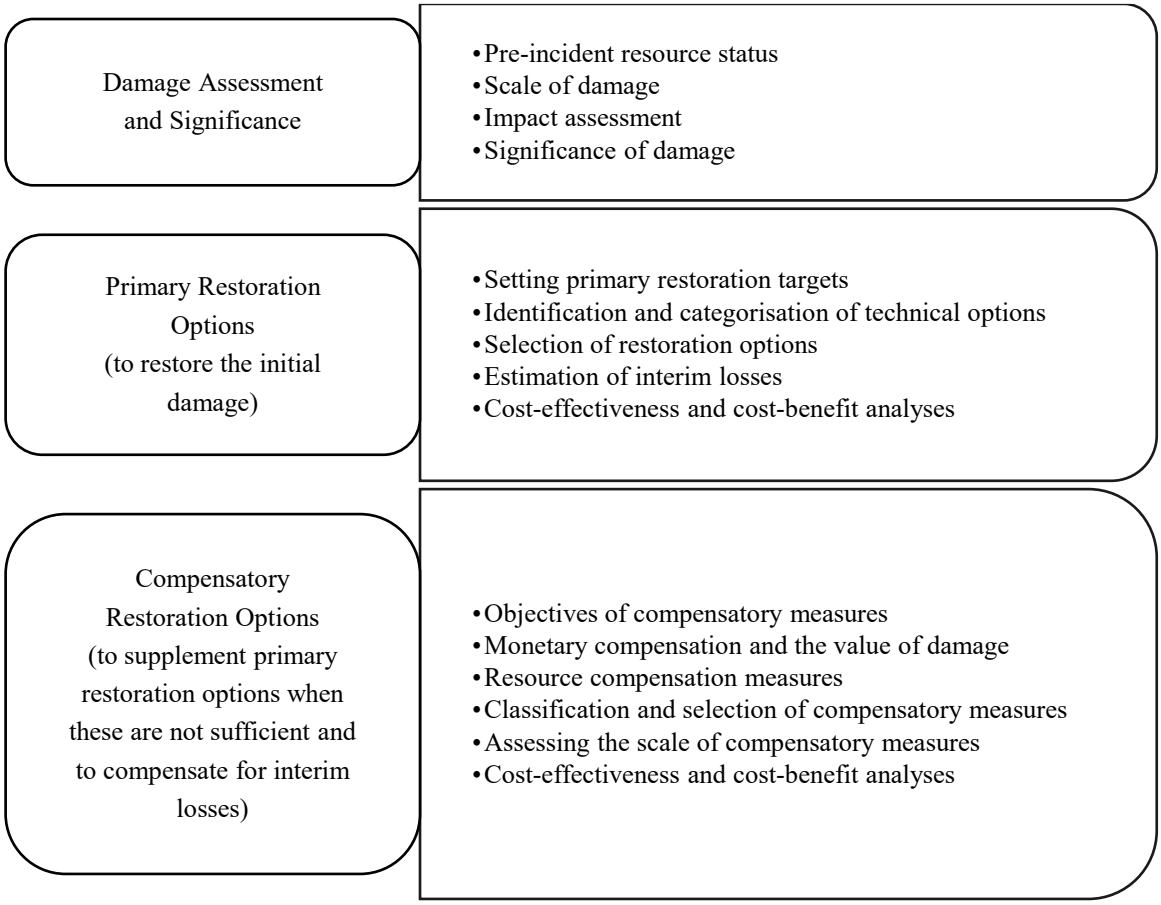
- How to define 'significant damage' to natural resources and a 'minimum level of restoration';
- How, or to what extent, monetary valuation techniques can be used to estimate the economic value of biodiversity damage; and

- How, or to what extent, the valuation of damages to natural resources should be included in a future directive on liability.

In principle, there are three possible options to provide compensation for damages to natural resources:

- Monetary compensation: compensation according to the 'value of damage' caused to natural resources;
- Resource ('in-kind') compensation: investment in resource restoration projects, which could be on-site and/or off-site; and
- Mixture of in-kind compensation (partial restoration) and a monetary payment.

The liability covering damage to natural resources could be framed either as an obligation to pay for the damage incurred in order to compensate via monetary compensation, or as an obligation to compensate through restoration and investment in natural resources, both on-site and off-site (resource compensation).



13.3 SCALE OF DAMAGE / ECOLOGICAL DAMAGE ASSESSMENT –

Based on site specific features and nature of mining involved, the following activities are considered for assessment of ecological damage:

- Damage due to change in Land use/ Land cover
- Damage due to loss of vegetation / Plant cover
- Damage due to Air pollution
- Damage due to exploitation of surface water resources
- Damage due to exploitation of Ground water resourcesDamage due to non-implementation of Environmental Management measures

Damage due to change in Land use / Land Cover:

Mining operations have led to change in land use / land cover (LULC) of the ML area.

TABLE 13.1: DAMAGE DUE TO CHANGE IN LAND USE / LAND COVER -G.O 215

Period	Sl.No.	Land use / Land Cover	Area in ha	Area in %
Mining Plan Period (2016-17)	1	Area already covered under pits and quarries	*46.36	25.63
	2	Waste Dump	16.69	9.22
	3	Infrastructures including, office and labor rest shelter	NIL	NIL
	4	Mine roads	*2.00	1.10
	5	Areas under plantation	NIL	NIL
	6	Un utilized area	*115.78	64.02
	Total		**180.83.0**	**100%**

Source: Approved ROMP online report

*area considered as damaged or disturbed

Area disturbed or damaged due to mining operations during 2016-17 is 46.36 ha,

Considering compensation @ Rs 50,000/- per hectare **of damaged land i.e., 46.36 ha * 50,000 = Rs 23,18,000/--P1**

Source: Approved ROMP online report

Damage due to loss of vegetation / Plant cover:

The mining operation was carried out from the year of 1973 & 1981 with valid Mining Plan, in the year 2016-17 ; there is a growth in the area of Plantation, settlement, road and vegetation.

The damage caused due to mining activities from 2016 to 2017 shall be loss of shrubs and tree covers in the damaged area of 10.48 ha. Considering option if the damaged land was not subjected to mining and utilized for plantation and considering rate of plantation at 500 trees/plants per ha and Value shall be Rs. 30 per tree/plant for its biomass.

Thus considering effective loss of 500 trees/plants per hectare, the damage cost shall be 500 trees per ha x 10.48ha x Rs 30 per tree = Rs 1,57,200/-

Damage due to Air pollution:

All the air quality parameters like particulate matters (PM_{10} & $PM_{2.5}$) and SO_2, NO_2 and free silica percentage are found in the permissible limit. There is no visible damage due to air pollution in the core and buffer zone of the mining area.

Damage due to exploitation of surface water resources:

There is no river stream, nallah or any other water body passing through the lease area. During rain some natural drains may form in the area. For that, garland drains all along the quarry surface edge keeping a barrier from the mine surface will be constructed to arrest incoming water to and from the mine. The surface run off during the rainy season will be prevented from entering into the active pits by constructing garland drains

Peripheral Garland drains to be constructed to divert the water into the natural gradient.

Dimension of the Garland drain is 9483m (L) X 1m (W) X 0.8m (D)-P1,

and 2497m (L) X 1m (W) X 0.8m (D)-P2, the cost would be around Rs 100 per meter for the construction and maintenance of Garland drain the total cost for the construction of Garland drain Rs. 11,98,000/-

Damage due to exploitation of Ground water resources:

Any ground water table loss if any would have been recouped by the rainfalls in this area.

No water was used for mining activities

Damage due to non-implementation of Environmental Management measures:

The project proponent has obtained mining license as per MMDR Act 1957, Mining plan along with Environmental Management plan is prepared since 1998. The mining operation was carried out as per the Approved Mining plan, Scheme of Mining along with Environmental Management plan; the proponent does not have EMP approved by the MoEF / SEIAA.

Damage assessment has been done considering the measures which Tamil Nadu Cement Corporation Limited Limestone Mine should have implemented including monitoring during mining operations for protecting various environmental components.

The Environmental safeguards which Tamil Nadu Cement Corporation Limited Limestone Mine should have taken during the mining operations at various stages is given below:

TABLE 13.2: ENVIRONMENTAL SAFEGUARDS SUPPOSED TO BE IMPLEMENTED

Conceptualization: Preliminary Environmental assessment	Baseline Monitoring studies should have been carried out
Planning: Detailed studies of Environmental impacts and design of safeguards	Impact Assessment should have been carried out and an environmental management plan should have been prepared and implemented Its effectiveness should have been monitored
Execution: Implementation of environmental safety measures	Once the mine commences its operations after obtaining EC, all measures should be practiced and implemented immediately.
Operation: Monitoring of effectiveness of built-in safeguards	Half yearly compliance monitoring should have been prepared and submitted

Source: Proposed by FAE's & EIA Coordinator

The pollution related activities for which EMP should have been in place during mine operations are extracted from the list provided by MOEF & CC for formulation and implementation of environmental management plan and monitoring of effectiveness of measures during and after commissioning of project.

The resource conservation and pollution abatement versus the damage assessed for not implementing the measures based on applicability are detailed below:

- Liquid Effluents
- Air Pollution
- Solid Wastes
- Noise and Vibration
- Occupational Safety and Health
- Medical check-up
- Prevention, maintenance and operation of Environment Control Systems
- House-Keeping
- Human Settlements
- Recovery-reuse of waste products
- Vegetal Cover
- Emergency Planning
- Environment Management Cell

TABLE 13.3: DAMAGE DUE TO NON-IMPLEMENTATION OF ENVIRONMENTAL MANAGEMENT MEASURES

Sl.No.	Resource Conservation/Pollution Abatement Aspect	Applicability	Damage due to Non Implementation of EMP Measures	Damage cost (Rs.)
1	**Liquid Effluents**			
A	Effluents should be treated well to the standards as prescribed by the Central/State Water Pollution Control Boards.	There was no discharge of any effluent from the mine.	No damage observed, however, since labour are employed for mining activities, septic tank followed by soak pit is provided within the lease area	No Damage Cost is involved.
B	Soil permeability studies should be made prior to effluents being discharged into holding tanks or impoundments and steps taken to prevent percolation and ground water contamination.	No discharge of effluent except for domestic waste water in soak pit	There is no damage as there is no effluent discharge leading to percolation and ground water contamination.	No Damage Cost is involved.
C	Effluents containing toxic compounds, oil and grease have been known to cause extensive death of flora & fauna.	Mining activity did not result in release of any toxic compounds. The machineries repair works were carried out in the service centers located in nearby area.	There is no damage as no effluents are generated from the mine leading to toxic compounds or oil and grease release leading to death of flora & fauna. The project area is not foraging ground and sheltering land for Migratory birds. Mine Pit water do not possess any biological species that serve as their food.	No Damage Cost is involved.
D	Deep well burial of toxic effluents should not be resorted to as it can result in resurfacing and ground water contamination. Re-surfacing has been known to cause extensive damage to crop.	No such activity is involved in the subject mine. There is no discharge and no re-surfacing of contaminants is involved leading to damage to crop.	There is no damage as the project area is devoid of crop.	No Damage Cost is involved.
E	In all cases, efforts should be made for re-use of water and its conservation	The water consumption is mainly for dust suppression, plantation and domestic use, which is mostly used from the rain water harvested in the mine pits	There is no damage as there is no scope for reuse of water as it cannot be recovered	No Damage Cost is involved.
F	In order to ascertain the change in water quality in the area, water samples were collected from the mine site and surrounding areas. Summary of the water quality data are presented below:			

GROUND WATER SAMPLING RESULTS

Sl.No.	Test Parameters	Units	WW1	WW2	WW3	BW1	BW2	BW3	BW4
1	pH	-	7.53	7.32	7.56	6.98	7.03	7.23	7.36
2	Total Dissolved Solids	mg/l	368	399	464	425	428	366	401
3	Chloride as CI	mg/l	75.6	83.5	93.4	89.5	84.5	68.7	76.4
4	Sulphates as SO_4	mg/l	39.4	43.6	47.6	40.3	45.3	39.7	44.6

5	Magnesium as Mg	mg/l	10.7	14.6	17.5	16.5	15.6	10.7	11.7

SURFACE WATER SAMPLING RESULTS

Sl.No.	Test Parameters	Units	SW1	SW2	SW3
1	pH	-	7.72	7.91	7.86
2	Total Dissolved Solids	mg/l	426	497	504
3	Chloride as CI	mg/l	72.5	88.9	93.4
4	Sulphates as SO_4	mg/l	32.1	51.3	56.5
5	Magnesium as Mg	mg/l	12.6	13.6	25.8

Interpretation: It can be seen from the above that TDS, Chloride in the mine water to the nearby villages' ground water are almost similar and are found well within the limit. As mine water discharge are not sent outside the project area, it does not affect the nearby surface water sources.

G	Infrastructural facilities should be provided for monitoring water quality.	Though there is no water pollution from the mining activity. Monitoring should have been carried out.	No Monitoring Carried out	Monitoring Cost Rs 1,00,000/-
2	**Air Pollution**			
A	The emission levels of pollutants should conform to the standards prescribed as per NAAQ.	Mining activity was by opencast method. Mine pit was done in the proper way by taking all steps for dust control by water sprinkling. Hence the dust emission resulting in PM_{10} and $PM_{2.5}$during mining was addressed.	The predicted increment in GLC of PM_{10} at the selected receptor locations due to mining activities vary from 43.0-10.47µg/m^3. Thus, predicted total GLC of PM_{10} at the selected receptor locations would range from 50–60µg/m^3. Therefore, it may be concluded that annual 24-hraverage PM_{10} concentration in the buffer zone of the mine site will be less than the standard limit of 100 µg/m^3 as per the NAAQS, 2009. The predicted increment in GLC of $PM_{2.5}$ due to mining activities would vary from 0 –25.0 µg/m^3. However, predicted total GLC of $PM_{2.5}$ at the selected receptor locations would range from 23.5–6.23µg/m^3. Therefore, it is assumed that annual 24-hr average$PM_{2.5}$ concentration around the mine site will be less than the standard limit of 60µg/m^3 as per the NAAQS, 2009. No damage is caused due to air pollution. It is also evident from the above; there is no impact on the vegetation in the area due to air pollution.	No Damage Cost is involved.

C	Infrastructural facilities should be provided for monitoring ambient air quality.	Though there is no air pollution from the mining activity. Monitoring should have been carried out.	No Monitoring Carried out	Monitoring Cost Rs 2,00,000/-
	Ambient air quality was monitored within project area and outside the project area. The reports are enclosed. The summary of the AAQ is given below – ➢ The $PM_{2.5}$ values ranges 15.0 to 29.2 µg/m^3; which are well below the permissible limit of 60 µg/m^3 as per guideline of MoEF & CC notification Dated: 16th May 2009. ➢ The PM_{10} values ranges from 39.0 to 45.1 µg/m^3 which are below the permissible limit of 100 µg/m^3. ➢ All other parameters are well within the prescribed limits of NAAQ standards			
3	**Solid Wastes**			
A	The site for waste disposal should be checked to verify permeability so that no contaminants percolate into the ground water or river/lake.	Waste dumps are nontoxic in nature.	No damage is there as OB material is a stable material existing and the contamination due to percolation of in situ/disturbed material does not arise	No Damage Cost is involved
B	Reactive materials should be disposed of by immobilizing the reactive materials with suitable additives.	No toxic material/chemicals are found in the OB dump. Rather it contains some percentage of Calcium Carbonate which can be further segregated.	No damage is caused. The product i.e. Magnesite are stable material and not reactive Material. No environmental hazard is expected	No Damage Cost is involved
C	Intensive programs of tree plantation on disposal areas should be undertaken.	There is waste (Mineral rejects + side burden) generated from the mine dumped in the nearby lease area in proponent own patta land dump sites are earmarked surrounding which there will be plantation.	Dumps simultaneously backfilled	No Damage Cost is involved
D	Infrastructural facilities should be provided for monitoring soil quality.	Though there is no soil erosion / deterioration from the mining activity. Monitoring should have been carried out.	No Monitoring Carried out	Monitoring Cost Rs 1,50,000/-
4	**Noise and Vibration**			
A	Adequate measures should be taken for control of noise and vibration in the mining area.	This is mechanized mine consisting of opencast mine workings where blasting was done and that can produce some noise and vibration.	The impact due to noise levels/vibrations is felt in core zone on mineworkers. All workers deputed in mine are provided with safety equipment's. a. Helmets b. Gloves c. Goggles d. Shoes e. Dust Masks f. Ear Plug / Ear Muff g. Blasting Shelter	No Damage Cost is involved.

5	**Occupational safety and Health**			
A	Proper precautionary measures for adopting occupational safety and health standards should be taken.	The mining activity involves the occupation risk or safety by inhalation of fine dust during mining and blasting.	All mine workers were provided with following personal protection equipment a. Helmets b. Gloves c. Goggles d. Shoes e. Nose Masks No health issues are reported.	No Damage Cost is involved.
6	**Medical Check-Up**			
A	Proper medical check-up should be carried out	The dust due to wind drift can cause respiratory and other health issues.	However periodical medical check-ups done as per DGMS guidelines.	No Damage Cost is involved.
7	**House –Keeping**			
A	Proper house- keeping and cleanliness should be maintained both inside and outside	Fugitive dust with drifting of wind during movement of vehicular and spill over	The practice of transportation in area with trucks covered with tarpaulin is practiced. Water sprinkling thrice a day on haul roads, working face & admin block. Office premises & infrastructural area are well developed by plantation.	No Damage Cost is involved.
8	**Human Settlements**			
A	Persons who are displaced or have lost agricultural lands as a result should be properly rehabilitated.	The project area is proponent own government and patta land and free from following since inception of mine operation a. No agricultural lands / crops b. No habitation is present	CSR Activities were carried out and the proponent has spent Rs 10 lakhs till date	No Damage Cost is involved.
9	**Transport systems**			
A	Proper parking places should be provided for the trucks and other vehicles by the lessees to avoid any congestion or blocking of roads	Proper parking place is provided.	Trucks are parked in the open spaces of the project area and no inconvenience is caused to local vehicles. Vehicles possessing Pollution Under Control (PUC) Certificate is only permitted and the same are used.	No Damage Cost is involved.
B	Spillage of materials. Proper road safety signs both inside and outside the project area should be displayed for avoiding road accidents	Signs boards are installed and the proponent participates in yearly safety week celebrations conducted by DGMS	There were no accidental deaths due to heavy vehicular traffic due to movement of tippers / dumpers from the subject mine	No Damage Cost is involved.
10	**Recovery – Reuse of waste products**			

A	Efforts should be made to recycle or recover the waste materials to the extent possible. The treated liquid effluents can be conveniently and safely used for irrigation of lands, plants and fields for growing nonedible crops.	No recovery of waste products from the mine as no waste is generated in terms of effluent or in terms of solid waste	Not applicable	No Damage Cost is involved.
11	**Greenbelt**			
A	Afforestation should be done in the mine.	Greenbelt development has been carried out since the commencement of mining operation	Greenbelt development has been carried out as per approved mining plan	No Damage Cost is involved.
B	Infrastructural facilities should be provided for monitoring of flora &fauna and green belt.	Monitoring has not been carried out.	Monitoring should have been carried out at least twice a year within the project area and outside project area for monitoring of biodiversity index.	Monitoring Cost Rs 1,00,000/-
12	**Emergency plan**			
A	Emergency Preparedness plan should be in place for handling unforeseen incidents/natural calamities	Moderate Risk Zone as per BMTPC, Vulnerability Atlas of Seismic zone of India IS: 1893 – 2002	Mine pits filled with water until seepage/ total soaking are likely to result in threat to moving cattle/persons. As per the information obtained no person has died in project area and not even single cattle have fallen in the mine pit of this area.	No Damage Cost is involved.
13	**Environment Management Cell**			
A	PP should identify within its setup a Department/Section/Cell with trained personnel to take up the model responsibility of environmental management as required for planning and implementation of the projects.	Environment Management Cell was not formed officially.	Should carry out an Audit by external personnel having experience in Environment and safety matters to inspect and suggest the measures.	Non-Implementation of supervision on environmental aspects = Rs 2,00,000/-
14	**CSR Activities**			
A	Community Welfare measures	CSR activities have been carried out.	CSR Activities were carried out and the company has spent Rs 10 lakhs till date	No Damage Cost is involved.

Source: Proposed by FAE's & EIA Coordinator

TABLE 13.4: TOTAL DAMAGE COST

Activity		Damage cost (Rs.)
Ecological Damage Cost		
Due to change in Land-use/Land cover		**Rs.23,18,000/-**
loss of Vegetation /Plant cover		Rs 1,57,200/-
Damage due to exploitation of Surface water resources		Rs. 5,70,000/-
Damage due to Non implementation of Environmental Management Measures		
1	Liquid Effluents / water monitoring	Rs 1,00,000/-
2	Air Pollution	Rs 2,00,000/-
3	Solid Wastes / Soil	Rs 1,50,000
4	Noise and Vibration	Rs 1,00,000/-
5	Occupational Safety and Health	Rs 00
6	Medical Check-Up	Rs 00
7	House – Keeping	Rs 00
8	Human Settlements	Rs 00
9	Transport Systems	Rs 00
10	Recovery –Reuse of Waste Products	Rs 00
11	Greenbelt	Rs 1,00,000
12	Emergency Plan	Rs 00
13	Environment Management cell	Rs 2,00,000/-
TOTAL		**Rs 38,95,200/-**

Source: Proposed by FAE's & EIA Coordinator

Remediation Plan –

TABLE 13.5: REMEDIATION PLAN WITH ACTION PLAN SPECIFIC TO THE REGION ALONG WITH BUDGET

Env. Component	Remediation Measures for Environmental damage	1st Year (in Rs)	2nd Year (in Rs)	3rd Year (in Rs)	Total (Rs.)
Air Environment	Automatic water sprinkler in the haul road and mines	2,00,000	-	-	2,00,000
Water Environment	Renovation of Rain Water Harvesting Pits	-	1,50,000	-	1,50,000
Land Environment	Construction of Garland Drains	1,00,000	-	-	1,00,000
Ecological Environment	Avenue Plantation	-	1,00,000	-	1,00,000
Socio economic environment	Improving Sanitation facilities to the government school	-	-	1,00,000	1,00,000
Total					**Rs.6,00,000**

Source: Proposed by FAE's & EIA Coordinator

TABLE 13.6: YEAR WISE SUMMARY OF REMEDIATION PLAN WITH COST

Environment Component	1st Year	2nd Year	3rd Year	Total (Rs.)
Air Environment	2,00,000	-	-	2,00,000
Water Environment	-	1,50,000	-	1,50,000
Land Environment	1,00,000	-	-	1,00,000
Ecological Environment	-	1,00,000	-	1,00,000
Socioeconomic environment	-	-	1,00,000	1,00,000
Total				**Rs. 6,00,000**

Source: Proposed by FAE's & EIA Coordinator

Natural Resources Augmentation –

TABLE 13.7: NATURAL RESOURCE AUGMENTATION PLAN SPECIFIC TO THE REGION ALONG WITH ACTION PLAN

Environmental components	Natural Resource Augmentation	1st Year	2nd Year	3rd Year	Total (Rs.)
Water Environment	Rain water harvesting structures at prominent place in the Alangulam and Lakshmipuram	1,50,000 Implementation	1,00,000 Maintenance	50,000 Maintenance	3,00,000
Air Environment	Planting trees in the nearby Villages	1,00,000 Plantation	50,000 Maintenance	50,000 Maintenance	2,00,000
Land / Soil Environment	Providing Agricultural needs for 5 families	1,00,000			1,00,000
TOTAL					**6,00,000**

Source: Proposed by FAE's & EIA Coordinator

Community Resource Development (augmentation) Plan –

TABLE 13.8: THE COMMUNITY RESOURCES DEVELOPMENT PLAN SPECIFIC TO THE REGION ALONG WITH ACTION PLAN

Sl.No	Community Resource Development	1st Year	2nd Year	3rd Year	Total (Rs.)
1	Purified drinking water facilities and improving smart class facilities to the Government school	5,00,000	-	-	5,00,000
TOTAL					**5,00,000**

Source: Proposed by FAE's & EIA Coordinator

Budget for remediation plan, natural resource augmentation plan and community resource augmentation plan, the total damage cost as computed above shall be **Rs 38,9 5,200/-**The summary of amounts which will be spent for Remediation Plan, Natural Resource Augmentation Plan and Community Resource Augmentation Plan is given below

TABLE 13.9: SUMMARY OF AMOUNTS WHICH WILL BE SPENT FOR REMEDIATION PLAN, NATURAL RESOURCE AUGMENTATION PLAN AND COMMUNITY RESOURCE AUGMENTATION PLAN

Sl. No.	Description	Estimated cost in Rs
1	Remediation Plan	6,00,000
2	Natural Resources Augmentation Plan	6,00,000
3	Community Resources Augmentation Plan	5,00,000
Total Budgetary Provision		17,00,000/-

Source: Proposed by FAE's & EIA Coordinator

Calculation of bank guarantee amount as per Notification No. S.O. 804(E) Dated: 14.03.2017 shall be **Rs. 17,00,000/-** as per details given here in above.

ANNEXURE

ALANGULAM & LAKSHMIPURAM LIMESTONE MINES

Alangulam & Lakshmipuram Village,

Sivakasi Taluk,

Virudhunagar District,

Tamil Nadu

EXTENT = 180.83.0 Ha

G.O No & Date	Total Extent (Ha)	MoEFCC ToR obtained
G.O.No 215, 18.09.1995	180.83.0 Ha	F.No.23-167/2018-1A.III (V) dated 26th July 2021
Total	180.83.0 Ha	

Project Proponent

M/S TAMIL NADU CEMENTS CORPORATION LTD.

(A GOVERNMENT OF TAMIL NADU UNDERTAKING)

5th Floor, Aavin Illam,No.3A,

Pasumpon Muthuramalingam Salai,

Nandanam,

Chennai – 600 035

LIST OF ANNEXURES

F.No.23-167/2018-IA.III(V)
Government of India
Ministry of Environment, Forest and Climate Change
Impact Assessment Division
******

Indira Paryavaran Bhawan
Vayu Wing, 3rd Floor
Jor Bagh Road, Aliganj
New Delhi-110 003
Date: 26th July, 2021

To
M/s Tamil Nadu Cements Corporation Limited
II Floor, LLA Building, 735 Anna Salai
Chennai - 600 002

Sub: Alangulam Lime Stone Mine (MLA 180.83 Ha) at Village Alangulam & Lakshmipuram, Taluk Sivakasai, District Virudhunagar (Tamilnadu) for total excavation -141570 tonnes per annum(limestone-99099 tonnes + total waste-42471 tonnes + top soil -0 tonnes) by M/s Tamil Nadu Cements Corporation Limited - Terms of Reference - reg.

Sir,

This has reference to proposal no.IA/TN/MIN/65890/2017 of M/s Tamil Nadu Cements Corporation Limited is for production of 142880 Tonne per annum (TPA) Name of the Minerals-Lime Stone from -Name of the Mine- Alangulam Limestone Mines (ML Area 180.83.0 Ha, located at Survey No. 28, 29, 30/2 etc. in Alangulam Village & 169/3, 169/4 in Lakshmipuram Village. The mining lease is located on Survey of India Topo-sheet no.58-G/11. The area is bounded between the coordinates Latitude 9°22'20"N to 77°41'47"E and Longitude 09° 21'25"N to 77° 40'24"E.

2. The said project/activity is covered under category A of item 1(a) of the Schedule to the EIA Notification, 2006 as amended, and requires prior EC from the MoEF&CC based on the appraisal by Expert Appraisal Committee.

3. The EAC (V) noted that this is a case of violation of the provisions of the Environment (Protection) Act, 1986 as mine was operated without obtaining prior environmental clearance. Fresh application was made online vide proposal no. IA/TN/MIN/65890/2017 dated 03 July 2017 under violation category for Term of References (ToR) in terms of provision of the Ministry's Notification S.O 804 (E) andsubmittedForm-1andPFR.

4. The project proponent submitted that the project is only for excavation of Limestone, which is a Major Mineral.

5. The project proponent submitted that Letter from the Deputy Director of Mines and Geology, Virudhunagar district of Tamil Nadu vide G.O. No. 215/IND dated

18.09.1995 for a period of 20 years and lease expired on 23.11.2013 and the application for 2nd lease renewal was applied. As per MMDR act 2015, the validity of mining lease is extended to 31.03.2030.

6. The project proponent submitted that the method of mining is by fully mechanized open cast method; Jackhammers with compressors and wagon drills will be deployed for drilling. Deep hole blasting will be carried out to loosen the inset limestone. Slurry type of explosives with ANFO will be used for blasting. The spacing and burden will be 3m and the depth of the hole will be 10m. The hole is drilled to a depth of 10m, giving 10% sub grade drilling to avoid toe formation. The blasting will be restricted to two to three rows of drilling with each row consisting of 10 to 12 holes. The holes are drilled either in a staggered pattern or square pattern. Loading and transport of the mineral and waste will be done by Hydraulic excavators and tippers.

Bench Parameter	
Mining limit at depth	Upto 90m (max) depth
Bench height	6 m & 9 m
Bench Width	More than the height of the bench
Bench slop	60° from the Horizontal
No. of working Days in a Yr	300 days
No. of shift per days	One shift
width of Each Bench (Minimum)	6m & 9m
No. of working days per month	25 days

Deep hole blasting will be carried out to loosen the insitu limestone. Slurry type of explosives with ANFO will be used for blasting. The spacing and burden will be 3m and the depth of the hole will be 6m and 9m, but the hole is drilled to a depth of 10, giving 10% sub grade drilling to avoid toe formation. The blasting will be restricted to two to three rows of drilling with each row consisting of 10 to 12 holes. The holes are drilled either in a staggered pattern or square pattern.

Depth of each hole	10m
Diameter of hole	30-35 mm
Spacing between holes	3.0m
Burden for holes	3.0m
Pattern of hole	Staggered pattern or square pattern.
Inclination of holes	S60° W- N60° E (Vertical)
Use of delay detonators	15 to 25 holes will be blasted by using millisecond
Detonating fuse	Cord
Hole pattern	V pattern

The project proponent submitted that in a single blast 15 to 25 holes will be blasted by using millisecond delay detonators and the holes are fired by means of series connection using "V" pattern initiation

Yield	-3000 Tons
Powder factor	-5
Total explosive required	- 600 Kg Kg
@20 % Booster	-120 Kg Kg
80 % ANFO	- 480 Kg Kg
Charges/ hole	- 50 Kg
Max. No. of holes blasted at a delay time	- 6
Charges per delay	- 300 Kg

The company has obtained explosives license to store explosives. The details of explosives magazine licenses are given below.

License No. & validity	Type of explosive	Class	Division	Quantity
E/HQ/TN22/3 (E88) Valid up-to 31.03.2020 *applied for renewal	Nitrate mixture	2	0	8400 kg
	Safety fuse	6	1	16000 m.
	Detonating fuse	6	2	35000 m
E/SC/TN/22/424 (E32184) Valid up-to 31.03.2020 *applied for renewal	Nitrate mixture	2	0	2000 kg
	Safety fuse	6	1	12000 m
	Detonating fuse	6	2	305 m
	Electric/ordinary detonators	6	3	13000 Nos.
E/HQ/TN/22/10 (E102) Valid up-to 31.03.2020 *applied for renewal	Detonators	6	3	200000 Nos.
E/HQ/TN/22/24 (E146) Valid up-to 31.03.2020 *applied for renewal	Nitrate mixture	2	0	9000 kg
E/SC/TN/25/28 (E19702) Exp.Van-TCM 3618 Valid up-to 31.03.2020 *applied for renewal				9464 kg

8. The project proponent submitted the following land use as per mining plan at the end of plan period and at conceptual stage

Sl.No	Details	Land use pattern		
		As on date (in Ha.)	At end of scheme period (in Ha.)	At the end of life of mines (in Ha.)
1.	Mining (Quarry)	43.51.0	0.35.0	85.40.0
2.	Waste dump	18.27.0	-	8.71.0*
3.	Office & infrastructure	-	-	-
4.	Processing Plant	-	-	-
5.	Mineral stack processing	-	-	-
6.	Sub grade mineral stacks	-	-	-
7.	Mine roads	2.00.0	-	2.50.0
8.	Areas under plantation	-	0.75.0	0.75.0

9.	Un utilized area	117.05.0	115.95.0	83.47.0
10.	Total	180.83.0	117.05.0	180.83.0

9. The project proponent submitted that generation of waste during the end of the life of the mine as under.

Category	**ROM (Ts)**	**Limestone @ 70% (Ts)**	**Mineral Rejects @ 30%(Ts)**	**Inter burden (Ts)**	**Topsoil (Ts)**	**Side Burden (Ts)**	**Total Waste (30% Mineral rejects + Interburden+ Sideburden) (Ts)**
2020-21 From Jan 2021)	47630	33341	14289	25390	10044	141720	181399
2021-22	142880	100016	42864	13990	3534	85028	141882
2022-2023	142410	99687	42723	150	0	41595	84468
Tortal	332920	233044	99876	39530	13578	268343	407749

Dimension of waste dump during the end of the life of the mine

Dump	**Length x Width x Height**	**Location in the lease area**
Dump Yard – 15 - Existing & Proposed topsoil temporary dump	197m x 160m x 1m	North
North Dump Yard – 17 - Proposed Mineral reject temporary dump	400m x 139m x 26.4m	
Dump Yard – 16	93m x 55m x 12m	
Dump Yard – 7a	113m x 73m x 12m	
Dump Yard – 7b 180m x 106m x 15m	180m x 106m x 15m	
Dump Yard - 6	340m x 135m x 9m	Centre
Dump Yard - 8	219m x 138m x 14m	
Dump Yard - 9	460m x 253m x 19m	
Dump Yard - 10	117m x 80m x 12m	
Dump Yard - 5		
Dump Yard – 11 - Existing & Proposed side burden and interburden temporary dump	430m x 175m x 21.5m	

Dump Yard – 12a - Existing & Proposed topsoil temporary dump	216m x 66m x 10m	South
Dump Yard – 12b	237m x 66m x 6m	

The waste does not consists any toxic substance in the form of solid, liquid and gas.

10. The project proponent submitted that the mining lease area does not include any forest area. The existing land use pattern is government waste land. Additionally, the waste land and fallow land upon mining and suitable reclamation will results in beneficial rehabilitation of the derelict land. Emphasis will be on restoration of mined out lands to reservoir.

11. The project proponent submitted the details of past production of mine since its inception duly authenticated by Department of Mines & Geology, State Government:

Year	G.O.215	G.O.427	G.O.871
1967-68	--	--	38451.760
1968-69	--	--	147502.330
1969-70	--	--	137418.540
1970-71	--	--	93386.680
1971-72	--	--	190552.860
1972-73	--	--	406990.850
1973-74	16075.920	--	397225.290
1974-75	2521.63	19145.440	280855.910
1975-76	198719.540	267961.750	142422.260
1976-77	428946.650	134867.760	5444.990
1977-78	370458.760	88764.860	7036.160
1978-79	536839.440	15472.570	--
1979-80	425817.310	21326.550	--
1980-81	463639.680	6615.480	12976.510
1981-82	443936.870	20742.990	--
1982-83	394489.090	10209.770	--
1983-84	368968.480	3303.050	--
1984-85	348642.340	53683.060	23111.780
1985-86	443347.650	40113.800	27328.040
1986-87	492680.010	--	--
1987-88	383683.300	60.180	--
1988-89	426502.680	2563.000	--
1989-90	356036.650	33543.200	--
1990-91	294421.174	20369.290	--
1991-92	314712.500	--	--
1992-93	298956.780	479.200	--
1993-94	256052.980	64299.320	46529.820
1994-95	266275.600	101780.000	2041.980
1995-96	262661.000	2485.000	--
1996-97	374210.000	10440.000	--

1997-98	156982.000	--	--
1998-99	155094.000	--	110021.110

Annexure II

Production details for the 6.0218, 427 and 871 since 1992 to 2018

Year	6.0.218	6.0.427	6.0.871
1999-2000	7947.750	53802.180	86775.390
2000-01	151084.470	38500.000	4883.800
2001-02	45989.700	111939.270	2500.000
2002-03	47500.130	110198.030	1671.050
2003-04	164476.530	42976.700	7499.990
2004-05	84949.330	84816.960	7888.950
2005-06	90396.090	97698.790	4348.330
2006-07	76048.940	82533.770	4750.690
2007-08	50392.620	52013.500	4141.070
2008-09	54469.390	49897.470	5659.830
2009-10	59886.010	35941.540	2972.980
2010-11	60132.720	72619.140	2967.720
2011-12	41017.180	37784.780	4477.330
2012-13	33662.000	41961.000	2994.000
2013-14	48165.160	42946.120	--
2014-15	30968.400	22159.230	--
2015-16	125810.510	42960.520	--
2016-17	60989.610	62268.590	37370.450
2017-18	--	--	--

12. The project proponent submitted that there is no forest, Wildlife Sanctuaries or Habitats for any Specific Wildlife, Aravalli/Doon Valley/ Western Ghats/Eco-Sensitive area within 10 km radius of the ML Area.

14. The project proponent submitted that total Manpower is 44 for proposed project. Total project cost is 16130 Lakhs.

15. The project proponent submitted the Affidavit to comply with all the statutory requirements and judgment of Hon'ble Supreme Court dated the 2nd August 2017 in Writ Petition (Civil) No. 114 of 2014 in the matter of Common Cause versus Union of India and Ors.

16. The project proponent submitted that the proposed project is for Limestone (Major Mineral) from existing Alangulam Limestone mines.

17. Observations and recommendations of committee of 10thEAC meeting held on held on 11-12 July, 2018: The EAC, after detailed deliberations on the proposal in terms of the provisions of the MoEF&CC Notification dated 14th March, 2017, confirmed the case to be of violation of the EIA Notification, 2006 and recommended to defer the proposal for want of following information from project proponent:

(i) Validity of LOI/mine lease along with the documentary proof.
(ii) Details of past production of mine since its inception duly authenticated by Department of Mines & Geology, State Government.
(iii) Certificate from Mines and Geology that PP has not carried out mining activity beyond mine lease boundary.
(iv) Details of habitation in the mining lease area as per the observation of KML file

(v) Permission from DGMS for blasting as village is within the mine lease area.
(vi) Chronological details of CTE and CTO granted, if any.

18. EAC in its 44th meeting (present meeting) held during 18th – 19th February, 2021: After detailed presentation by the PP, EAC observed that PP has gone for enhanced production beyond 1993-94 base year production level without taking prior EC hence violated the provision of the EIA notification under E (P) Act. EAC further noted PP has submitted the letter dated 12.07.2018 of Department of Mines and Geology wherein it was informed that lease for extension till 31.03.2030 is under consideration under MMDR Act 2015. EAC deliberated on other additional information sought in the earlier meeting. The EAC, after detailed deliberations on the information presented by the PP, recommended for issuing Standard Term of Reference along with the specific Term of Reference for undertaking EIA and preparation of Environmental Management Plan (EMP).

19. The Ministry has examined the proposal in accordance with the Environmental Impact Assessment Notification, 2006 and further amendments thereto; and after accepting the recommendation of EAC in its 44th meeting held during 18th – 19th February, 2021 and corrigendum minutes of EAC in its 45th meeting held during 8th – 9th March, 2021 grant the TOR for M/s Tamil Nadu Cements Corporation Limited is for total excavation -141570 tonnes per annum(limestone-99099 tonnes + total waste-42471 tonnes + top soil -0 tonnes) for Alangulam Limestone Mines (ML Area 180.83.0 Ha, located at Survey No.28, 29, 30/2 etc. in Alangulam Village & 169/3, 169/4 in Lakshmipuram Village for grant of Standard Terms of References with following Specific Terms of References.

A. Specific Terms of References

i. The State Government/SPCB to take action against the project proponent under the provisions of section 19 of the Environment (Protection) Act, 1986, and further no consent to operate to be issued till the project is granted EC.
ii. The project proponent shall be required to submit a bank guarantee equivalent to the amount of remediation plan and natural and community resource augmentation plan with the SPCB prior to the grant of EC. The quantum shall be recommended by the EAC and finalized by the regulatory authority. The bank guarantee shall be released after successful implementation of the EMP, followed by recommendations of the EAC and approval of the regulatory authority.
iii. Assessment of ecological damage with respect to air, water, land and other environmental attributes. The collection and analysis of data shall be done by an environmental laboratory duly notified under the Environment (Protection) Act, 1986, or an environmental laboratory accredited by NABL, or a laboratory of a Council of Scientific and Industrial Research (CSIR) institution working in the field of environment.
iv. Preparation of EMP comprising remediation plan and natural and community resource augmentation plan corresponding to the ecological damage assessed and economic benefits derived due to violation.

v. The remediation plan and the natural and community resource augmentation plan to be prepared as an independent chapter in the EIA report by the accredited consultants.
vi. The PP is required to conduct public hearing as per EIA notification, 2006.
vii. One season base line data is to be collected and reported in the EIA/EMP report.
viii. Mine plan approved by Indian Bureau of Mines to be submitted.
ix. The PP should also address the all the issues raised during public hearing along with commitments made and with fund provision to address above issues in tabular form to be submitted along with EIA/EMP report.
x. Detailed hydrological study to be carried out in core and buffer zone of the project as per GEC 2015 guidelines.
xi. In case of violation of above undertaking, the ToR/Environmental Clearance shall be liable to be terminated forthwith.
xii. Budget of remediation plan and natural and community resource augmentation plan corresponding to the ecological damage shall be completed within three years and to be prepared accordingly.
xiii. The Action Plan on the compliance of the recommendations of the CAG as per Ministry's Circular No. J-11013/71/2016-IA. I (M), dated 25.10.2017 needs to be submitted at the time of appraisal of the project and included in the EIA/EMP Report.

B. Standard Terms of References

(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.A copy of the document in support of the fact that the proponent is the rightful lessee of the mine should be given.

(2) 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 and mining technology and should be in the name of the lessee.

(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 and mining technology and should be in the name of the lessee.

(4) All corner coordinates of the mine lease area, superimposed on a High Resolution Imagery / topo-sheet 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).

(5) Does the company have 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.

(6) 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.

(7) 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.

(8) 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.

(9) 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.

(10) 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.

(11) 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.

(12) 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.

(13) The vegetation in the RF/PF areas in the study area, with necessary details, should be given.

(14) 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.

(15) Location of National Parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, 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 the 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 State Wildlife Department/Chief Wildlife Warden under the Wildlife (Protection) Act, 1972 and copy furnished.

(16) 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, 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 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.

(17) Proximity to Areas declared as 'Critically Polluted' or the project areas likely to come under the 'Aravali 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 Dept. Should be secured and furnished to the effect that the proposed mining activities could be considered.

(18) 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).

(19) 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 located in the mine lease area will be shifted or not. The issues relating to shifting of Village including their R&R and socio-economic aspects should be discussed in the report.

(20) One season (non-monsoon) primary baseline data on ambient air quality (PM10, SO_2 and NO_x), water quality, noise level, soil and flora and fauna shall be

collected and the AAQ and other data so compiled presented date-wise in the EIA and EMP Report. Site-specific meteorological data should also be collected. The location of the monitoring stations should be such as to represent whole of the study area and justified keeping in view the predominant downwind direction and location of sensitive receptors. There should be at least one monitoring station within 500 m of the mine lease in the pre-dominant downwind direction. The mineralogical composition of PM10, particularly for free silica, should be given.

(21) 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.

(22) 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.

(23) Necessary clearance from the Competent Authority for drawl of requisite quantity of water for the project should be provided.

(24) Description of water conservation measures proposed to be adopted in the project should be given. Details of rainwater harvesting proposed in the project, if any, should be provided.

(25) 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.

(26) Base d 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. 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.

(27) 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.

(28) 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.

(29) 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.

(30) 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.

(31) Details of the onsite shelter and facilities to be provided to the mine workers should be included in the EIA report.

(32) 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.

(33) 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.

(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.

(35) 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.

(36) 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.

(37) Detailed environmental management plan 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.

(38) Public hearing points raised and commitment of the project proponent on the same along with time bound action plan to implement the same should be provided and also incorporated in the final EIA/EMP Report of the project.

(39) Details of litigation pending against the project, if any, with direction / order passed by any Court of Law against the project should be given.

(40) The cost of the project (capital cost and recurring cost) as well as the cost towards implementation of EMP should clearly be spelt out:

(a) All documents to be properly referenced with index and continuous page numbering.

(b) Where data are presented in the report especially in tables, the period in which the data were collected and the sources should be indicated.

(c) Where the documents provided are in a language other than English, an English translation should be provided.

(d) The Questionnaire for environmental appraisal of industrial projects as devised earlier by the Ministry shall also be filled and submitted.

(e) While preparing the EIA report, the instructions for the proponents and instructions for the consultants issued by MoEF O.M.No.J-11013/41/2006-IA.II(I) dated 4th August, 2009, which are available on the website of this Ministry, should also be followed.

(f) Changes, if any made in the basic scope and project parameters (as submitted in Form-I and the F.R for securing the ToR) should be brought to the attention of MoEF&CC with reasons for such changes and permission should be sought, as the ToR may also have to be altered. Post Public Hearing changes in structure and content of the draft EIA/EMP (other than modifications arising out of the P.H. process) will entail conducting the PH again with the revised documentation.

(g) As per the circular no.J-11011/618/2010-IA.II(I) dated 30.5.2012, you are requested to submit certified report of the status of compliance of the conditions stipulated in the environment clearance for the existing operations of the project by the Regional Office of Ministry of Environment & Forests, if applicable.

20. 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.

21. The prescribed TOR would be valid for a period of four years for submission of the EIA/EMP report, as per the O.M. No. J-11013/41/2006-IA.II(I) dated 22.03.2010, 22.08.2014, 08.10.2014, 07.11.2014 and Ministry's Notification S.O. 751(E) dated 17th February, 2020.

22. After preparing the draft EIA (as per the generic structure prescribed in Appendix-III of the EIA Notification, 2006) covering the above mentioned issues, the proponent will get the public hearing conducted and take further necessary action for obtaining environmental clearance in accordance with the procedure prescribed under the EIA Notification, 2006.

Yours faithfully,

(Pankaj Verma)
Scientist E

Copy to

(1) The Secretary, Ministry of Mines, Government of India Shastri Bhawan, New Delhi.
(2) The Secretary, Department of Environment, Government of Tamil Nadu. Chennai.
(3) The Secretary, Department of Forests, Government of Government of Tamil Nadu, Chennai
(4) The Secretary, Department of Mines and Geology, Government of Tamil Nadu, Chennai
(5) The Chief Conservator of Forests, Regional Office (C), Ministry of Env., Forest and Climate Change, Regional Office (SEZ), Ist and IInd Floor, Handloom Export Promotion Council, 34, Cathedral Garden Road, Nungambakkam, Chennai – 34.
(6) The Chairman, Tamil Nadu Pollution Control Board, 76, Mount Salai, Guindy, Chennai- 600 032, Tamil Nadu.
(7) The Member Secretary, Central Pollution Control Board, Parivesh Bhavan, CBD cum- Office complex, East Arjun Nagar, New Delhi-1100032.
(8) The Member Secretary, Central Ground Water Authority, 18/11, Jam Nagar House, Man Singh Road, New Delhi-110011.
(9) The Controller General, Indian Bureau of Mines, Indira Bhavan, Civil Lines, Nagpur-440 001.
(10) The District Collector, Virudhunagar.
(11) Guard File.
(12) PARIVESH PORTAL.

(Pankaj Verma)
Scientist E

ANNEXURE - 1

-98-

GOVERNMENT OF TAMIL NADU

Abstract

Mines and Minerals - Mining Lease - Limestone and Kankar - Kamarajar District, Sattur taluk, Alangulam and Lakshmipuram villages - Over an extent of 180.83.00 hectares - Mining Lease first renewal application of Tvl.Tamil Nadu Cements Corporation Limited - Orders issued.

- -

INDUSTRIES (MMD.2) DEPARTMENT

G.O.Ms.No. 215 Dated:18.9.95.

Read:-

1) G.O.Ms.No.595, Industries, dt.3.4.72.
2) G.O.Ms.No.39, Industries, dt.9.1.79.
3) From Tvl.Tamil Nadu Cements Corporation Limited, Mining Lease first renewal application dt.16.11.92.
4) From the Collector, Kamarajar District, Letter No.RV3/1724,/92, dt.3.12.93.
5) From Commissioner of Geology and Mining, Letter No.22593/B2/93, dt.22.3.94 and 5.5.94.
6) From Tamil Nadu Cements Corporation Limited, Letter No.13813/LAM.1/Mkg/TNCEM/93-94, dt.26.7.94.
7) Government Letter No.10787/MMD.2/94-4, Industries, dt.14.9.94 addressed to Government of India.
8) From Government of India, Ministry of Mines, Letter No.4/257/94-M.IV, dt.3.8.95.

...

ORDER:

In Government Order Ms.No.595, Industries, dt.3.4.72, a mining lease for limestone was granted in favour of Tamil Nadu Industrial Development Corporation (TIDCO) Limited over an extent of 437.49 acres in Alangulam and Lakshmipuram villages, Sattur taluk, the then Ramanathapuram District for a period of twenty years. Subsequently, the total extent of lease area was modified as 446.83 acres. The lease deed was executed on 24.11.73.

Consequent on the setting up of Tamil Nadu Cements Corporation Limited as a subsidiary of Tamil Nadu Industrial Development Corporation Limited for operation of major cement plant at Alangulam, the mining lease was also transferred to Tamil Nadu Cement Corporation Limited in G.O.Ms.No.39, Industries, dt.9.1.79. The mining lease expired on 23.11.93. The Tamil Nadu Cements Corporation Limited have preferred mining lease renewal application on 16.11.92 with requisite certificates/documents etc., including approved Mining Plan.

...2

2. The Collector, Kamarajar District in his letter fourth read above has reported that out of the total extent of 446.83 acres of lands applied for renewal of lease in S.Nos.28, 29 etc. in Alangulam village and in S.No.169/3 and 169/4 in Lakshmipuram village, the lessee company owns patta lands to an extent of 408.97 acres (404.93 acres in Alangulam village and 4.04 acres in Lakshmipuram village) and the remaining 37.86 acres poramboke lands in Alangulam village. There is no objection for grant of mining lease renewal to Tamil Nadu Cements Corporation Limited on the above lands.

3. The Commissioner of Geology and Mining, in his letter fifth read above, has reported that as per approved Mining Plan, the effective mineable reserves of Cement grade limestone have been estimated at 134.37 lakh tonnes which will last for 26 years. The lessee company would require 10.40 lakh tonnes of limestone per annum under the expansion programme. The area applied for renewal doesnot satisfy Secti 6(1)(c) of Mines and Minerals (Regulation and Development) Act,1957. The Commissioner of Geology and Mining has also reported that the total extent of area held under mining lease for limestone by Tamil Nadu Cements Corporation Limited, exceeds the 10 square kms. limit which attracts Section 6(1)(b) of Mines and Minerals (Regulation and Development) Act,1957. The Commissioner of Geology and Mining has recommended for the grant of first renewal of mining lease for limestone and kankar in favour of Tvl.Tamil Nadu Cements Corporation Limited over an extent of 446,83 acres in Alangulam and Lakshmipuram villages, Sattur taluk, Kamarajar District for a period of 20 years subject to prior approval of Government of India under Section 8(2) of Mines and Minerals (Regulation and Development) Act, 1957-and in relaxation of Section 6(1)(b) and (c) of Mines and Minerals (Regulation and Development) Act, 1957.

4. The Government after due examination have decided to accept the recommendation of Commissioner of Geology and Mining in para 3 above and to grant first renewal of mining lease for limestone over an extent of 446.83 acres (180.83.0 hectares) in Alangulam and Lakshmipuram villages as preferred in the mining lease application of Tamil Nadu Cements Corporation Limited third read above for a period of 20 years. The Government of India in their letter eighth read above, have also conveyed their approval under Section 8(2) and in relaxation of Section 6(1)(b) and 6(1)(c) of Mines and Minerals (Regulation and Development) Act,1957 to the first renewal of mining lease for limestone over an area applied for in favour of M/s.Tamil Nadu Cements Corporation Limited, Alangulam for a period of 20(twenty) years, subject to compliance of amended provisions of the Mining Act and Rules and other applicable rules.

5. In exercise of the powers conferred under Section 10(3) of the Mines and Minerals (Regulation and Development) Act, 1957 (Central Act 67 of 1957), the

...3

Governor of Tamil Nadu hereby sanctions the first renewal of mining lease in favour of Tvl. Tamil Nadu Cements Corporation Limited, Madras.2, for limestone over an extent of 446.83 acres (163.87.5 hectares of patta lands and 15.32.0 hectares of poramboke lands in Alangulam village and 1.63.5 hectares of patta lands in Lakshmipuram village) in S.Nos. as listed out in Appendix I in Sattur taluk, Kamarajar District for a period of 20 years with effect from 24.11.93 subject to the conditions mentioned in sub-rule(i) of rule 27 of Mineral Concession Rules, 1960 and to the conditions specified in the Appendix II to this order.

6. The rates of royalty, dead rent and surface rent shall be as follows:-

Royalty:

Limestone

(a) L.D.Grade (Less than 1.5 percent Silica content) Rs.50 per tonne.
(b) Others Rs.25 per tonne.

Dead Rent:

From 21st year onwards .. Rs.90/- hectare per annum.

Surface rent and Water rate:

At such rates as the land revenue and other cesses assessable on the land are paid.

7. The applicant firm should pay a deposit of Rs.2,000/- (Rupees Two Thousand only) as prescribed in rule 32 of Mineral Concession Rules, 1960 before the lease deed is actually executed.

8. The terms and conditions stated in this order are subject to such further modifications, additions and alterations as may be included in the lease deed when finalised.

9. The Collector of Kamarajar District is requested to take necessary further action for the execution of the renewal lease deed in the prescribed form. As soon as the deed is executed, the date of such execution should be reported to the Government and Commissioner of Geology and Mining. The Collector is also requested to ensure compliance by the applicant firm of the amended provisions of the Mines and Minerals (Regulation and Development) Act,1957 and Mineral Concession Rules, 1960 and other

...4

applicable Acts and Rules including Forest (Conservation) Act, 1980.

(BY ORDER OF THE GOVERNOR)

C.RAMACHANDRAN
PRINCIPAL SECRETARY TO GOVERNMENT

To

Tvl. Tamil Nadu Cements Corporation Limited,
LL.. Building, 735 Anna Salai,
Madras-2.

The Commissioner of Geology and Mining, Guindy,
Madras.32.

The Collector, Kamarajar District,
Virudhunagar(WS)

Copy to: The Secretary to Government of India,
Ministry of Mines, New Delhi.1.

The Controller General, Indian Bureau of Mines,
Civil Lines, Indira Bhavan, Nagpur-440 001.

The Controller of Mines(s), Government of India,
Indian Bureau of Mines, No.29 Industrial Suburbs
II Stage, Bangalore.22.

The Regional Controller of Mines, Indian Bureau of
Mines, No.29, Vijayaraghava Road, T.Nagar, Madras.17.

The Director of Mines(Safety), Ministry of Labour,
Oorgaum Region, Kolar-Gold Field, Kolar District
Karnataka- PIN 563 120.

Industries (OP.II) Department, Madras.9.
sf/sc.

//forwarded/by order//

18/9/95

SECTION OFFICER.

ss/12/9

COPY OF.

GOVERNMENT OF TAMILNADU
ABSTRACT

ANNEXURE - 1A

MINES & MINERALS - Mining Lease - Limestone & Kanker Ramanathapuram District Sattur Taluk - Over an extent of 437.49 acres in Alangulam & Lakshmipuram villages - Application of TamilNadu Industrial Development Corporation Ltd., Madras - Sanctioned.

-:-

INDUSTRIES DEPARTMENT

G.O.Ms.No:595(Industries) Dated:3rd April'72.
Read the following:

01. From the Collector of Ramanathapuram lr.D.Dis.39187/68 dated 4.4.70.

02. From the Director of Industries & Commerce, lr.No:4348/B3/70, dated 15.5.70.

03. From the Director of Industries & Commerce,lr.No:4348/B3/70-1, dt.16.06.70.

04. From the TamilNadu Industrial Development Corporation Ltd.,lr.9/E111/70 dt.20.08.70.

05. From the Collector of Ramanathapuram L.K.Dis.34103/71 dated 20.07.71.

06. From the Government of India,Ministry of Steel & Mines Department of Mines,lr.2(212)71 MVI dt.14.01.72.

ORDER: - : -

In exercise of the powers conferred under Section 10(3) of the Mines & Minerals (Regulation & Development) Act 1957 (Central Act 57 of 1957) the Governor of TamilNadu hereby sanctions the grant to TamilNadu Industrial Development Corporation Limited, Madras of a mining lease for limestone & Kanker for a period of 20 years over an extent of 437.40 acres in Alangulam and Lakshmipuram villages as detailed in Appendix I to this order in Sattur Taluk of Ramanathapuram District subject to the conditions mentioned in Sub-Rule (1) of rule 27 of the Mineral Concession Rules 1960 and also to the conditions specified in Appendix II to this order.

02. The rates of royalty, dead rent and surface rent shall be as follows : -

ROYALTY. GOVERNMENT LANDS. LIMESTONE.

(a) Superior grade with 45% or more of Cao Rs. 1.25 per tonne
(b) Inferior grade with less than 45% Cao Rs. 0.75 per tonne

KANKAR. 7% of the sale price at pit's mouth.

PATTA LANDS.

1. Limestone
(a) Superior grade with 45% or more of Cao Rs. 0.63 per tonne
(b) Inferior Grade less than 45% Cao Rs. 0.38 "

2. KANKAR. 3½ % of the sale price at pit's mouth.

DEAD RENT. GOVERNMENT LANDS.

Ist year	..	Nil
IInd year to 5th year	..	Rs.12.50 per hectare perannum
6th year to 10th year	..	Rs.25.00 -do-
11th year onwards	..	Rs.37.50 -do-

20

Patta Lands:

1st year	..	Nil
2nd year to 5th year	..	Rs.6.25 per hectare per annum
6th year to 10th year	..	Rs.12.50 -do-
11th year onwards	..	Rs.18.75 -do-

SURFACE RENT.

At such rate as the land revenue and cesses assessable on the land are paid.

The applicant should pay a deposit of Rs.1,000/- as prescribed in rule 32 of the Mineral Concession Rules 1960 before the lease is actually executed.

03. The terms & conditions stated in this order are subject to such further modifications, additions and alterations as may be included in the lease deed when finalised.

04. The Collector of Ramanathapuram is requested to take necessary action for the execution of the lease deed. He is also requested to include in the lease deed the preemption clause 21.A communicated in GO.Ms.No:4326 Industries, Labour & Cooperation, dated 10.09.82 as subsequently amended. As soon as the licence deed is executed, the date of such execution should be reported to the Government and the Director of Industries & Commerce.

M.S.RAMESH,
JOINT SECRETARY TO GOVERNMENT.

/true copy/

Sd .. ..
SUPERINTENDENT.

/true copy/

ANNEXURE - 2

G.O. MS.NO. 39 INDUSTRIES DEPARTMENT DATED 9.1.1979

AGREEMENT

An Agreement made this Ninth day of June 1980 between the Governor of Tamil Nadu (hereinafter called the Governor and assigns) of the one part and Tamil Nadu Cements Corporation Limited, Alangulam Works a Company Registered under the Companies Act and having its Registered Office at 'II Floor, L.I.C. Buildings, 735, Anna Salai, Madras-600 002 (hereinafter called the Transferee which expression shall where the context so admits includes his successors and assigns) of the other part.

Whereas by virtue of an indenture of lease (hereinafter called the lease) dated 24th November 1975 and made

COLLECTOR,
RAMANATHAPURAM

FOR TAMIL NADU CEMENTS CORPORATION LTD.,

GENERAL MANAGER.

/contd...2/

between the Governor of Tamil Nadu and Tamil Nadu Cements Corporation Limited (hereinafter called "the lessee") the lessee is entitled to search for and work the mines and minerals therein mentioned for the term of twenty years subject to the payment of the rent and royalties and the observance and performance of the lessee's covenants and condition in the lease reserve and contained including a covenant not to assign the lease or any interest thereunder without the previous sanction of the Governor.

COLLECTOR,
RAMANATHAPURAM.

For TAMIL NADU CEMENTS CORPORATION Ltd.,

GENERAL MANAGER.

/contd...3/

And where as the lessee is desirous of transferring and assigning the lease in respect of 180.83.0 Hectares (446.83 acres) of lands in Alangulam and Lakshmipuram villages the details of which are furnished in the schedule below to the transferee and the Governor has at the request of the lessee granted sanction in G.O. Ms.No.39 Industries dated 9.1.1979 to such transfer and assignment upon condition of the transferee entering into an agreement containing the terms and conditions hereinafter set forth.

Now it is hereby agreed and declared by the transferee with the Governor that from and after the transfer and assignment ofthe lease by the lessee to the transferee, the transferee shall be bound by and liable to perform and observe and confirm and be subject respectively to all the provisions and conditions and all the covenant and stipulations on the part of the lessee contained in the lease in the same manner and in all respects as if the lease had been granted to the transferee as the lease thereunder and the transferee had originally executed it as such.

In consideration of the premises the transferee hereby further agrees to perform and observe and confirm and be subject to the provisions and conditions hereinafter contained namely:-

1) The transferee agrees to commence mining operations within a period of two years from the date of this agreement.

For TAMIL NADU CEMENTS CORPORATION

COLLECTOR,
RAMANATHAPURAM.

2) The transferee agrees to report the quantity of the minerals mined every year after the date of this agreement and how it was used or to whom it was sold.

3) The Governor shall have power and liberty to retain the deposit made by the transferee on applying for this transfer as security for and on account of the performance by the transferee of the terms of this agreement and any claim for compensation which may be made by any person or persons against the transferee and the Governor, in respect of any damage or injury done by the transferee in exercise of any of the powers conferred on it by the lease and in or towards payment of any damages, costs and expenses which may become payable as a result of or in connection with any suits or proceedings which may be instituted against the Government of Tamil Nadu in respect of any such damage or injury and also for the restoration by the transferee to its natural original condition of the surface of all lands which shall be occupied by the transferee and for the cost of fencing or filling in or abandoned pits made by the transferee in the said land during its tenancy thereof.

FOR TAMILNADU CEMENTS

COLLECTOR,
RAMANATHAPURAM.

-14-

The transferee agrees that the above provisions and conditions shall be read and construed as part and parcel of the lease deed, dated 24th November 1973 and as if such provisions and conditions had originally been contained therein.

In witness where of the Collector of Ramanathapuram at Madurai acting for and on behalf of and by the order and direction of the Governor of Tamil Nadu and General Manager, Tamil Nadu Cements Corporation Limited, Alangulam Works, Alangulam for and on behalf of Tamil Nadu Cements Corporation Limited have hereunto set their hands.

Signed by: V.MADHAVAN NAIR.

COLLECTOR,
RAMANATHAPURAM AT
MADURAI.
(for and on behalf and
by the order and
direction of the Governor)

In the presence of:

Witness:

(P. Nalarajan)
Spl. Dy. Tahsildar
(Mines)
Ramnad Collectorate,
Madurai.

Signed by: K. SRINIVASAN

For TAMIL NADU CEMENTS CORPORATION LTD.,

GENERAL MANAGER.

In the presence of:

Witness:

T. SRINIVASAN.
Manager (Admn.)
Tamilnadu Cements Corpn Ltd
Alangulam

/contd...6/

SCHEDULE OF LANDS TRANSFERRED.

Name of Village: ALANGULAM Taluk: DATTUR

Village No. : 64 District: RAMANATHAPURAM

PATTA LANDS

Survey Number (1)	Extent Acres (2)	Cent (3)	Hectare (4)	Ares. (5)
28/1	1	98	0. 80. 0	
2	1	72	0. 69. 5	1.49.5
29/1	0	34	0. 14. 0	
2	2	45	0. 99. 0	1.13.0
30/2	0	10	0. 04. 0	
31	3	05	1. 23. 5	
32/1	1	41	0. 57. 0	
3	0	40	0. 16. 0	
4	1	36	0. 55. 0	
5	0	74	0. 30. 0	
34	2	00	0. 81. 0	
35	3	52	1. 42. 5	
36	1	66	0. 67. 0	
37	1	41	0. 57. 0	
38	1.	63	0. 66. 0	
39/1	1	72	0. 69. 5	
2	1	88	0. 76. 0	2.23.5
3	1	92	0. 77. 5	
40	6	46	2. 61. 5	
41	1	27	0. 51. 5	
43/1	0	51	0. 20. 5	0.40.5
2	0	49	0. 20. 0	

For TAMIL NADU CEMENTS CORPORATION LTD.,

COLLECTOR,
RAMANATHAPURAM

GENERAL MANAGER.

ALANGULAM VILLAGE (contd...

(1)	(2)	(3)	(4)	(5)
44/1	0	73	0. 29. 5	
54	1	20	0. 48. 5	
82/1	0	07	0. 03. 0	
2	0	08	0. 03. 0	
3	0	06	0. 02. 5	
4	0	03	0.01 . 0	
5	0	04	0. 01. 5	
6	1	98	0. 80. 0	
7	0	10	0. 04. 0	
8	0	08	0. 03. 0	
9	0	11	0. 04. 5	
11 B	0	07	0. 03. 0	
12	0	21	0. 08. 5	1.14.5
84/1B	0	49	0. 20. 0	
86/2	0	76	0. 31. 0	
87/2	0	77	0. 31. 0	
88/2	0	67	0. 27. 0	
89/1B	0	52	0. 21. 0	0.42.0
2B	0	52	0. 21. 0	
90/2	0	65	0. 26. 5	
92	2	31	0. 93. 5	
94	1	50	0. 60. 5	
100	1	40	0. 56. 5	
102/3	1	13	0. 45. 5	
103/1B	0	64	0. 26. 0	
2B	0	73.	0. 29. 5	5.5
			6.81.0	

COLLECTOR,
RAMANATHAPURAM.

For TAMILNADU CEMENTS CORPORATION LTD.,

GENERAL MANAGER.

/contd...8/

ALANGULAM VILLAGE (contd...

(1)	(2)	(3)	(4)	(5)
104/1	2	44.	0. 98. 5	
2B	0	75	0. 30. 5	1.29.0
105/1	1	28	0. 52. 0	
2	1	23	0. 50. 0	1.01.5
112/1	1	20	0. 48. 5	
2	1	31	0. 53. 0	1.01.5
113	1	34	0. 54. 0	
114	1	16	0. 47. 0	
120/1	1	11	0. 45. 0	
2	1	14	0. 46. 0	0.91.0
123/1	1	05	0. 42. 5	
2	1	04	0. 42. 0	0.84.5
124	2	05	0. 83. 0	
125/1	2	34	0. 94. 5	
2	2	00	0. 81. 0	1.75.5
126/2	2	20	0. 89. 0	
3	1	45	0. 58. 5	1.47.5
157/1	2	04	0. 82. 5	
2	2	03	0. 82. 0.	
158	3	58	1. 45. 0	
159	3	14	1. 27. 0	
160/1	1	52	0. 61. 5	
160/2A	1	67	0. 67. 5	
160/2B	0	85	0. 34. 5	
3	0	88	0. 35. 5	1.49.0
161/1	1	70	0. 69. 0	
2	1	68	0. 68. 0	1.37.0

17.87

COLLECTOR,
RAMANATHAPURAM.

FOR TAMILNADU CEMENTS CORPORATION LTD.,

GENERAL MANAGER

ALANGULAM VILLAGE (Contd...)

(1)	(2)	(3)	(4)	(5)
162	2	58	1. 04. 5	
177	4	28	1. 73. 0	
209/1	2	28	0. 92. 5	
2A	0	60	0. 24. 5	
2B1	1	14	0. 46. 0	1.91.5
2B2	0	70	0. 28. 5	
210/1	0	41	0. 16. 5	
2	1	10	0. 44. 5	
211	2	19	0. 88. 5	
212/1	3	66	1. 48. 0	
2	3	82	1. 54. 5	
213	1	70	0. 69. 0	
214	1	84	0. 74. 5	
215	3	03	1. 24. 5	
216	3	35	1. 35. 5	
217	2	26	0. 91. 5	
218	1	38	0. 56. 0	
219	1	41	0. 57. 0	
220/1	2.11		0. 85. 5	
2A	0	66	0. 26. 5	
2B	0	63	0. 25. 5	
2C	0	65	0. 26. 5	1.64.0
221/1	2	01	0. 81. 5	1.60.5
2	1	97	0. 79. 5	161.0
222	2	44	0. 98. 5	
224	1	66	0. 67. 0	

20 19.5

For TAMIL NADU CEMENTS CORPORATION LTD.,

COLLECTOR,
RAMANATHAPURAM

20 21.5

GENERAL MANAGER.

/contd...10/

ALANGULAM VILLAGE (Contd...)

(1)	(2)	(3)	(4)	(5)
226/1	1	55	0. 62. 5	0 63.0
227/1A	2	44	0. 98. 5	
230/2	0	85	0. 34. 5	0 34.0
231/2	0	55	0. 22. 5	
232/2	0	43	0. 17. 5	
233/2B	0	30	0. 12. 0	
235/2	1	55	0. 62. 5	
237	2	80	1. 13. 5	1918
238/1	2	69	1. 09. 0	1.90.5
2	2	02	0. 82. 0	
239/1	4	68	1. 89. 5	2.51.0
2	1	52	0. 61. 5	
240/1	1	64	0. 67. 0	1.30.5
2	1	56	0. 63. 0	
241	1	90	0. 77. 0	
245/1	3	54	1. 48. 5	
2A	1	82	0. 73. 5	2 22.5
2B	1	82	0. 73. 5.	
252	1	24	0. 50. 0	4.55
253	1	16	0. 47. 0	
254/1A	2	48	1. 00. 5	
1B	2	00	0. 81. 0	3.36.5
2	3	84	1. 55. 5	
255/1	1	69	0. 68. 5	
2	0.	98	0. 39. 5	108.0
256	1	67.	0. 67. 5	

19.77.5

COLLECTOR,
RAMANATHAPURAM.

For TAMIL NADU CEMENTS CORPORATION LTD.,

GENERAL MANAGER.

19.72.0

/contd...11/

ALANGULAM VILLAGE (contd...)

(1)	(2)	(3)	(4)	(5)
257	2	10	0. 85. 0 ✓	
258/1	1	00	0. 40. 5 ✓	
259/1	1	51	0. 61. 0 ✓	
263	2	96	1. 20. 0 ✓	
266/1A	0	74	0. 30. 0	
2A	0	73	0. 29. 5	1.18.5 ✓
3	1	46	0. 59. 0	
279/1B	0	89	0. 36. 0	
4B	1	80	0. 73. 0	1.09.0 ✓
280/2	0	95	0. 38. 5 ✓	
284/2	1	29	0. 52. 0	0 52.5 ✓
285/2	1	31	0. 53. 0 ✓	
286	1	64	0. 66. 5 ✓	
303/1A	0	92	0. 37. 0	
2A	1	26	0. 51. 0	0.88.0 ✓
305/1	0	75	0. 30. 5	
2	0	86	0. 35. 0	0 65.0
306/1	1	07	0. 43. 5 ✓	
308/1	0	62	0. 25. 0	0 25 5
309/1	0	64	0. 26. 0 ✓	
313/1A	0	89	0. 36. 0 ✓	
314/1	0	85	0. 34. 5 ✓	
316/1A	0	47	0. 19. 0	
316/2A1	0	41	0. 16. 5	0 36 5 ✓
319/1A	0	33	0. 13. 5	0 13.0
324/1A	1	19	0. 48. 0 ×	
			11.59.5	

29/

COLLECTOR,
RAMANATHAPURAM

For TAMIL NADU CEMENT CORPORATION LTD.,

GENERAL MANAGER.

11.12.6

/contd... 12/

ALANGULAM VILLAGE (Contd...)

(1)	(2)	(3)	(4)	(5)
324/1B	0	28	0. 11. 5	
2A	0	22	0. 09. 0	0 77.0
2B	1	68	0. 68. 0	
325/1	0	18	0. 07. 5	
2	0	10	0. 04. 0	
3	0.	10	0. 04. 0	
4	0	11	0. 04. 5	
5	0	10	0. 04. 0	
6	1	04	0. 42. 0	0 61.0
326/1	1	38	0. 56. 0	
331/2B	0	73	0. 29. 5	
339/1B	1	24	0. 50. 0	
340/2	1.	15	0. 46. 5	0 47.0
341	1	20	0. 48. 5	
350/1A	0	71	0. 28. 5	
3A	0	30	0. 12. 0	0 41.0
351/1A	0	74	0. 30. 0	
352/1	2	31	0. 93. 5	
370/1A	0	72	0. 29. 0	
2A	0	81	0. 33. 0	0 62.0
371/1	0	89	0. 36. 0	
372/1	0	82	0. 33. 0	
374/1A	1	99	0. 80. 5	
376	2	03	0. 82. 0	
457	1	55	0. 62. 5	
459	1	80	0. 73. 0	
460/1	0	85	0. 34. 5	
			10 12 5	

For TAMIL NADU CEMENTS CORPORATION LTD.,

COLLECTOR,
RAMANATHAPURAM

10.02.0

GENERAL MANAGER.

/contd... 13/

ALANGULAM VILLAGE (Contd...)

(1)	(2)	(3)	(4)	(5)
460/2A	5	97	2. 41. 5	
461/1	0	31	0. 12. 5	
461/2A	0	52	0. 21. 0	
462/1	1	30	0. 52. 5	
472/2	1	06	0. 43. 0	
3A	1	28	0. 52. 0	
4A	1	18	0. 48. 0	
473/1	1	08	0. 43. 5	
2A	0	74	0.30. 0	
3A	1	04	0. 42. 0	
474	1	12	0. 45. 5	
475	2	11	0. 85. 5	
476/1B	0	87	0. 35. 0	
2B	0	95	0. 38. 5	
477	5	05	2. 04. 5	
478/1	0	97	0. 39. 5	
2	0	96	0. 39. 0	
629/1	1	08	0. 43. 5	
2	0	84	0. 34. 0	
3	4	00	1. 62. 0	
4	0	68	0. 27. 5	
630	3	57	1. 44. 5	
632/1	0	60	0. 24. 5	
670	2	30	0. 93. 0	
671/1	0	51	0. 20. 5	
2A	0	14	0. 05. 5	
2B	0	15	0. 06. 0	
2C	0	15	0. 06. 0	
2D	0	16	0. 06. 5	

COLLECTOR,
RAMANATHAPURAM

FOR TAMIL NADU CEMENTS CORPORATION LTD.,

GENERAL MANAGER.

/contd...2/

ALANGULAM VILLAGE (Contd...)

(1)	(2)	(3)	(4)	(5)
671/3	0	44	0. 18. 0	0.38.0
4	0	49	0. 20. 0	
673/1	1	20	0. 48. 5	1.49.0
2	1	30	0. 52. 5	
3	1	18	0. 48. 0	
674	0	52	0. 21. 0	
675/1A	1	82	0. 73. 5	1.40.0
2A	1	02	0. 41. 5	
2B	0	62	0. 25. 0	
676/1	1	00	0. 40. 5	0.70.0
2	0	73	0. 29. 5	
677/1	0	71	0. 28. 5	0.55.5
2	0	66	0. 26. 5	
678/1	1	12	0. 45. 5	0.47.5
679	1	14	0. 46. 0	
681/1	2	11	0.85. 5	0.85.5
680	2	00	01 81. 0	0.81.00
681/2	0	32	0. 13. 0	0.13.00
683/1	3	70	1. 49. 5	1.85.0
2	0	87	0. 35. 0	
685/2	0	38	0. 15. 5	0.40.0
682/2	0	55	0. 22. 5	0.60.5
1	0	94	0. 38. 0	
689	5	20	2. 10. 5	
690/2	0	09	0. 03. 5	
704	3	76	1. 52. 0	
703/2	5	20	2. 10. 5	
709	3	80	1. 54. 0	
			17.85.0	

COLLECTOR,
RAMANATHAPURAM.

17.62.5

For TAMILNADU CEMENTS CORPORATION LTD.,

GENERAL MANAGER.

/contd...15/

ALANGULAM VILLAGE (Contd...)

(1)	(2)	(3)	(4)	(5)
710/1	1	41	0- 57. 0	
2	1	41	0. 57. 0	1.14.0
711/1A	2	00	0. 81. 0	
1B	2	08	0. 84. 0	1.65.0
713/1	0	48	0. 19. 5	
714/1	0	44	0. 18. 0	
2	1	70	0. 69. 0	1.96.5
3	2	72	1. 10. 0	
715/2	1	77	0. 71. 5	
720/2	1	38	0. 56. 0	
721/2	4	50	1. 82. 0	
730/1	0	96	0. 39. 0	
2	3	04	1. 23. 0	1.62.0
731	1	09	0. 44. 0	
732	1	37	0. 55. 5	
733	1	27	0. 51. 5	
734/1	0	85	0. 34. 5	1.47.5
2	2	80	1. 13. 5	
735	2	42	0. 98. 0	
737/1B	1	05	0. 42. 5	1.74.5
2	3	24	1. 31. 0	
792	9	00	3. 64. 0	
793	2	88	1. 16. 5	
935	2	77	1. 12. 0	
936	2	39	0. 96. 5	
937	2	09	0. 84. 5	
977	1	82	0. 73. 5	
978	2	70	1. 09. 5	

FOR TAMIL NADU CEMENTS CORPORATION LTD.,

COLLECTOR,
RAMANATHAPURAM.

GENERAL MANAGER.

/contd...16/

3

ALAGULAM VILLAGE (CONTD....)

(1)	(2)	(3)	(4) (5)
1141	2	02	0. 82. 0 ✓
1142	3	11	1. 26. 0 ✓
1143/1	1	62	0. 69. 5
2	1	62	0. 65. 5
	404	93	163. 87. 5

1.13.0 131.0

8.210/702

163.87.5 ✓

163.05 + 82.0

POROMBOKE LANDS

25	2	14	0. 86. 5
27	2	98	1. 20. 5
30/1 ✓	0	68	0. 27. 5
32/2	0	58	0. 23. 5
33	0	59	0. 24. 0
42/1	2	48	1. 00. 5
2	0	18	0. 07. 5
44/2	0	93	0. 37. 5
83	2	79	1. 13. 0
85	1	84	0. 74. 5
101	0	54	0. 22. 0
108	1	57	0. 63. 5
121	0	65	0. 26. 5
122	1	68	0. 68. 0
223	1	56	0. 63. 0
225	1	76	0. 71. 0
236	0	23	0. 09. 5
229	0	77	0. 31. 0
342/1	3	10	1. 25. 5

For TAMIL NADU CEMENTS CORPORA

GENERAL MANAGER

COLLECTOR,
RAMANATHAPURAM

10.950

/c

PORAMBOKE LANDS (contd...)

(1)	(2)	(3)	(4)	(5)
375	1	32	0. 53. 5	
458	0	96	0. 39. 0	
672/1	1	22	0. 49. 5	
2	0	03	0. 01. 0	
3	0	04	0. 01. 5	0. 52. 0
690/1	6	46	2. 61. 0	
934	0	78	0. 31. 5	
	37	86	15. 32. 0	

COLLECTOR,
RAMANATHAPURAM.

For TAMIL NADU CEMENTS CORPORATION LTD.,

GENERAL MANAGER.

/contd...18/

Name of Village: LAKSHMIPURAM Taluk: SATTUR

Village No. : 144 District: RAMANATHAPURAM.

PATTA LANDS

Survey Number	Extent Acres	Cent	Hectares	Area
169/3	2	90	1. 17. 5	169/3
169/4	1	14	0. 46. 0	
	4	04	1. 63. 5	1.63.00

ABSTRACT

Name of village	Patta Ac. C.	Hec. Ares.	Poramboke Ac. C.	Hec. Ares.	Total Ac. C.	Hec. Ares
Alangulam	404.93	163.87.5	37.86	15. 32. 0	442.79	179.19.5
Lakshmipuram	4.04	1.63.5	-	-	4.04	1.63.5
Grand Total ..	408.97	165.51.0	37.86	15. 32. 0	446.83	180.83.

Signed by: V. MADHAVAN NAIR

COLLECTOR,
RAMANATHAPURAM AT
MADURAI.
(for and on behalf and
by the order and
direction of the Governor)

In the presence of:

Witness:

Signed by: K. SRINIVASAN

For TAMIL NADU CEMENTS CORPORATION LTD.

GENERAL MANAGER.

In the presence of:

Witness:

ANNEXURE - 2A

Email / Speed post

भारत सरकार / GOVERNMENT OF INDIA
खान मंत्रालय / MINISTRY OF MINES
भारतीय खान ब्यूरो / INDIAN BUREAU OF MINES
क्षेत्रीय खान नियंत्रक कार्यालय / OFFICE OF THE REGIONAL CONTROLLER OF MINES

Telephone no.: 044-24914461/1570
Telefax no. 044-24911295
Email ID: ro.chennai@ibm.gov.in

C-4-A Rajaji Bhavan
CGO complex, Besant Nagar
Chennai – 600 090.

No. TN/VRD/LST/ROMP-1643.MDS

Dated : 05.03.2021

To :
M/s. Tamilnadu Cements Corporation Limited
II Floor, LLA Buildings, 735
Anna Salai
Chennai – 600 002.

Sub. : Approval of Review Mining Plan with PMCP for Alangulam & Lakshmipuram Limestone Mine over an extent of 180.83.0 Hectares in S.F.Nos.28,29,30/2 etc. in Alangulam & Lakshmipuram Village, Vembakkottai Taluk, Virudhunagar District, Tamilnadu submitted by M/s. Tamilnadu Cements Corporation Limited under Rule 17(1) of MCR, 2016.

Ref. : Qualified person letter No.Nil dated 24.02.2021.

Sir,

In exercise of the powers delegated to me under Rule 16 of Minerals (Other than Atomic & Hydro Carbon Energy Minerals) Concession Rules, 2016 vide Gazette Notification No. S.O. 1857(E) dated 18.5.2016 issued by the Controller General, Indian Bureau of Mines under F.No. T-43004/CGBM/MM(DR)/2015, I hereby approve the above said Review of Mining Plan for **Limestone** mineral only. This approval is subject to the following conditions.

1) That the Review of Mining Plan (including Progressive Mine Closure Plan) is approved without prejudice to any other law applicable to the mine/area from time to time whether made by the Central Government, State Government or any other authority.
2) That this approval of the Review of Mining Plan (including Progressive Mine Closure Plan) does not in any way imply the approval of the Government in terms of any other provision of the Mines & Mineral (Development & Regulation) Act, 2015 or the Mineral Concession Rules, 2016 or any other law including Forest (Conservation) Act, 1980, Environment Protection Act, 1986 and the rules made there under.
3) That this Review of Mining Plan (including Progressive Mine Closure Plan) is approved without prejudice to any other order or direction from any court of competent jurisdiction.
4) Provisions of the Mines Act, 1952 and Rules & Regulations made thereunder including submission of notice of opening, appointment of manager and other statutory officials as required by the Mines Act, 1952 shall be complied with.
5) The Provisions made under MM(D&R) Act, 2015 (Amended) and Rules made thereunder shall be complied with.
6) The contents of circular No. 2/2010 issued by the Chief Controller of Mines, IBM, Nagpur vide his letter No. 11013/3/MP/90-CCOM Vol. VII dated 06.04.2010 shall be complied with.
7) The execution of Mining Plan / Review of Mining Plan shall be subjected to vacation of prohibitory orders / notices, if any.
8) This approval of mining operations and associated activities is restricted to the mining lease area only. The mining lease area is as shown on the statutory plans under rule 32 of Mineral Conservation and Development Rules, 2017, by the lessee. Indian Bureau of Mines does not take any responsibility regarding correctness of the boundaries of the lease shown on the ground with reference to the lease map and other plans furnished by the lessee.
9) The Environmental Monitoring Cell of the Company shall continue monitoring ambient air quality, dust fall rate, water quality, soil sample analysis and noise level measurements on various stations established for the purpose both in the core zone and buffer zone, as per Department of Environment guidelines and keeping in view IBM's Circular No.3/92, season-wise every year or by engaging preferably the services of an Environmental laboratory approved by MOEF/CPCB. The data so generated shall be maintained in a bound paged register kept for the purpose and the same shall be made available to the inspecting officer on demand.

10) If anything is found to be concealed as required by the Mines Act in the contents of Review of Mining Plan and proposal for rectification has not been made, the approval shall be deemed to have been withdrawn with immediate effect.
11) Yearly report as required under Rule 26(2) of MCDR,2017setting for the extent of protection and rehabilitation works carried out as envisaged in the approved progressive mine closure plan and if there is any deviations, reasons thereof shall be submitted before 1st July of every year to the regional office, IBM , Chennai.
12) The Review of Mining Plan is approved for the proposals contained therein and as applicable from the date of approval for the mining activities to be carried out within the mining leasehold. The earlier instances of irregular mining/illegal mining, if any, shall not be regularized through the approval of this document.
13) The financial assurance submitted should be renewed before expiry of the same.
14) In case mining lease falls within a radius of 10 kms. of National Park/Sanctuary, recommendations of NBWL have to be obtained as per the orders of the Hon'ble Supreme Court in I.A. No. 460/2004.
15) This approval is subject to the mining operations as per the proposals shall be carried out only after obtaining necessary clearances from MOEF, Pollution Control Board, Forest Department etc
16) This approval is subjected to the extension of the validity of the mining lease by the State government as per Section 8A(5) of MMDR Act, 2015 (Amended).
17) This approval is subject to submission of DGPS Plan duly authenticated by the State Government and submission of modifications in the approved Mining Plan if, consequent to the authentication of DGPS Survey Plan, any change in mining lease area is accepted by the State Government.
18) This approval is subject to the conditions as per the directions given in WP(c)No.114/2014 given by the Hon'ble Supreme Court of India should be taken care while implementing the proposals given in the PMCP part of the documents.

Yours faithfully,

5.3.2021

Encl. Copy of approved Review of Mining Plan
(including Progressive Mine Closure Plan)

(वी.जयकृष्ण बाबु / V. Jaya Krishna Babu)
क्षेत्रीय खान नियंत्रक / Regional Controller of Mines

Copy for information to:-

1. Shri A. Jagannathan, Qualified person, Old No.260-B, New No.17, Advaitha Ashram Road, Alagapurma, Salem – 636 004.
2. The Commissioner of Geology & Mining, Government of Tamilnadu, Guindy, Chennai – 600 032 along with copy of the approved Review of Mining Plan.

Encl : As above.

(वी.जयकृष्ण बाबु / V. Jaya Krishna Babu)
क्षेत्रीय खान नियंत्रक / Regional Controller of Mines

ANNEXURE -17A

HYDROLOGICAL REPORT FOR ALANGULAM CEMENT WORKS (TANCEM) (G.O.No.215/IND, Dt.18.09.1995)

LOCATION OF THE APPLIED LEASE AREA

STATE	:	TAMILNADU
DISTRICT	:	VIRUDHUNAGAR
TALUK	:	VEMBAKOTTAI
VILLAGE	:	LAKSHMIPURAM & ALANGULAM
EXTENT	:	180.83.0 Hectares

FOR

APPLICANT

M/S. TAMILNADU CEMENTS CORPORATION LIMITED IN LAKSHMIPURAM & ALANGULAM VILLAGES OF VEMBAKOTTAI TALUK, VIRUDHUNAGAR DISTRICT, TAMILNADU, INDIA

PREPARED BY

Dr. G. BASKARAN, M.Sc., Ph.D.,

PROFESSOR AND HEAD

CENTRE FOR WATER RESOURCES MANAGEMENT

UNIVERSITY OF MADRAS

CHENNAI – 600 025

November - 2022

CONTENTS

2.5 Drainage map

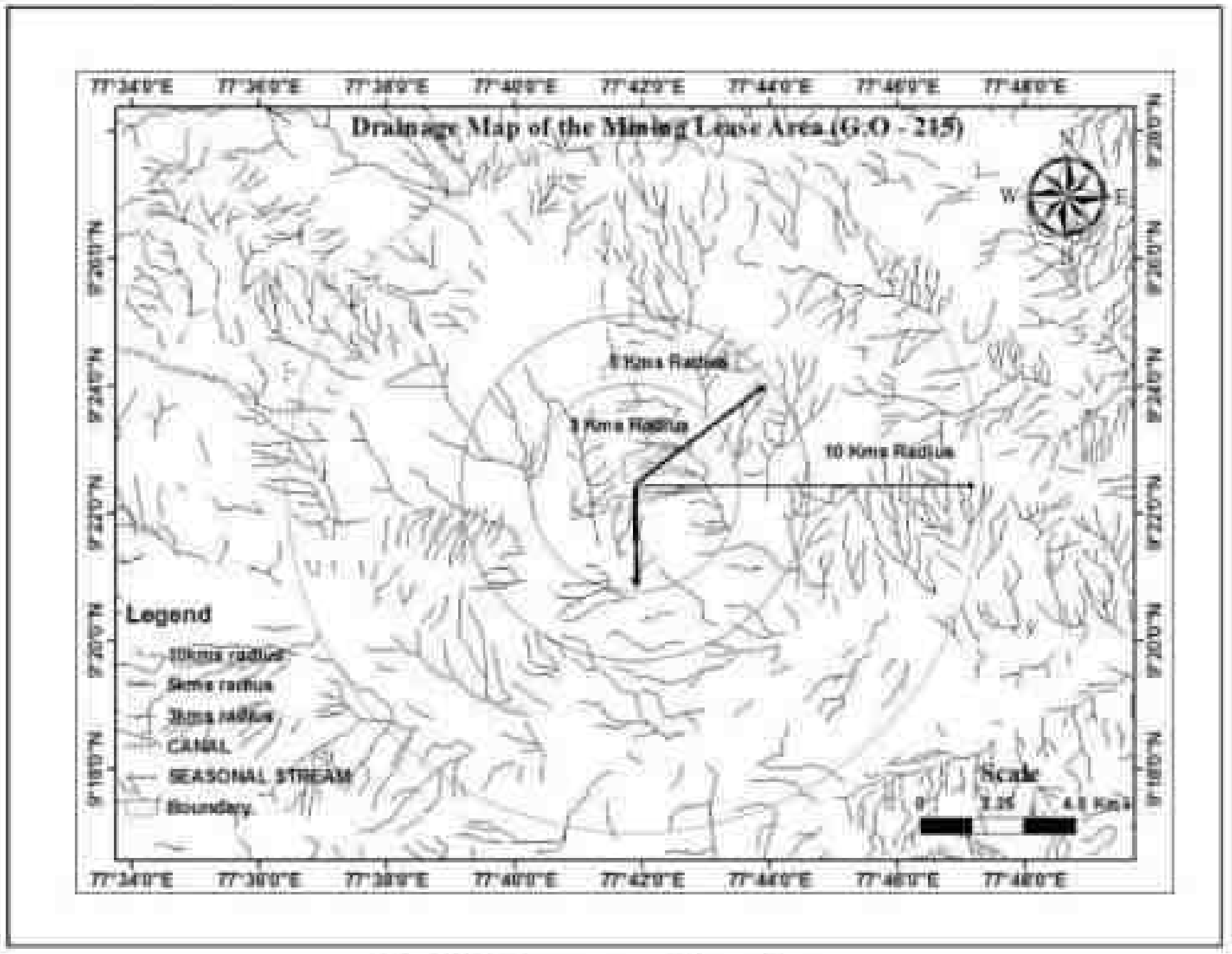


Fig. 5 Drainage map of the study area

2.6 Drainage Pattern Study

The study area is situated M/S. Tamilnadu Cements Corporation Limited in Lakshmipuram and Vadakarai Villages of Vembakottai Taluk, Virudhunagar District, Tamilnadu, India. The drainage pattern study reveals that from the proposed mine lease applied area in or around 10kms, 5kms and 3kms radius study observed shown in **Fig. 5 and Fig. 6**, there are no major River passed through with in the radius, seasonal streams and canal are identified but no more water flows along the direction in the study area. According to the drainage pattern study noticed the seasonal streams and canals in or around the area, there are no major impacts on the proposed mine lease applied area.

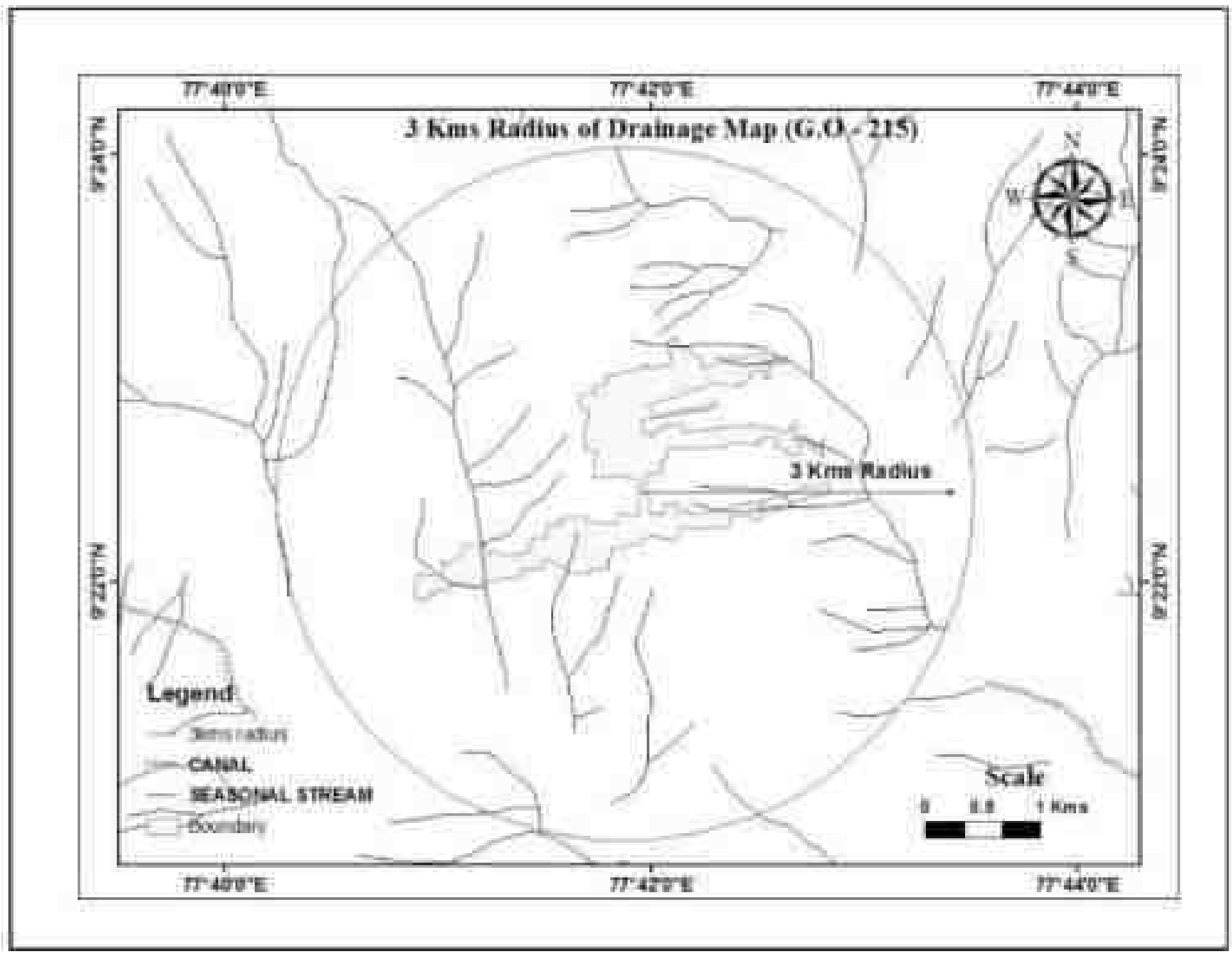


Fig. 6 3 km radius of the area

2.8 Water table studies

According to Groundwater Estimation Committee (GEC-2015), we have collected the post and pre- monsoon seasons water samples. The post-monsoon seasons (August-2022), there are three dug wells (DW) were identified, Namely, DW 1, DW 2 and DW 3 around the study area shown in **Fig. 8**. DW 1, water level is 7.1 m, DW 2, water level is 12.1 m and DW 3, water level is 12.5 m. The pre-monsoon seasons (September-2022), the water table level raised due unexpected rainfall, Namely, DW 1, DW 2 and DW 3 around the study area shown in **Fig. 9**. DW 1, water level is 6.5 m, DW 2, water level is 11.4 m and DW 3, water level is 11.6 m. According to the DW 2 and DW 3, water level is deeper level compared to the other dug wells because of continuous used by the land owner and recharge of the dug well is very slow in nature. In the study represents that the there are no major impacts in study area.

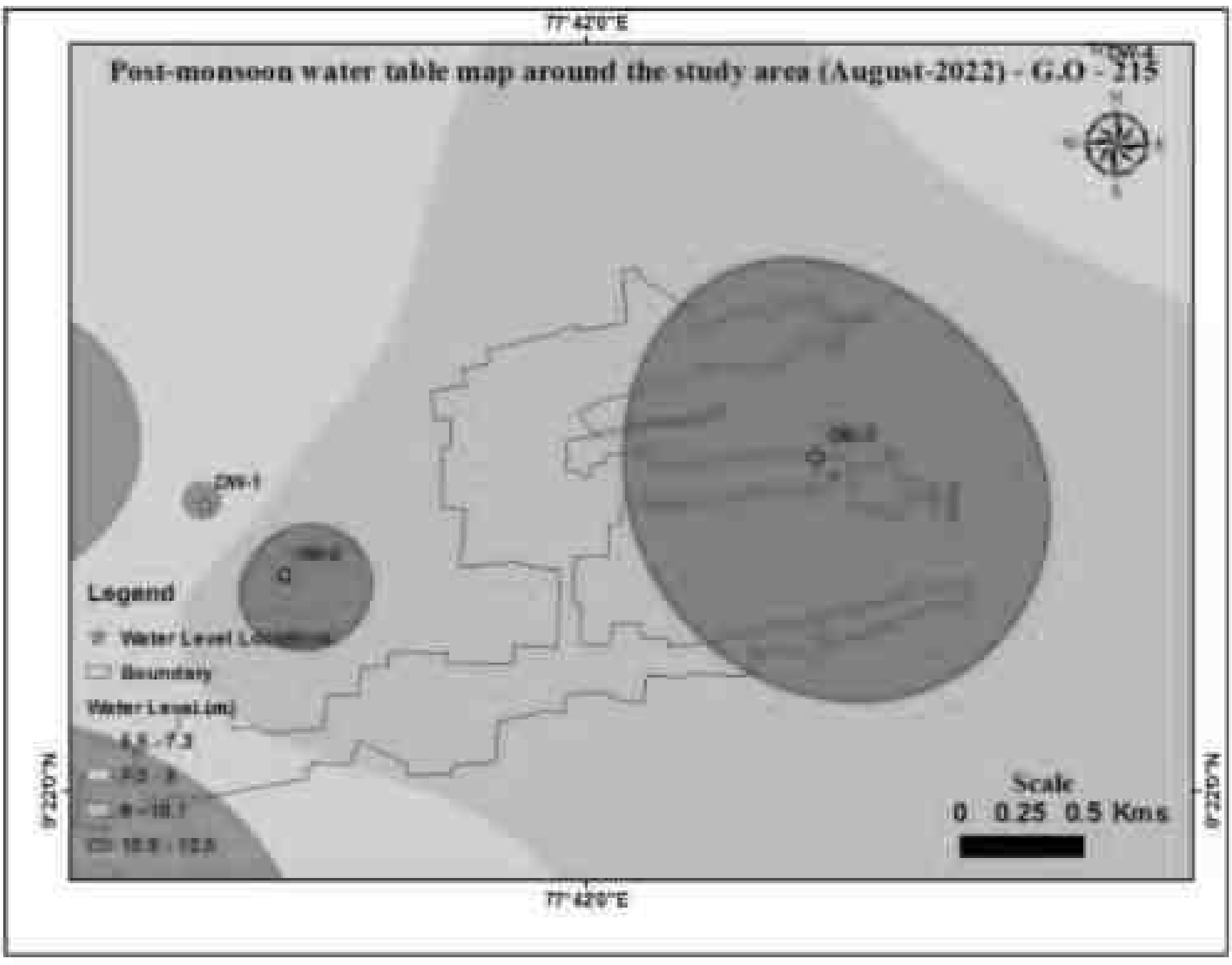


Fig. 8 Post-monsoon water table map around the study area (August-2022)

CHAPTER 4

PUMPING TEST

4.1 Introduction

The pumping test is an aquifer test, performed to estimate the hydrological properties of an aquifer. In other words, pumping test is a field-based test in which a well is pumped at a controlled rate and its response on groundwater level i.e. drawdown is measured in one or more nearby observation wells or optionally in the pumping well itself. During this experiment, the drawdown of groundwater level and the discharge were measured continuously over time until the groundwater level reaches a steady state. Based on the observed/collected data, the aquifer parameters such as transmissivity, hydraulic conductivity and storativity were determined and estimate the hydrogeological properties of an aquifer using pumping test carry out the pumping test.

Fig. 46 Pumping test in the study area

4.2 Site description and methods adopted

The pumping test was conducted in the Laksmipuram and Alangulam village of Virudhunagar district, Tamil Nadu, India on 29/09/2022 shown in **Fig. 46**. A bore well with the depth of about 75 m below ground level (bgl) was selected as the pumping/control well for the study. The static water level of 4.80 m bgl was measured before conducting the pumping test using automatic water level indicator. The groundwater in the pumping well was abstracted through 3 Horse Power (HP) motor and the discharged water was transferred through a hose pipe at greater distance and collected in a barrel in order to measure the volume of discharge. The collected water in the barrels are discarded over time at a greater distance from the pumping well to avoid the recharge/leakage into the pumping well. The pumping test was carried out until the groundwater level reaches a steady state.

4.3 Observations

In this site, the pumping well attained the steady state at 130 mins of continuous pumping and the final drawdown was measured as 9.45 m bgl. The constant-rate of pumping was maintained all through the test and the discharge was calculated as 35 lit/min. During the pumping test, a total volume of about 4180 litres of groundwater was abstracted over the 130 mins time period. After reaching the steady state, the pumping was stopped and the recovery rate were measured using automatic water level indicator, obtained data were shown in **Fig. 47**. From the measured time dependent drawdown data, the aquifer parameters were estimated using Theis with Jacob Correction and Theis recovery method.

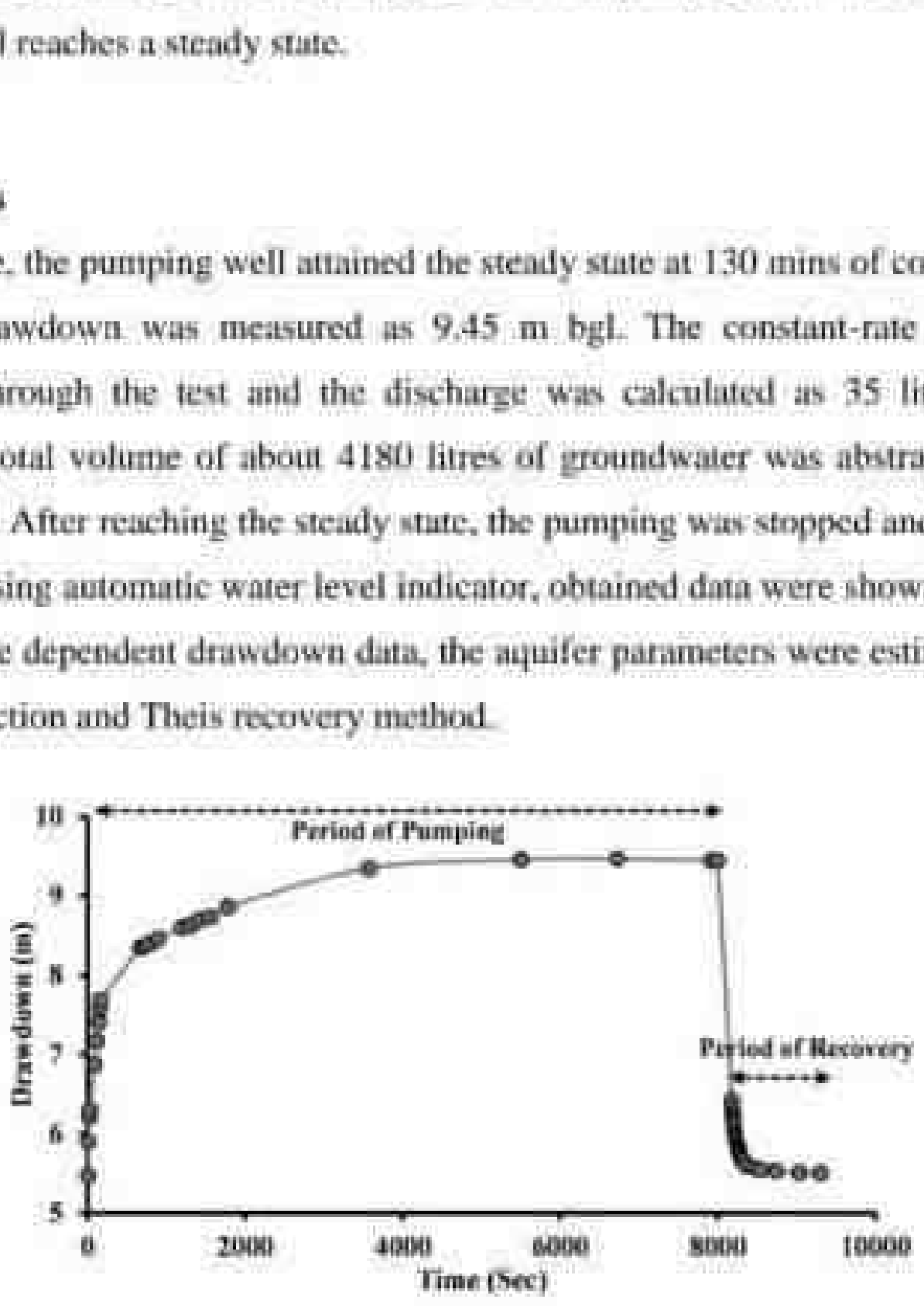


Fig. 47 Measured drawdown vs. time plot during pumping and recovery test

The data obtained from the pumping test are plotted separately in graph as drawdown versus time **Fig. 48**. The drawdown value and time lap for this location was evaluated. The obtained basic time lag and other well details were substituted in the Theis and Jacob equation as well as Theis recovery equation to determine the transmissivity, hydraulic conductivity and storativity.

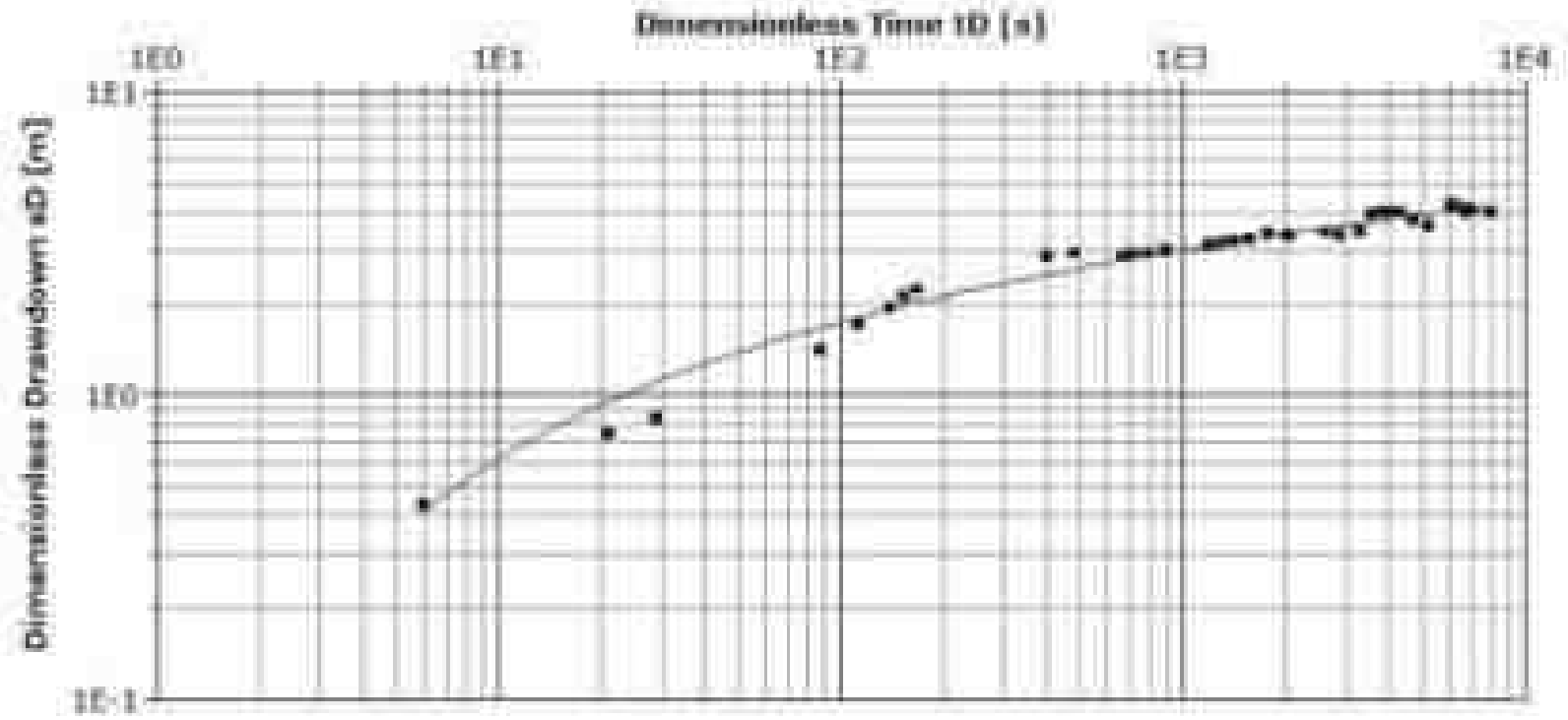


Fig. 48 Drawdown vs. time plot prepared using the data collected during pumping test

4.4 Interpretation of Pumping Well

The hydraulic conductivity of the aquifer of this region was estimated as 1.87 x 10^1 m/day, transmissivity is 4.11 x 10^2 m^2/day and storativity of 6.75 x 10^{-1} through this pumping test. Based on the estimated aquifer parameters, it is been inferred that the yield of bore well is very good and most promising for abstraction for longer period. Further, an abandoned bore well located at a distance of about 16 m from the pumping well was monitored and found no drawdown, which indicates that the groundwater of this region is highly controlled by the well-developed fractures of the groundwater system in this region. Further, the pumping well is located closer to the abandoned quarry which holds rainwater and act as a source of groundwater recharge. Hence, the water in the bore wells and nearby open well are very shallow. This could also be a major reason for achieving the steady state at the earliest during the pumping test.

4.5 Summary of the pumping well

The hydraulic conductivity of the aquifer of this region was estimated as 4.03×10^{-1} m/day, transmissivity is 1.01×10^{1} m^2/day and storativity of 2.47×10^{-2} through this pumping test. Based on the estimated aquifer parameters, it has been inferred that the yield of bore well is moderate and abstraction can be possible for longer period at low yield. Further, a domestic bore well located at a distance of about 50 m from the pumping well was monitored and found minimal drawdown, which indicates that the groundwater of this region is moderately controlled by the fractures present in the host rocks of this region. Based on the aquifer parameters and the VES based subsurface characterization, it is recommended that the groundwater of this region can be extracted at the range of 50-100 m^3/day using 3 - 5 HP centrifugal pumps with the pumping duration of ~8 hr to the next six months. Aquifer property can be evaluated based on monsoon since estimation of groundwater extraction rate is highly depends on the aquifer conditions and behavior.

CHAPTER 5

QUALITY OF GROUNDWATER

5.1 Introduction

The rainfall is the main source for the availability of water both in surface and sub-surface. The quantum of rainfall varies every year depending upon the monsoon. However, the extraction of surface and sub-surface water is increasing year by year. It leads to environmental impact on the water sources like depletion of water level, deterioration of water quality. It makes the demand for the quantification of available water and also its quality for various purposes like agriculture, industries, drinking and domestic purposes. For the present assessment, the value of Total Dissolved Solids (TDS) have been considered for demarcation of good / bad quality areas. For this purpose, the TDS value of less than or equal to 2000 mg/l have been considered as good quality and the value more than 2000 mg/l have been considered as bad quality areas.

The presence of fluoride in natural Ground Water is having its merits and demerits depending upon the concentration. Presence of fluoride <1.0 mg/l in drinking water reduces dental diseases whereas higher level > 1.50 mg/l will affect the health and causes dental fluorosis. Nitrate is noted significantly in Ground Water due to use of chemical fertilizer for agriculture and other local pollution rocks and soils are also contributing nitrate to Ground Water. Arsenic is another poisonous heavy metal in Ground Water. The allowable limits for drinking purposes are 0.05 mg/l.

5.2 Study area

The study area is undertaken by M/s. Tamilnadu Cements Corporation Limited, a Government of Tamilnadu undertaking has set up a Cement plant at Alangulam, near Rajapalayam in Virudhunagar District. Totally, three water samples were collected from the bore wells (BW), dug well (DW) as shown in **Fig. 50**. The post-monsoon season (August-2022), there were three water samples were collected and analyzed in Center for Water Resources Management, University of Madras, Chennai, and results shows that no major differences in the water samples. Pre-monsoon samples (Septemper-2022), there were five water samples were collected and sent to NABL laboratory the reports were shown in the end. The results of quality of groundwater are being enclosed as **Annexure (Lab Report)**.

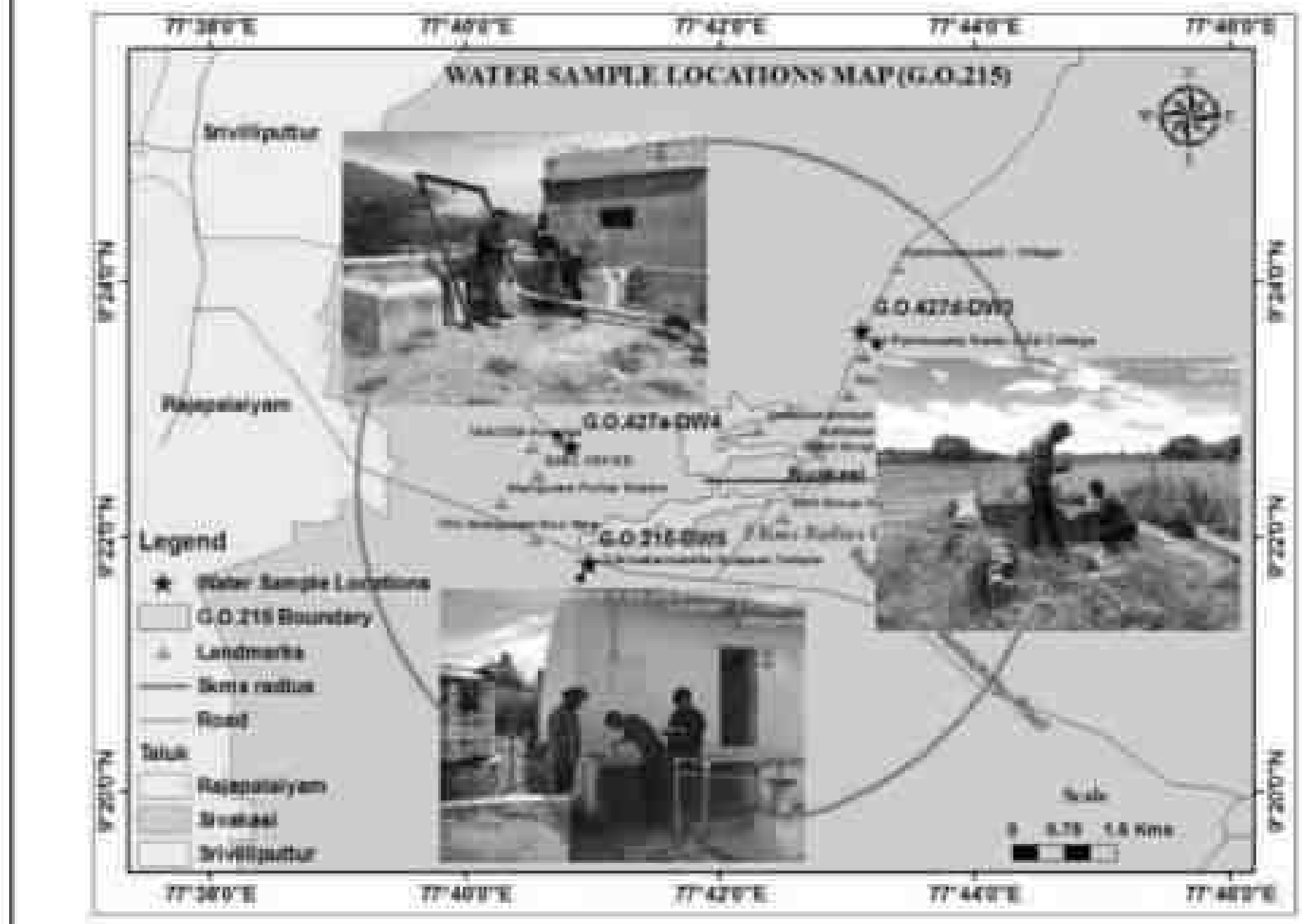


Fig. 50 Water sample locations map

5.3 Interpretation of water quality data

Table 6 Bureau of Indian Standards BIS: 10500:1991, BIS 10500: 2012, 2014 and Revised 2022 & World Health Organization Standards; and water samples showing above permissible limit

Sl No.	Characteristic	Units	Requirement (Acceptable Limit)	Permissible Limit	Water sample shows which is the above permissible limit
1	Colour	Hazen	5	25	
2	Turbidity (NTU)	NTU	5	10	
3	Biological Oxygen Demand (BOD)	mg/l	0.1	1.0	
4	pH value	--	6.5-8.5	No relaxation	
5	Total dissolved solids (TDS)	mg/l	500	2 000	G.O.427a/DW4
6	Chemical Oxygen Demand (COD)	mg/l	2	4	G.O.427d/DW3 and G.O.427a/DW4
7	Oil & Grease	mg/l	5	No relaxation	
8	Sodium (Na)		-	200	
9	Potassium (K)	mg/l	-	42	
10	Fluoride (F)		1.0	1.5	
11	Iron (Fe)		0.3	No relaxation	G.O.427a/DW4
12	Chloride (Cl)	mg/l	250	1000	G.O.427a/DW4
13	Calcium (Ca)	mg/l	75	200	G.O.215 BW5 and G.O.427a/DW4
14	Magnesium (Mg)	mg/l	30	100	
15	Nitrate (NO_3)	mg/l	45	No relaxation	
16	Sulphate (SO_4)	mg/l	200	400	
17	Total alkalinity (HCO_3)	mg/l	200	600	
18	Total hardness	mg/l	200	600	G.O.215 BW5 and G.O.427a/DW4
19	Electrical Conductivity (EC) at 25° C	µ mhos/cm	Sensitive quality <1500 Semi-tolerant : 1500-3000 Tolerant : >3000		G.O.427a/DW4
20	Dissolved oxygen	mg/l	more than 6	-	
21	Bicarbonate as $CaCO_3$	mg/l	200	600	
Microbiological Parameters					
22	Total coliform	MPN/100ml	1-10	No relaxation	G.O.215 BW5, G.O.427d/DW3 and G.O.427a/DW4

The chemical characteristics of ground water in the phreatic zone in the study area has been studied using the analytical data of three ground water samples collected from the from the bore wells (BW), dug well (DW), namely, G.O.215 BW-5, G.O. 427a DW4 and G.O. 427d

DW3. The study of quality of ground water in deeper aquifers in the study area has been attempted using the data collected from exploratory bore/dug wells constructed in the study area. Ground water is in phreatic aquifers in the study area. Total, twenty two parameters were analyzed, namely, Color, Turbidity, BOD, pH, TDS, COD, Oil and Grease, Sodium, Potassium, Fluoride, Iron, Chlorides, Calcium, Magnesium, Nitrate, Sulphates, Total Alkalinity, Total Hardness, Electrical Conductivity, Dissolved oxygen, Bicarbonate and Total coliform.

Medical researchers have established that presence of some constituents in drinking waters, in small amount, are essential whereas in large concentrations they are injurious to human health. Based on these considerations, Bureau of Indian Standards (BIS) has prescribed limits for various physical, chemical biological and radionuclides for waters used for drinking purposes. Limits for some constituents have been extended to maximum permissible levels; uses of these waters are permitted only in the absence of an alternative source with desirable concentrations. In the study area, the water quality parameters were recorded the above permissible limits with Probable effects shown in the below table.

Table 7 Probable health effects in the above permissible limit water samples

S No	Parameters	Water sample ID	Probable health effects
1	Total dissolved solids (TDS)	G.O.427a/DW4 (3615mg/l)	May cause gastro-intestinal irritation, corrosion and laxative effect to new users.
2	Chemical Oxygen Demand (COD)	G.O.427d/DW3 (12 mg/l) and G.O.427a/DW4 (8 mg/l)	If all these pollutants are present at the maximum permissible concentration, the effluent may lead to eutrophication. Therefore, data on ecological change should be monitored.
3	Iron (Fe)	G.O.427a/DW4 (0.32 mg/l)	Causes staining of laundry and porcelain. In traces it is essential for nutrition.
4	Chloride (Cl)	G.O.427a/DW4 (1154 mg/l)	May be injurious to heart or kidney patients. Taste, indigestion, corrosion& palatability are affected.
5	Calcium (Ca)	G.O.215 BW5 (334 mg/l) and G.O.427a/DW4 (668 mg/l)	Excessive Cause incrustation, deficiency causes rickets, essential for nervous, muscular, cardiac functions and in coagulation of blood.
6	Total hardness	G.O.215 BW5 (946 mg/l) and G.O.427a/DW4 (1940 mg/l)	Causes scaling, excessive soap consumption, calcification of arteries.
7	Electrical Conductivity (EC) at 25° C	G.O.427a/DW4 (5562 µ mhos/cm)	Plant growth is retarded with stunted fruits, leaves and stem in high salinity
8	Total coliform	G.O.215 BW5 (350 MPN/100ml), G.O.427d/DW3 (220 MPN/100ml) and G.O.427a/DW4 (110 MPN/100ml)	Causes water borne diseases like coliform jaundice: Typhoid, Cholera etc. produces infections involving skin mucous membrane of eyes, ears and throat.

5.4 Suggestions for improvement of groundwater governance

Groundwater is recognized as a common pool resource. The use of groundwater by anybody should in no way cause adverse impacts on realization of other person's fundamental right to safe water for life. Access to groundwater without any discrimination, equitable distribution, and sustainable use considering the needs of future generations are considered. Right to water for life is the first priority and then to agriculture, and eco system needs. The precautionary principle and the polluter pay principle only to conserve and recharge groundwater. The responsibility of the State for ensuring every person's right to safe water even when water service is delegated to a private agency.

Groundwater is not amenable to ownership by the State, communities or persons and the State is the public trustee of groundwater. It also deals elaborately on groundwater protection and groundwater security plans. The Groundwater Act should incorporate legal pronouncement on groundwater such as the public, trust doctrine and recognition of the right to groundwater. It addresses the deficiencies in the present legal frame work in dealing with over exploitation and includes the improvements to the control mechanism to ensure the qualitative and quantitative sustainability of groundwater resources. It proposes to strengthen the regulating powers of Panchayat and Municipal bodies related to Ground water in line with articles 243G and 243W of the constitution. The Pricing of Ground Water for irrigation, Industrial and domestic purposes and collecting fees by water users association should be left to the State decision.

5.5 Conclusion

According to the results, all the parameters are within the permissible limit except, Total dissolved solids (TDS), Chemical Oxygen Demand (COD), Iron (Fe), Chloride (Cl), Calcium (Ca), Total hardness, Electrical Conductivity (EC) and Total coliform in all the three water samples, namely, G.O.215/BW5, G.O.427d/DW3 and G.O.427a/DW4.

The probable health effects noticed are explained in Table 7. Over all, it may cause gastro-intestinal irritation, corrosion and laxative effect to new users. If all these pollutants are present at the maximum permissible concentration, the effluent may lead to eutrophication. Therefore, data on ecological change should be monitored. Causes staining of laundry and

porcelain. In traces it is essential for nutrition, but, may be injurious to heart or kidney patients. Taste, indigestion, corrosion& palatability are affected. Excessive Cause incrustation, deficiency causes rickets, essential for nervous, muscular, cardiac functions and in coagulation of blood. Causes scaling, excessive soap consumption, calcification of arteries. Plant growth is retarded with stunted fruits, leaves and stem in high salinity Causes water borne diseases like coliform jaundice; Typhoid, Cholera etc. produces infections involving skin mucous membrane of eyes, ears and throat.

Finally, it is recommended to do the water treatment method to use the groundwater for drinking and domestic purposes.

ANNEXURE

PRE-MONSOON (SEPTEMBER-2022)

Enviro Care
INDIA PRIVATE LIMITED

TEST REPORT

Report No :	ECI-WA-2022/10/004	Report Date :	08.10.2022
Customer Name & Address	Dr D.Baskaran, Professor And Head Centre For Water Resource Management University of Madras Chennai-600 025		
Customer Reference :	WO Date: 30/09/2022	Sample Reference No :	ECI-WA-2022/10/004
Sample Drawn By :	ECI	Sample Received On :	03.10.2022
Sample Collected Date :	01.10.2022	Test Commenced On :	03.10.2022
Qty of Sample Received :	2L	Test Completed On :	08.10.2022
Sample Description :	Water	Sampling Method :	IS 3025 Part 01 & IS 1622
Sample Mark :	[illegible]		

S.No	PARAMETERS	UNITS	RESULTS	TEST METHOD
1	Color	Hazen	BDL(DL<1.0)	IS 3025 Part 04
2	Turbidity	NTU	BDL(DL<0.5)	IS 3025 Part 10
3	Bio chemical oxygen demand (BOD @ 27°C for 3 days)	mg/L	<1.5	IS 3025 Part 44
4	pH Value @ 25°C	--	7.9	IS 3025 Part 11
5	Total Dissolved Solids(TDS) @ 105°C	mg/L	696	IS 3025 Part 16
6	Chemical Oxygen Demand (COD)	mg/L	12	IS 3025 Part 58
7	Oil & Grease	mg/L	BDL(DL<1.0)	IS 3025 Part 39
8	Sodium (as Na)	mg/L	<1.0	IS 3025 Part 45
9	Potassium (as K)	mg/kg	35	IS 3025 Part 33
10	Fluoride(as F)	mg/L	<0.1	IS 3025 Part 60
11	Iron (as Fe)	mg/L	BDL(DL<0.01)	IS 3025 Part 53
12	Chlorides (as Cl)	mg/L	124	IS 3025 Part 32
13	Calcium (as Ca)	mg/L	117	IS 3025 Part 40
14	Magnesium (as Mg)	mg/L	12	IS 3025 Part 46
15	Nitrate(as NO_3)	mg/L	<1.0	IS 3025 Part 34
16	Sulphates (as SO_4^{2-})	mg/L	28	IS 3025 Part 24
17	Total Alkalinity (as $CaCO_3$)	mg/L	376	IS 3025 Part 23
18	Total Hardness(as $CaCO_3$)	mg/L	343	IS 3025 Part 21
19	Electrical Conductivity (EC) @ 25°C	µmhos/cm	1071	IS 3025 Part 14

Note : 1. [illegible]
2. [illegible]
3. [illegible]
4. [illegible]
5. [illegible]
6. [illegible] jurisdiction Only

Enviro Care
INDIA PRIVATE LIMITED

TEST REPORT

Report No : ECI-VIA-2022/10/004

20	Dissolved oxygen	mg/L	7.1	IS 3025 Part 38
21	Bicarbonate as $CaCO_3$	mg/L	276	IS 3025 Part 51
Microbiological Parameters				
22	Total coliform	MPN/100mL	220	IS 1622

--- End of Report ---

Verified By:

Remarks:

For ENVIRO CARE INDIA PRIVATE LIMITED
(Laboratory Division)

Authorized Signatory

Note : 1. [illegible]
2. [illegible]
3. [illegible]
4. [illegible]
5. [illegible]
6. [illegible]

Enviro Care
INDIA PRIVATE LIMITED

Report No :	ECI-WA-2223/10926	Report Date :	08.10.2022
Customer Name & Address	Dr.S.Baskaran, Professor And Head, Centre For Water Resorce Management, University of Madras, Chennai-600 025		
Customer Reference :	WO Date: 30/09/2022	Sample Reference No :	ECI-WA-2223/10926
Sample Drawn By :	ECI	Sample Received On :	03.10.2022
Sample Collected Date :	01.10.2022	Test Commenced On :	03.10.2022
Qty of Sample Received :	2L	Test Completed On :	08.10.2022
Sample Description :	Water	Sampling Method :	IS 3025 Part 01 & IS 1622
Sample Mark :	G.O. 407a (Dark		

S.No	PARAMETERS	UNITS	RESULTS	TEST METHOD
1	Color	Hazen	BDL(DL=1.0)	IS 3025 Part 04
2	Turbidity	NTU	<0.5	IS 3025 Part 10
3	Bio chemical oxygen demand (BOD @ 27°C for 3 days)	mg/L	BDL(DL=1.0)	IS 3025 Part 44
4	pH Value @ 25°C	-	7.4	IS 3025 Part 11
5	Total Dissolved Solids(TDS) @ 105°C	mg/L	3615	IS 3025 Part 16
6	Chemical Oxygen Demand (COD)	mg/L	8.0	IS 3025 Part 58
7	Oil & Grease	mg/L	BDL(DL=1.0)	IS 3025 Part 39
8	Sodium (as Na)	mg/L	42	IS 3025 Part 45
9	Potassium (as K)	mg/kg	14	IS 3025 Part 02
10	Fluorides(as F)	mg/L	<0.1	IS 3025 Part 60
11	Iron (as Fe)	mg/L	0.32	IS 3025 Part 03
12	Chlorides (as Cl)	mg/L	1154	IS 3025 Part 32
13	Calcium (as Ca)	mg/L	656	IS 3025 Part 40
14	Magnesium (as Mg)	mg/L	69	IS 3025 Part 46
15	Nitrates(NO_3)	mg/L	<0.1	IS 3025 Part 34
16	Sulphates (as SO_4^{2-})	mg/L	356	IS 3025 Part 24
17	Total Alkalinity (as $CaCO_3$)	mg/L	275	IS 3025 Part 23
19	Total Hardness(as $CaCO_3$)	mg/L	1940	IS 3025 Part 21
19	Electrical Conductivity (EC) @ 25°C	µmhos/cm	5062	IS 3025 Part 14

Note : (1) The results relate only to this item tested.
(2) Any correction not prepared shall invalidate this report.
(3) Report shall not be reproduced except in full without written approval of the laboratory.
(4) Unless informed by customer, the test items will be disposed 15 days from the date of issue of this report.
(5) Total liability of our laboratory is limited to the invoice amount.
(6) Any dispute arising out of this report is subjected to Madurai Jurisdiction Only.

Enviro Care
INDIA PRIVATE LIMITED

TEST REPORT

	Report No :			
20.	Dissolved oxygen	mg/L	6.1	IS 3025 Part 38
21.	Bicarbonate as $CaCO_3$	mg/L	270	IS 3025 Part 51
Microbiological Parameters:				
22.	Total coliform	MPN/100mL	110	IS 1622

← End of Report →

Verified By

Remarks :

For ENVIRO CARE INDIA PRIVATE LIMITED
Laboratory Division

Authorised Signatory

Note : 1) The results relate only to the item tested.
2) Any interpolation must prevent short to overlook this report.
3) Report shall not be reproduced anywhere except in full and in any case, it must be with the permission of the laboratory.
4) Unless informed by customer, the test items will not be retained for more than 15 days from date of issue of test report.
5) Total liability of our company is limited to the invoice amount.
6) Any dispute during suit of this report is subjected to Meerut Jurisdiction Only.

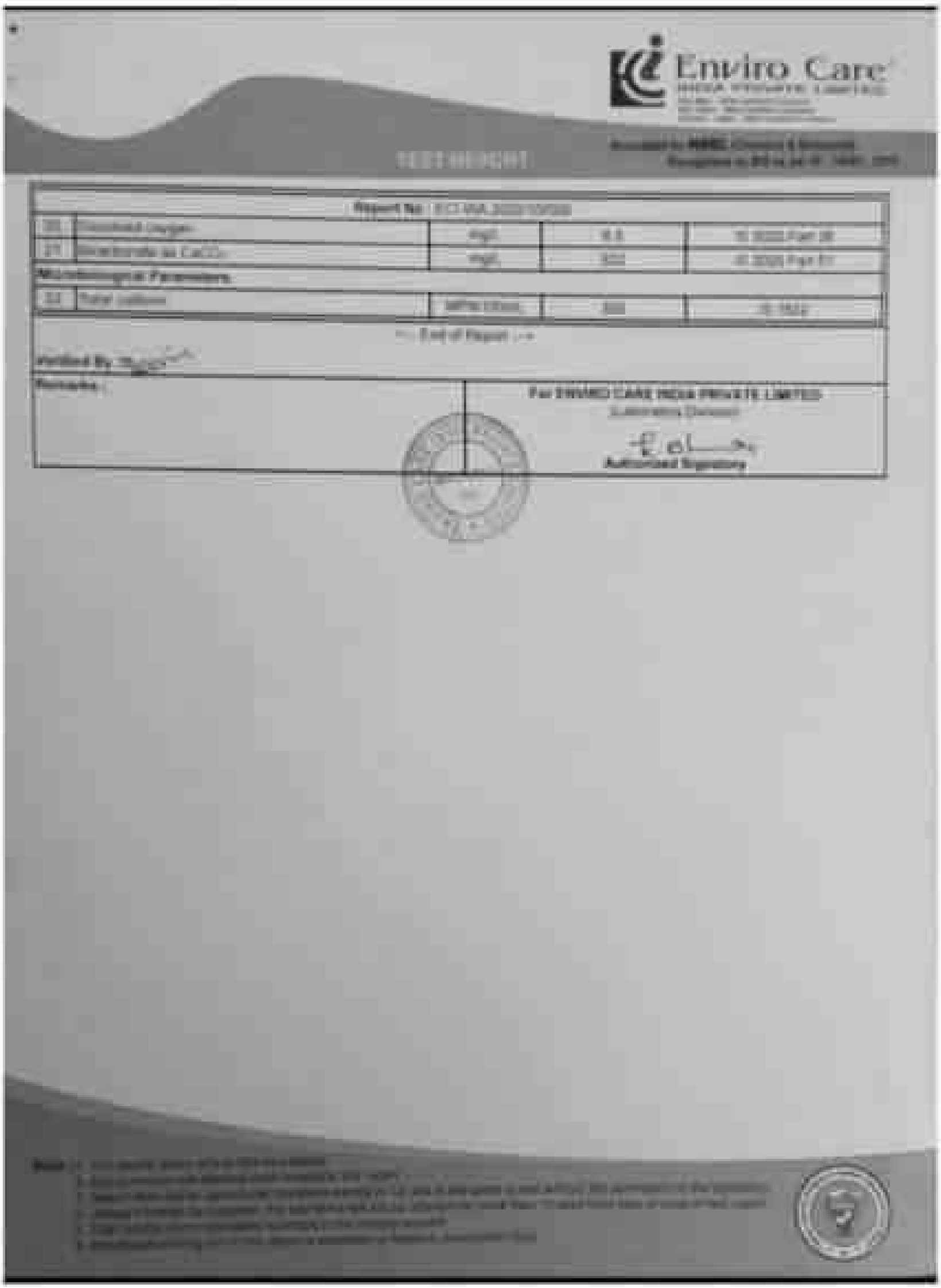
Enviro Care

TEST REPORT

Report No :	[illegible]	Report Date :	06.12.2023
Customer Name & Address	Dr.G.Baskaran, Professor And Head, Centre For Water Resource Management University of Madras, Chennai-600 025		
Customer Reference :	WO Date: 30/09/2023	Sample Reference No :	EC/ISA/2023/0009
Sample Drawn By :	EC	Sample Received On :	03.10.2023
Sample Collected Date :	01.10.2023	Test Commenced On :	03.10.2023
Qty of Sample Received :	1L	Test Completed On :	06.10.2023
Sample Description :	Water	Sampling Method :	IS 3025 Part 01 & IS 1622
Sample Mark :	G.D.418 / BW 8		

S.No	PARAMETERS	UNITS	RESULTS	TEST METHOD
1	Color	Hazen	BDL(DL-1.0)	IS 3025 Part 04
2	Turbidity	NTU	<0.5	IS 3025 Part 10
3	Bio chemical oxygen demand (BOD @ 27°C for 3 days)	mg/L	BDL(DL-1.0)	IS 3025 Part 44
4	pH Value @ 25°C	-	7.1	IS 3025 Part 11
5	Total Dissolved Solids(TDS) @ 180°C	mg/L	1982	IS 3025 Part 16
6	Chemical Oxygen Demand (COD)	mg/L	8.0	IS 3025 Part 58
7	Oil & Grease	mg/L	<1.0	IS 3025 Part 39
8	Sodium (as Na)	mg/L	44	IS 3025 Part 45
9	Potassium (as K)	mg/kg	15	IS 3025 Part 02
10	Fluoride (as F)	mg/L	<0.1	IS 3025 Part 60
11	Iron (as Fe)	mg/L	0.83	IS 3025 Part 53
12	Chlorides (as Cl)	mg/L	554	IS 3025 Part 32
13	Calcium (as Ca)	mg/L	134	IS 3025 Part 40
14	Magnesium (as Mg)	mg/L	37	IS 3025 Part 46
15	Nitrates (as NO_3^-)	mg/L	<1.0	IS 3025 Part 34
16	Sulphates (as SO_4^{2-})	mg/L	212	IS 3025 Part 24
17	Total Alkalinity (as $CaCO_3$)	mg/L	522	IS 3025 Part 23
18	Total Hardness(as $CaCO_3$)	mg/L	640	IS 3025 Part 21
19	Electrical Conductivity (EC) @ 25°C	µmhos/cm	2863	IS 3025 Part 14

Notes : 1) The results relate only to the item tested.
2) Any corrections may affected in the successive test report.
3) Report shall not be reproduced except in full and in the same format without the permission of the laboratory.
4) Unless otherwise by customer, the test results will be disposed not more than 15 days from date of issue of test report.
5) Total liability of our laboratory is limited to the invoice amount.
6) Any disputes arising out of this report is subjected to Madurai jurisdiction Only.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TEST REPORT
Report No
End of Report
Verified By
Remarks
For ENVIRO CARE INDIA PRIVATE LIMITED
Authorised Signatory

Chapter 1 : General Information

1.1 : Lease Details

IBM Registration Number :	IBM/7446/2011
Lease Code :	64129901
Mine Code :	38TMN30033
Name of Lessee :	Tamilnadu Cements Corporation Limited
Address of Lessee :	5th Floor, Aavin Illam, No.3A 5th Floor, Aavin Illam, No.3A, Pasumpon Muthuramalingam Road, Nandanam, Chennai
Type of Lessee :	PSU
Name of Mining Lease :	LAKSHMIPURAM LST 180dot830HA
State :	TAMIL NADU
District :	VIRUDHUNAGAR
Tehsil/ Taluk/ Mandal :	VEMBAKOTTAI
Village :	Alangulam
Lease Area (Ha) :	180.83
Forest Area (Ha) :	0.0000
Name of Minerals :	LIMESTONE

Name of associated minerals :	
Type :	Existing Lease
Period of the proposal (FY) from :	2023 - 24
Period of the proposal (FY) to :	2027 - 28
Type of working :	Opencast
Nature of Use :	Captive
Category of Mine :	Category A

1.1.1 : Initial/subsequent Lease grant details

Grant	From	To	Lease deed execution date	Lease registration date
Initial Grant	24/11/1973	23/11/1993	24/11/1973	24/11/1973
1st Extension	24/11/1993	23/11/2013	24/11/1993	24/11/1993

1.1.2 : Mining Plan Submission Criteria Details

Type of Document :	Review Of Mining Plan Under Rule 17(2) Of MCR, 2016
Reason/s For Modification :	Review Of Mining Plan Is Due For Submission
Period for which modification is proposed :	2023-2024 to 2027-2028

1.2 : Land Ownership Details

View Land Ownership Details Excel	Land_Ownership_Details.xlsx

1.3 : Existing Lease

Date of Execution :	24/11/1973

1.3.1 : Approval of earlier Mining Plan & Its Subsequent Review in Chronological Order

S.N.	Letter Number	Date	Period		Type Of Approved Document	Remark
			From	To		
1	TN/VRD/LST/MS-74/SZ	13/03/2005	01/04/2004	31/03/2009	Scheme Of Mining	The first scheme of mining plans was submitted for the period from 2004-05 to 2008-09.
2	TN/VRD/LST/MS-641-SZ/258	14/06/2012	01/04/2009	23/11/2013	Scheme Of Mining	The second scheme of mining plan was submitted for the period from 2011-12 to 2013-14(23.11.2013). The period from 2009-10 to 2010-11 was expired.
3	TN/VRD/MP/LST-1852-SZ	04/09/2013	24/11/2013	31/03/2018	Mining Plan	The mining plans was submitted for the period from 24.11.2013 to 31.03.2018.
4	TN/VRD/LST/ROMP-1643.MDS	05/03/2021	01/04/2018	31/03/2023	Review Of Mining Plan	The first Review of mining plan was submitted for the period from 2018-19 to 2022-23.

1.3.2 : Partial Surrenderd Area During Stages of Operations in Chronological Order

Not Applicable

1.3.3 : Transfer of Lease Area Subsequent to Grant

Sr.no	Transfer of lease deed letter number	Date of execution of Transfer lease deed	Name of Transferor	Nature of block transferred		
				Granted through auction	Other than through auction for captive use	Other than through auction for non captive use
1	GO Ms No 39, Industries, dt 09.01.1979	09/06/1980	Tamilnadu Industrial Development Corporation Limited	No	Yes	No

1.3.4 : Statutory Compliances

1.3.4.1 : Environment Clearance

Applicable :	Yes
Letter No :	F.No.23-167/2018-IA.III(V) TOR granted by SEIAA. TOR is enclosed as Annexure 5.
Date :	26/07/2021
Validity :	25/07/2025
ROM Mineral :	141570.0000 (Tonnes)

1.3.4.2 : SPCB Approvals

Letter No :	F.No.23-167/2018-IA.III(V) TOR granted by SEIAA. TOR is enclosed as Annexure 5.
Approval of :	Consent To Operate

Date :	26/07/2021
Validity :	25/07/2025
ROM Mineral :	141570.0000 (Tonnes)

1.3.4.3 : Forest Clearance

Applicable :	No
Letter No :	Nil
Date :	Nil
Validity :	Nil
Area (Ha) :	Nil

1.3.4.4 : Land Acquisition Details

Total Area Acquired in hectare:	165.5100
Total Amount Paid (INR) :	893662.0000

1.3.5 : Mine Location Details

Toposheet Number :	58 G/11

1.3.5.1 : Location of Boundary Pillars

View Location of Boundary Pillars Excel	215 location_boundary_pillar.xlsx

1.3.6 : Owner/Nominated Owner Details

Name	PAN of owner / Nominated Owner	Address of owner/ Nominated Owner	Mobile Number	Email	Please attach Minutes of Board Resolution in case of Nominated Owner
Pooja Kulkarni IAS	AKNPK1233E	The Managing Director Mines Ms Tamilnadu Cements Corporation Limited 5th Floor AavinIllam No3A Pasumpon MuthuramalingamSalai Nandanam Chennai 600035	9655813722	tncalgmmines@gmail.com	3_Authorization_Letter.pdf

1.3.7 : Qualified Person Details as per M(OAHCEM)CR, 2016

S.N.	Prefix	Name	PAN of QP	Address	Mobile no.	Qualification	Exp in years as prescribed under the rule	Email
1	Mr	P Thangaraju	AEJPT5234Q	No: 17, Advaitha Ashram Road, Alagapuram, Salem – 636 004.	9443356539	MSc Geology PhD	5	infogeoexploration1@gmail.com

Chapter 2A : Geology & Exploration

2A.1 : Geology

2A.1.1 : Topography

Terrain :	Undulating
Highest Level (m) from MSL :	114.0000
Lowest Level (m) from MSL :	60.0000
Average Level (m) from MSL :	87.0000
Drainage Pattern :	Dendritic
Order of Stream :	Order 2
Min Dist of Stream from Lease Area(m) :	7000.0000

2A.1.2 : Details of Physiographic features and Infrastructures avaiable in and around the lease/ block area

Description	Location if existing Within the lease/block area	Distance from boundary periphery in kms, if existing outside the lease/block area. (within 5.00Kms)	Remark if any
River/Nallah/Reservoir	Nil	Nil	Nil
Public roads (Tar road, cart road)	SH 183 East side	0.5	Rajapalayam Vembakottai 0.5km SW
Railway track	Nil	Nil	Nil
Human settlements	Nil	0.25	Name of the Hamlets Distance in km Direction Population Alangulam 0.25km SW 1900 Lakshmipuram 1.5km S 5600 Uppupatti 1km NE 1500 Edirkottai 1.5km E - 4300
Archaeological monuments/ places of	Nil	0.37	Shri Vinayagar Temple-0.37km - SW

worships/public utilities etc			Kaliamman Temple-0.55km - SW
Wild life sanctuaries/ national parks	Nil	Nil	Nil
Coastal Regulation Zone (CRZ)	Nil	Nil	Nil
Powertransmision lines/telephone lines	LT power line passing Eastern side of the area.	0.1	LT power line passing western side of the area-0.1km
Firing range	Nil	Nil	Nil
Ordinance factory	Nil	Nil	Nil
grazing land/ burial ground or cremation ground	Burial ground-SE	0.1	Nil
Any other specify	Nil	0.25	Nearby village-Alangulam 0.25Km SW, Nearest Railway station- Sivakasi 13km NE Nearest Port-Airport Madurai NE 65 km & Seaport Tuticorin SE 87km Distance of SH/NH from lease area-SH-186 Rajapalayam Vembakottai 0.5km South NH-744 Madurai to Tenkasi -16km NW

Particulars	Distance from lease boundary in kms
Near by village	0.25
Nearest Railway station	13.00
Nearest Port	65.00
Distance of SH/NH from lease area	0.50

2A.1.3 : Regional Geology

Regional Geology

The limestone belt represents zone of mineralization of calcareous sediments which are subsequently metamorphosed in the geological past. The deposit belongs to Darwarian Group of Archean Era which forms the oldest group of rock formation. The limestone deposit shows different gradations both in physical and chemical composition. The colour of the limestone is white. The limestone is mostly coarse grained with pocket of fine-grained material. The topsoil is black cotton soil with an average thickness of about 1m. The lease area is not affected by any Geological disturbances like

Fold, Fault. The general geological sequence of the limestone deposits is as follows: Order of Super position: AGE ROCKFORMATION: Recent - Black soil. Archean - Crystalline Limestone. - Calc-gneisses.

2A.1.4 : Local Geology & Structure

2A.1.4.1 : Local Geological Set-up

The area was surveyed in detail to prepare a Geological map in the scale of 1:4000 showing the various formations and attitude of the deposit. It is inferred that the Limestone mineral is of grade suitable for cement industries and in form band running S600W-N600E with SE600 dip. Top soil covers up to a depth in about 0.5m to 1.5m. Recovery of minerals is estimated as 70%. The recovery percentage is based on the knowledge gained from the present mine workings and adjacent working mine in this region, by the field tests carried out in the lease area and analysis done in Companys inhouse Laboratories and Government Laboratory-National Council for Cement and Building Materials, New Delhi.The general geological sequence of the limestone deposits is as follows: Order of Super position: AGE ROCKFORMATION: Recent - Black soil Archean - Crystalline Limestone - Calc-gneisses

2A.1.4.2 : Structure

Linear Banded Structure. The general drainage pattern of the area is of subdendritic and dentritic pattern. The area was surveyed in detail to prepare a Geological map in the scale of 1:4000 showing the various formations and attitude of the deposit. It is inferred that the Limestone mineral is of grade suitable for cement industries and in form single bed running S600W N600E with SE600 dip. Top soil covers up to a depth in about 0.5m to 1.5m.

2A.1.4.3 : Lithology, Petrographic & Mineralogical Description for Major, Associated & Indicator Minerals

Lithology: The area comprises crystalline Archaean rocks of deep-seated metamorphic origin which include mainly calc-gneiss, cordierite-sillimanite Gneiss, Biotite gneiss and granite gneiss. The gneisses appear to have resulted by migratizations of the preexisting sediments by intrusive of high-grade metamorphism viz. High temperatures and pressures. In addition, younger intrusive such as granites, pegmatites and quartz veins are also found in limestone band. The depositional sequence of the crystalline limestone is very well inferred existing limestone mine in this belt. The general geological sequence of the limestone deposits is as follows: Order of Super position: Age Rockformation Recent - Black soil Achaean - Crystalline limestone - Calc-gneiss

2A.1.4.4 : Mode of Occurance & Controls of Mineralization

The limestone belt represents zone of mineralization of calcareous sediments which are subsequently metamorphosed in the geological past. The deposit belongs to Darwarian Group of Archean Era which forms the oldest group of rock formation. The limestone deposit shows different gradations both in physical and chemical composition. The colour of the limestone is white. The limestone is mostly coarse grained with pocket of fine grained material. The topsoil is black cotton soil with an average thickness of about 1m. The lease area is not affected by any Geological disturbances like Fold, Fault. The physical attitude of the limestone bed is as follows: Strike / Trend of the Ore Body: S60 degree W-N60 degree E Amount of dip of Ore body: 60degree Dip Direction of the Ore Body: SE Plunge of Mineral Body (degree) (if any): - Direction of plunge: -

2A.1.4.5 : Extent of Weathering/ Alteration
There is no weathering.

2A.1.4.6 : Nature/Form of Mineral	Fibrous
Specify If any other	crystalline limestone

2A.1.4.7 : Extent of Mineralization
The mine has reached maximum 45m depth and based on the existing pits and drilled core drills, the depth of the mineralization has been proved up to 89m with an average of 1m topsoil in the lease area. Hence, the reserves and resources are estimated up to 89m depth during the Present Plan Period. 89m -1m Topsoil + 88m Limestone

2A.1.4.8 : Deposit Type (as per MEMC Rule)
Type of Deposit Bedded Stratiform and tabular deposits of regular and irregular habit Principal Minerals Iron Ore, Manganese Ore, Bauxite, Limestone, Chromite/Potash and Salt Beds etc.

Strike / Trend of the Ore Body						
S	60	W	to	N	60	E

Amount of Dip of the Ore Body (degree)	Amount of Dip of the Ore Body (degree)
60	60
(from)	(to)

Dip Direction of the Ore Body			Plunge of Mineral Body (degree) (if any)	Direction of Plunge		
SE	0	SE	0	W	Nil	W

2A.2: Exploration

2A.2.1: Summary of The Previous Exploration (for fresh grant) / During Last Plan Period (for existing leases)

Name of The Agency
Tamil Nadu Cements Corporation Limited and Department of Geology and Mining, Govt. of Tamil Nadu

2A.2.1.1: Geological Mapping

SI.No.	Year		Scale	Area Covered (Ha)
	From	To		
1	01/04/2018	31/03/2023	1:5000	180.8300

2A.2.1.2: Airborne Geophysical Survey

SI.No.	Type of Survey	Spacing (m)	Total line (km)	Area Covered (Ha)	Latitude (dd:mm:ss.ss)		Longitude (dd:mm:ss.ss)	
					Form	To	Form	To
1	NIL	0	0.00	0.0000	Nil	Nil	Nil	Nil

2A.2.1.3: Ground Geophysical Survey

SI.No.	Type of Survey	Spacing (m)	Total line (km)	Area Covered (Ha)	Latitude (dd:mm:ss.ss)		Longitude (dd:mm:ss.ss)	
					Form	To	Form	To
1	Nil	0	0	0.0000	Nil	Nil	Nil	Nil

2A.2.1.4: Geochemical Survey

SI.No.	Type of Sample	No of Samples	Aanlysis report	Area Covered (Ha)
1	Nil	0	Nil	Nil

2A.2.1.5: Pitting

Number of Pits
0

SI.No.	Year		Pit ID	Length of Pit (m)	Width of Pit (m)	Depth of Pit (m)	Depth (from)	Depth(to)	Running mtr	Litho units exposed	Name of the radical	Av Grade(in %)	Latitude (dd:mm:ss.ss)		Longitude (dd:mm:ss.ss)	
	From	To											From	To	From	To
1	Nil	Nil	Nil	0.00	0.00	0.00	0.00	0.00	0.00	Nil	Nil	0.00	Nil	Nil	Nil	Nil

2A.2.1.6: Trenching

Number of Trenches
0

2A.2.1.6.1: Spacing

Min (m)	Max (m)	Avg (m)
Nil	Nil	Nil

SI.No.	Year		Trench ID	Length of Trench (m)	Width of Trench (m)	Depth of Trench(m)	Depth (from)	Depth(to)	Running mtr	Litho units exposed	Name of the radical	Av. Grade	Latitude (dd:mm:ss.ss)		Longitude (dd:mm:ss.ss)	
	From	To											From	To	From	To
1	Nil	Nil	Nil	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0	0.0000	Nil	Nil	Nil	Nil

2A.2.1.7 Exploratory Drilling(Core/non Core)

SI.No.	Year	Exploration agency	Core holes	Non-core (RC/DTH)	Grand total	Attach log sheet of each borehole in

	From	To		Number of boreholes drilled	Total mtrs	Number of boreholes drilled	Total mtrs	Number of boreholes drilled	Total mtrs	csv/excel format
1	Nil	Nil	Nil	0	0.00	0	0.00	0	0.00	core_Drilling.xlsx

2A.2.1.8: Exploratory Mining

SI.No.	Pit/Adit ID	Length in Mtr	Width in Mtr	Depth in mtrs	Volume (m^3)
1	Nil	0.00	0.00	0.00	0.00

2A.2.1.9: Sampling

SI.No.	Type of sample	No of samples collected	Number of samples analyzed	Latitude (dd:mm:ss.ss)		Longitude (dd:mm:ss.ss)		Remark if any
				From	To	From	To	
1	Others	1	1	10:45:48.00	10:45:48.00	78:16:46.04	78:16:46.04	Nil
2	Others	1	1	10:45:48.41	10:45:48.41	78:16:47.54	78:16:47.54	Nil

2A.2.1.10: Chemical Analysis

SI.No.	Sample ID	Minerals	Radical with garde in %	Name of Agency	Type of agency	Attachment
1	GLCS/TR/3009/2023-24	Limestone	CaO 47.20 MgO 2.40 SiO 12.05 FeO 0.83 AlO 2.36 LOI 34.50	Global Lab and Consultancy Services, Salem	NABL accredited	3008.xlsx
2	GLCS/TR/3008/2023-24	Limestone	CaO 47.50 MgO 1.14 SiO 11.20 FeO 1.20 AlO 2.28 LOI 36.15	Global Lab and Consultancy Services, Salem	NABL accredited	3009.xlsx

* Chemical analysis of core /non vore samples may be uploaded in CSV file which shall normally include Five files namely collar file, survey file and Geology log file, Assay file & RQD File.

2A.2.1.11: Petrology & Mineralogical Studies

SI.No.	Type of Sample	Number of Sample Drawn	Number of Sample Analyzed	Petrographic Study Report
1	None	0	0	Nil

2A.2.1.12: Beneficiation Studies

SI.No.	Type of Beneficiation	Number of Samples	Attach
1	Nil	0	Nil

2A.2.1.13: Bulk Density Study as per M(EMC) Rules, 2015 and SOP of CGPB

Method adopted for calculating bulk density of ore and waste
The lessee collected samples from the different areas in existing mining pit and after coning and quartering, one representative sample was analyzed in NABL Laboratory to find out the chemical and physical properties of the limestone mineral. Based on the analysis, it revealed that the limestone mineral is of grade suitable for cement industries. The bulk density has been reckoned as 2.5. This is a running mine and the bulk density varies from 2.3 to 2.5.

SI.No.	Nature of Ore/OB	Mineral	Number of samples	Bulk Density Established (t/m^3)
1	Crystalline Formation	Limestone	2	2.50

2A.2.1.14: Area Covered under Exploration

Level of exploration	Area in Ha.		Total Area in Ha.
	Forest	Non Forest	
G-1	0.000000	0.000000	0.000000
G-2	0.000000	53.000000	53.000000
G-3	0.000000	0.000000	0.000000
G-4	0.000000	0.000000	0.000000
Area proved as Non-mineralized	0.000000	0.000000	0.000000
Area to be explored	0.000000	127.830000	127.830000
Total	0.000000	180.830000	180.830000

2A.2.2: Summary of The Previous Exploration (Before Last Plan Period)

Name of The Agency
Tamilnadu Cements Corporation Limited and Department of Geology and Mining, Govt. of Tamilnadu and Government Agency-National Council for Cement and Building Materials, New Delhi & TANCEM. In-house Laboratory.

2A.2.2.1: Geological Mapping

SI.No.	Year		Scale	Area Covered (Ha)
	From	To		
1	24/11/1993	31/03/2018	1:5000	180.83

2A.2.2.2: Airborne Geophysical Survey

SI.No.	Type of Survey	Spacing (m)	Total line (km)	Area Covered (Ha)	Latitude (dd:mm:ss.ss)		Longitude (dd:mm:ss.ss)	
					From	To	From	To
1	NIL	0.00	0.000000	0.00	Nil	Nil	Nil	Nil

2A.2.2.3: Ground Geophysical Survey

SI.No.	Type of Survey	Spacing (m)	Total line (km)	Area Covered (Ha)	Latitude (dd:mm:ss.ss)		Longitude (dd:mm:ss.ss)	
					From	To	From	To
1	NIL	0	0	0.0000	Nil	Nil	Nil	Nil

2A.2.2.4: Geochemical Survey

SI.No.	Type of Sample	No of Samples
1	Nil	0

2A.2.2.5: Pitting

SI.No.	Pit ID	Length of Pit (m)	Width of Pit (m)	Depth of Pit (m)	Litho units exposed	Litho Unit From (m)	Litho Unit To (m)	Average Grade(%)	Running Metres (m)	Latitude (dd:mm:ss.ss)		Longitude (dd:mm:ss.ss)	
										Form	To	Form	To
1	Nil	0.00	0.00	0.00	Nil	0.00	0.00	0.00	0.00	Nil	Nil	Nil	Nil

2A.2.2.6: Trenching

Number of Trenches
0

Spacing

Min (m)	Max (m)	Avg (m)
0.00	0.00	0.00

Area Covered Under Trenching

Co-ordinates

Latitude

North	Nil
North	Nil
North	Nil
North	Nil

Longitude

East	Nil
East	Nil

East	Nil
East	Nil

SI.No.	Trench ID	Length of Trench (m)	Width of Trench (m)	Depth of Trench (m)	Litho Units Exposed	Average Grade	Running mtr	Latitude (dd:mm:ss.ss)		Longitude (dd:mm:ss.ss)	
								From	To	From	To
1	Nil	0.0000	0.0000	0.0000	Nil	0	0.0000	Nil	Nil	Nil	Nil

2A.2.2.7: Exploratory Drilling

2A.2.2.7.1:Core/Non-core Drilling

SI.No.	Year		Exploration agency	Core holes		Non-core (RC/DTH)		Grand total		Attach log sheet of each borehole in csv/excel format
	From	To		Number of boreholes drilled	Total mtrs	Number of boreholes drilled	Total mtrs	Total boreholes	Total mtrs	
1	01/04/1994	31/03/1999	Tamilnadu Cements Corporation Limited and Department of Geology and Mining, Govt. of Tamilnadu	14	600.00	0	0.00	14	600.00	215_drilled_borehole_new.xlsx

2A.2.2.8: Exploratory Mining

SI.No.	Pit / Adit ID	Volume (m^3)
1	Nil	0.00

2A.2.2.9: Sampling

SI.No.	Type of sample	Number of Samples	Area Covered (Ha)	Latitude (dd:mm:ss.ss)	Longitude (dd:mm:ss.ss)

				From	To	From	To
1	Others	2	0.50	09:23:02.36	09:23:02.36	77:42:21.83	77:42:21.83
2	Others	2	0.50	09:22:59.65	09:22:59.65	77:42:15.62	77:42:15.62
3	Others	2	0.50	09:22:58.21	09:22:58.21	77:42:08.12	77:42:08.12
4	Others	2	0.50	09:22:55.50	09:22:55.50	77:42:05.19	77:42:05.19
5	Others	2	0.50	09:22:51.13	09:22:51.13	77:41:57.31	77:41:57.31
6	Others	2	0.50	09:22:38.46	09:22:38.46	77:42:45.67	77:42:45.67
7	Others	2	0.50	09:22:41.26	09:22:41.26	77:42:31.82	77:42:31.82
8	Others	2	0.50	09:22:39.88	09:22:39.88	77:42:08.09	77:42:08.09
9	Others	2	0.50	09:22:33.15	09:22:33.15	77:41:47.96	77:41:47.96
10	Others	2	0.50	09:22:15.04	09:22:15.04	77:41:56.87	77:41:56.87
11	Others	2	0.50	09:22:13.80	09:22:13.80	77:41:48.34	77:41:48.34
12	Others	2	0.50	09:22:08.98	09:22:08.98	77:41:27.12	77:41:27.12
13	Others	2	0.50	09:22:02.78	09:22:02.78	77:42:15.34	77:42:15.34
14	Others	2	0.50	09:21:58.78	09:21:58.78	77:42:09.82	77:42:09.82

2A.2.2.10: Chemical Analysis

SI.No.	Sample ID	Minerals	Radical Analysis	Attachment
1	70/K2 -1	Limestone	CaO 39.20 MgO 9.22 SiO 17.20 FeO 1.0 AlO 2.20 LOI 31.15	Chemical_Analysis.pdf
2	70/K2 -2	Limestone	CaO 47.60 MgO 2.42 SiO 12.05 FeO 0.84 AlO 2.36 LOI 34.60	Chemical_Analysis.pdf
3	71/K2 -1	Limestone	CaO 50.20 MgO 2.35 SiO 7.20 FeO 1.20 AlO 1.36 LOI 37.85	Chemical_Analysis.pdf
4	71/K2 -2	Limestone	CaO 47.50 MgO 1.14 SiO 11.20 FeO 1.20 AlO 2.28 LOI 36.60	Chemical_Analysis.pdf
5	73/K3 -1	Limestone	CaO 52.40 MgO 1.56 SiO 3.50 FeO 0.80 AlO 1.00 LOI 40.03	Chemical_Analysis.pdf

6	73/K3 -2	Limestone	CaO 49.80 MgO 1.68 SiO 7.00 FeO 0.96 AlO 1.54 LOI 38.40	Chemical_Analysis.pdf
7	74/K3-1	Limestone	CaO 51.20 MgO 1.76 SiO 4.20 FeO 0.32 AlO 0.88 LOI 40.96	Chemical_Analysis.pdf
8	74/K3-2	Limestone	CaO 51.0 MgO 1.71 SiO 6.18 FeO 0.72 AlO 1.82 LOI 39.03	Chemical_Analysis.pdf
9	76/K4-1	Limestone	CaO 47.00 MgO 3.60 SiO 8.86 FeO 1.68 AlO 2.10 LOI 36.69	Chemical_Analysis.pdf
10	76/K4-2	Limestone	CaO 47.40 MgO 3.25 SiO 8.0 FeO 1.55 AlO 2.60 LOI 37.0	Chemical_Analysis.pdf
11	77/K4-1	Limestone	CaO 49.80 MgO 1.15 SiO 6.91 FeO 1.28 AlO 2.42 LOI 38.11	Chemical_Analysis.pdf
12	77/K4-2	Limestone	CaO 49.0 MgO 1.05 SiO 7.12 FeO 0.41 AlO 0.98 LOI 41.44	Chemical_Analysis.pdf
13	84/AVB-1	Limestone	CaO 51.40 MgO 1.13 SiO 7.41 FeO 1.04 AlO 1.84 LOI 37.61	Chemical_Analysis.pdf
14	84/AVB-2	Limestone	CaO 51.50 MgO 1.88 SiO 5.06 FeO 0.72 AlO 0.86 LOI 39.69	Chemical_Analysis.pdf
15	39/HSB	Limestone	CaO 48.30 MgO 0.61 SiO 10.10 FeO 1.28 AlO 2.82 LOI 36.20	Chemical_Analysis.pdf
16	39/HSB	Limestone	CaO 47.40 MgO 0.65 SiO 12.0 FeO 1.04 AlO 2.76 LOI 36.25	Chemical_Analysis.pdf
17	82/AVB-1	Limestone	CaO 50.20 MgO 1.06 SiO 8.95 FeO 0.80 AlO 1.36 LOI 37.40	Chemical_Analysis.pdf
18	82/AVB-2	Limestone	CaO 52.80 MgO 0.69 SiO 5.17 FeO 0.76 AlO 0.88 LOI 39.58	Chemical_Analysis.pdf
19	46/AVB-1	Limestone	CaO 48.00 MgO 1.84 SiO 9.81 FeO 0.80 AlO 1.20 LOI 37.35	Chemical_Analysis.pdf
20	46/AVB-2	Limestone	CaO 48.80 MgO 4.53 SiO 6.70 FeO 1.20 AlO 0.90 LOI 37.84	Chemical_Analysis.pdf
21	44/AVB-1	Limestone	CaO 44.70 MgO 2.15 SiO 15.55 FeO 0.64 AlO 1.66 LOI 35.05	Chemical_Analysis.pdf

22	44/AVB-2	Limestone	CaO 46.10 MgO 1.45 SiO 12.65 FeO 1.04 AlO 2.36 LOI 36.10	Chemical_Analysis.pdf
23	72/K2-1	Limestone	CaO 50.40 MgO 1.12 SiO 7.20 FeO 1.20 AlO 2.00 LOI 38.15	Chemical_Analysis.pdf
24	72/K2-2	Limestone	CaO 48.40 MgO 1.63 SiO 8.82 FeO 1.28 AlO 1.48 LOI 37.46	Chemical_Analysis.pdf
25	K-19 -1	Limestone	CaO 48.20 MgO 2.70 SiO 6.85 FeO 0.88 AlO 0.82 LOI 39.0	Chemical_Analysis.pdf
26	K-19 -2	Limestone	CaO 49.90 MgO 2.95 SiO 5.80 FeO 0.83 AlO 1.42 LOI 39.54	Chemical_Analysis.pdf
27	86/AVB-1	Limestone	CaO 51.30 MgO 2.69 SiO 4.55 FeO 0.72 AlO 1.08 LOI 39.5	Chemical_Analysis.pdf
28	86/AVB-2	Limestone	CaO 53.10 MgO 0.78 SiO 3.26 FeO 0.80 AlO 1.38 LOI 40.51	Chemical_Analysis.pdf
29	GLCS/TR/2527/2023-24	Limestone	CaO 44.74 MgO 2.98 SiO 13.67 FeO 1.10 AlO 3.04 LOI 40.51	2527_NABL_ACC.pdf
30	GLCS/TR/2528/2023-24	Limestone	CaO 46.70 MgO 2.10 SiO 8.69 FeO 1.24 AlO 2.79 LOI 37.51	2528.pdf
31	GLCS/TR/2529/2023-24	Limestone	CaO 45.64 MgO 2.94 SiO 11.29 FeO 1.24 AlO 1.27 LOI 36.46	2529.pdf
32	GLCS/TR/2530/2023-24	Limestone	CaO 44.57 MgO 2.98 SiO 13.47 FeO 1.18 AlO 1.52 LOI 35.24	2530.pdf
33	GLCS/TR/2531/2023-24	Limestone	CaO 46.87 MgO 2.30 SiO 8.86 FeO 1.13 AlO 1.27 LOI 38.51	2531.pdf

2A.2.2.11:Petrology & Mineralogical Studies

SI.No.	Type of Sample	Number of Sample Drawn	Number of Sample Analyzed	Petrographic Study Report
1	None	0	0	Nil

2A.2.2.12: Beneficiation Test

SI.No.	Type of Beneficiation	Number of Samples	Attachment
1	Nil	0	Nil

2A.2.2.13: Bulk Density

SI.No.	Rock Type	Number of Samples	Minerals	Bulk Density Established (t/m^3)
1	Nil	0	Nil	0.00

2A.2.2.14: Area Covered under Exploration

Level of exploration	Area in Ha.		Total Area in Ha.
	Forest	Non Forest	
G-1	0.0000	0.0000	0.0000
G-2	0.0000	53.0000	53.0000
G-3	0.0000	0.0000	0.0000
G-4	0.0000	0.0000	0.0000
Area proved as Non-mineralized	0.0000	0.0000	0.0000
Area to be explored	0.0000	127.8300	127.8300
Total	0.0000	180.8300	180.8300

SI.No.	Year		Area converted to G1 from G2, G3 & G4	% increase in G-1 Area	Remaining Area % in G2	Remaining Area % in G3	Remaining Area % in G4	Remaining Area in G2	Remaining Area in G3	Remaining Area in G4
	From	To								
1	01/04/1994	31/03/1999	0.00	0.00	53.00	0.00	0.00	0.00	0.00	0.00
Potentially Mineralised area (Ha)										53.00

2A.2.3 Ore Body Geometry & Grade

SI.No.	Name of the ore band	General Strike / Trend	Dip Of Mineral Body	Average Strike Length (m)	Average Width (m)	Chemical parameters				

						Average Depth (m)	Name of the radical	Min Grade (%)	Max Grade (%)	Avg Grade (%)
1	ALQ Mines	NE-SW	SE	600.00	90.00	30.00	CaO	45.00	47.00	46.00
2	ALS	NE-SW	SE	2460.00	78.00	81.00	CaO	45.00	47.00	46.00
3	HSLS	NE-SW	SE	850.00	80.00	89.00	CaO	45.00	47.00	46.00
4	HSLN	NE-SW	SE	350.00	100.00	30.00	CaO	45.00	47.00	46.00
5	K Two	NE-SW	SE	1250.00	22.00	30.00	CaO	45.00	47.00	46.00
6	K Three	NE-SW	SE	1400.00	50.00	30.00	CaO	45.00	47.00	46.00
7	K Four	NE-SW	SE	1900.00	30.00	36.00	CaO	45.00	47.00	46.00
8	K Five	NE-SW	SE	660.00	20.00	27.00	CaO	45.00	47.00	46.00

2A.2.4: Reserve / Resource Estimation Method

2A.2.4.1: Methodology

Resource / Reserve Estimation Method
Plan Area Method
Methodology
The estimation of mineral reserves is done by plan area method. For Reserve calculation the length and width of the deposit is shown in the Geological plan & cross sections. (Please plate Ref. 3 and 4). The length in m (L) and width in m (W) is multiplied to get Area (in sqm). Then the area is multiplied with the Depth in m (D) which gives the Volume. Then the volume is multiplied with the Bulk density which gives the reserves in tonnes. In short - L (m) X W(m) X D(m)=Volume(cum) x Bulk density (in tonnes/cum) = ROM(Ts). During the previous approved plan period 60% recovery was discussed and the same 70% recovery of limestone is given in the present plan period also. The bulk density has been reckoned as 2.5. Remaining 30% is mineral reject. This is a running mine and the bulk density varies from 2.4 to 2.5. Therefore, we have assumed 2.5 as the bulk density. The bulk density and the recovery percentage are given based on the knowledge gained from the past mine workings, present mine workings and the adjacent working mine in this region. As analyzed by in-house and Government laboratories limestone which has more than 65% $CaCO_3$ is best suited for cement and lime based industries, the grade below 20% of $CaCO_3$ with contaminations of calc gneiss waste are considered as mineral rejects in these particular formations. This mineral reject does not have any commercial value and is considered as waste. The mine has reached maximum 45m depth and based on the existing pits and drilled core drills, the depth of the mineralization has been proved upto 89m with an average of 1m topsoil in the lease area. Hence, the reserves and resources are estimated upto 89m depth during the Present Plan Period. 89m [1m Topsoil + 88m Limestone]

2A.2.4.2: Resource Calculation

SI.No.	Cross Section/Block	Section Area/ Block Area(sq mt)	Influence(m)	Depth in mtr	Volume (m^3)	Bulk Density (t/m^3)	Resource Quantity (t)	Level of Exploration	Type of Land	Name of the radical	Grade (%)	Method used for resource estimation
1	K2 BAND X2X3 A5A6 TO X4X5 A9A10	1293.97	50.00	30.00	38819.20	2.50	97048.00000	331	non-forest	CaO	34	Block Area Method
2	K3 BAND X6X7A1A2 TO X7X8A3A4	2481.35	50.00	30.00	74440.40	2.50	186101.00000	331	non-forest	CaO	34	Block Area Method
3	K4 BAND X13X14B5B6 TO X15X16B9B10	1261.84	50.00	36.00	45426.40	2.50	113566.00000	331	non-forest	CaO	34	Block Area Method
4	ALS BAND Y2Y3C5C6 TO Y6Y7C13C14	3581.30	50.00	81.00	290085.60	2.50	725214.00000	331	non-forest	CaO	34	Block Area Method
5	HSLS BAND Z4Z5D4D5	783.03	50.00	89.00	69690.00	2.50	174225.00000	331	non-forest	CaO	34	Block Area Method
6	K2 BAND X3X4A7A8 TO X4X5A9A10	157.40	50.00	30.00	4722.00	2.50	11805.00000	331	non-forest	CaO	34	Block Area Method
7	K3 BAND X6X7A1A2 TO X7X8A3A4	445.87	50.00	30.00	13376.00	2.50	33440.00000	331	non-forest	CaO	34	Block Area Method
8	K4 BAND X11X12B1B2 TO X15X16B9B10	1807.14	50.00	36.00	65057.20	2.50	162643.00000	331	non-forest	CaO	34	Block Area Method
9	ALS BAND	8295.93	50.00	81.00	671970.20	2.50	1679925.500	331	non-forest	CaO	34	Block Area

	Y2Y3C5C6 TO Y7Y8C15C16						00					Method
10	HSL S Z4Z5D4D5	1754.19	50.00	89.00	156123.00	2.50	390307.50000	331	non-forest	CaO	34	Block Area Method
11	75m safety barrier	9419.40	50.00	88.70	835500.40	2.50	2088751.00000	331	non-forest	CaO	34	Block Area Method
12	K2 BAND X1X2A1A2 TO X4X5A9A10	13013.87	50.00	30.00	390416.00	2.50	976040.00000	331	non-forest	CaO	34	Block Area Method
13	K3 BAND X6X7A1A2 TO X9X10A11A12	49991.17	50.00	30.00	1499735.20	2.50	3749338.00000	331	non-forest	CaO	34	Block Area Method
14	K4 BAND X11X12B1B2 TO Z6Z7D8D9	33456.00	50.00	36.00	1204416.00	2.50	3011040.00000	331	non-forest	CaO	34	Block Area Method
15	ALS BAND Y3Y4C7C8 TO Y9Y10C19C20	37367.26	50.00	81.00	3026748.00	2.50	7566870.00000	331	non-forest	CaO	34	Block Area Method
16	K5 BAND Y11Y12C21C22 TO Y13Y14C25C26	12665.01	50.00	27.00	341955.20	2.50	854888.00000	331	non-forest	CaO	34	Block Area Method
17	HSL N BAND ZZ1DD1 TO Z1Z2DD1	37251.80	50.00	30.00	1117554.00	2.50	2793885.00000	331	non-forest	CaO	34	Block Area Method
18	ALQ MINES BAND Y1Y2C1C2	34118.59	50.00	30.00	1023557.80	2.50	2558894.50000	331	non-forest	CaO	34	Block Area Method

	TO YYCC											
19	HSL S BAND Z4Z5D2D3 TO Z4Z5D4D5	13491.01	50.00	89.00	1200699.80	2.50	3001749.50000	331	non-forest	CaO	34	Block Area Method
Total					12070292.40		30175731.00000					

2A.2.4.3: Mineral Resource Estimate for Conversion to Mineral Reserve

The mineral resources estimated is converted to mineral reserve by excluding mineral blocked in benches and in safety barrier. The mineral reserves is categorized as 111 and the mineral resources is categorized as 221 & 222.

2A.2.4.4: Threshold value & Cut off Parameters

Threshold value: Radicals- MgO-5(max), CaO-34(min) Cut off value- MgO-5(max), CaO-34(min), Fe_2O_3-1.5 (max), SiO_2-12%(max), LOI -43(max), Al_2O_3-1.5 %(max)

2A.2.4.5: Mining Factors or Assumptions

It is a mining factors only not for assumption, based on the existing pits and Drilled boreholes the availability of reserves and resources are estimated.

2A.2.4.6: Metallurgical Factors or Assumptions

It is a mining factors only not for assumption, based on the existing pits and Drilled boreholes the availability of reserves and resources are estimated.

2A.2.4.7: Cost & Revenue Factors

S.No Particulars Cost of production Per ton 1. Labour charges - Rs.92 2. Royalty paid to Mines & Geology - Rs.80 3. National Mineral Exploration Trust - Rs.1.60 4. District Mineral Foundation (DMF)-30% of royality - Rs.24 5. Explosives expenses - Rs.60 6. Drilling expenses - Rs.30 7. Transport from mine head to Stockyard (loading & unloading) - Rs.203 8. Miscellaneous and over heads - Rs.50 Total - Rs.540.60 The cost of production is Rs.540.60/ton. Hence, the mining is economically viable at present market conditions. Excavators per month 8 No. : Rs.16,00,000/- Dumper per month 2 No. : Rs.1,00,000/- Wagon drill per month 1 nos. : Rs.50,000/- Compressor per month 2 nos. : Rs.50,000/- Dozer per month 1 nos. : Rs.50,000/- Tippers per month 6 Nos. :

Rs.3,00,000/- Drilling machines(Jack hammers) per month 6 Nos. Rs.1,00,000/- Water tanker per month 1 nos. Rs.25,000/- Loose tools : Rs.70,000/- The capital cost will be around Rs.23,45,000/-.

2A.2.4.8: Market Assessment

The entire mined out limestone is of grade suitable for cement industries and is being utilized as raw material for cement manufacturing in the company's own captive plant which is located at Alangulam Village, Virudhunagar District which is at a distance of about 1km NW from the mine site.

2A.2.4.9: Other Modifying Factors

Nil

2A.2.4.10: Classification

The Reserves and Resources were assessed based on the United Nations Framework Classifications as Amended in the Mineral Conservation and Development Rules (Second Amendment) Rules 2003 and in exercise of the powers conferred by section 18 of the Mines and Minerals (Development and Regulations) Act 1957(67 of 1957) and Subsequently to the CCOM Circular No.4, 2009, dated 21.10.2009.

2A.2.4.11: Calculation of blocked resources

SI.No.	Reserves blocked due to	Cross section/Block	Sectional area/ block area (in Sq mtr)	Influence (m)	Depth (m)	Volume (m^3)	Bulk Density (t/m^3)	Resource Quantity (t)	UNFC code	Type of Land	Name of the radical	Grade (%)	Method used for resource estimation
1	Other	K2 BAND X3X4 A7A8 II	11.00	50.00	6.00	66.00	2.50	165.00000	221	Non-forest	CaO	47	Block area method
2	Other	K2 BAND X3X4 A7A8 III	180.00	50.00	6.00	1080.00	2.50	2700.00000	221	Non-forest	CaO	47	Block area method
3	Other	K2 BAND X4X5 A9A10 II	11.00	50.00	6.00	66.00	2.50	165.00000	221	Non-forest	CaO	47	Block area method

4	Other	K2 BAND X4X5 A9A10 III	180.00	50.00	6.00	1080.00	2.50	2700.00000	221	Non-forest	CaO	47	Block area method
5	Other	K2 BAND X4X5 A9A10 IV	540.00	50.00	4.50	2430.00	2.50	6075.00000	221	Non-forest	CaO	47	Block area method
6	Other	K3 BAND X6X7 A1A2 III	88.00	50.00	5.50	484.00	2.50	1210.00000	221	Non-forest	CaO	47	Block area method
7	Other	K3 BAND X6X7 A1A2 IV	714.00	50.00	3.00	2142.00	2.50	5355.00000	221	Non-forest	CaO	47	Block area method
8	Other	K3 BAND X7X8 A3A4 III	688.00	50.00	5.50	3784.00	2.50	9460.00000	221	Non-forest	CaO	47	Block area method
9	Other	K3 BAND X7X8 A3A4 IV	1548.00	50.00	4.50	6966.00	2.50	17415.00000	221	Non-forest	CaO	47	Block area method
10	Other	K4 BAND X11X12 B1B2 IV	2800.00	50.00	4.50	12600.00	2.50	31500.00000	221	Non-forest	CaO	47	Block area method
11	Other	K4 BAND X11X12 B1B2 V	2800.00	50.00	4.50	12600.00	2.50	31500.00000	221	Non-forest	CaO	47	Block area method
12	Other	K4 BAND X11X12 B1B2 VI	2800.00	50.00	5.00	14000.00	2.50	35000.00000	221	Non-forest	CaO	47	Block area method
13	Other	K4 BAND X13X14 B5B6 II	638.04	50.00	4.50	2871.20	2.50	7178.00000	221	Non-forest	CaO	47	Block area method
14	Other	K4 BAND X13X14 B5B6 III	1218.00	50.00	5.00	6090.00	2.50	15225.00000	221	Non-forest	CaO	47	Block area method
15	Other	K4 BAND X13X14	1740.00	50.00	6.00	10440.00	2.50	26100.00000	221	Non-forest	CaO	47	Block area method

		B5B6 IV											
16	Other	K4 BAND X15X16 B9B10 II	396.00	50.00	6.00	2376.00	2.50	5940.00000	221	Non-forest	CaO	47	Block area method
17	Other	K4 BAND X15X16 B9B10 III	1360.00	50.00	3.00	4080.00	2.50	10200.00000	221	Non-forest	CaO	47	Block area method
18	Other	ALS BAND Y2Y3 C5C6 III	72.00	50.00	1.50	108.00	2.50	270.00000	221	Non-forest	CaO	47	Block area method
19	Other	ALS BAND Y2Y3 C5C6 IV	644.00	50.00	6.50	4186.00	2.50	10465.00000	221	Non-forest	CaO	47	Block area method
20	Other	ALS BAND Y2Y3 C5C6 V	1739.04	50.00	2.50	4347.60	2.50	10869.00000	221	Non-forest	CaO	47	Block area method
21	Other	ALS BAND Y2Y3 C5C6 VII	6400.00	50.00	70.00	448000.00	2.50	1120000.00000	221	Non-forest	CaO	47	Block area method
22	Other	ALS BAND Y2Y3 C5C6 VIII	6000.00	50.00	9.00	54000.00	2.50	135000.00000	221	Non-forest	CaO	47	Block area method
23	Other	ALS BAND Y2Y3 C5C6 IX	5700.00	50.00	1.00	5700.00	2.50	14250.00000	221	Non-forest	CaO	47	Block area method
24	Other	ALS BAND Y3Y4 C7C8 VI	510.00	50.00	9.00	4590.00	2.50	11475.00000	221	Non-forest	CaO	47	Block area method
25	Other	ALS BAND Y3Y4 C7C8 VII	2852.00	50.00	8.00	22816.00	2.50	57040.00000	221	Non-forest	CaO	47	Block area method
26	Other	ALS BAND Y6Y7 C13C14 II	17.00	50.00	9.00	153.00	2.50	382.50000	221	Non-forest	CaO	47	Block area method

27	Other	ALS BAND Y6Y7 C13C14 III	93.00	50.00	9.00	837.00	2.50	2092.50000	221	Non-forest	CaO	47	Block area method
28	Other	ALS BAND Y6Y7 C13C14 IV	765.02	50.00	9.00	6885.20	2.50	17213.00000	221	Non-forest	CaO	47	Block area method
29	Other	ALS BAND Y6Y7 C13C14 V	6400.00	50.00	9.00	57600.00	2.50	144000.00000	221	Non-forest	CaO	47	Block area method
30	Other	ALS BAND Y6Y7 C13C14 VI	5900.00	50.00	9.00	53100.00	2.50	132750.00000	221	Non-forest	CaO	47	Block area method
31	Other	ALS BAND Y7Y8 C15C16 II	334.98	50.00	9.00	3014.80	2.50	7537.00000	221	Non-forest	CaO	47	Block area method
32	Other	ALS BAND Y7Y8 C15C16 III	2210.93	50.00	3.00	6632.80	2.50	16582.00000	221	Non-forest	CaO	47	Block area method
33	Other	HSL S Z4Z5 D4D5 IV	8.00	50.00	9.00	72.00	2.50	180.00000	221	Non-forest	CaO	47	Block area method
34	Other	HSL S Z4Z5 D4D5 V	24.98	50.00	9.00	224.80	2.50	562.00000	221	Non-forest	CaO	47	Block area method
35	Other	HSL S Z4Z5 D4D5 VI	295.02	50.00	9.00	2655.20	2.50	6638.00000	221	Non-forest	CaO	47	Block area method
36	Other	HSL S Z4Z5 D4D5 VII	2013.02	50.00	9.00	18117.20	2.50	45293.00000	221	Non-forest	CaO	47	Block area method
37	Other	HSL S Z4Z5 D4D5 VIII	3782.00	50.00	9.00	34038.00	2.50	85095.00000	221	Non-forest	CaO	47	Block area method
38	Other	HSL S Z4Z5 D4D5	5490.00	50.00	8.00	43920.00	2.50	109800.00000	221	Non-forest	CaO	47	Block area method

		IX											
39	Other	HSL S Z4Z5 D4D5 X	6343.96	50.00	9.00	57095.60	2.50	142739.00000	221	Non-forest	CaO	47	Block area method
40	7.5 Meter Safety Barrier	safety barrier	435.00	50.00	30.00	13050.00	2.50	32625.00000	221	Non-forest	CaO	47	Block area method
41	7.5 Meter Safety Barrier	safety barrier	5850.00	50.00	30.00	175500.00	2.50	438750.00000	221	Non-forest	CaO	47	Block area method
42	7.5 Meter Safety Barrier	safety barrier	480.00	50.00	30.00	14400.00	2.50	36000.00000	221	Non-forest	CaO	47	Block area method
43	7.5 Meter Safety Barrier	safety barrier	740.00	50.00	30.00	22200.00	2.50	55500.00000	221	Non-forest	CaO	47	Block area method
44	7.5 Meter Safety Barrier	safety barrier	870.00	50.00	30.00	26100.00	2.50	65250.00000	221	Non-forest	CaO	47	Block area method
45	7.5 Meter Safety Barrier	safety barrier	256.00	50.00	88.70	22707.20	2.50	56768.00000	221	Non-forest	CaO	47	Block area method
46	7.5 Meter Safety Barrier	safety barrier	1260.00	50.00	54.00	68040.00	2.50	170100.00000	221	Non-forest	CaO	47	Block area method
47	7.5 Meter Safety Barrier	safety barrier	390.00	50.00	18.00	7020.00	2.50	17550.00000	221	Non-forest	CaO	47	Block area method
48	7.5 Meter Safety Barrier	safety barrier	6220.00	50.00	30.00	186600.00	2.50	466500.00000	221	Non-forest	CaO	47	Block area method
49	7.5 Meter Safety Barrier	safety barrier	552.00	50.00	78.00	43056.00	2.50	107640.00000	221	Non-forest	CaO	47	Block area method

50	7.5 Meter Safety Barrier	safety barrier	330.00	50.00	30.00	9900.00	2.50	24750.00000	221	Non-forest	CaO	47	Block area method
51	7.5 Meter Safety Barrier	safety barrier	1450.00	50.00	63.00	91350.00	2.50	228375.00000	221	Non-forest	CaO	47	Block area method
52	7.5 Meter Safety Barrier	safety barrier	2363.00	50.00	42.00	99246.00	2.50	248115.00000	221	Non-forest	CaO	47	Block area method
53	7.5 Meter Safety Barrier	safety barrier	800.00	50.00	54.00	43200.00	2.50	108000.00000	221	Non-forest	CaO	47	Block area method
54	7.5 Meter Safety Barrier	safety barrier	240.00	50.00	42.00	10080.00	2.50	25200.00000	221	Non-forest	CaO	47	Block area method
55	7.5 Meter Safety Barrier	safety barrier	113.01	50.00	27.00	3051.20	2.50	7628.00000	221	Non-forest	CaO	47	Block area method
56	Other	K2 X1X2 A1A2 I	10728.00	50.00	3.00	32184.00	2.50	80460.00000	222	Non-Forest	CaO	47	Block area method
57	Other	K2 X1X2 A1A2 II	10728.00	50.00	6.00	64368.00	2.50	160920.00000	222	Non-Forest	CaO	47	Block area method
58	Other	K2 X1X2 A1A2 III	10728.00	50.00	6.00	64368.00	2.50	160920.00000	222	Non-Forest	CaO	47	Block area method
59	Other	K2 X1X2 A1A2 IV	10728.00	50.00	6.00	64368.00	2.50	160920.00000	222	Non-Forest	CaO	47	Block area method
60	Other	K2 X1X2 A1A2 V	10728.00	50.00	6.00	64368.00	2.50	160920.00000	222	Non-Forest	CaO	47	Block area method
61	Other	K2 X2X3 A3A4 II	3576.00	50.00	3.00	10728.00	2.50	26820.00000	222	Non-Forest	CaO	47	Block area method
62	Other	K2 X2X3 A3A4 III	3576.00	50.00	6.00	21456.00	2.50	53640.00000	222	Non-Forest	CaO	47	Block area method
63	Other	K2 X2X3 A5A6 I	80.00	50.00	5.00	400.00	2.50	1000.00000	222	Non-Forest	CaO	47	Block area method

64	Other	K2 X2X3 A5A6 II	72.00	50.00	3.00	216.00	2.50	540.00000	222	Non-Forest	CaO	47	Block area method
65	Other	K2 X2X3 A5A6 II	1386.00	50.00	3.00	4158.00	2.50	10395.00000	222	Non-Forest	CaO	47	Block area method
66	Other	K2 X3X4 A7A8 I	1020.00	50.00	6.00	6120.00	2.50	15300.00000	222	Non-Forest	CaO	47	Block area method
67	Other	K2 X3X4 A7A8 II	1012.00	50.00	2.50	2530.00	2.50	6325.00000	222	Non-Forest	CaO	47	Block area method
68	Other	K2 X3X4 A7A8 II	1496.00	50.00	6.00	8976.00	2.50	22440.00000	222	Non-Forest	CaO	47	Block area method
69	Other	K2 X3X4 A7A8 III	2508.00	50.00	6.00	15048.00	2.50	37620.00000	222	Non-Forest	CaO	47	Block area method
70	Other	K2 X4X5 A9A10 I	238.00	50.00	6.00	1428.00	2.50	3570.00000	222	Non-Forest	CaO	47	Block area method
71	Other	K2 X4X5 A9A10 II	442.00	50.00	6.00	2652.00	2.50	6630.00000	222	Non-Forest	CaO	47	Block area method
72	Other	K2 X4X5 A9A10 III	2254.00	50.00	6.00	13524.00	2.50	33810.00000	222	Non-Forest	CaO	47	Block area method
73	Other	K2 X4X5 A9A10 IV	2254.00	50.00	6.00	13524.00	2.50	33810.00000	222	Non-Forest	CaO	47	Block area method
74	Other	K3 X6X7 A1A2 II	1116.00	50.00	6.00	6696.00	2.50	16740.00000	222	Non-Forest	CaO	47	Block area method
75	Other	K3 X6X7 A1A2 III	15345.00	50.00	6.00	92070.00	2.50	230175.00000	222	Non-Forest	CaO	47	Block area method
76	Other	K3 X6X7 A1A2 IV	15345.00	50.00	6.00	92070.00	2.50	230175.00000	222	Non-Forest	CaO	47	Block area method
77	Other	K3 X7X8 A3A4 II	1683.20	50.00	1.00	1683.20	2.50	4208.00000	222	Non-Forest	CaO	47	Block area method
78	Other	K3 X7X8 A3A4 III	4257.00	50.00	6.00	25542.00	2.50	63855.00000	222	Non-Forest	CaO	47	Block area method
79	Other	K3 X7X8 A3A4 IV	4257.00	50.00	6.00	25542.00	2.50	63855.00000	222	Non-Forest	CaO	47	Block area method

80	Other	K3 X7X8 A5A6 I	2016.00	50.00	6.00	12096.00	2.50	30240.00000	222	Non-Forest	CaO	47	Block area method
81	Other	K3 X7X8 A5A6 II	4914.00	50.00	1.00	4914.00	2.50	12285.00000	222	Non-Forest	CaO	47	Block area method
82	Other	K3 X7X8 A5A6 III	4914.00	50.00	6.00	29484.00	2.50	73710.00000	222	Non-Forest	CaO	47	Block area method
83	Other	K3 X7X8 A5A6 IV	4914.00	50.00	6.00	29484.00	2.50	73710.00000	222	Non-Forest	CaO	47	Block area method
84	Other	K3 X8X9 A7A8 I	351.00	50.00	6.00	2106.00	2.50	5265.00000	222	Non-Forest	CaO	47	Block area method
85	Other	K3 X8X9 A7A8 II	3780.00	50.00	6.00	7560.00	2.50	18900.00000	222	Non-Forest	CaO	47	Block area method
86	Other	K3 X8X9 A7A8 II	13152.00	50.00	4.00	52608.00	2.50	131520.00000	222	Non-Forest	CaO	47	Block area method
87	Other	K3 X8X9 A7A8 III	14796.00	50.00	6.00	88776.00	2.50	221940.00000	222	Non-Forest	CaO	47	Block area method
88	Other	K3 X8X9 A7A8 IV	13700.00	50.00	6.00	82200.00	2.50	205500.00000	222	Non-Forest	CaO	47	Block area method
89	Other	K3 X8X9 A7A8 V	12878.00	50.00	6.00	77268.00	2.50	193170.00000	222	Non-Forest	CaO	47	Block area method
90	Other	K3 X9X10 A9A10 I	1792.00	50.00	6.00	10752.00	2.50	26880.00000	222	Non-Forest	CaO	47	Block area method
91	Other	K3 X9X10 A9A10 II	18800.00	50.00	3.00	56400.00	2.50	141000.00000	222	Non-Forest	CaO	47	Block area method
92	Other	K3 X9X10 A9A10 II	22800.00	50.00	3.00	68400.00	2.50	171000.00000	222	Non-Forest	CaO	47	Block area method
93	Other	K3 X9X10 A9A10 III	23028.00	50.00	6.00	138168.00	2.50	345420.00000	222	Non-Forest	CaO	47	Block area method
94	Other	K3 X9X10 A9A10 IV	23028.00	50.00	6.00	138168.00	2.50	345420.00000	222	Non-Forest	CaO	47	Block area method
95	Other	K3 X9X10 A9A10 V	23028.00	50.00	6.00	138168.00	2.50	345420.00000	222	Non-Forest	CaO	47	Block area method

96	Other	K3 X9X10 A11A12 I	3116.00	50.00	2.00	6232.00	2.50	15580.00000	222	Non-Forest	CaO	47	Block area method
97	Other	K3 X9X10 A11A12 II	3403.00	50.00	6.00	20418.00	2.50	51045.00000	222	Non-Forest	CaO	47	Block area method
98	Other	K3 X9X10 A11A12 III	6544.90	50.00	2.00	13089.80	2.50	32724.50000	222	Non-Forest	CaO	47	Block area method
99	Other	K3 X9X10 A11A12 III	18480.00	50.00	4.00	73920.00	2.50	184800.00000	222	Non-Forest	CaO	47	Block area method
100	Other	K3 X9X10 A11A12 IV	17520.00	50.00	6.00	105120.00	2.50	262800.00000	222	Non-Forest	CaO	47	Block area method
101	Other	K3 X9X10 A11A12 V	16800.00	50.00	6.00	100800.00	2.50	252000.00000	222	Non-Forest	CaO	47	Block area method
102	Other	K4 X11X12 B1B2 I	14140.00	50.00	6.00	84840.00	2.50	212100.00000	222	Non-Forest	CaO	47	Block area method
103	Other	K4 X11X12 B1B2 II	14140.00	50.00	6.00	84840.00	2.50	212100.00000	222	Non-Forest	CaO	47	Block area method
104	Other	K4 X11X12 B1B2 III	14140.00	50.00	6.00	84840.00	2.50	212100.00000	222	Non-Forest	CaO	47	Block area method
105	Other	K4 X11X12 B1B2 IV	14140.00	50.00	6.00	84840.00	2.50	212100.00000	222	Non-Forest	CaO	47	Block area method
106	Other	K4 X11X12 B1B2 V	14140.00	50.00	6.00	84840.00	2.50	212100.00000	222	Non-Forest	CaO	47	Block area method
107	Other	K4 X11X12 B1B2 VI	14140.00	50.00	6.00	84840.00	2.50	212100.00000	222	Non-Forest	CaO	47	Block area method
108	Other	K4 X12X13 B3B4 I	8339.00	50.00	6.00	50034.00	2.50	125085.00000	222	Non-Forest	CaO	47	Block area method
109	Other	K4 X12X13 B3B4 II	8339.00	50.00	6.00	50034.00	2.50	125085.00000	222	Non-Forest	CaO	47	Block area method
110	Other	K4 X12X13 B3B4 III	8339.00	50.00	6.00	50034.00	2.50	125085.00000	222	Non-Forest	CaO	47	Block area method
111	Other	K4 X12X13 B3B4 IV	8339.00	50.00	6.00	50034.00	2.50	125085.00000	222	Non-Forest	CaO	47	Block area method

112	Other	K4 X12X13 B3B4 V	8339.00	50.00	6.00	50034.00	2.50	125085.00000	222	Non-Forest	CaO	47	Block area method
113	Other	K4 X13X14 B5B6 I	4234.00	50.00	6.00	25404.00	2.50	63510.00000	222	Non-Forest	CaO	47	Block area method
114	Other	K4 X13X14 B5B6 II	4234.00	50.00	6.00	25404.00	2.50	63510.00000	222	Non-Forest	CaO	47	Block area method
115	Other	K4 X13X14 B5B6 III	4234.00	50.00	6.00	25404.00	2.50	63510.00000	222	Non-Forest	CaO	47	Block area method
116	Other	K4 X13X14 B5B6 IV	4234.00	50.00	6.00	25404.00	2.50	63510.00000	222	Non-Forest	CaO	47	Block area method
117	Other	K4 X14X15 B7B8 I	4692.00	50.00	6.00	28152.00	2.50	70380.00000	222	Non-Forest	CaO	47	Block area method
118	Other	K4 X14X15 B7B8 II	4692.00	50.00	6.00	28152.00	2.50	70380.00000	222	Non-Forest	CaO	47	Block area method
119	Other	K4 X14X15 B7B8 III	4080.00	50.00	6.00	24480.00	2.50	61200.00000	222	Non-Forest	CaO	47	Block area method
120	Other	K4 X14X15 B7B8 IV	3468.00	50.00	6.00	20808.00	2.50	52020.00000	222	Non-Forest	CaO	47	Block area method
121	Other	K4 X15X16 B9B10 I	2196.00	50.00	6.00	13176.00	2.50	32940.00000	222	Non-Forest	CaO	47	Block area method
122	Other	K4 X15X16 B9B10 II	2196.00	50.00	6.00	13176.00	2.50	32940.00000	222	Non-Forest	CaO	47	Block area method
123	Other	K4 X15X16 B9B10 III	2074.00	50.00	6.00	12444.00	2.50	31110.00000	222	Non-Forest	CaO	47	Block area method
124	Other	K4 Z5Z6 D6D7 II	3834.00	50.00	6.00	23004.00	2.50	57510.00000	222	Non-Forest	CaO	47	Block area method
125	Other	K4 Z5Z6 D6D7 III	4185.00	50.00	6.00	25110.00	2.50	62775.00000	222	Non-Forest	CaO	47	Block area method
126	Other	K4 Z5Z6 D6D7 IV	4860.00	50.00	6.00	29160.00	2.50	72900.00000	222	Non-Forest	CaO	47	Block area method
127	Other	K4 Z5Z6 D6D7 V	4860.00	50.00	6.00	29160.00	2.50	72900.00000	222	Non-Forest	CaO	47	Block area method

128	Other	K4 Z6Z7 D8D9 II	4032.00	50.00	6.00	24192.00	2.50	60480.00000	222	Non-Forest	CaO	47	Block area method
129	Other	K4 Z6Z7 D8D9 III	4032.00	50.00	6.00	24192.00	2.50	60480.00000	222	Non-Forest	CaO	47	Block area method
130	Other	K4 Z6Z7 D8D9 IV	4032.00	50.00	6.00	24192.00	2.50	60480.00000	222	Non-Forest	CaO	47	Block area method
131	Other	K4 Z6Z7 D8D9 V	4032.00	50.00	6.00	24192.00	2.50	60480.00000	222	Non-Forest	CaO	47	Block area method
132	Other	ALS Y3Y4 C7C8 V	12212.00	50.00	9.00	109908.00	2.50	274770.00000	222	Non-Forest	CaO	47	Block area method
133	Other	ALS Y3Y4 C7C8 VI	12212.00	50.00	9.00	109908.00	2.50	274770.00000	222	Non-Forest	CaO	47	Block area method
134	Other	ALS Y3Y4 C7C8 VII	12212.00	50.00	8.00	97696.00	2.50	244240.00000	222	Non-Forest	CaO	47	Block area method
135	Other	ALS Y6Y7 C13C14 II	1920.00	50.00	9.00	17280.00	2.50	43200.00000	222	Non-Forest	CaO	47	Block area method
136	Other	ALS Y6Y7 C13C14 III	4794.00	50.00	9.00	43146.00	2.50	107865.00000	222	Non-Forest	CaO	47	Block area method
137	Other	ALS Y6Y7 C13C14 IV	6486.00	50.00	9.00	58374.00	2.50	145935.00000	222	Non-Forest	CaO	47	Block area method
138	Other	ALS Y6Y7 C13C14 V	10752.00	50.00	9.00	96768.00	2.50	241920.00000	222	Non-Forest	CaO	47	Block area method
139	Other	ALS Y6Y7 C13C14 VI	9912.00	50.00	9.00	89208.00	2.50	223020.00000	222	Non-Forest	CaO	47	Block area method
140	Other	ALS Y7Y8 C15C16 II	20368.00	50.00	9.00	183312.00	2.50	458280.00000	222	Non-Forest	CaO	47	Block area method
141	Other	ALS Y7Y8 C15C16 III	20368.00	50.00	9.00	183312.00	2.50	458280.00000	222	Non-Forest	CaO	47	Block area method
142	Other	ALS Y2Y3 C3C4 I	13987.00	50.00	9.00	125883.00	2.50	314707.50000	222	Non-Forest	CaO	47	Block area method
143	Other	ALS Y2Y3 C3C4 II	14271.00	50.00	9.00	128439.00	2.50	321097.50000	222	Non-Forest	CaO	47	Block area method

144	Other	ALS Y2Y3 C3C4 III	13530.00	50.00	9.00	121770.00	2.50	304425.00000	222	Non-Forest	CaO	47	Block area method
145	Other	ALS Y2Y3 C3C4 IV	12505.00	50.00	9.00	112545.00	2.50	281362.50000	222	Non-Forest	CaO	47	Block area method
146	Other	ALS Y2Y3 C3C4 V	11480.00	50.00	9.00	103320.00	2.50	258300.00000	222	Non-Forest	CaO	47	Block area method
147	Other	ALS Y2Y3 C3C4 VI	10455.00	50.00	9.00	94095.00	2.50	235237.50000	222	Non-Forest	CaO	47	Block area method
148	Other	ALS Y2Y3 C3C4 VII	9225.00	50.00	9.00	83025.00	2.50	207562.50000	222	Non-Forest	CaO	47	Block area method
149	Other	ALS Y2Y3 C3C4 VIII	8200.00	50.00	9.00	73800.00	2.50	184500.00000	222	Non-Forest	CaO	47	Block area method
150	Other	ALS Y2Y3 C3C4 IX	7175.00	50.00	9.00	64575.00	2.50	161437.50000	222	Non-Forest	CaO	47	Block area method
151	Other	ALS Y6Y7 C11C12 III	2500.00	50.00	9.00	22500.00	2.50	56250.00000	222	Non-Forest	CaO	47	Block area method
152	Other	ALS Y6Y7 C11C12 IV	2500.00	50.00	9.00	22500.00	2.50	56250.00000	222	Non-Forest	CaO	47	Block area method
153	Other	ALS Y6Y7 C11C12 V	6200.00	50.00	9.00	55800.00	2.50	139500.00000	222	Non-Forest	CaO	47	Block area method
154	Other	ALS Y6Y7 C11C12 VI	6700.00	50.00	9.00	60300.00	2.50	150750.00000	222	Non-Forest	CaO	47	Block area method
155	Other	ALS Y6Y7 C11C12 VI	3260.00	50.00	4.00	13040.00	2.50	32600.00000	222	Non-Forest	CaO	47	Block area method
156	Other	ALS Y5Y6 C9C10 V	4238.00	50.00	6.00	25428.00	2.50	63570.00000	222	Non-Forest	CaO	47	Block area method
157	Other	ALS Y5Y6 C9C10 VI	27058.00	50.00	6.00	162348.00	2.50	405870.00000	222	Non-Forest	CaO	47	Block area method
158	Other	ALS Y5Y6 C9C10 VII	27058.00	50.00	6.00	162348.00	2.50	405870.00000	222	Non-Forest	CaO	47	Block area method
159	Other	ALS Y8Y9 C17C18 I	9010.00	50.00	9.00	81090.00	2.50	202725.00000	222	Non-Forest	CaO	47	Block area method

160	Other	ALS Y8Y9 C17C18 II	12455.00	50.00	9.00	112095.00	2.50	280237.50000	222	Non-Forest	CaO	47	Block area method
161	Other	ALS Y8Y9 C17C18 III	12455.00	50.00	9.00	112095.00	2.50	280237.50000	222	Non-Forest	CaO	47	Block area method
162	Other	ALS Y9Y10 C19C20 I	4380.00	50.00	9.00	39420.00	2.50	98550.00000	222	Non-Forest	CaO	47	Block area method
163	Other	ALS Y9Y10 C19C20 II	4380.00	50.00	1.00	4380.00	2.50	10950.00000	222	Non-Forest	CaO	47	Block area method
164	Other	ALS Y9Y10 C19C20 II	15120.00	50.00	8.00	120960.00	2.50	302400.00000	222	Non-Forest	CaO	47	Block area method
165	Other	ALS Y9Y10 C19C20 III	15120.00	50.00	9.00	136080.00	2.50	340200.00000	222	Non-Forest	CaO	47	Block area method
166	Other	K5 Y11Y12 C21C22 I	5460.00	50.00	9.00	49140.00	2.50	122850.00000	222	Non-Forest	CaO	47	Block area method
167	Other	K5 Y11Y12 C21C22 II	5460.00	50.00	9.00	49140.00	2.50	122850.00000	222	Non-Forest	CaO	47	Block area method
168	Other	K5 Y11Y12 C21C22 III	5460.00	50.00	9.00	49140.00	2.50	122850.00000	222	Non-Forest	CaO	47	Block area method
169	Other	K5 Y12Y13 C23C24 I	4880.00	50.00	9.00	43920.00	2.50	109800.00000	222	Non-Forest	CaO	47	Block area method
170	Other	K5 Y12Y13 C23C24 II	4880.00	50.00	9.00	43920.00	2.50	109800.00000	222	Non-Forest	CaO	47	Block area method
171	Other	K5 Y12Y13 C23C24 III	4880.00	50.00	9.00	43920.00	2.50	109800.00000	222	Non-Forest	CaO	47	Block area method
172	Other	K5 Y13Y14 C25C26 I	2325.00	50.00	9.00	20925.00	2.50	52312.50000	222	Non-Forest	CaO	47	Block area method
173	Other	K5 Y13Y14 C25C26 II	2325.00	50.00	9.00	20925.00	2.50	52312.50000	222	Non-Forest	CaO	47	Block area method
174	Other	K5 Y13Y14	2325.00	50.00	9.00	20925.00	2.50	52312.5000	222	Non-Forest	CaO	47	Block area

		C25C26 II						0					method
175	Other	HSL N ZZ1 DD1 I	1242.00	50.00	6.00	7452.00	2.50	18630.00000	222	Non-Forest	CaO	47	Block area method
176	Other	HSL N ZZ1 DD1 II	1242.00	50.00	6.00	7452.00	2.50	18630.00000	222	Non-Forest	CaO	47	Block area method
177	Other	HSL N ZZ1 DD1 III	1242.00	50.00	1.00	1242.00	2.50	3105.00000	222	Non-Forest	CaO	47	Block area method
178	Other	HSL N ZZ1 DD1 III	13064.00	50.00	5.00	65320.00	2.50	163300.00000	222	Non-Forest	CaO	47	Block area method
179	Other	HSL N ZZ1 DD1 IV	13064.00	50.00	6.00	78384.00	2.50	195960.00000	222	Non-Forest	CaO	47	Block area method
180	Other	HSL N ZZ1 DD1 V	13064.00	50.00	6.00	78384.00	2.50	195960.00000	222	Non-Forest	CaO	47	Block area method
181	Other	HSL N Z1Z2 DD1 I	11704.00	50.00	6.00	70224.00	2.50	175560.00000	222	Non-Forest	CaO	47	Block area method
182	Other	HSL N Z1Z2 DD1 II	11856.00	50.00	6.00	71136.00	2.50	177840.00000	222	Non-Forest	CaO	47	Block area method
183	Other	HSL N Z1Z2 DD1 III	11856.00	50.00	1.00	11856.00	2.50	29640.00000	222	Non-Forest	CaO	47	Block area method
184	Other	HSL N Z1Z2 DD1 III	42712.00	50.00	5.00	213560.00	2.50	533900.00000	222	Non-Forest	CaO	47	Block area method
185	Other	HSL N Z1Z2 DD1 IV	42712.00	50.00	6.00	256272.00	2.50	640680.00000	222	Non-Forest	CaO	47	Block area method
186	Other	HSL N Z1Z2 DD1 V	42712.00	50.00	6.00	256272.00	2.50	640680.00000	222	Non-Forest	CaO	47	Block area method
187	Other	ALQMines Y1Y2 C1C2 I	7936.00	50.00	6.00	47616.00	2.50	119040.00000	222	Non-Forest	CaO	47	Block area method

188	Other	ALQMines Y1Y2 C1C2 II	7936.00	50.00	3.00	23808.00	2.50	59520.00000	222	Non-Forest	CaO	47	Block area method
189	Other	ALQMines Y1Y2 C1C2 II	38144.00	50.00	3.00	114432.00	2.50	286080.00000	222	Non-Forest	CaO	47	Block area method
190	Other	ALQMines Y1Y2 C1C2 III	38144.00	50.00	6.00	228864.00	2.50	572160.00000	222	Non-Forest	CaO	47	Block area method
191	Other	ALQMines Y1Y2 C1C2 IV	38144.00	50.00	6.00	228864.00	2.50	572160.00000	222	Non-Forest	CaO	47	Block area method
192	Other	ALQMines Y1Y2 C1C2 V	38144.00	50.00	6.00	228864.00	2.50	572160.00000	222	Non-Forest	CaO	47	Block area method
193	Other	ALQMines YY CC I	5037.00	50.00	6.00	30222.00	2.50	75555.00000	222	Non-Forest	CaO	47	Block area method
194	Other	ALQMines YY CC II	5037.00	50.00	6.00	30222.00	2.50	75555.00000	222	Non-Forest	CaO	47	Block area method
195	Other	ALQ Mines YY CC III	5037.00	50.00	6.00	30222.00	2.50	75555.00000	222	Non-Forest	CaO	47	Block area method
196	Other	ALQMines YY CC IV	5037.00	50.00	6.00	30222.00	2.50	75555.00000	222	Non-Forest	CaO	47	Block area method
197	Other	ALQMines YY CC V	5037.00	50.00	6.00	30222.00	2.50	75555.00000	222	Non-Forest	CaO	47	Block area method
198	Other	HSL S Z4Z5 D2D3 I	1540.00	50.00	5.00	7700.00	2.50	19250.00000	222	Non-Forest	CaO	47	Block area method
199	Other	HSL S Z4Z5 D2D3 II	1584.00	50.00	4.00	6336.00	2.50	15840.00000	222	Non-Forest	CaO	47	Block area method
200	Other	HSL S Z4Z5 D2D3 II	2200.00	50.00	5.00	11000.00	2.50	27500.00000	222	Non-Forest	CaO	47	Block area method

201	Other	HSL S Z4Z5 D2D3 III	2244.00	50.00	3.00	6732.00	2.50	16830.00000	222	Non-Forest	CaO	47	Block area method
202	Other	HSL S Z4Z5 D2D3 III	3476.00	50.00	6.00	20856.00	2.50	52140.00000	222	Non-Forest	CaO	47	Block area method
203	Other	HSL S Z4Z5 D2D3 IV	6292.00	50.00	9.00	56628.00	2.50	141570.00000	222	Non-Forest	CaO	47	Block area method
204	Other	HSL S Z4Z5 D2D3 V	6380.00	50.00	9.00	57420.00	2.50	143550.00000	222	Non-Forest	CaO	47	Block area method
205	Other	HSL S Z4Z5 D2D3 VI	6380.00	50.00	9.00	57420.00	2.50	143550.00000	222	Non-Forest	CaO	47	Block area method
206	Other	HSL S Z4Z5 D2D3 VII	6380.00	50.00	9.00	57420.00	2.50	143550.00000	222	Non-Forest	CaO	47	Block area method
207	Other	HSL S Z4Z5 D2D3 VIII	6380.00	50.00	9.00	57420.00	2.50	143550.00000	222	Non-Forest	CaO	47	Block area method
208	Other	HSL S Z4Z5 D2D3 IX	6380.00	50.00	9.00	57420.00	2.50	143550.00000	222	Non-Forest	CaO	47	Block area method
209	Other	HSL S Z4Z5 D2D3 X	6380.00	50.00	9.00	57420.00	2.50	143550.00000	222	Non-Forest	CaO	47	Block area method
210	Other	HSL S Z4Z5 D4D5 VI	15600.00	50.00	9.00	140400.00	2.50	351000.00000	222	Non-Forest	CaO	47	Block area method
211	Other	HSL S Z4Z5 D4D5 VII	16848.00	50.00	9.00	151632.00	2.50	379080.00000	222	Non-Forest	CaO	47	Block area method
212	Other	HSL S Z4Z5 D4D5	16848.00	50.00	9.00	151632.00	2.50	379080.00000	222	Non-Forest	CaO	47	Block area method

		VIII											
213	Other	HSL S Z4Z5 D4D5 IX	16848.00	50.00	9.00	151632.00	2.50	379080.00000	222	Non-Forest	CaO	47	Block area method
214	Other	HSL S Z4Z5 D4D5 X	16848.00	50.00	9.00	151632.00	2.50	379080.00000	222	Non-Forest	CaO	47	Block area method
Total						11551830.80		28879577.00					

2A.2.4.12: Calulation of Reserves - I

SI.No.	Cross section/Block	Sectional area/ block area (in Sq mtr)	Influence (m)	Depth (m)	Volume (m^3)	Bulk Density (t/m^3)	Resource Quantity (t)	UNFC code	Type of Land	Name of the radical	Grade (%)	Method used for resource estimation
1	K2 BAND X2X3 A5A6 II	600.00	50.00	3.00	1800.00	2.50	4500.00	111	Non-forest	CaO	47	Block area method
2	K2 BAND X2X3 A5A6 II	2100.00	50.00	3.00	6300.00	2.50	15750.00	111	Non-forest	CaO	47	Block area method
3	K2 BAND X3X4 A7A8 I	285.04	50.00	5.00	1425.20	2.50	3563.00	111	Non-forest	CaO	47	Block area method
4	K2 BAND X3X4 A7A8 II	242.08	50.00	2.50	605.20	2.50	1513.00	111	Non-forest	CaO	47	Block area method
5	K2 BAND X3X4 A7A8 II	1914.06	50.00	3.50	6699.20	2.50	16748.00	111	Non-forest	CaO	47	Block area method
6	K2 BAND X3X4 A7A8 III	1120.00	50.00	6.00	6720.00	2.50	16800.00	111	Non-forest	CaO	47	Block area method

7	K2 BAND X4X5 A9A10 I	98.00	50.00	5.00	490.00	2.50	1225.00	111	Non-forest	CaO	47	Block area method
8	K2 BAND X4X5 A9A10 II	91.00	50.00	4.00	364.00	2.50	910.00	111	Non-forest	CaO	47	Block area method
9	K2 BAND X4X5 A9A10 II	2300.00	50.00	2.00	4600.00	2.50	11500.00	111	Non-forest	CaO	47	Block area method
10	K2 BAND X4X5 A9A10 III	1206.97	50.00	6.00	7241.80	2.50	18104.50	111	Non-forest	CaO	47	Block area method
11	K2 BAND X4X5 A9A10 IV	571.96	50.00	4.50	2573.80	2.50	6434.50	111	Non-forest	CaO	47	Block area method
12	K3 BAND X6X7 A1A2 I	582.00	50.00	4.00	2328.00	2.50	5820.00	111	Non-forest	CaO	47	Block area method
13	K3 BAND X6X7 A1A2 II	388.00	50.00	1.50	582.00	2.50	1455.00	111	Non-forest	CaO	47	Block area method
14	K3 BAND X6X7 A1A2 III	3978.04	50.00	5.50	21879.20	2.50	54698.00	111	Non-forest	CaO	47	Block area method
15	K3 BAND X6X7 A1A2 IV	2242.00	50.00	3.00	6726.00	2.50	16815.00	111	Non-forest	CaO	47	Block area method
16	K3 BAND X7X8 A3A4 I	1900.00	50.00	5.00	9500.00	2.50	23750.00	111	Non-forest	CaO	47	Block area method
17	K3 BAND X7X8 A3A4 II	1700.00	50.00	1.00	1700.00	2.50	4250.00	111	Non-forest	CaO	47	Block area method
18	K3 BAND X7X8 A3A4	3568.98	50.00	5.50	19629.40	2.50	49073.50	111	Non-forest	CaO	47	Block area method

	III											
19	K3 BAND X7X8 A3A4 IV	2687.96	50.00	4.50	12095.80	2.50	30239.50	111	Non-forest	CaO	47	Block area method
20	K4 BAND X13X14 B5B6 TO X15X16-B9B10	2232.98	50.00	4.50	10048.40	2.50	25121.00	111	Non-forest	CaO	47	Block area method
21	K4 BAND X13X14 B5B6 TO X15X16-B9B10	1711.04	50.00	5.00	8555.20	2.50	21388.00	111	Non-forest	CaO	47	Block area method
22	K4 BAND X13X14 B5B6 TO X15X16-B9B10	1160.00	50.00	6.00	6960.00	2.50	17400.00	111	Non-forest	CaO	47	Block area method
23	K4 BAND X13X14 B5B6 TO X15X16-B9B10	1728.00	50.00	6.00	10368.00	2.50	25920.00	111	Non-forest	CaO	47	Block area method
24	K4 BAND X13X14 B5B6 TO X15X16-B9B10	1403.97	50.00	6.00	8423.80	2.50	21059.50	111	Non-forest	CaO	47	Block area method
25	K4 BAND X13X14 B5B6 TO X15X16-B9B10	357.00	50.00	3.00	1071.00	2.50	2677.50	111	Non-forest	CaO	47	Block area method
26	ALS BAND Y2Y3 C5C6 TO Y6Y7-C13C14	184.00	50.00	1.50	276.00	2.50	690.00	111	Non-forest	CaO	47	Block area method
27	ALS BAND Y2Y3 C5C6 TO Y6Y7-C13C14	228.00	50.00	6.50	1482.00	2.50	3705.00	111	Non-forest	CaO	47	Block area method

28	ALS BAND Y2Y3 C5C6 TO Y6Y7 C13C14	1036.96	50.00	2.50	2592.40	2.50	6481.00	111	Non-forest	CaO	47	Block area method
29	ALS BAND Y2Y3-C5C6 TO Y6Y7-C 13C14	760.00	50.00	4.00	3040.00	2.50	7600.00	111	Non-forest	CaO	47	Block area method
30	ALS BAND Y2Y3-C5C6 TO Y6Y7-C 13C14	2185.00	50.00	4.00	8740.00	2.50	21850.00	111	Non-forest	CaO	47	Block area method
31	ALS BAND Y2Y3-C5C6 TO Y6Y7-C 13C14	2565.00	50.00	4.00	10260.00	2.50	25650.00	111	Non-forest	CaO	47	Block area method
32	ALS BAND Y2Y3-C5C6 TO Y6Y7-C 13C14	5415.04	50.00	2.50	13537.60	2.50	33844.00	111	Non-forest	CaO	47	Block area method
33	ALS BAND Y2Y3-C5C6 TO Y6Y7-C 13C14	8170.00	50.00	9.00	73530.00	2.50	183825.00	111	Non-forest	CaO	47	Block area method
34	ALS BAND Y2Y3-C5C6 TO Y6Y7-C 13C14	4686.00	50.00	9.00	42174.00	2.50	105435.00	111	Non-forest	CaO	47	Block area method
35	ALS BAND Y2Y3-C5C6 TO Y6Y7-C 13C14	1560.00	50.00	8.00	12480.00	2.50	31200.00	111	Non-forest	CaO	47	Block area method
36	ALS BAND Y2Y3-C5C6 TO Y6Y7-C 13C14	4180.00	50.00	5.50	22990.00	2.50	57475.00	111	Non-forest	CaO	47	Block area method

37	ALS BAND Y2Y3-C5C6 TO Y6Y7-C 13C14	6365.02	50.00	9.00	57285.20	2.50	143213.00	111	Non-forest	CaO	47	Block area method
38	ALS BAND Y2Y3-C5C6 TO Y6Y7-C 13C14	4154.00	50.00	3.00	12462.00	2.50	31155.00	111	Non-forest	CaO	47	Block area method
39	ALS BAND Y2Y3-C5C6 TO Y6Y7-C 13C14	259.02	50.00	4.50	1165.60	2.50	2914.00	111	Non-forest	CaO	47	Block area method
40	ALS BAND Y2Y3-C5C6 TO Y6Y7-C 13C14	555.02	50.00	9.00	4995.20	2.50	12488.00	111	Non-forest	CaO	47	Block area method
41	ALS BAND Y2Y3-C5C6 TO Y6Y7-C 13C14	739.98	50.00	9.00	6659.80	2.50	16649.50	111	Non-forest	CaO	47	Block area method
42	ALS BAND Y2Y3-C5C6 TO Y6Y7-C 13C14	1823.98	50.00	9.00	16415.80	2.50	41039.50	111	Non-forest	CaO	47	Block area method
43	HSL-S BAND Z4Z5-D4D5 VI	1500.00	50.00	2.00	3000.00	2.50	7500.00	111	Non-forest	CaO	47	Block area method
44	HSL-S BAND Z4Z5-D4D5 VII	5254.00	50.00	9.00	47286.00	2.50	118215.00	111	Non-forest	CaO	47	Block area method
45	HSL-S BAND Z4Z5-D4D5 VIII	1932.00	50.00	9.00	17388.00	2.50	43470.00	111	Non-forest	CaO	47	Block area method

46	HSL-S BAND Z4Z5-D4D5 IX	252.00	50.00	8.00	2016.00	2.50	5040.00	111	Non-forest	CaO	47	Block area method
Total					518461.60		1296154.00					

2A.2.4.13: Calculation of Reserves -II

Mineral	LIMESTONE

Reserves/ Resources estimated as on	05/05/2023

UNIT of estimation	tonnes

A. Mineral Reserve

Classification	Code	Quantity			Grade		Remark
		Forest	Non Forest	Total	Forest	Non Forest	
1. Proved Mineral Reserve (A)	111	0.00	1296154.00	1296154.00	0	cement grade	Nil
2. Probable Mineral Reserve (A)	121	0.00	0.00	0.00	0	0	Nil
3. Probable Mineral Reserve (A)	122	0.00	0.00	0.00	0	0	Nil

B. Remaining Resources

Classification	Code	Quantity			Grade		Remark
		Forest	Non Forest	Total	Forest	Non Forest	
1. Feasibility Mineral Resource (B)	211	0.00	0.00	0.00	0	0	Nil
2. Prefeasibility Mineral Resource (B)	221	0.00	4366872.00	4366872.00	0	cement grade	Nil
3. Prefeasibility	222	0.00	24512705.00	24512705.00	0	cement grade	Nil

Mineral Resource (B)							
4. Measured Mineral Resource (B)	331	0.00	0.00	0.00	0	0	Nil
5. Indicated Mineral Resource (B)	332	0.00	0.00	0.00	0	0	Nil
6. Inferred Mineral Resource (B)	333	0.00	0.00	0.00	0	0	Nil
7. Reconnaissance Mineral Resource (B)	334	0.00	0.00	0.00	0	0	Nil

Total Mineral Resources (A+B) :	30175731.00

2A.2.4.13: Calculation of Reserves -III

No associate minerals are available!

2A.2.5: Future Exploration Proposal

2A.2.5.1: Geological Mapping

SI.N.	Year	Scale	Area Covered (Ha)
1	2023-2024	1:5000	180.83
2	2024-2025	1:5000	180.83
3	2025-2026	1:5000	180.83
4	2026-2027	1:5000	180.83
5	2027-2028	1:5000	180.83

2A.2.5.2: Ground Geophysical Survey

SI.No.	Year	Type of Survey	Spacing (m)	Total line (km)	Area Covered (Ha)	Latitude (dd:mm:ss.ss)		Longitude (dd:mm:ss.ss)	
						From	To	From	To

1	Nil	Nil	0	0	0.0000	Nil	Nil	Nil	Nil

2A.2.5.3: Pitting

Number of Pits
0

SI.No.	Year	Land Type	Pit ID	Length of Pit (m)	Width of Pit (m)	Depth of Pit (m)	Latitude (dd:mm:ss.ss)		Longitude (dd:mm:ss.ss)	
							From	To	From	To
1	Nil	Nil	Nil	0.00	0.00	0.00	Nil	Nil	Nil	Nil

2A.2.5.4: Trenching

Number of Trenches
0

2A.2.5.4.1: SPACING

Min (m)	Max (m)	Avg (m)
0.00	0.00	0.00

2A.2.5.4.2: Area Covered Under Trenching

Co-ordinates

SI.No.	Year	Land Type	Trench ID	Length of Trench (m)	Width of Trench (m)	Depth of Trench(m)	Latitude (dd:mm:ss.ss)		Longitude (dd:mm:ss.ss)	
							From	To	From	To
1	Nil	Nil	Nil	0.0000	0.0000	0.0000	Nil	Nil	Nil	Nil

2A.2.5.5: Exploratory Drilling

2A.2.5.5.1: Core Drilling & Non-Core Drilling

SI.No.	Year	In Forest Area				In Non Forest Area				Total Borehole	Total Meter
		No. of Borehole	Total Mtr	Type Borehole	Grid Interval	No. of Borehole	Total Mtr	Type Borehole	Grid Interval		
1	2023-2024	0	0.00	Nil	0.00	80	1909.00	Core	100.00	80	1909.00
2	2024-2025	0	0.00	Nil	0.00	78	2503.00	Core	100.00	78	2503.00

2A.2.5.6: Exploratory Mining

SI.No.	Year	Pit ID	Length in meter	Width in meter	Depth in meter	Volume (m^3)
1	Nil	Nil	0.00	0.00	0.00	0.00

2A.2.5.7: Sampling

SI.No.	Year	Type of Sample	Number of Samples Proposed	Area Covered(Ha)	Latitude (dd:mm:ss.ss)		Longitude (dd:mm:ss.ss)	
					From	To	From	To
1	2023-2024	Others	80	180.83	09:21:53.52	09:21:53.52	77:40:53.90	77:40:53.90
2	2024-2025	Others	78	180.83	09:22:38.59	09:22:38.59	77:41:56.26	77:41:56.26

2A.2.5.8 Petrographic & Mineralgraphic Studies

SI.No.	Year	Type of Sample	Number of Samples Proposed
1	Nil	None	0

Chapter 2B : Geology & Exploration UG : NA

Chapter 3: Mineral Beneficiation / Processing

Name of The Ore/Mineral	Limestone

3.1: Mineralogy of the ROM ore/ Mineral

SI.No	Valuable Mineral Name	Approx. Mineral %	Gangue Mineral/s name	Approx. Mineral Gangue %
1	Limestone	70.0000	Mineral reject	30.0000

3.2: Complete Chemical Analysis of the ROM Ore/Mineral

SI.No	Radical	Wt%
1	CaO	47.2000
2	MgO	2.4000
3	SiO2	12.0500
4	Fe2O3	0.8300
5	Al2O3	2.3600
6	LOI	34.5000

3.3: Crushing Section

3.3.1: Primary Crushing

Not Applicable

3.3.2: Secondary Crushing

Not Applicable

3.3.3: Tertiary Crushing

Not Applicable

3.4: Grinding Section

3.4.1: Dry Grinding

Not Applicable

3.4.2: Wet Grinding

Not Applicable

3.5: Dry Processing

3.5.1: Screening and Classification

Not Applicable

3.5.2: Other Operations

Not Applicable

3.5.3: Product Quality

Not Applicable

3.6: Wet Processing

3.6.1: Scrubbing / Washing

SI.No	Type of Scrubbers / washers	Stages, if applicable	Make	Capacity(tph)	Feed Size(mm)	Product Size (mm)	Product Quality, if available	Water Requirement(l/h)	Fresh Water Requirement (l/h)	Recirculated Water (l/h)
1	nil	Not applicable	NIL	0.0000	0.0000	0.0000	0	0.0000	0.0000	0.0000

3.6.2: Screening and Classification

SI.No	Type of screen / classifiers	Stages, if applicable	Make	Capacity(tph)	Aperture Size of Screen/Classifier (mm), if applicable	Feed Size(mm)	Product Size (mm)	Product Quality, if available	Water Requirement(l/h)	Fresh Water Requirement (l/h)	Recirculated Water (l/h)
1	nil	Not applicable	NIL	0.0000	0.0000	0.0000	0.0000	0	0.0000	0.0000	0.0000

3.6.3: Gravity Separation

SI.No	Type of separators	Stages, if applicable	Make	Capacity(tph)	Feed Size(mm)	Product (Conc) (tph)	Product-Mid (tph), if	Product-Tail (tph)	Water Requirement(l/h)	Fresh Water Requirement	Recirculated Water (l/h)

	(jig, table, spiral, etc.)						available			(l/h)	
1	nil	NIL	NIL	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

3.6.4: Magnetic Separation

SI.No	Type of magnetic separators (magnetic intensity)	Stages, if applicable	Make	Capacity(tph)	Feed Size(mm)	Product-Mag (tph)	Product-Mid (tph), if available	Product non-Mag (tph)	Water Requirement(l/h)	Fresh Water Requirement (l/h)	Recirculated Water (l/h)
1	nil	NIL	NIL	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

3.6.5: Flotation

SI.No	Type of flotation equipment (froth/ column)	Stages (rougher/ cleaner, etc), if applicable	Make	Capacity(tph)	Feed Size(mm)	Product-Float (tph)	Product non-Float (tph)	Water Requirement(l/h)	Fresh Water Requirement (l/h)	Recirculated Water (l/h)
1	NIL	NIL	NIL	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

3.6.6: Other Operations

SI.No	Type of equipment / operation	Stages, if applicable	Make	Capacity(tph)	Feed Size(mm)	Product-Conc (tph)	Product-Mid (tph), if available	Product-Tail (tph)	Water Requirement(l/h)	Fresh Water Requirement (l/h)	Recirculated Water (l/h)
1	NIL	Not applicable	NIL	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

3.6.7: Product Quality (wet processing)

Products	Wt%	In Tonnes	Size (Range) mm	Complete chemical analysis
Concentrate	0.0000	0.0000	0	0
Sub-grade	0.0000	0.0000	0	0
Rejects	0.0000	0.0000	0	0

3.7: Overall Product Quality (Dry cum Wet Processing)

Products	Wt%	In Tonnes	Size (Range) mm	Complete chemical analysis
Concentrate	0.0000	0.0000	0	0
Sub-grade	0.0000	0.0000	0	0
Rejects	0.0000	0.0000	0	0

3.8: Disposal Method for tailing/ rejects

a) Explain the disposal method for tailing or reject from processing plant with detail chemical / mineral analysis of tailing	Nil
b) Size and capacity of tailing pond, toxic effect of such tailings, process adopted to neutralise its effect (if any)	Nil
c) Any other data (if available)	Nil

3.9: Overall water requirement of mining and mineral processing

Indicate quantity, source of supply, disposal of water and extent of recycling and chemical analysis of water	Nil

3.10: Flow sheets and charts

Material balance chart of mineral processing plant(s) (each stage of process)	Nil

Attach flow sheet of beneficiation of plant(s)	Nil
Any other data (if applicable)	Nil

Chapter 4A: Mining Operations

4A.1.1: Existing Method of Mining	Mechanized

Choose one or more	HEMM with deephole drilling	HEMM with deephole drilling	HEMM with deephole drilling	HEMM with deephole drilling

4A.1.2: Proposed Method of Mining	Mechanized

Choose one or more	HEMM with deephole drilling	HEMM with deephole drilling	HEMM with deephole drilling	HEMM with deephole drilling

Reasons for Proposed Changes	No change in proposed method

4A.2: Operational Parameters

4A.2.1: Inventory of Existing Pits & Dumps

4A.2.1.1: Pits

SI.No.	Pit ID	Pit Status	Area Covered by Pit(Ha)	Pit Dimensions(L*W*D)
1	ALQ Mines	Active	3.08	200*154*10
2	ALS-Pit 1	Active	5.44	340*160*40
3	ALS-Pit 2	Active	12.16	760*160*40
4	ALS-Pit 3	Active	1.40	700*20*8
5	HSL-S	Active	10.01	435*230*45
6	HSL-N	Active	3.30	220*150*13

7	K2-Pit 1	Active	2.40	750*32*8
8	K2-Pit 2	Active	0.78	260*30*11
9	K3-Pit 1	Active	3.71	825*45*12
10	K3-Pit 2	Active	1.98	330*60*7
11	K3-Pit 3	Active	1.00	200*50*11
12	K4-Pit 1	Active	0.40	160*25*8
13	K4-Pit 2	Active	0.48	160*30*8
14	K4-Pit 3	Active	0.23	150*15*2

4A.2.1.2: Dumps and Stacks

4A.2.1.2.1: Dump Details

SI.No.	Dump ID	Dump Status	Type of Dump	Total of Dump Quantity(t)	Area Covered by Dump(Ha)	Height(m)	Latitude (dd:mm:ss.ss)		Longitude (dd:mm:ss.ss)	
							From	To	From	To
1	2	Active	Waste	462000.00	2.31	8.00	09:22:02.28	09:22:08.75	77:41:07.08	77:41:12.86
2	6	Active	Waste	686250.00	3.05	9.00	09:22:38.63	09:22:43.60	77:41:37.16	77:41:45.94
3	7a	Active	Waste	115500.00	0.39	12.00	09:22:46.16	09:22:48.78	77:41:56.35	77:41:58.71
4	7b	Active	Waste	742500.00	1.98	15.00	09:22:40.93	09:22:47.62	77:41:52.12	77:41:57.24
5	8	Active	Waste	828100.00	2.37	14.00	09:22:30.88	09:22:36.29	77:41:55.57	77:42:02.03
6	9	Active	Waste	893000.00	1.88	19.00	09:22:19.24	09:22:27.62	77:41:52.53	77:41:56.41
7	10	Active	Waste	69600.00	0.29	12.00	09:22:16.82	09:22:19.54	77:41:54.31	77:41:58.00
8	12a	Active	Waste	320000.00	1.28	10.00	09:22:03.12	09:22:05.77	77:41:24.58	77:41:31.59
9	12b	Active	Waste	231075.00	1.54	6.00	09:22:00.17	09:22:03.81	77:41:19.64	77:41:27.14
10	15	Active	Waste	333025.00	1.21	11.00	09:22:59.93	09:23:02.91	77:42:07.57	77:42:13.46
11	16	Active	Waste	120000.00	0.40	12.00	09:22:53.62	09:22:55.63	77:42:12.60	77:42:15.59

4A.2.1.2.2: Stack Details

SI.No.	Stack ID	Type of Stack	Total Stack of Quantity(t)	Area Covered by Stack(Ha)	Height(m)	Latitude (dd:mm:ss.ss)		Longitude (dd:mm:ss.ss)	
						From	To	From	To
1	Stack Yard dump	Stack for mineral	4087.51	0.162	1	09:22:01.99	09:22:05.52	77:41:00.76	77:41:04.80

4A.2.1.3: Details of stabilised dumps

SI.No.	Dump ID	Number of Terraces	Average Height of Terraces(m)	Lenght of Toe Wall(m)	Lenght of Garland Drain(m)	Area Stablized(Ha)	Method of Stablization
1	NIL	Nil	0.00	0.00	0.00	0.00	NIL

4A.2.2: Opencast Mining

4A.2.2.1: Bench Parameters

Pit ID	Year	Max Height of the Benches in Over Burden (m)	Min Width of the Benches in Over Burden (m)	Slope of the Bench in Over Burden (degree)	Max Height of the Benches in Mineral (m)	Minimum Width of the Benches in Mineral (m)	Slope of the Bench in Mineral (degree)	Overall Slope of Pit (degree)	Number of Benches in Top Soil	Number of Benches in Over Burden	Number of Benches in Mineral	Max Depth of Workings (m)	Depth of Water Table (mRL)	Max Slope Angle of Haul Roads (1xx in)
1	2023-2024	9.00	9.00	60.00	9.00	9.00	60.00	30.00	0	4	4	45.00	70.00	01:16
1	2024-2025	9.00	9.00	60.00	9.00	9.00	60.00	30.00	0	0	2	18.00	70.00	01:16
1	2025-2026	9.00	9.00	60.00	9.00	9.00	60.00	30.00	0	5	3	62.00	70.00	01:16
1	2026-2027	9.00	9.00	60.00	9.00	9.00	60.00	30.00	1	2	2	18.00	70.00	01:16
1	2027-2028	9.00	9.00	60.00	9.00	9.00	60.00	30.00	0	2	4	36.00	70.00	01:16

4A.2.2.2: Yearwise Opencast Development - I Continue

SI.No.	Year	Pit ID	Bench	Direction	Bulk	Bulk	Top Soil	Over	Over	ROM	ROM	Recovery	Mineral	Productio	Productio	OB Ratio

					Density of Overburden (BD1) (ton/m^3)	Density of Mineral (BD2) (tonn/m^3)	Volume (Length x Width x Height) (m^3)	Burden Volume (Length x Width x Height) (m^3)	Burden Quantity (t)	Volume (Length x Width x Height) (m^3)	Quantity (t)		Reject (t)	n Main (t)	n Associated (t)	to Ore (m^3/ton)
1	2023-2024	ALS	I to V	W-E	2.50	2.50	0.00	159424.80	398562.00	56173.20	140433.00	0.70	42129.90	98303.10	0.00	1.1352
2	2024-2025	ALS	V-VI	W-E	2.50	2.50	0.00	0.00	0.00	56628.00	141570.00	0.70	42471.00	99099.00	0.00	Nil
3	2025-2026	ALS	I to VII	W-E	2.50	2.50	0.00	142784.80	356962.00	56166.00	140415.00	0.70	42124.50	98290.50	0.00	1.0169
4	2026-2027	ALS	I to II	W-E	2.50	2.50	2280.00	33535.20	83838.00	56334.80	140837.00	0.70	42251.10	98585.90	0.00	0.2381
5	2027-2028	ALS	I to IV	W-E	2.50	2.50	0.00	67129.60	167824.00	56062.40	140156.00	0.70	42046.80	98109.20	0.00	0.4790
Total									1007186.00		703411.00		211023.30	492387.70	0.00	

4A.2.2.2 Yearwise Opencast Development - I End

SI.No.	Year	Pit ID	Total Topsoil Volume (m^3)	Total Over Burden Volume (m^3)	Total Over Burden Quantity (t)	Total ROM Volume (m^3)	Total ROM Quantity (t)
1	2023-2024	ALS	0.00	159424.80	398562.00	56173.20	140433.00
2	2024-2025	ALS	0.00	0.00	0.00	56628.00	141570.00
3	2025-2026	ALS	0.00	142784.80	356962.00	56166.00	140415.00
4	2026-2027	ALS	2280.00	33535.20	83838.00	56334.80	140837.00
5	2027-2028	ALS	0.00	67129.60	167824.00	56062.40	140156.00
		Total	2280.00	402874.40	1007186.00	281364.40	703411.00

4A.2.2.3: Transportation & Hauling Equipment

SI.No.	Type	Make	Capacity (m^3)	No. of Equipments
1	Tipper	Ashok Leyland	25.00	6

4A.3: Material Handling Summary

4A.3.1: Studies Undertaken

Title	Study Undertaken	Attachment (only pdf allowed)
Blast Vibration Study Report	Yes	17_Blast_study_new.pdf
Slope Stability Study Report	No	Nil
Recovery Study Report	No	Nil
Hydrological Study Report	Yes	17A_hydrological_study_new.pdf
Mineral Beneficiation Study Report	No	Nil
Subsidence Study Report	No	Nil
Geotechical Study Report	No	Nil
Any Other Study Report	No	Nil
Bulk Density Study Report	Yes	15_BD_study_report.pdf

4A.3.2: Insitu Mining

SI.No.	Year	Waste Quantity(t)	ROM Quantity(t)	Total Handling (t)	ROM Quantity Saleable Mineral (t)	ROM Quantity Mineral Reject (t)	OB Ratio to Ore (Waste Quantity / ROM Quantity)	Grade Range (%)
1	2023-2024	398562.00	140433.00	538995.00	98303.10	42129.90	2.84	47
2	2024-2025	0.00	141570.00	141570.00	99099.00	42471.00	0.00	47
3	2025-2026	356962.00	140415.00	497377.00	98290.50	42124.50	2.54	47
4	2026-2027	83838.00	140837.00	224675.00	98585.90	42251.10	0.60	47
5	2027-2028	167824.00	140156.00	307980.00	98109.20	42046.80	1.20	47

	Total	1007186.00	703411.00	1710597.00	492387.70	211023.30

4A.3.3: Dump workings

SI.No.	Year	Dump ID	Latitude (dd:mm:ss.ss)		Longitude (dd:mm:ss.ss)		Area (m2)	Avg Height of Dump (m)	Volume (m^3)	Total Dump Quantity (t)	Proposed Dump Handling Quantity (t) (A)	Proposed Recovery of Saleable Mineral (t)(B)	Proposed Waste Quantity (t) (A-B)	Grade Range (%)	Justification
			From	To	From	To									
1	Nil	NIL	Nil	00:00:00.00	00:00:00.00	00:00:00.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0

4A.3.4: Calculation Summary

Year	2023-2024	2024-2025	2025-2026	2026-2027	2027-2028	Total
(A) Total ROM quantity (t)	140433.00	141570.00	140415.00	140837.00	140156.00	703411.00
(B) Saleable ore from ROM (t)	98303.00	99099.00	98291.00	98586.00	98109.00	492388.00
(C) Proposed Dump Handling Quantity (t)	0.00	0.00	0.00	0.00	0.00	0.00
(D) Saleable Ore recovered from dump workings (t)	0.00	0.00	0.00	0.00	0.00	0.00
(E) Total Saleable Ore (t)(=B+D)	98303.00	99099.00	98291.00	98586.00	98109.00	492388.00
(F) Total Quantity Handled (t)(=A+C)	140433.00	141570.00	140415.00	140837.00	140156.00	703411.00

4A.4: Machine Calculation

4A.4.1: Machine Requirement Summary

Number of Average Working Days in One Year (A)	300
Number of Shifts per Day (B)	1
Material Handling Required per Day (t) ((D)=Largest of (Q1,Q5)/(A))	1155
Material to be Handled per Shift (t) ((E)=(D)/(B))	1155
Handling Required per Hour (t) ((F)=(E)/8 hours)	144
Effective Shift Time	7 hrs 00 mins

4A.4.2: Shovel / Excavator Requirement

Effective Shift Time	7 hrs	00 mins

SI.No.	Type	Bucket Capacity (m^3)(A)	Bucket Fill Factor (B)	Swell Factor (C)	Tonnage Factor (t/m^3) (D)	Machine Utilization Factor (%) (U)	Efficiency (%) (E)	Cycle time (sec) (F)	(G) TPH =TPH (G) =((3600 x A x B x C x D x E x U) / F)	Total Hours (H) =Number of working days x Number of shifts/day x Effective shift hours	Yearly handling by one Excavator (t) (I)=(G x H)	Maximum handling of the material by this machine during the block period (t) (J)	Number of excavator machines required (K) = (J / I)	Standby excavator (L)
1	Excavator-L & T Komatsu	1.20	0.9	0.7	0.60	0.70	0.80	30	30.48	2100	64008.00	541132.00	8.45	0

4A.4.3: Dumper Requirement

Effective Shift Time	7 hrs	00 mins

SI.No.	Total Hours=Number of working days (W)x Number of shifts/day x Effective shift hours (Machine Requirement Summary) (A)	Capacity of Dumpers (t) (B)	Speed of the dumper (KMPH) (i)	Lead Distance (KM) (ii)	Time taken to cover distance in minutes(iii) =(ii/i) x 60	Queuing, Loading Time at Shovel (min) (iv)	Queuing, Unloading Time during unloading (min) (v)	Total Time to complete one trip(vi) = (iii + iv + v)	No. of Trips / hr = (60 / vi)	Total transportation per hour =(B X vii)	Yearly handling by one dumper (ix) = A x TPH	Maximum handling of the material by this machine during the block period (t) (x)	Number of dumpers will be (xi) =(x / ix)	Plus Standby dumper (xii)
1	2100	25.00	15.00	1.50	6.00	8.00	2.00	16.00	3	93	196875.00	441333.00	2	0

4A.4.4: Drill Machine Requirement

Effective Shift Time	7 hrs	00 mins

SI.No.	Type of Drill	Depth of Hole(including Sub-grade Drilling (m)	Spacing (m)	Burden (m)	Bulk Density of Waste (t/m^3)	Bulk Density of Mineral (t/m^3)	Yield per Hole (t)	Yield per Meter (t/m) = Yield per Hole (t)/Depth of Hole(including Sub-grade Drilling (m))	Annual Target Known (t)	Drilling Requirement per Day (m) = (Annual Target Known (t) / Yield per Meter (t/m))/Number of Average Working Days in One Year (A)	Drilling Requirement per Shift(m)	Rate of Drilling per Hours (m/hr) = Drilling Requirement per Shif t(m)/Effective Shift Time	Required No. of drills (m/c) = Required rate of drilling in meters per hr./ Actual rate of drilling in meters per hr of the machine deployed	Stand by Drill
1	Mechanica	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	6.00	0

	1													
2	Hydraulic	10.00	3.00	3.00	2.50	2.50	225.00	22.50	541132.00	80.17	80.17	11.45	0.57	0

4A.4.5: Machine Deployment Details

4A.4.5.1: Excavator & Loading Equipment

SI.No.	Type	Make	Capacity (m^3)	No. of Equipments
1	Excavator	Tata Hitachi	1.20	8

4A.4.5.2: Dozers Details

SI.No.	Type	Make	Capacity (hp)	No. of Equipments
1	Dozer BD	D10 Dozer	3.60	1

4A.4.5.3: Drilling Details

SI.No.	Type	Make	Capacity (t)	Diameter of Hole(mm)
1	Mechanical	Atlas Copco	1.81	35.00

4A.5 Blasting Requirement

4A.5.1: Blasting & Explosive Requirement in Waste/Development

SI.No.	Drill Pattern / Spacing of Holes (m)	Burden of Holes (m)	Number of Rows / Rings	Yield per Holes in Waste (m^3)	Frequency of Blasting in a Week	Maximum Number of Holes Blasted in a Round	Charge per Hole (kg)	Charge per Round (kg)	Explosive Requirement Per Month in Development (kg)	Powder Factor in Development / Waste (t/kg)	Depth Of Hole
1	3	3	1	80	3	4	30	120	3000	0.15	10

4A.5.2: Blasting & Explosive Requirement in Mineral / Ore

Type of Explosive	Type of Explosives used / to be Used
Slurry Explosives	Aluminised Slurry Explosives (Large Diameter)

SI.No.	Total ROM proposed to be handled in CUM/annum	Total ROM proposed to be handled in CUM/day	Spacing of Holes (m)	Burden of Holes (m)	Number of Rows	Yield per Holes in ROM Zone (m^3)	Frequency of Blasting in a Week	Maximum Number of Holes Blasted in a Round	No of Holes Required to be Blasted per Round	Charge per Hole (kg)	Charge per Round (kg)	Explosive Requirement Per Month for ROM Zone Blasting (kg)	Powder Factor in Ore (t/kg)	Pop Shooting (no of Boulders)	Plaster Shooting (no of Boulders)	Use of Rockbreaker	Capacity	Secondary Blasting Requirements	Depth Of Hole
1	58017.00	193.39	3	3	1	80	3	3	3	30	90	2250	0.150	0	0	2	0	Yes	10

4A.6: Man Power Deployment

4A.6.1: Managerial

SI.No.	Particular	Number of Persons in Shift 1	Number of Persons in Shift 2	Number of Persons in Shift 3	Number of Persons in General Shift	Total No. of Persons per day
1	Mining Engineer	0	0	0	1	1
2	Geologist	0	0	0	1	1
3	1st Class	0	0	0	1	1
4	2nd Class Manager	0	0	0	1	1

4A.6.2: Supervisory

SI.No.	Particular	Number of Persons in	Number of Persons in	Number of Persons in	Number of Persons in	Total No. of Persons per

		Shift 1	Shift 2	Shift 3	General Shift	day
1	Foreman	0	0	0	1	1
2	Mine-mate	0	0	0	1	1
3	other	0	0	0	1	1

4A.6.3: Skilled Workers / Operators

SI.No.	Particular	Number of Persons in Shift 1	Number of Persons in Shift 2	Number of Persons in Shift 3	Number of Persons in General Shift	Total No. of Persons per day
1	Other	0	0	0	7	8
2	Operator	0	0	0	8	8
3	Drill Operator	0	0	0	10	10
4	Technician	0	0	0	2	2

4A.6.4: Semi-skilled Workers

SI.No.	Number of Persons in Shift 1	Number of Persons in Shift 2	Number of Persons in Shift 3	Number of Persons in General Shift	Total No. of Persons per day
1	0	0	0	5	5

4A.6.5: Unskilled Workers

SI.No.	Number of Persons in Shift 1	Number of Persons in Shift 2	Number of Persons in Shift 3	Number of Persons in General Shift	Total No. of Persons per day
1	0	0	0	5	5

4A.6.6: Others Specify

SI.No.	Particular	Number of Persons in	Number of Persons in	Number of Persons in	Number of Persons in	Total No. of Persons per

		Shift 1	Shift 2	Shift 3	General Shift	day
1	Nil	0	0	0	0	0

4A.6.7: No of Persons Engaged Per Day

SI.No.	Number of Persons in Shift 1	Number of Persons in Shift 2	Number of Persons in Shift 3	Number of Persons in General Shift	Total No. of Persons per day
1	0	0	0	45	45

No of Shifts per Day ((A) = Machine Requirement Summary (B))	1
Average Daily Employment per Shift ((B) = (Total Number of Person per Day) / (A))	45
Material to be Handled per Shift ((C) = Machine Requirement Summary (E))	1155

4A.6.8: Supervision

SI.No.	Particular	Qualification	Requirement / Proposed	In Position / Existing Strength	(Requirement / Proposed) - (In Position / Existing Strength) = (-) Shortage / (+) Excess	Remarks
1	Mines Manager	1st Class Mines Manager	1	1	0	Nil
2	Mining Engineer	BE.Mining	1	1	0	Nil
3	Geologist	M.Sc. Geology	1	1	0	Nil
4	Mining Mate	SSLC With 5 Yr Experience In Mining	1	1	0	Nil

4A.7: Waste Management

4A.7.1: Existing Dump

SI.No.	Year	Dump Id	Type of Dump	Proposed Area (ha)	Height (m)	Latitude (dd:mm:ss.ss)	Longitude (dd:mm:ss.ss)	Total Dump Quantity (m^3)	Existing Dump

						From	To	From	To		Location
1	2023-2024	Existing Topsoil Temporaray Dump-10	Waste	0.29	10.00	09:22:16.82	09:22:19.54	77:41:54.31	77:41:58.00	29000.00	S - 09:22:16.82N 09:22:19.54N 77:41:54.31E 77:41:58.00E
2	2024-2025	Existing Topsoil Temporaray Dump-10	Waste	0.29	8.00	09:22:16.82	09:22:19.54	77:41:54.31	77:41:58.00	23200.00	S - 09:22:16.82N 09:22:19.54N 77:41:54.31E 77:41:58.00E
3	2025-2026	Existing Topsoil Temporaray Dump-10	Waste	0.29	6.00	09:22:16.82	09:22:19.54	77:41:54.31	77:41:58.00	17400.00	S - 09:22:16.82N 09:22:19.54N 77:41:54.31E 77:41:58.00E
4	2026-2027	Existing Topsoil Temporaray Dump-10	Waste	0.29	4.00	09:22:16.82	09:22:19.54	77:41:54.31	77:41:58.00	11600.00	S - 09:22:16.82N 09:22:19.54N 77:41:54.31E 77:41:58.00E
5	2027-2028	Existing Topsoil Temporaray Dump-10	Waste	0.29	2.00	09:22:16.82	09:22:19.54	77:41:54.31	77:41:58.00	5800.00	S - 09:22:16.82N 09:22:19.54N 77:41:54.31E 77:41:58.00E
6	2026-2027	Existing & Proposed Mineral Reject Temporaray Dump-8	Mineral Reject	2.37	14.76	09:22:30.88	09:22:36.29	77:41:55.57	77:42:02.03	16900.00	09:22:30.88N 09:22:36.29N 77:41:55.57E 77:42:02.03E
7	2027-2028	Existing & Proposed Mineral Reject Temporaray	Mineral Reject	2.37	15.53	09:22:30.88	09:22:36.29	77:41:55.57	77:42:02.03	16819.00	09:22:30.88N 09:22:36.29N 77:41:55.57E 77:42:02.03E

		Dump-8									
8	2023-2024	Existing & Proposed Mineral Reject Temporaray Dump-12b	Mineral Reject	1.54	7.11	09:22:00.17	09:22:03.81	77:41:19.64	77:41:27.14	16852.00	SW 09:22:00.17N 09:22:03.81N 77:41:19.64E 77:41:27.14E
9	2024-2025	Existing & Proposed Mineral Reject Temporaray Dump-12b	Mineral Reject	1.54	8.21	09:22:00.17	09:22:03.81	77:41:19.64	77:41:27.14	16988.00	SW 09:22:00.17N 09:22:03.81N 77:41:19.64E 77:41:27.14E
10	2025-2026	Existing & Proposed Mineral Reject Temporaray Dump-12b	Mineral Reject	1.54	9.27	09:22:00.17	09:22:03.81	77:41:19.64	77:41:27.14	16850.00	SW 09:22:00.17N 09:22:03.81N 77:41:19.64E 77:41:27.14E
11	2026-2027	Existing & Proposed Side & Interburden Temporaray Dump-9	Waste	1.88	20.78	09:22:19.24	09:22:27.62	77:41:52.53	77:41:56.41	33535.00	S- 09:22:19.24N 09:22:27.62N 77:41:52.53E 77:41:56.41E
12	2027-2028	Existing & Proposed Side & Interburden Temporaray Dump-9	Waste	1.88	24.35	09:22:19.24	09:22:27.62	77:41:52.53	77:41:56.41	67130.00	S- 09:22:19.24N 09:22:27.62N 77:41:52.53E 77:41:56.41E
13	2023-2024	Existing & Proposed Side & Interburden Temporaray Dump-2	Waste	2.31	14.90	09:22:02.28	09:22:08.75	77:41:07.08	77:41:12.86	159425.00	SW 09:22:02.28N 09:22:08.75N 77:41:07.08E 77:41:12.86E
14	2025-2026	Existing & Proposed Side & Interburden	Waste	2.31	21.08	09:22:02.28	09:22:08.75	77:41:07.08	77:41:12.86	142785.00	SW 09:22:02.28N 09:22:08.75N

		Temporaray Dump-2									77:41:07.08E 77:41:12.86E

4A.7.2: New Dump

SI.No.	Year	Dump Id	Type of Dump	Proposed Area (ha)	Height (m)	Latitude (dd:mm:ss.ss)		Longitude (dd:mm:ss.ss)		Total Dump Quantity (m^3)	New Dump Location
						From	To	From	To		
1	Nil	Nil	Nil	0.00	0.00	Nil	Nil	Nil	Nil	0.00	Nil

4A.7.3: Existing Stack

SI.No.	Year	Stack ID	Type of Stack	Proposed Area (ha)	Height (m)	Latitude (dd:mm:ss.ss)		Longitude (dd:mm:ss.ss)		Total Stack Quantity (m^3)	Existing Stack Location
						From	To	From	To		
1	Nil	-	Nil	0.00	0.00	Nil	Nil	Nil	Nil	0.00	-

4A.7.4: New Stack

SI.No.	Year	Stack ID	Type of Stack	Proposed Area (ha)	Height (m)	Latitude (dd:mm:ss.ss)		Longitude (dd:mm:ss.ss)		Total Stack Quantity (m^3)	New Stack Location
						From	To	From	To		
1	Nil	-	Nil	0.00	0.00	Nil	Nil	Nil	Nil	0.00	-

4A.8: Mineral Waste Handling To Utilize As Minor Mineral

SI.No.	Year	Dump ID	Type of Dump	Proposed Area (ha)	Quantity Handled (t)	Quantity Recovered (t)	Name Of Minor Mineral	Alternative Waste Utilization (m^3)
1	Nil	-	Nil	0.00	0.00	0.00	Nil	0.00

4A.9: Use of Minerals

SI.No.	Proposed Use Of Mineral	Name Of Mineral	Relevant Use Of Mineral	Physical Specifications	Chemical Specifications

1	Captive use in Own Industry	LIMESTONE	The entire mined out limestone is of grade suitable for cement industries and is being utilized as raw material for cement manufacturing in the companys own captive plant which is located at Alangulam Village, Virudhunagar District which is at a distance	Creamy white in colour & Size 100mesh	CaO: 40 to 4 MgO: 0.15 to 1.5%

* Choose among these:

1. Captive use in own industry

2. Direct Selling

3. Selling Post-Beneficiation /Up-gradation

*Select more than one, if applicable

Chapter 4 B : Mining Operations UG : NA

Chapter 5: Sustainable Mining

5.1: Sustainable Mining and SDF Implementations in Compliance of Rule 35 of MCDR'2017

Measures will be taken to regulate the sustainable mining.

(Total 200 characters)

Compliance of Vishakha Committee Guidelines for prevention of women harassment at workplace	Not Applicable

5.2: CSR INITIATIVES

5.2.1: 2023-2024

Details of Work Proposed during the Year / Measures Planned for the Affected Segment	Cumulative Work done / Measures Taken
5.2.1.1: Area to be Developed for Recreation	
Area (Ha)	Area (Ha)
0.00	0.00

5.2.1.2: Area for Water Storage & Recharge Facility	
Area (Ha)	Area (Ha)
0.00	0.00

5.2.1.3: Efforts Made towards Housing for Local Communities	
Number of Houses	Number of Houses
0	0

5.2.1.4: Efforts Made towards Providing Transport to Local Communities	
Number of Beneficiaries	Number of Beneficiaries
0	0

5.2.1.5: Efforts Made towards Providing Healthcare to Local Communities	
Number of Beneficiaries	Number of Beneficiaries
100	100

5.2.1.6: Efforts Made towards Providing Hygiene & Sanitation to Local Communities	
Number of Beneficiaries	Number of Beneficiaries
150	150

5.2.1.7: Efforts Made towards Skill Development Programs to Local Communities	
Number of Beneficiaries	Number of Beneficiaries
100	100

5.2.1.8: Efforts Made to Promote Education & Knowledge Based Initiatives	
Number of Beneficiaries	Number of Beneficiaries
15	15

5.2.1.9: Communication Facilities Provided to Local Communities	
Number of Beneficiaries	Number of Beneficiaries
0	0

5.2.1.10: Any Other Steps Taken for Improving the Socio-Economic Standard of Local Communities	
Number of Beneficiaries	Number of Beneficiaries
0	0

5.2.1.11: Adoption of ODF		
Number of Toilets Built inside the Lease Area	Number of Toilets Built outside the Lease Area:	Number of Beneficiaries
2	0	20

5.2.1.12: Awareness Program among Mine Workers for Swatchata	
Number of Swatchata Programmes Proposed	Number of Swatchata Programmes Held
1	1

5.2.1.13: Efforts for green energy	
Total energy consumption (KWh)	Green energy consumption (% of total)
0.00	0.00

5.2.1.14: Water & recycled use	
Total water consumption (KLD)	Water recycled (% of total)
1.00	30.00

5.2.2: 2024-2025

Details of Work Proposed during the Year / Measures Planned for the Affected Segment	Cumulative Work done / Measures Taken
5.2.2.1: Area to be Developed for Recreation	
Area (Ha)	Area (Ha)
0.00	0.00

5.2.2.2: Area for Water Storage & Recharge Facility	
Area (Ha)	Area (Ha)
0.00	0.00

5.2.2.3: Efforts Made towards Housing for Local Communities	
Number of Houses	Number of Houses
0	0

5.2.2.4: Efforts Made towards Providing Transport to Local Communities	
Number of Beneficiaries	Number of Beneficiaries
0	0

5.2.2.5: Efforts Made towards Providing Healthcare to Local Communities	
Number of Beneficiaries	Number of Beneficiaries
100	200

5.2.2.6: Efforts Made towards Providing Hygiene & Sanitation to Local Communities	
Number of Beneficiaries	Number of Beneficiaries
150	300

5.2.2.7: Efforts Made towards Skill Development Programs to Local Communities	
Number of Beneficiaries	Number of Beneficiaries
100	200

5.2.2.8: Efforts Made to Promote Education & Knowledge Based Initiatives	
Number of Beneficiaries	Number of Beneficiaries
10	25

5.2.2.9: Communication Facilities Provided to Local Communities	
Number of Beneficiaries	Number of Beneficiaries
0	0

5.2.2.10: Any Other Steps Taken for Improving the Socio-Economic Standard of Local Communities	
Number of Beneficiaries	Number of Beneficiaries
0	0

5.2.2.11: Adoption of ODF		
Number of Toilets Built inside the Lease Area	Number of Toilets Built outside the Lease Area:	Number of Beneficiaries
0	0	40

5.2.2.12: Awareness Program among Mine Workers for Swatchata	
Number of Swatchata Programmes Proposed	Number of Swatchata Programmes Held
1	2

5.2.2.13: Efforts for green energy	
Total energy consumption (KWh)	Green energy consumption (% of total)
0.00	0.00

5.2.2.14: Water & recycled use	
Total water consumption (KLD)	Water recycled (% of total)
1.00	30.00

5.2.3: 2025-2026

Details of Work Proposed during the Year / Measures Planned for the Affected Segment	Cumulative Work done / Measures Taken
5.2.3.1: Area to be Developed for Recreation	
Area (Ha)	Area (Ha)
0.00	0.00

5.2.3.2: Area for Water Storage & Recharge Facility	
Area (Ha)	Area (Ha)
0.00	0.00

5.2.3.3: Efforts Made towards Housing for Local Communities	
Number of Houses	Number of Houses
0	0

5.2.3.4: Efforts Made towards Providing Transport to Local Communities	
Number of Beneficiaries	Number of Beneficiaries
0	0

5.2.3.5: Efforts Made towards Providing Healthcare to Local Communities	
Number of Beneficiaries	Number of Beneficiaries
100	300

5.2.3.6: Efforts Made towards Providing Hygiene & Sanitation to Local Communities	
Number of Beneficiaries	Number of Beneficiaries
150	450

5.2.3.7: Efforts Made towards Skill Development Programs to Local Communities	
Number of Beneficiaries	Number of Beneficiaries
110	310

5.2.3.8: Efforts Made to Promote Education & Knowledge Based Initiatives	
Number of Beneficiaries	Number of Beneficiaries
10	35

5.2.3.9: Communication Facilities Provided to Local Communities	
Number of Beneficiaries	Number of Beneficiaries
0	0

5.2.3.10: Any Other Steps Taken for Improving the Socio-Economic Standard of Local Communities	
Number of Beneficiaries	Number of Beneficiaries
0	0

5.2.3.11: Adoption of ODF		
Number of Toilets Built inside the Lease Area	Number of Toilets Built outside the Lease Area:	Number of Beneficiaries
0	0	60

5.2.3.12: Awareness Program among Mine Workers for Swatchata	
Number of Swatchata Programmes Proposed	Number of Swatchata Programmes Held
1	3

5.2.3.13: Efforts for green energy	
Total energy consumption (KWh)	Green energy consumption (% of total)
0.00	0.00

5.2.3.14: Water & recycled use	
Total water consumption (KLD)	Water recycled (% of total)
1.00	30.00

5.2.4: 2026-2027

Details of Work Proposed during the Year / Measures Planned for the Affected Segment	Cumulative Work done / Measures Taken
5.2.4.1: Area to be Developed for Recreation	
Area (Ha)	Area (Ha)
0.00	0.00

5.2.4.2: Area for Water Storage & Recharge Facility	
Area (Ha)	Area (Ha)
0.00	0.00

5.2.4.3: Efforts Made towards Housing for Local Communities	
Number of Houses	Number of Houses
0	0

5.2.4.4: Efforts Made towards Providing Transport to Local Communities	
Number of Beneficiaries	Number of Beneficiaries
0	0

5.2.4.5: Efforts Made towards Providing Healthcare to Local Communities	
Number of Beneficiaries	Number of Beneficiaries
100	400

5.2.4.6: Efforts Made towards Providing Hygiene & Sanitation to Local Communities	
Number of Beneficiaries	Number of Beneficiaries
150	600

5.2.4.7: Efforts Made towards Skill Development Programs to Local Communities	
Number of Beneficiaries	Number of Beneficiaries
100	410

5.2.4.8: Efforts Made to Promote Education & Knowledge Based Initiatives	
Number of Beneficiaries	Number of Beneficiaries
10	45

5.2.4.9: Communication Facilities Provided to Local Communities	
Number of Beneficiaries	Number of Beneficiaries
0	0

5.2.4.10: Any Other Steps Taken for Improving the Socio-Economic Standard of Local Communities	
Number of Beneficiaries	Number of Beneficiaries
0	0

5.2.4.11: Adoption of ODF		
Number of Toilets Built inside the Lease Area	Number of Toilets Built outside the Lease Area:	Number of Beneficiaries
0	0	80

5.2.4.12: Awareness Program among Mine Workers for Swatchata	
Number of Swatchata Programmes Proposed	Number of Swatchata Programmes Held
1	4

5.2.4.13: Efforts for green energy	
Total energy consumption (KWh)	Green energy consumption (% of total)
0.00	0.00

5.2.4.14: Water & recycled use	
Total water consumption (KLD)	Water recycled (% of total)
1.00	30.00

5.2.5: 2027-2028

Details of Work Proposed during the Year / Measures Planned for the Affected Segment	Cumulative Work done / Measures Taken
5.2.5.1: Area to be Developed for Recreation	
Area (Ha)	Area (Ha)
0.00	0.00

5.2.5.2: Area for Water Storage & Recharge Facility	
Area (Ha)	Area (Ha)
0.00	0.00

5.2.5.3: Efforts Made towards Housing for Local Communities	
Number of Houses	Number of Houses
0	0

5.2.5.4: Efforts Made towards Providing Transport to Local Communities	
Number of Beneficiaries	Number of Beneficiaries
0	0

5.2.5.5: Efforts Made towards Providing Healthcare to Local Communities	
Number of Beneficiaries	Number of Beneficiaries
100	500

5.2.5.6: Efforts Made towards Providing Hygiene & Sanitation to Local Communities	
Number of Beneficiaries	Number of Beneficiaries
150	750

5.2.5.7: Efforts Made towards Skill Development Programs to Local Communities	
Number of Beneficiaries	Number of Beneficiaries
100	510

5.2.5.8: Efforts Made to Promote Education & Knowledge Based Initiatives	
Number of Beneficiaries	Number of Beneficiaries
15	60

5.2.5.9: Communication Facilities Provided to Local Communities	
Number of Beneficiaries	Number of Beneficiaries
0	0

5.2.5.10: Any Other Steps Taken for Improving the Socio-Economic Standard of Local Communities	
Number of Beneficiaries	Number of Beneficiaries
0	0

5.2.5.11: Adoption of ODF		
Number of Toilets Built inside the Lease Area	Number of Toilets Built outside the Lease Area:	Number of Beneficiaries
0	0	100

5.2.5.12: Awareness Program among Mine Workers for Swatchata	
Number of Swatchata Programmes Proposed	Number of Swatchata Programmes Held
1	5

5.2.5.13: Efforts for green energy	
Total energy consumption (KWh)	Green energy consumption (% of total)
0.00	0.00

5.2.5.14: Water & recycled use	
Total water consumption (KLD)	Water recycled (% of total)
1.00	30.00

5.3: Rehabilitation & Resettlement of Affected Persons

Particular	2023-2024	2024-2025	2025-2026	2026-2027	2027-2028

Proposed Number of Project Affected Persons(PAP)	0	0	0	0	0
Proposed Number of Person for Alternate Arrangement for Sustainable Livelihood	0	0	0	0	0
Proposed Number of Person for Skill Training	0	0	0	0	0
Proposed Number of Person Likely to get Direct Employment	0	0	0	0	0
Proposed Number of Person Likely to get Indirect Employment	0	0	0	0	0
Proposed Project Affected Families Skilled and Absorbed	0	0	0	0	0
Proposed Number of Project Affected Families	0	0	0	0	0

Chapter 6: Progressive Mine Closure Plan

6.1: Status of Land

Total Area Degraded					Total mined out area Reclaimed and Rehabilitated			Other Areas Reclaimed and Rehabilitated	
Total area under excavation in the lease		Area under Dumps(in hect)	Area under utility services(in hect)	Area under Stack yards(in hect)	Mined out Area Reclaimed but not rehabilitated(in hect)	Mined outArea fully Rehabilitated from Reclaimed area(in hect)	Area under Water Reservoir considered Rehabilitated (in hect)	Stabililized Waste dump Rehabilitated (in hect)	Virgin area under Green Belt (in hect)
Area under mining operation	Mined Out area in the lease								
46.36	0.00	16.69	2.00	0.00	0.00	0.00	0.00	0.00	0.00

6.2: Progressive Reclamation and Rehabilitation Plan

6.2.1: Backfilling

Quantity of Waste / Fill Material Available at Site (m^3)	0.00
Availability of Top Soil for Spreading (m^3)	31280.00
Proposed Spread Area (m^2)	63000.00

6.2.1.1: Year Wise Proposal

SI.No	Year	Pit ID	Area (m^2)	Top RL	Bottom RL	Estimated Expenditure (₹ INR)
1	Nil	Nil	0.00	0	0	0.00

6.2.2: Water Reservoir

Average Rainfall of The Area (mm)	820.00
Proposed Area under Water Storage	0

6.2.2.1: Preparations For Ground Water Recharging

6.2.2.1.1: Drilling Holes	
Year	Proposed no of Holes to be Drilled
2023-2024	0.00
2024-2025	0.00
2025-2026	0.00
2026-2027	0.00
2027-2028	0.00

6.2.2.1.2:Preparation of Course Gravel Bed	
Year	Proposed Area of Bed (LxW)
2023-2024	0
2024-2025	0
2025-2026	0
2026-2027	0
2027-2028	0

Please specify, if others
Nil

6.2.2.2: Protective measures (Please specify running meter)

6.2.2.2.1: Fencing			
Year	Proposed Fencing Length (m)	Latitude(dd:mm:ss.ss)	Longitude(dd:mm:ss.ss)

		From	To	From	To
2023-2024	3560	09:21:52.19	09:22:18.98	77:40:51.38	77:42:28.34
2024-2025	3874	09:22:13.91	09:22:28.66	77:41:30.78	77:42:55.91
2025-2026	3643	09:22:00.85	09:22:41.63	77:41:58.61	77:42:52.48
2026-2027	4005	09:22:26.79	09:22:53.74	77:41:36.85	77:42:43.64
2027-2028	3948	09:22:42.58	09:23:05.41	77:41:36.62	77:42:37.42

6.2.2.2.2: Retaining Wall

Year	Proposed Wall Length (m)	Latitude (dd:mm:ss.ss)		Longitude (dd:mm:ss.ss)	
		From	To	From	To
2023-2024	664	09:22:02.21	09:22:08.86	77:41:06.96	77:41:14.13
2024-2025	851	09:22:00.13	09:22:05.87	77:41:20.47	77:41:31.68
2025-2026	1362	09:22:16.64	09:22:36.46	77:41:52.11	77:42:02.78
2026-2027	1235	09:22:35.85	09:22:55.70	77:41:34.69	77:42:15.74
2027-2028	1169	09:22:40.85	09:23:03.01	77:41:52.03	77:42:13.55

6.2.2.2.3: Garland Drains

Year	Proposed Bund Length (m)	Latitude (dd:mm:ss.ss)		Longitude (dd:mm:ss.ss)	
		From	To	From	To
2023-2024	4583	09:21:54.76	09:22:17.32	77:40:51.58	77:42:05.67
2024-2025	4900	09:22:26.18	09:23:03.83	77:41:36.45	77:42:36.45
2025-2026	0	Nil	Nil	Nil	Nil
2026-2027	0	Nil	Nil	Nil	Nil
2027-2028	0	Nil	Nil	Nil	Nil

6.2.3: Green Belt Development

6.2.3.1: Cumulative work done (upto end of previous block of five years)

SI.No	Total Expenditure Incurred up to Last Year (INR)	Area Covered (Ha)	Number of Plants	Survival Rate (%)
1	17000.00	0.07	170	30.00

6.2.3.2: Year Wise Proposal

SI.No	Year	Green Belt Location (s)	Area Proposed to be Covered (Ha)	Number of Plants Proposed	Expected Survival Rate (%)	Estimated Expenditure (₹ INR)
1	2023-2024	South boundary barrier	3.15	1575	70	157500
2	2024-2025	East and South boundary barrier	3.15	1575	70	157500
3	2025-2026	East boundary barrier	3.15	1575	70	157500
4	2026-2027	west and north boundary barrier	3.15	1575	70	157500
5	2027-2028	East North boundary barrier	3.17	1585	70	158500

6.2.4: Use of Shallow Pits

6.2.4.1: Cumulative Work Done (upto end of previous block of five years)

SI.No	Pit ID	Work Done	Area covered (m^2)	Total Expenditure Incurred (up to last five year block) (₹ INR)
1	Nil	0	0.00	0.00

6.2.4.2: Year Wise Proposal

SI.No	Year	Pit ID	Total	Area	Suitable	Area	Total	Latitude (dd:mm:ss.ss)	Longitude (dd:mm:ss.ss)	Remarks

			Area(Ha)	Proposed for Crops (Ha)	Crops	Proposed for Grass (Ha)	Proposed Expenditure (₹ INR)	From	To	From	To	
1	2023-2024	Nil	0.00	0.00	0	0.00	0.00	00:00:00.00	00:00:00.00	00:00:00.00	00:00:00.00	Nil
2	2024-2025	Nil	0.00	0.00	0	0.00	0.00	00:00:00.00	00:00:00.00	00:00:00.00	00:00:00.00	Nil
3	2025-2026	Nil	0.00	0.00	0	0.00	0.00	00:00:00.00	00:00:00.00	00:00:00.00	00:00:00.00	Nil
4	2026-2027	Nil	0.00	0.00	0	0.00	0.00	00:00:00.00	00:00:00.00	00:00:00.00	00:00:00.00	Nil
5	2027-2028	Nil	0.00	0.00	0	0.00	0.00	00:00:00.00	00:00:00.00	00:00:00.00	00:00:00.00	Nil

6.2.5: Pisciculture

6.2.5.1: Total Expenditure incurred as on Date (INR)	0

6.2.5.2: Cumulative work done as on Date

SI.No	Pit ID	Area (m^2)	Expenditure (₹ INR)
1	Nil	0.00	0.00

6.2.5.3: Year Wise Proposal

SI.No	Year	Pit ID	Area (m^2)	Estimated Expenditure (₹ INR)
1	2023-2024	0	0.00	0.00
2	2024-2025	0	0.00	0.00
3	2025-2026	0	0.00	0.00
4	2026-2027	0	0.00	0.00
5	2027-2028	0	0.00	0.00

6.2.5.4: Source of Water for Pisciculture	nil

6.2.5.5: Whether the quality of water has been assessed & found to be suitable for Pisciculture	No

6.2.6: Recreational Facility

6.2.6.1: Total Expenditure Incurred (up to last five year block) (INR)	0.00

6.2.6.2: Cumulative work done as on Date

SI.No	Pit ID	Area (m^2)	Expenditure (₹ INR)
1	Nil	0.00	0.00

6.2.6.3: Year Wise Proposal

SI.No	Year	Type of Recreational Facility	Area Covered (Ha)	Latitude (dd:mm:ss.ss)		Longitude (dd:mm:ss.ss)		Estimated Expenditure (INR)
				From	To	From	To	
1	2023-2024	0	0.00	00:00:00.00	00:00:00.00	00:00:00.00	00:00:00.00	0.00
2	2024-2025	0	0.00	00:00:00.00	00:00:00.00	00:00:00.00	00:00:00.00	0.00
3	2025-2026	0	0.00	00:00:00.00	00:00:00.00	00:00:00.00	00:00:00.00	0.00
4	2026-2027	0	0.00	00:00:00.00	00:00:00.00	00:00:00.00	00:00:00.00	0.00
5	2027-2028	0	0.00	00:00:00.00	00:00:00.00	00:00:00.00	00:00:00.00	0.00

6.2.7: Dump Area Stabilization & Development

SI.No	Year	Dump ID	No of Terraces	Average Height of Terraces (m)	Length of Toe Wall (m)	Length of Garland Drain (m)	Area Stabilized (Ha)	Method of Stabilization	Estimated Expenditure (₹ INR)	No of Check Dams
1	Nil	Nil	0	0.00	0.00	0.00	0.00	0	0.00	Nil

6.2.8: Other Form of Reclaiming the Area

6.2.8.1: Cumulative work done as on Date

SI.No	Total Expenditure incurred as on Date (INR)	Work Done
1	0.00	0

6.2.8.2: Year Wise Proposal

SI.No	Year	Work Proposals	Estimated Expenditure (INR)
1	2023-2024	nil	0.00
2	2024-2025	nil	0.00
3	2025-2026	nil	0.00
4	2026-2027	nil	0.00
5	2027-2028	nil	0.00

6.2.9: TopSoil Management

6.2.9.1: Cummulative Work Done as on Date

SI.No	Top Soil Generated (m^3)	Top Soil Utilized (m^3)	Topsoil Stored (m^3)	Total expenditure incurred as on date (₹)
1	463600.00	173600.00	290000.00	450000.00

6.2.9.2: Year Wise Proposal

SI.No	Year	Topsoil Generated (m^3) (A)	Topsoil Utilized (m^3) (B)	Topsoil Stored (m^3) (A-B)	Estimated Expenditure (INR)
1	2023-2024	0.00	0.00	0.00	50000.00
2	2024-2025	0.00	0.00	0.00	50000.00
3	2025-2026	0.00	0.00	0.00	50000.00

4	2026-2027	2280.00	2280.00	0.00	50000.00
5	2027-2028	0.00	0.00	0.00	50000.00

6.2.10: Tailings Dam Management

SI.No	Year	Yearly generation of Tailing (m^3) (A)	Total capacity of Tailing Pond (m^3)	Measures Proposed for Periodic Desilting	Yearly Utilization of Tailing (m^3) (B)	Disposal of Tailing to Tailing Pond (m^3) (A-B)	Tailing Dam Design	Structural Stability Studies
1	2023-2024	0.00	0.00	0	0.00	0.00	Nil	Nil
2	2024-2025	0.00	0.00	0	0.00	0.00	Nil	Nil
3	2025-2026	0.00	0.00	0	0.00	0.00	Nil	Nil
4	2026-2027	0.00	0.00	0	0.00	0.00	Nil	Nil
5	2027-2028	0.00	0.00	0	0.00	0.00	Nil	Nil

6.2.11: Land Use of Lease Area at the Expiry of Lease Period

Total Area Degraded				Non Degraded area	Total mined out area Reclaimed and Rehabilitated			Other Areas Reclaimed and Rehabilitated			
Mined Out area in the lease	Area under Dumps(in hect)	Area under the Tailing Dam	Area under utility services(in hect)	Area undisturbed/virgin	Mined out Area Reclaimed but not rehabilitated(in hect)	Mined outArea fully Rehabilitated from Reclaimed area(in hect)	Area under Water Reservoir considered Rehabilitated (in hect)	Stabililized Waste dump Rehabilitated (in hect)	Virgin area under Green Belt (in hect)	Rehabilitated Area under utility services(in hect)	Rehabilitated Area under Tailing dam (in hect)
51.74	16.69	0.00	2.50	109.90	0.00	0.00	51.74	16.69	109.90	2.50	0.00

Chapter 7: Financial Assurance/ Performance Surety (AREA PUT TO USE)

2023-2024

Consolidated View of Financial Assurance

SI.No	Particular	Area put to use at Start of Year (ha) (A)	Additional Requirement (ha) (B)	Total (ha) (C = A + B)
1	Area under Mining	46.36	0.46	46.82
2	Topsoil stacking	0.00	0.00	0.00
3	Overburden/Waste Dumping	16.69	0.00	16.69
4	Mineral Storage	0.00	0.00	0.00
5	Infrastructure (Workshop, Administrative Building etc.)	0.00	0.00	0.00
6	Roads	2.00	0.00	2.00
7	Railway	0.00	0.00	0.00
8	Tailing Pond	0.00	0.00	0.00
9	Effluent Treatment Plant	0.00	0.00	0.00
10	Mineral Separation Plant	0.00	0.00	0.00
11	Township Area	0.00	0.00	0.00
12	Others to specify	0.00	3.15	3.15
	Total	65.05	3.61	68.66

2024-2025

Consolidated View of Financial Assurance

SI.No	Particular	Area put to use at Start of Year (ha) (A)	Additional Requirement (ha) (B)	Total (ha) (C = A + B)
1	Area under Mining	46.82	0.46	47.28
2	Topsoil stacking	0.00	0.00	0.00
3	Overburden/Waste Dumping	16.69	0.00	16.69
4	Mineral Storage	0.00	0.00	0.00
5	Infrastructure (Workshop, Administrative Building etc.)	0.00	0.00	0.00
6	Roads	2.00	0.00	2.00
7	Railway	0.00	0.00	0.00
8	Tailing Pond	0.00	0.00	0.00
9	Effluent Treatment Plant	0.00	0.00	0.00
10	Mineral Separation Plant	0.00	0.00	0.00
11	Township Area	0.00	0.00	0.00
12	Others to specify	3.15	3.15	6.30
	Total	68.66	3.61	72.27

2025-2026

Consolidated View of Financial Assurance

SI.No	Particular	Area put to use at Start of Year (ha) (A)	Additional Requirement (ha) (B)	Total (ha) (C = A + B)
1	Area under Mining	47.28	0.46	47.74
2	Topsoil stacking	0.00	0.00	0.00
3	Overburden/Waste Dumping	16.69	0.00	16.69
4	Mineral Storage	0.00	0.00	0.00
5	Infrastructure (Workshop, Administrative Building etc.)	0.00	0.00	0.00

6	Roads	2.00	0.00	2.00
7	Railway	0.00	0.00	0.00
8	Tailing Pond	0.00	0.00	0.00
9	Effluent Treatment Plant	0.00	0.00	0.00
10	Mineral Separation Plant	0.00	0.00	0.00
11	Township Area	0.00	0.00	0.00
12	Others to specify	6.30	3.15	9.45
	Total	72.27	3.61	75.88

2026-2027

Consolidated View of Financial Assurance

SI.No	Particular	Area put to use at Start of Year (ha) (A)	Additional Requirement (ha) (B)	Total (ha) (C = A + B)
1	Area under Mining	47.74	0.46	48.20
2	Topsoil stacking	0.00	0.00	0.00
3	Overburden/Waste Dumping	16.69	0.00	16.69
4	Mineral Storage	0.00	0.00	0.00
5	Infrastructure (Workshop, Administrative Building etc.)	0.00	0.00	0.00
6	Roads	2.00	0.00	2.00
7	Railway	0.00	0.00	0.00
8	Tailing Pond	0.00	0.00	0.00
9	Effluent Treatment Plant	0.00	0.00	0.00
10	Mineral Separation Plant	0.00	0.00	0.00
11	Township Area	0.00	0.00	0.00
12	Others to specify	9.45	3.15	12.60
	Total	75.88	3.61	79.49

2027-2028

Consolidated View of Financial Assurance

SI.No	Particular	Area put to use at Start of Year (ha) (A)	Additional Requirement (ha) (B)	Total (ha) (C = A + B)
1	Area under Mining	48.20	0.46	48.66
2	Topsoil stacking	0.00	0.00	0.00
3	Overburden/Waste Dumping	16.69	0.00	16.69
4	Mineral Storage	0.00	0.00	0.00
5	Infrastructure (Workshop, Administrative Building etc.)	0.00	0.00	0.00
6	Roads	2.00	0.00	2.00
7	Railway	0.00	0.00	0.00
8	Tailing Pond	0.00	0.00	0.00
9	Effluent Treatment Plant	0.00	0.00	0.00
10	Mineral Separation Plant	0.00	0.00	0.00
11	Township Area	0.00	0.00	0.00
12	Others to specify	12.60	3.17	15.77
	Total	79.49	3.63	83.12
	Grand Total			83.12

Financial Assurance

Financial Assurance

Category A Mining Lease

Total Area Proposed to be put to use in	Amount of Bank Gurantee (Lac INR)	Valid till (dd/mm/yyyy)	Upload copy of Bank Gurantee as attachment

hect(Year 1 to 5)			
83.12	415.60	31/03/2028	Nil

Category B Mining Lease

SI.No	Total Area Proposed to be put to use in hect(Year 1 to 5)	Amount of Bank Gurantee (Lac INR)	Valid till (dd/mm/yyyy)	Upload copy of Bank Gurantee as attachment
1	Nil	Nil	Nil	Nil

Chapter 8: Review of Previous Proposals (Not applicable for fresh grant)

8.1: General

8.1.1: Lease Area Utilization

Sl. No.	Type of land use (in ha)	Area at the beginning of the proposal period	Area proposed under activity	Actual Area utilized in the proposal period	Deviation	Reasons for deviation
1	Mining	46.36	47.44	46.36	-1.08	Mine was stopped on 01.07.2017 for not obtaining environmental clearance from competence authority. EC is under process. Please refer Annexure No 5.
2	Mineral storage	0.00	0.00	0.00	0	-
3	Mineral Beneficiation plant	0.00	0.00	0.00	0	-
4	Township	0.00	0.00	0.00	0	-
5	Tailing Pond	0.00	0.00	0.00	0	-
6	Railways	0.00	0.00	0.00	0	-
7	Roads	2.00	2.00	2.00	0	-
8	Infrastructure (Workshop, administrative building etc.)	0.00	0.00	0.00	0	-
9	OB/waste dump	16.69	16.69	16.69	0	-
10	Top soil preservation	0.00	0.00	0.00	0	-
11	Others	0.00	0.50	0.00	-0.50	Mine was stopped on

						01.07.2017 for not obtaining environmental clearance from competence authority. EC is under process. Please refer Annexure No 5.
12	Total area put to use	65.05	66.63	65.05	-1.58	Mine was stopped on 01.07.2017 for not obtaining environmental clearance from competence authority. EC is under process. Please refer Annexure No 5.
13	Excavated area reclaimed	0.00	0.00	0.00	0	-
14	Waste dump area reclaimed	0.00	0.00	0.00	0	-
15	Undisturbed Area	115.78	114.20	115.78	1.58	Mine was stopped on 01.07.2017 for not obtaining environmental clearance from competence authority. EC is under process. Please refer Annexure No 5.
	Total	180.83	180.83	180.83	0	

8.1.2: SDF and CSR Expenditures

Activity	Proposals		Achievement	Deviation	Reasons for deviation
Total expenditure incurred for implementation of SDF at mine level including - Environment Protection - CSR & other welfare activities in peripheral area (Explanation: Expenditure is not over and above the	10% of Royalty (a)	Total Expenditure for SDF implementation (b)			

statutory levies imposed by the Government; However, THIS EXCLUDES CONTRIBUTION TO DMF & NMET and is over and above the statutory levies imposed by the Government.)					
CSR (Corporate Social Responsibility) spending at the mine level in Proposal Period (as per Companies Act, 2013 or otherwise)	0.00	0.00	1500000.00	1500000.00	Mine was stopped on 01.07.2017 for not obtaining environmental clearance from competence authority. EC is under process

8.2: Technical Details

8.2.1: Exploration

Particulars	Proposals			Achievement			Deviation			Reasons for deviation
	Boreholes	Pits	Trenchs	Boreholes	Pits	Trenchs	Boreholes	Pits	Trenchs	
Number of Boreholes/ Pits/ Trenches	158	00000	0	Nil	Nil	Nil	-158	Nil	Nil	Mine was stopped on 01.07.2017 for not obtaining environmental clearance from competence authority. EC is under process. Please refer Annexure No 5.
Boreholes Meterage (If Boreholes selected in first row) (m)	14220			0			-14220			-
Grid	50			0			-50			-

G Axis upgradation during Proposal Period as per guidelines of MEMC Rule 2015)	0	0	0	-
Area converted under G1 from G2/G3	0	0	0	-

8.2.2: Mine Development (Opencast/ Underground/ Both/ Dump Mining)

Particulars	Proposals	Actual	Deviation	Reasons for deviation
8.2.2.1: Generation of Ore/Waste While Development				
Ore	282953	0	-282953	Mine was stopped on 01.07.2017 for not obtaining environmental clearance from competence authority. EC is under process. Please refer Annexure No 5.
Waste	385738	0	-385738	-
Generated Waste while ROM recovery	84886	0	-84886	-
Dumping Site (For Surface)	Dump 2 09:22:02.28N 9:22:08.75N 77:41:07.08 E 77:41:12.86E Dump 12b 9220.80N 9222.97N 774126.72E 774120.63E	0	Dump 2 09:22:02.28N 9:22:08.75N 77:41:07.08 E 77:41:12.86E Dump 12b 9220.80N 9222.97N 774126.72E 774120.63E	-
Removal of waste/ over burden in cubic meters	33954	0	-33954	-
8.2.2.2: Excavation				
Lateral extent	Nil	0	Nil	Proposal-09:21:58.70N 09:22:03.46N 77:41:19.68E 77:41:14.11E 09:21:57.71N 09:21:59.70N 77:41:11.97E 77:41:08.30E,

				Achieved-Nil
Vertical extent	54	0	54	proposal-54m RL104m to RL 50m, Achieved-Nil

8.2.3: Mining operation: Dump Mining

Particulars	Proposals	Achievement	Deviation	Reasons for deviation
Handling of Material	0	0	0	0
Waste Generated post recovery	0	0	0	0
Dumping site for waste	0	0	0	0

8.2.4: Zero Waste Mining

Particulars	Proposals	Achievement	Deviation	Reasons for deviation
Alternative use / Disposal of Waste Generated (excluding top soil)	0.00	0.00	0.00	0

8.2.5: Backfilling

Particulars	Proposals	Achievement	Deviation	Reasons for deviation
Site (Co-ordinates)	0	0	0	0
Area	0	0	0	0
Depth	0	0	0	0
Volume Backfilled (CuM)	0	0	0	0
Backfilled Area available for Reclamation and Rehabilitation	0	0	0	0
Backfilled Area Reclaimed and Rehabilitated	0	0	0	0
Balance Backfilled Area	0	0	0	0

8.2.6: Production of Mineral(s)

Particulars	Proposals	Achievement	Deviation	Reasons for deviation
8.2.6.1: ROM				
Opencast	282953.0000	0.0000	-282953.0000	Mine was stopped on 01.07.2017 for not obtaining environmental clearance from competence authority. EC is under process. Please refer Annexure No 5.
8.2.6.2: Cleaned Ore				
Opencast	198067.0000	0.0000	-198067.0000	-do-
Dump Mining	0.0000	0.0000	0.0000	-do-
Recovery from Mineral Rejects or Tailings	0.0000	0.0000	0.0000	-do-
Total	198067.0000	0.0000	-198067.0000	-do-

8.2.7: Handling of Mineral Rejects/ Sub-Grade

Particulars	Proposals	Achievement	Deviation	Reasons for deviation
Generation of mineral rejects				
Opencast	84886	0	-84886	Mine was stopped on 01.07.2017 for not obtaining environmental clearance from competence authority. EC is under process. Please refer Annexure No 5.
Dump Mining	0	0	0	-
Other recovery	0	0	0	-
Stacking of mineral rejects/ sub-grade mineral (Dump Id)	0	0	0	-

Blending of mineral reject / sub-grade	0	0	0	-

8.2.8: Environment Compliances

Particulars	Proposals	Achievement	Deviation	Reasons for deviation
8.2.8.1: Top soil				
Generation	0	0	0	Nil
Utilization	0	0	0	Nil
Stacking (Dump Id)	0	0	0	Nil
Reclamation	0	0	0	Nil
Rehabilitation	0	0	0	Nil
8.2.8.2: Afforestation (Dumps/Benches/Backfilled Area etc.)				
2018 - 2019	0	0	0	Nil
2019 - 2020	0	0	0	Nil
2020 - 2021	00	0	0	Nil
2021 - 2022	0	0	0	Nil
2022 - 2023	0	0	0	Nil
8.2.8.3: Afforestation (Green Belt)				
2018 - 2019	0	0	0	-
2019 - 2020	0	90	90	As mine was stopped on 01.07.2017, hence afforestation not carried out as proposed.
2020 - 2021	0	80	80	-
2021 - 2022	280	0	-280	-
2022 - 2023	280	0	-280	-
Construction of check dams	0	0	0	Nil

Construction of Garland Drain (in meter)	0	0	0	Nil
Construction of Retaining Walls (in meter)	0	0	0	Nil
8.2.8.4: Tailings				
Generation	0	0	0	Nil
Utilization	0	0	0	Nil
Disposal	0	0	0	Nil

8.3: Socio-Economic Review

8.3.1: Rehabilitation & Resettlement for Project Affected People

Particulars	Proposals	Achievement	Deviation	Reasons for deviation
No. of Project Affected People (PAP)	0.0000	0.0000	0.0000	Nil
%age of PAP for whom alternate arrangements made for sustained livelihood	0.0000	0.0000	0.0000	Nil
% of project affected families given employment	0.0000	0.0000	0.0000	Nil
% of project affected families who have been skilled by the lessee and absorbed (% of total employment given to affected families)	0.0000	0.0000	0.0000	Nil

8.3.2 : Grievance Redressal

Grievances Received	2018 - 2019	2019 - 2020	2020 - 2021	2021 - 2022	2022 - 2023
	0	0	0	0	Nil

Grievances Redressed	0	0	0	0	Nil

8.3.3: Welfare and socio-economic development programs for local communities

Particulars	Nil	Nil	Nil	Nil	Nil
8.3.3.1 Support for Drinking Water & Agriculture					
No. of Water Storage Tanks constructed	-	-	-	-	-
Drinking Water Facilities provided (Bore wells/ Pumps etc.)	-	-	-	--	-
Irrigation Support provided (Canals/ Pumps etc.)	-	-	-	-	-
No. of Water tanks De-silted	-	-	-	-	-
Water Treatment facilities provided (A/NA)	-	-	-	-	-
Amount of Water treated (in kL) (if selected A in above)	-	-	-	-	-
8.3.3.2 Support to Health & Medical Services					
No. of persons identified from Occupational health diseases	-	-	-	-	-
No. of Health Camps/ Medicine Camps Organized	-	-	--	-	-
8.3.3.3 Support to Skill development & Education					
Vocational Training Provided/ Support Provided					
No. of employees undergone Vocational training	-	-	-	15	15
No. of other persons undergone Vocational training	-	-	-	15	15
Number of Literacy & Education Camps held/	-	-	-	-	-

Supported					
8.3.3.4 Support to Transportation Services & Infrastructure					
Expenditure on Transportation Services & Infrastructure	-	-	-	-	-
Road development (m) in the peripheral area (not lease area)	-	-	-	-	-
No. of Public transport support provided (Ambulance/Buses/ School Vans etc)	-	-	-	-	-
8.3.3.5 Swatchata Programs: Creating/providing sanitation and healthy condition in and around the mine area					
Adoption of ODF within mining lease area					
No. of Toilets built in the Lease Area	-	-	-	-	-
Adoption of ODF in nearby villages					
No. Of Toilets built in the villages	-	-	-	2	2
Provision for greenage recreational facility (Within Lease Area/ Outside)					
Recreational Area Type (Picnic Spot/ tracks/Park Etc)	-	-	-	-	-
Area covered (For within Lease Area only)	-	-	-	-	-
Awareness program among Mine workers for Swatchata					
No. of Swatchchta Programmes held	-	-	-	2	2

Chapter 9 : Impact Assessment (NA)

Chapter 10: Annexures

1. Upload Document

1.1 Upload Document

SI.No.	Title	Is Upload	Document (only pdf allowed)
1	Letter of Intent /Letter of lease grant	Nil	1_1A_GO_215_595.pdf
2	Copy of lease deed executed	Nil	2_2A_TO_2E_new_redu.pdf
3	Copy of Declaration of Owner/Nominated Owner in case of Company/partnership firm	Nil	3_Authorization_Letter.pdf
4	ID & Address Proof of Owner/ Nominated Owner	Nil	4_Id_Proof_of_Lessee.pdf
5	Copy of Environment and Forest Clearence, Consent to Establish, Consent to Operate	Nil	5_ToR_EC_Status.pdf
6	Copy of Registration of Company (RoC)/Partnership firm (Registration) & Deed	Nil	6_ROC_MOA_AOA_DIREC_ORIGINAL_REDU.pdf
7	Consent letter for Qualified Person	Nil	7_Consent_for_QP.pdf
8	Experience & Qualification Details of Qualified Person	Nil	8_Qualification,_Experience,_Aadhaar_&_Pan_of_QP.pdf
9	Certificate from QP	Nil	9_QP_Certificate.pdf
10	Copy of Bank Guarantee	Nil	10_BG_Draft.pdf
11	Copy of Performance Surety	Nil	Nil
12	Copy of MDPA (as applicable)	Nil	Nil
13	Exploration details	Nil	11_Exploration_Details1_redu.pdf
14	Copy of feasibility Report	Nil	12_Feasibility_Report_new.pdf
15	Copy of Study reports conducted as per Para	Nil	17_17A_Blast_hydrological_study.pdf

	4.3.1		
16	Chemical and Mineralogical analysis report	Nil	15_16_16A_B_C_Chemical_Analysis_redu.pdf
17	Any other Report or Certification as required in the submitted Document.	Nil	23_Reserve_yearwise.pdf
18	Copy of Scale relaxation approval granted(if applicable)	Yes	21_scale_relaxation.pdf
19	Mineral processing flowsheet with stage wise recovery	Nil	Nil
20	Any Other	Yes	18_19_20_22_24_redu.pdf

Chapter 11: Plates (OC)

1. Upload Document

1.1 Upload Document

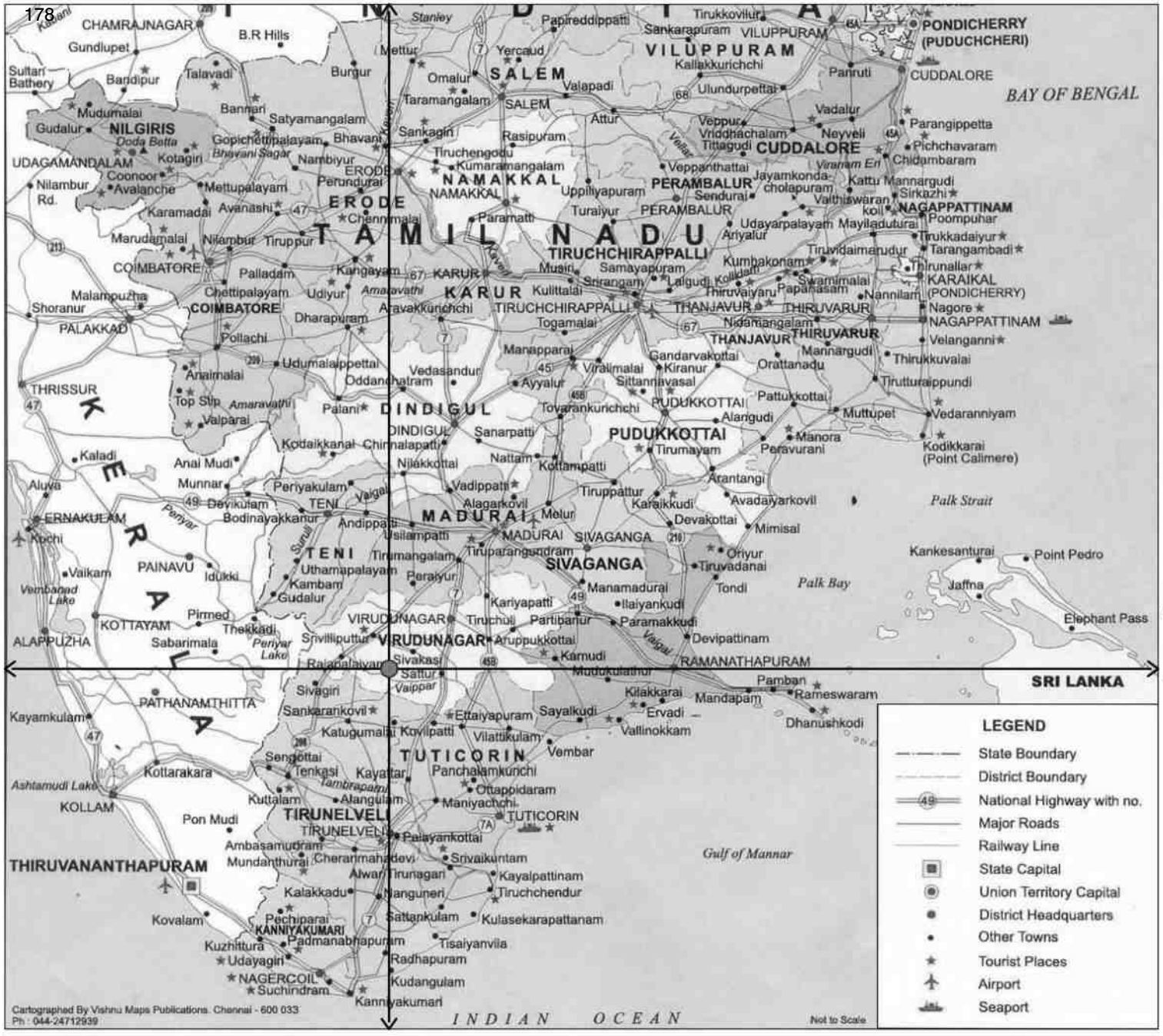
S.N.	Title	Is Upload	Document
1	Lease sketch plan;	Nil	IICAD.pdf
2	Surface Plan (.KMZ format)(Georeferenced); A statutory plan as per MCDR, 2017. The Plan should be submitted showing different color codes for:(1) Active Pits & Excavation area(2) Excavated area reclaimed & rehabilitated (3)Active dumps (4) Stabilized & rehabilitated dump area , (5) Green belt (6) Mineral Stacks (7) Utilities such as plant, buildings etc (8) Lease boundary along with other details.)	Nil	Surface_Plan_Yrwise_pl_1_2.kmz
3	Surface Geological Plan of the lease (.KMZ format)(Georeferenced); The Plan should be submitted showing different color codes for : (1) Lithological/Geological Occurance (2) Area under G1,G2,G3 & G4 (3) Active pits & Excavation area (4) Dump Area (5) Mineral Stacks (6) Lease boundary along with other details.)	Nil	Geological_Yr_pl_3.kmz
4	Surface Geological sections (in Pdf format); Geological sections with different color coding depicting all the features shown in Surface Geological Plan.)	Nil	III_sur_pl_IV_geo_pl_sec.pdf
5	Five year Production and Development plan (.KMZ format)(Georeferenced); The Plan should be submitted showing different color coding for: (1) Active Pit and Excavation area ,	Nil	Yrwise_pl_4_5.kmz

	(2) Year wise excavation proposal for year I to V ((3) Active dump and yearwise dump proposal for year I to V (4) Year wise Dump working proposal for year I to V (6) Lease boundary (with reference to chapter 4) along with other details.)		
6	Five year Production and Development sections (in pdf fromat); Year wise excavation and dumping proposals with different color coding depicting all the features as shown in the Five year Production and development plan.)	Nil	V_yr_pla.pdf
7	Progressive Mine Closure Plan (.KMZ format)(Georeferenced); The Plan should be submitted showing different color coding for : (1) Yearwise excavated area Reclaimed & rehabilitated for year I to V (2) Year wise dump area to be stabilized and dump area to be rehabilitatd for year I to V (3) Year wise Green area proposed from year I to V.(4) Any other reclamation and rehabilitation measures proposed.(5) Lease boundary (with reference to chapter 6) along with other details.)	Nil	Progressive_pl_1_2_3_4.kmz
8	Progressive mine Closure sections (in pdf format); Year wise Progressive mine clouser sections showing all the yearwise reclamation, rehabilitaion proposals as depicted in the Progessive mine clouser plan.)	Nil	VI_yr_sec_VII_pmcp_pl_sec.pdf
9	Conceptual Plan (.KMZ format)(Georeferenced); The Plan should depict the staus of lease area as envisaged at the end of life of Mine showing all the details. Status of land use shall be depicted by different color coding.)	Nil	Conceptual_&_Progressive_pl_5.kmz
10	Conceptual Sections (pdf) format;	Nil	IX_con_pl_sec.pdf
11	Geo referenced Cadastral Plan; Duly certified by the State Government)	Nil	215.pdf
12	Financial Assurance Plan (KMZ);	Nil	Financial.kmz

13	Environmental Plan (.KMZ format)(Georeferenced); As per MCDR, 2017 indicating all the details.)	Nil	Environment_plan.kmz
14	Any other plan/section as deemed necessary by approving authority;	Yes	I_IA_IB.pdf
15	Five Year Production and Development sections (in pdf format);	Yes	VIII_env_XI_fin.pdf
16	LEVEL WISE SLICE PLAN; LEVEL WISE SLICE PLAN (PDF FORMAT IN VISIBLE SCALE))	Nil	Nil

Chapter 11 : Plates(UG) : NA

09° 23' 05.46"N



77° 39' 55.40"E

77° 42' 55.98"E

09° 21' 28.44"N

N

ALANGULAM LIMESTONE MINE

Lessee:M/s. TAMILNADU CEMENTS CORPORATION Ltd,

PLATE NO : I

DATE OF SURVEY : 07.06.2023

LESSEE:

M/s. TAMIL NADU CEMENTS CORPORATION LIMITED,
5th FLOOR, AAVIN ILLAM, NO.3A,
PASUMPON MUTHURAMALINGAM SALAI, NANDANAM,
CHENNAI - 600 035.

LOCATION OF MINE :

G.O.No. : 215.

EXTENT : 180.83.0 HECTARES,
VILLAGES : ALANGKULAM & LAKSHMIPURAM.
TALUK : VEMBAKKOTAI,
DISTRICT : VIRUDHUNAGAR,

INDEX

M. LEASE AREA :

TOPO SHEET NO. : 58 - G / 11

LATITUDE : 09° 21' 28.44"N to 09° 23' 05.46"N
LONGITUDE : 77° 39' 55.40"E to 77° 42' 55.98"E

LOCATION PLAN

NOT TO SCALE
PAPER SIZE = 450mm X 300mm

PREPARED BY :

THIS IS TO CERTIFY THAT THE INFORMATION IN THIS PLATE IS TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE BASED UPON THE LEASE MAP AUTHENTICATED BY STATE GOVERNMENT

Dr.P.THANGARAJU,M.Sc.,Ph.D.
QUALIFIED PERSON

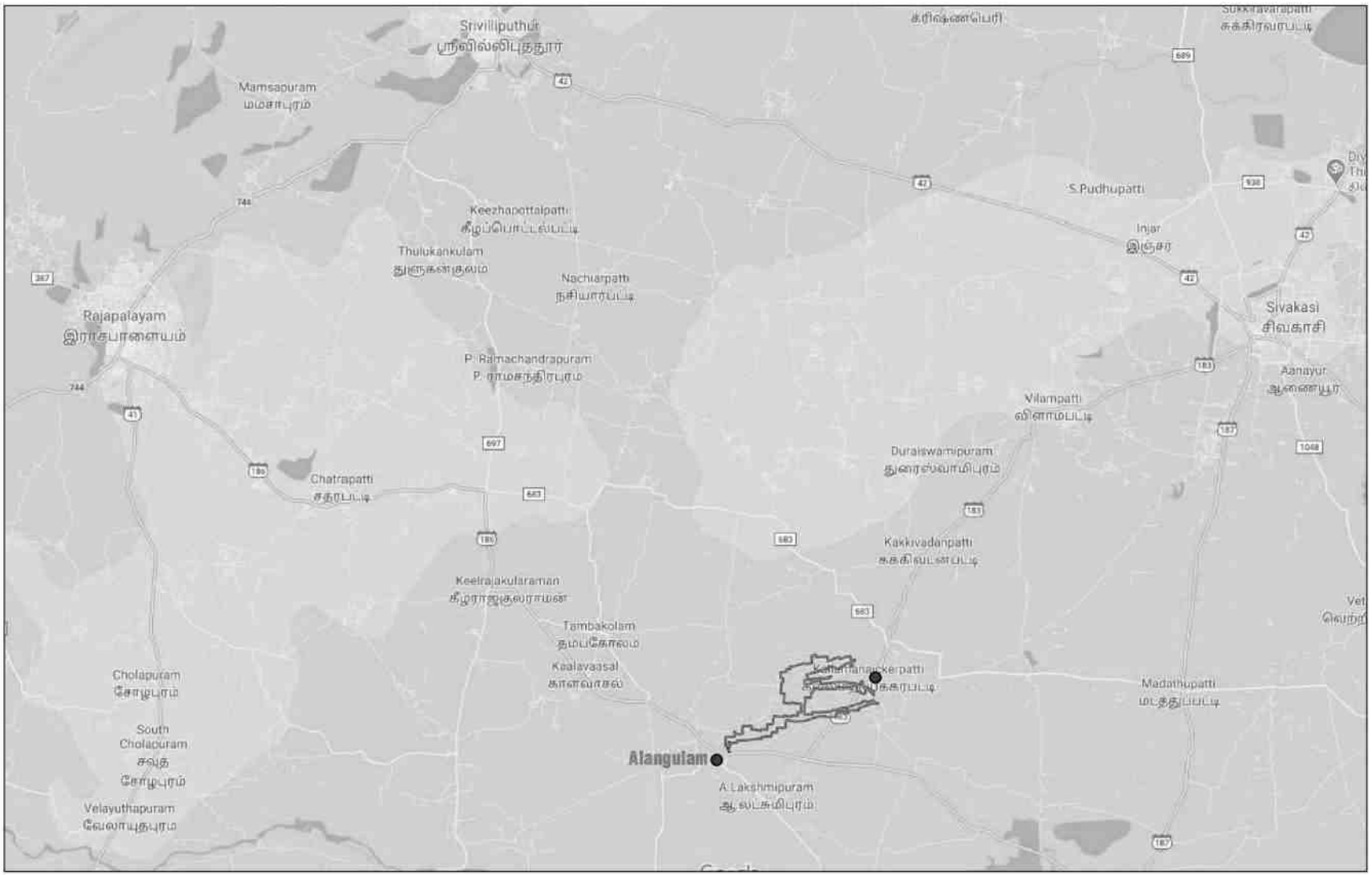


PLATE NO:I-A

DATE OF SURVEY : 07.06.2023

LESSEE:

M/s. TAMIL NADU CEMENTS CORPORATION LIMITED,
5th FLOOR, AAVIN ILLAM, NO.3A,
PASUMPON MUTHURAMALINGAM SALAI, NANDANAM,
CHENNAI - 600 035.

LOCATION OF MINE :

G.O.No. : 215.

EXTENT : 180.83.0 HECTARES,
VILLAGES : ALANGKULAM & LAKSHMIPURAM.
TALUK : VEMBAKKOTAI,
DISTRICT : VIRUDHUNAGAR,

INDEX

MINE L. AREA BOUNDARY

APPROACH ROAD

STATE HIGHWAY ROAD

ROUTE MAP

Not To Scale

PAPER SIZE=400mmX250mm

PREPARED BY :

THIS IS TO CERTIFY THAT THE INFORMATION IN THIS PLATE IS TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE BASED UPON THE LEASE MAP AUTHENTICATED BY STATE GOVERNMENT

Dr.P.THANGARAJU,M.Sc,Ph.D.,
QUALIFIED PERSON

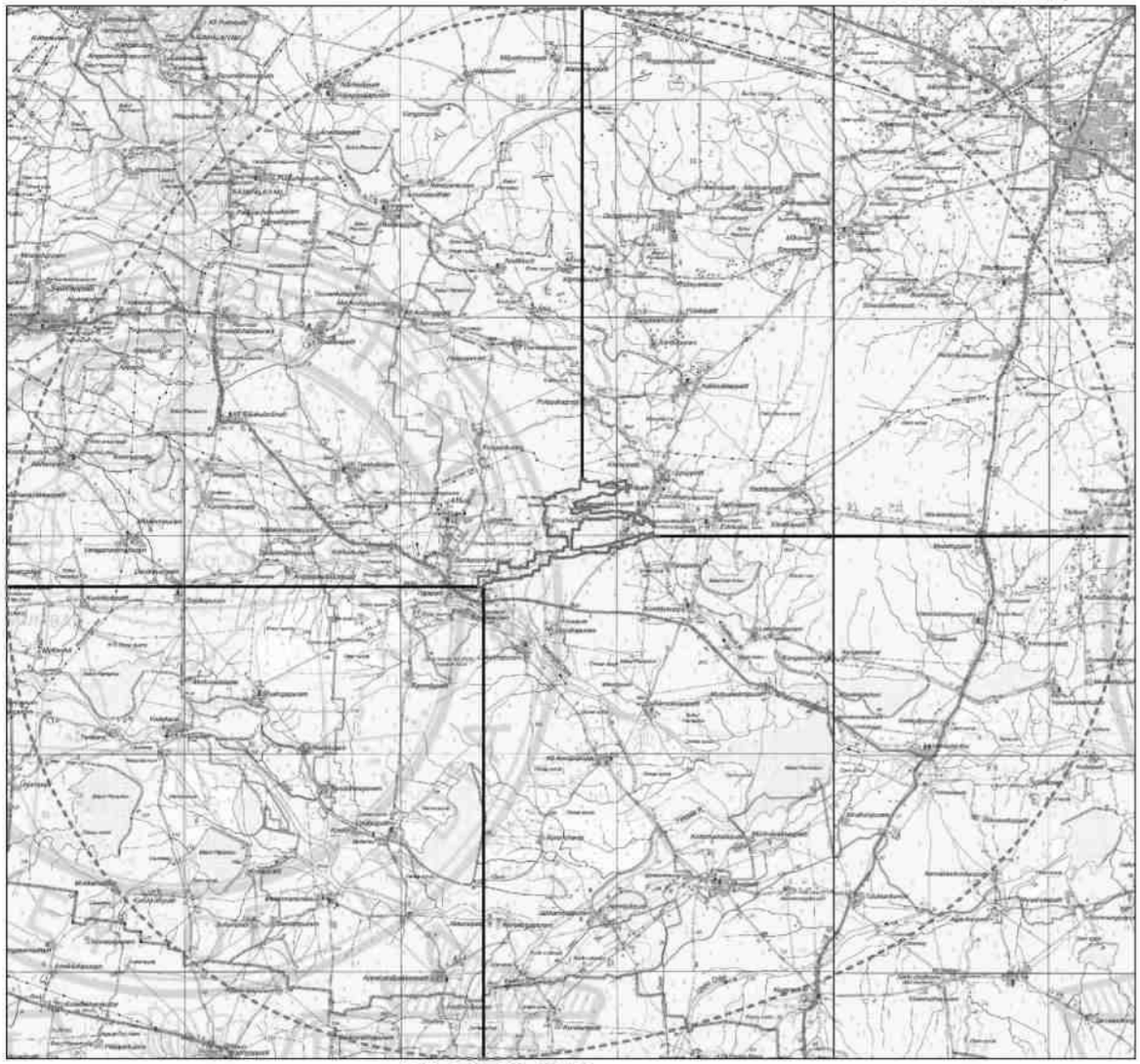
ALANGULAM LIMESTONE MINE
Lessee:M/s. TAMILNADU CEMENTS CORPORATION Ltd,

09° 28' 30.71"N

77° 34' 28.31"E

77° 48' 23.46"E

09° 16' 03.18"N



TOPO SHEET NO. : 58 - G / 11

LATITUDE : 09° 21' 28.44"N to 09° 23' 05.46"N
LONGITUDE : 77° 39' 55.40"E to 77° 42' 55.98"E

10KM RADIUS

MINE LEASE AREA :

N

PLATE NO:I-B

DATE OF SURVEY : 07.06.2023

CONVENTIONAL SYMBOLS

Express highway: with toll; with bridge; with distance stone
Roads, metalled: according to importance
Roads, double carriageway: according to importance
Unmetalled road. Cart-track. Pack-track with pass. Foot-path
Streams: with track in bed; undefined. Canal
Dams: masonry or rock-filled; earthwork. Weir.
River: dry with water channel; with island & rocks. Tidal river.
Submerged rocks. Shoal. Swamp. Reeds.
Wells: lined; unlined. Tube-well. Spring. Tanks: perennial; dry.
Embankments: road or rail; tank. Broken ground.
Railways, broad gauge: double; single with station; under constn.
Railways, other gauges: double; single with distance stone; do.
Mineral line or tramway. Kiln. Cutting with tunnel.
Contours with sub-features. Rocky slopes. Cliffs.
Sand features:(1)flat. (2)sand-hills(permanent). (3)dunes(shifting).
Towns or Villages: inhabited; deserted. Fort.
Huts: permanent; temporary. Tower. Antiquities.
Temple. Chhatri. Church. Mosque. Idgāh. Tomb. Graves.
Lighthouse. Lightship. Buoys: lighted; unlighted. Anchorage.
Mine. Vine on trellis. Grass. Scrub.
Palms: palmyra; other. Plantain. Conifer. Bamboo. Other trees.
Areas: cultivated; wooded. Surveyed tree.
Boundary, international.
,, state: demarcated; undemarcated.
,, district; subdivision; tahsil or tāluk; forest.
Boundary pillars: surveyed; unlocated
Heights, triangulated: station; point; approximate. △200 . 200 . 200
Bench-mark: geodetic; tertiary; canal. . BM 63·3 . BM 63·3
Post office. Telegraph office. Overhead tank.
Rest house or Inspection bungalow. Circuit house. Police station.
Camping ground. Forest: reserved; protected. RF PF
Spaced names: administrative; locality or tribal. KIKRI NĀGA
Hospital. Dispensary. Veterinary: Hospital / Dispensary
Aerodrome. Helipad. Tourist site.
Power line: with pylons surveyed; with poles unsurveyed.

LESSEE:

M/s. TAMIL NADU CEMENTS CORPORATION LIMITED,
5th FLOOR, AAVIN ILLAM, NO.3A,
PASUMPON MUTHURAMALINGAM SALAI, NANDANAM,
CHENNAI - 600 035.

LOCATION OF MINE :

G.O.No. : 215.

EXTENT : 180.83.0 HECTARES,
VILLAGES : ALANGKULAM & LAKSHMIPURAM.
TALUK : VEMBAKKOTAI,
DISTRICT : VIRUDHUNAGAR,

KEY PLAN
for 10Km RADIUS

SCALE- 1:1,00,000
PAPER SIZE = 450mm X 350mm

PREPARED BY :

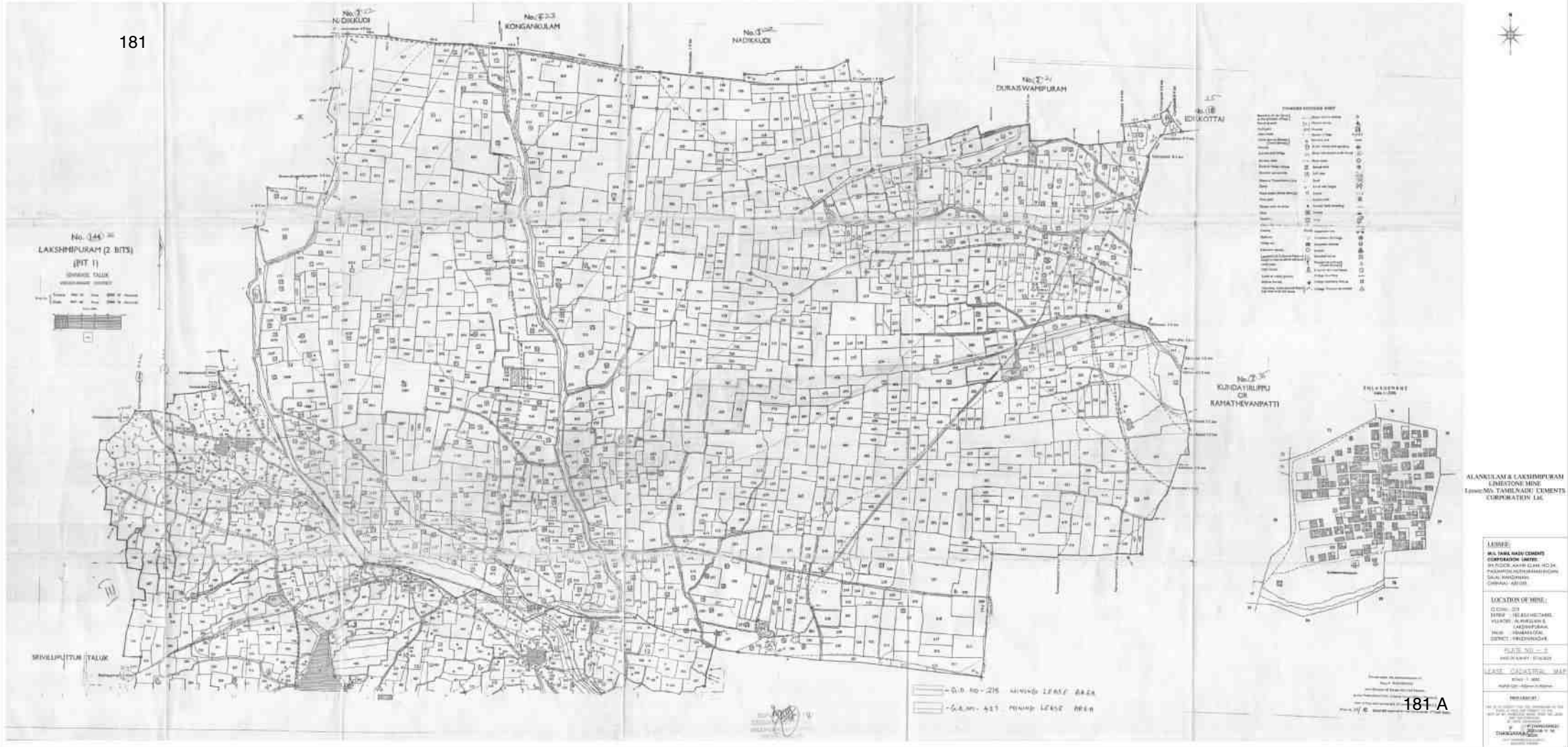
THIS IS TO CERTIFY THAT THE INFORMATION IN THIS PLATE IS TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE BASED UPON THE LEASE MAP AUTHENTICATED BY STATE GOVERNMENT

P THANGARAJU

P THANGARAJU
2023-08-12 09:48:16

Dr.P.THANGARAJU,M.Sc,Ph.D.,
QUALIFIED PERSON

181


No. 2
N.DIKKUDI
No. 2-3
KONGANKULAM
No. 3
NADIKKUDI
No. 2-4
DURAISWAMIPURAM
No. 1-8
EDAKOTTAI
No. 144
LAKSHMIPURAM (2 BITS)
(PIT 1)
SRIVILLIPUTTUR TALUK
No. 2
KUNDAYIRUPPU
OR
RAMATHEVANPATTI
ALANKULAM & LAKSHMIPURAM
LIMESTONE MINE
Lessee:M/s TAMILNADU CEMENTS
CORPORATION Ltd.
LESSEE:
M/s. TAMILNADU CEMENT
CORPORATION LIMITED
LOCATION OF MINE :
LEASE CADASTRAL MAP

181 A

EXISTING PIT DIMENSIONS			
Band Name	Length (Avg) in (m)	Width (Avg) in (m)	Depth (Avg) in (m)
ALO Mines	330	154	10
A1S - Pit 1	340	180	40
A1S - Pit 2	760	160	40
A1S - Pit 3	700	20	9
HSL - 5	435	230	41
MSL - N	230	130	13
K - 2 - Pit 1	750	10	8
K - 2 - Pit 2	240	38	11
K - 3 - Pit 1	625	45	12
K - 3 - Pit 2	330	60	7
K - 3 - Pit 3	200	50	11
K - 4 - Pit 1	160	25	8
K - 4 - Pit 2	160	30	8
K - 4 - Pit 3	330	33	2

EXISTING DUMP DIMENSIONS			
Dump Yard No.	Length (Avg) in (m)	Width (Avg) in (m)	Depth Avg) in (m)
2	131	183	8
6	333	123	9
7a	77	56	12
7b	185	125	15
8	163	130	14
9	235	80	19
10	58	58	12
12a	250	84	10
12b	137	65	8
13	123	38	11
14	80	50	12

INDEX

- MINE LEASE BOUNDARY
- 7.5m SAFETY DISTANCE
- TEMPORARY BENCH MARK
- CRUSHER UNIT
- INFRASTRUCTURE
- MINE ROAD
- POWER LINE
- ODAI / STREAM
- SH ROAD
- VILLAGE ROAD
- EXISTING PIT
- DUMP
- SPOT LEVEL
- B.I.
- STAGNANT STRIP
- TREES & SHRUBS

LESSEE:-

M/s. TAMIL NADU CEMENTS CORPORATION LIMITED.
5th FLOOR, AAVIN ILLAM, NO.3A,
PASUMPON MUTHURAMALINGAM
SALAI, NANDANAM,
CHENNAI - 600 035.

LOCATION OF MINE :

G.O.No. : 215
EXTENT : 180.83.0 HECTARES.
VILLAGES : ALANKULAM & LAKSHMIPURAM.
TALUK : VEMBAKKOTAI.
DISTRICT : VIRUDHUNAGAR.

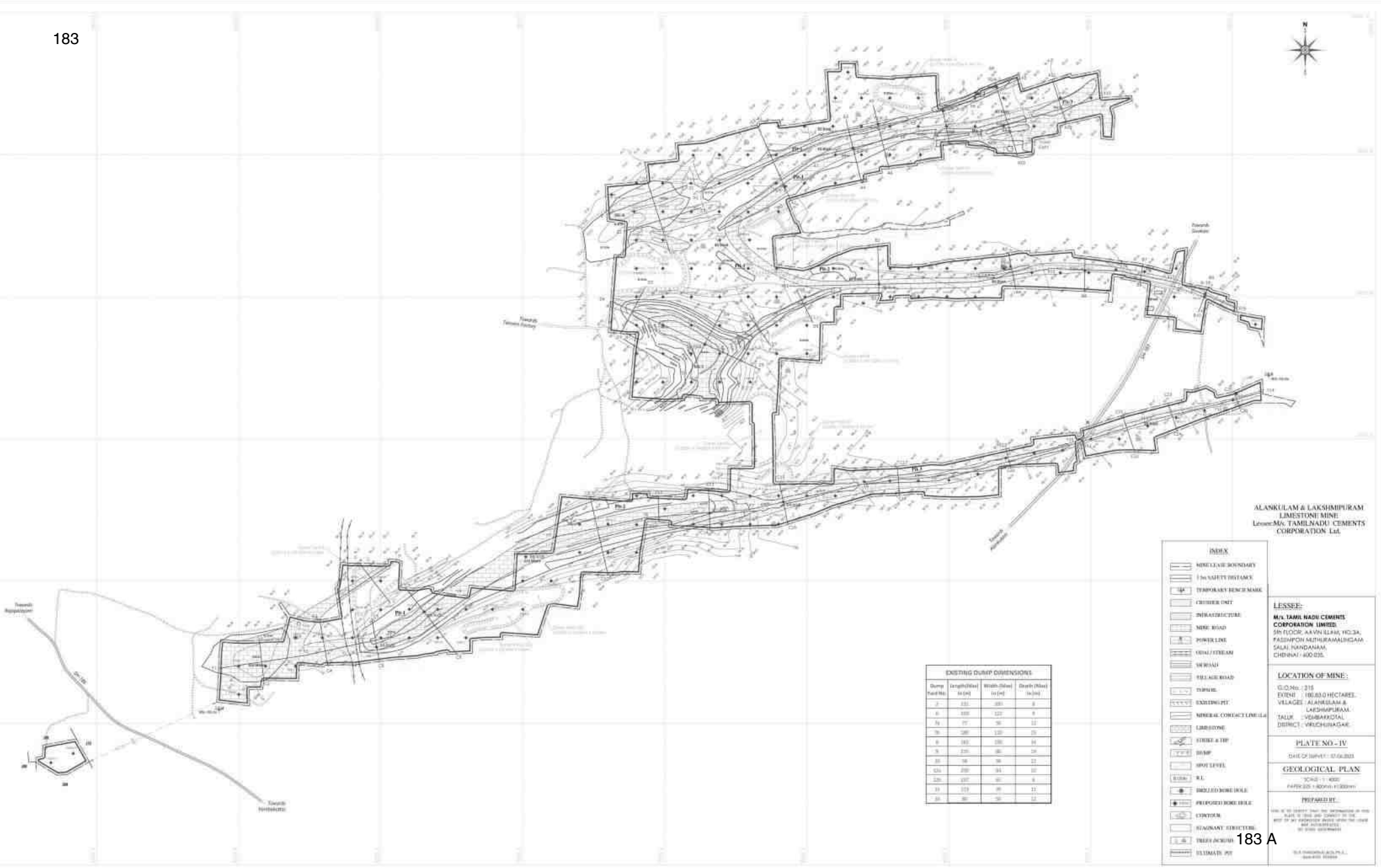
PLATE NO - III

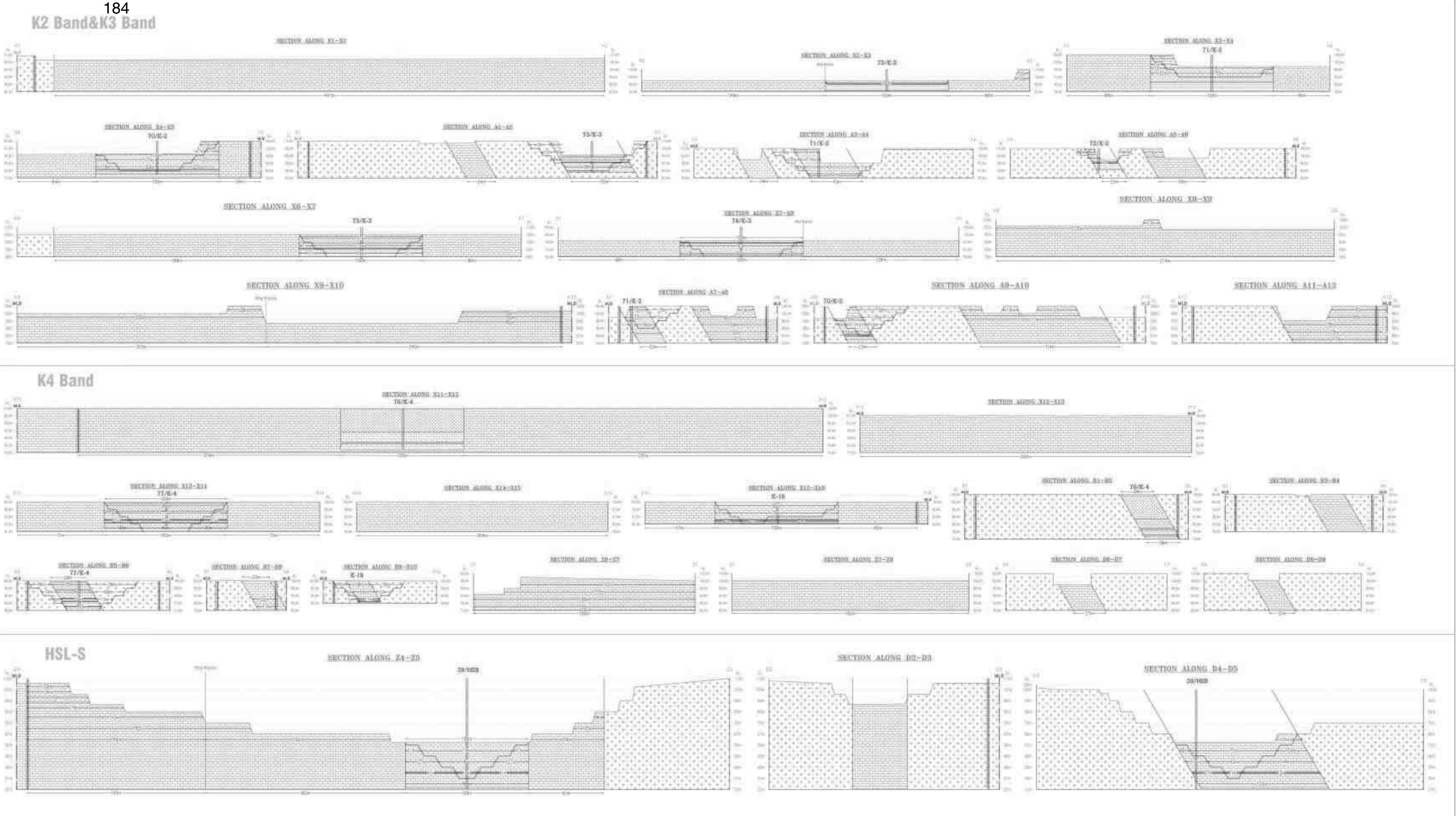
DATE OF SURVEY : 07.06.2023

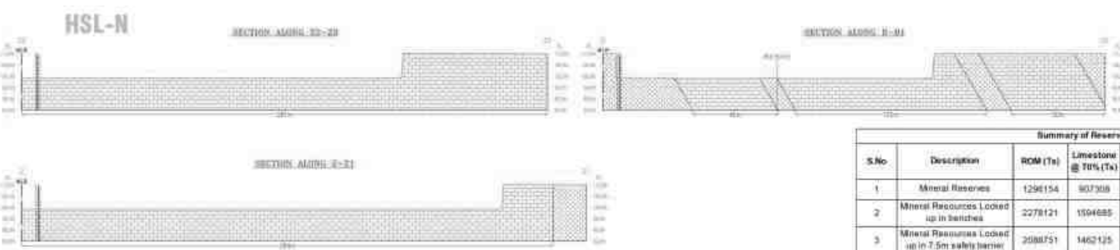
SURFACE PLAN

SCALE : 1 : 4000
PAPER SIZE = 850mm X 1300mm

PREPARED BY :


N
ALANKULAM & LAKSHMIPURAM
LIMESTONE MINE
Lessee:M/s. TAMILNADU CEMENTS
CORPORATION Ltd.
INDEX
MINE LEASE BOUNDARY
7.5m SAFETY DISTANCE
TEMPORARY BENCH MARK
CRUSHER UNIT
INFRASTRUCTURE
MINE ROAD
POWER LINE
ODAI / STREAM
SH ROAD
VILLAGE ROAD
TOPSOIL
EXISTING PIT
MINERAL CONTACT LINE (Lst
LIMESTONE
STRIKE & DIP
DUMP
SPOT LEVEL
R.L
DRILLED BORE HOLE
PROPOSED BORE HOLE
CONTOUR
SEASONAL STRUCTURE
TREES (SCRUB)
ULTIMATE PIT
EXISTING DUMP DIMENSIONS
Dump Yard No.
Length(Max) in (m)
Width (Max) in (m)
Depth (Max) in (m)
LESSEE:
M/s. TAMIL NADU CEMENTS CORPORATION LIMITED,
5th FLOOR, AAVIN ILLAM, NO.3A,
PASUMPON MUTHURAMALINGAM
SALAI, NANDANAM,
CHENNAI / 600 035.
LOCATION OF MINE :
G.O.Ms. : 216
EXTENT : 180.63.0 HECTARES.
VILLAGES : ALANKULAM &
LAKSHMIPURAM.
TALUK : VEMBAKKOTAI.
DISTRICT : VIRUDHUNAGAR.
PLATE NO - IV
DATE OF SURVEY : 07.04.2023
GEOLOGICAL PLAN
SCALE - 1 : 4000
PAPER SIZE: 1.400mm X 1.000mm
PREPARED BY,





Summary of Reserves & Resources									
S.No	Description	ROM (Ts)	Limestone @ 70% (Ts)	Mineral Rejects @ 30%(Ts)	Interburden (Ts)	Topsoil (Ts)	Side Burden (Ts)	UNFC CODE	Color Index
1	Mineral Reserves	1296154	907308	388846	340634	22654	1197185	111	
2	Mineral Resources Locked up in benches	2278121	1594685	683436				221	
3	Mineral Resources Locked up in 7.5m safety barrier	2088751	1462125	626625				221	
4	Mineral Resources	24512705	17158894	7353811.5				222	

ALANKULAM & LAKSHMIPURAM LIMESTONE MINE
Lessee:M/s. TAMILNADU CEMENTS CORPORATION Ltd,

LESSEE:
M/s. TAMIL NADU CEMENTS CORPORATION LIMITED,
5th FLOOR, AAVIN ILLAM, NO.3A,
PASUMPON MUTHURAMALINGAM SALAI, NANDANAM,
CHENNAI - 600 035.

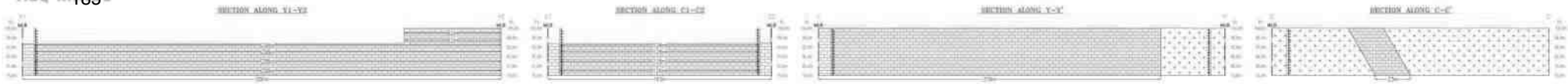
LOCATION OF MINE:
G.O.No. : 215
EXTENT : 180.83.0 HECTARES.
VILLAGES : ALANKULAM & LAKSHMIPURAM.
TALUK : VEMBAKKOTAI.
DISTRICT : VIRUDHUNAGAR

PLATE NO : IV-A1

GEOLOGICAL SECTIONS

SCALE : 1 : 1000

PREPARED BY :



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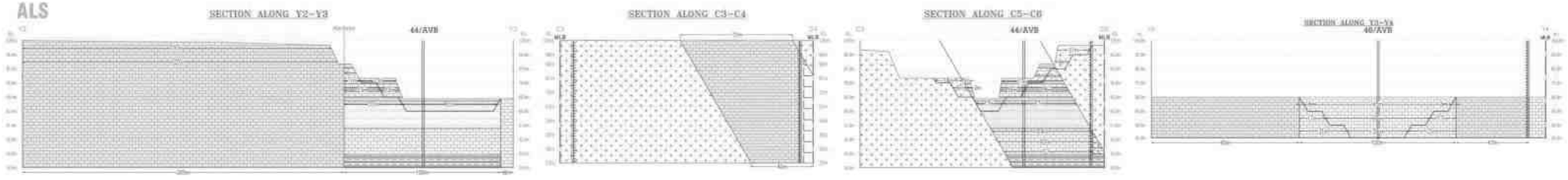
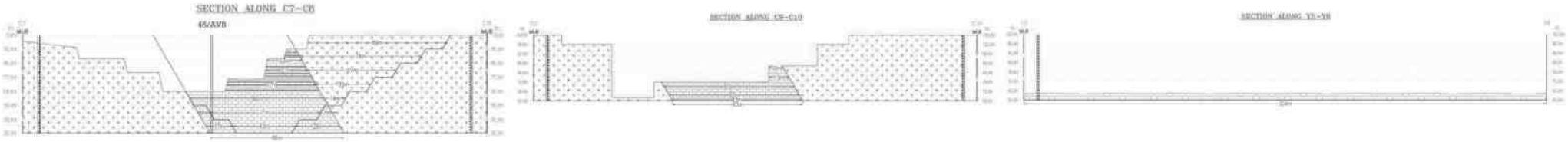
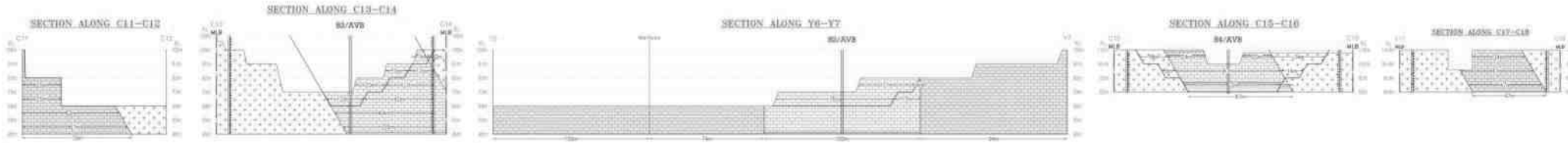
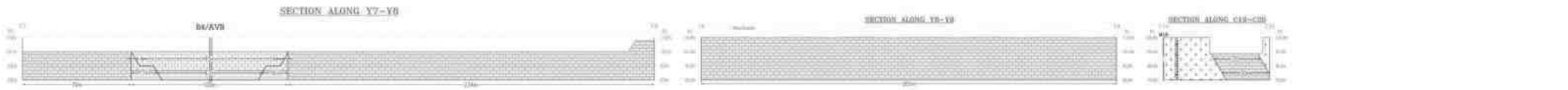
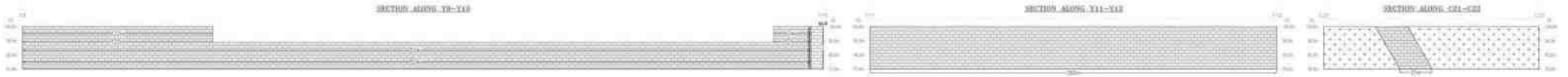
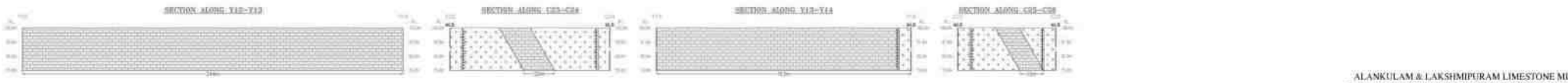












ALANKULAM & LAKSHMIPURAM LIMESTONE MINE
Lessee:M/s. TAMILNADU CEMENTS CORPORATION Ltd,

INDEX	
MINE LEASE BOUNDARY	WEATHERED GNEISS
7.5m SAFETY DISTANCE	CHARNOCKITE
TOP SOIL	BIOTITE GNEISS
MINERAL CONTACT LINE (Lat)	GNEISSIC ROCK
LIMESTONE	BORE HOLE
KANKAR	SURFACE PROFILE
ULTIMATE PIT	PROPOSED BENCHES
	BACK FILLING

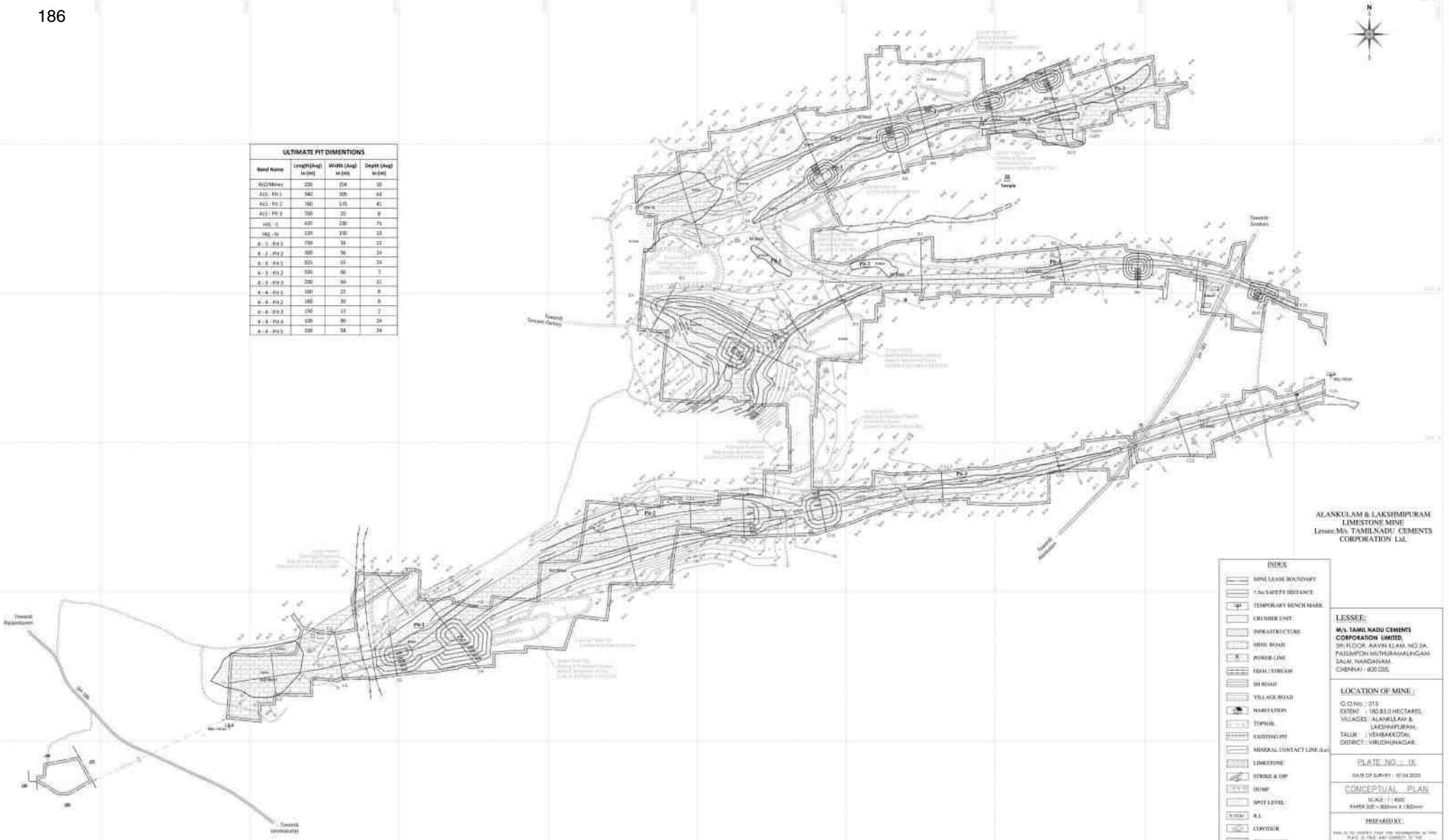
LESSEE:
M/s. TAMILNADU CEMENTS CORPORATION LIMITED,
5th FLOOR, AAVIN ILLAM, NO.3A,
PASUMPON MUTHURAMALINGAM SALAI, NANDANAM,
CHENNAI - 600 035.

LOCATION OF MINE :
G.O.No. : 215
EXTENT : 180.83.0 HECTARES,
VILLAGES : ALANKULAM & LAKSHMIPURAM.
TALUK : VEMBAKKOTAI.
DISTRICT : VIRUDHUNAGAR.

PLATE NO : IV-A2
DATE OF SURVEY : 07.06.2023

GEOLOGICAL SECTIONS
SCALE - 1 : 1000
PAPER SIZE - 800mm X 1 000mm

PREPARED BY :
THIS IS TO CERTIFY THAT THE INFORMATION IN THIS PLATE IS TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE BASED UPON THE LEASE MAP AUTHENTICATED BY STATE GOVERNMENT
P THANGARAJU



ULTIMATE PIT DIMENTIONS			
Bund Name	Length (Avg) in (m)	Width (Avg) in (m)	Depth (Avg) in (m)
A1(2)Mines	220	154	10
A11 - Pit 1	540	305	63
A11 - Pit 2	190	170	41
A11 - Pit 3	720	20	8
HIL - I	630	230	75
HIL - II	120	230	13
A - 1 - Pit 3	750	16	11
A - 2 - Pit 2	500	56	24
A - 3 - Pit 1	325	13	14
A - 3 - Pit 2	330	30	7
A - 3 - Pit 3	200	50	11
A - 4 - Pit 1	160	22	8
A - 4 - Pit 2	160	30	9
A - 4 - Pit 3	170	15	2
A - 5 - Pit 4	320	80	24
A - 6 - Pit 5	330	58	24

ALANKULAM & LAKSHMIPURAM
LIMESTONE MINE
Lessee,M/s. TAMILNADU CEMENTS
CORPORATION Ltd.

INDEX

- MINE LEASE BOUNDARY
- 7.5m SAFETY DISTANCE
- TEMPORARY BENCH MARK
- CRUSHER UNIT
- INFRASTRUCTURE
- MINE ROAD
- POWER LINE
- FEDAI / STREAM
- BB ROAD
- VILLAGE ROAD
- HABITATION
- TOPSOIL
- EXISTING PIT
- MINERAL CONTACT LINE (Lst)
- LIMESTONE
- STRIKE & DIP
- DUMP
- SPOT LEVEL
- R.L
- CONTOUR
- STOCK YARD
- TREES /SCRUBS
- WATER STORAGE
- ULTIMATE PIT

LESSEE:

M/s. TAMIL NADU CEMENTS CORPORATION LIMITED,
5th FLOOR, AAVIN ILLAM, NO.3A,
PASUMPON MUTHURAMALINGAM SALAI, NANDANAM,
CHENNAI - 600 035.

LOCATION OF MINE :

G.O.No. : 215
EXTENT : 180.83.0 HECTARES.
VILLAGES : ALANKULAM &
LAKSHMIPURAM,
TALUK : VEMBAKKOTAI,
DISTRICT : VIRUDHUNAGAR.

PLATE NO. : IX

DATE OF SURVEY : 07.04.2023

CONCEPTUAL PLAN

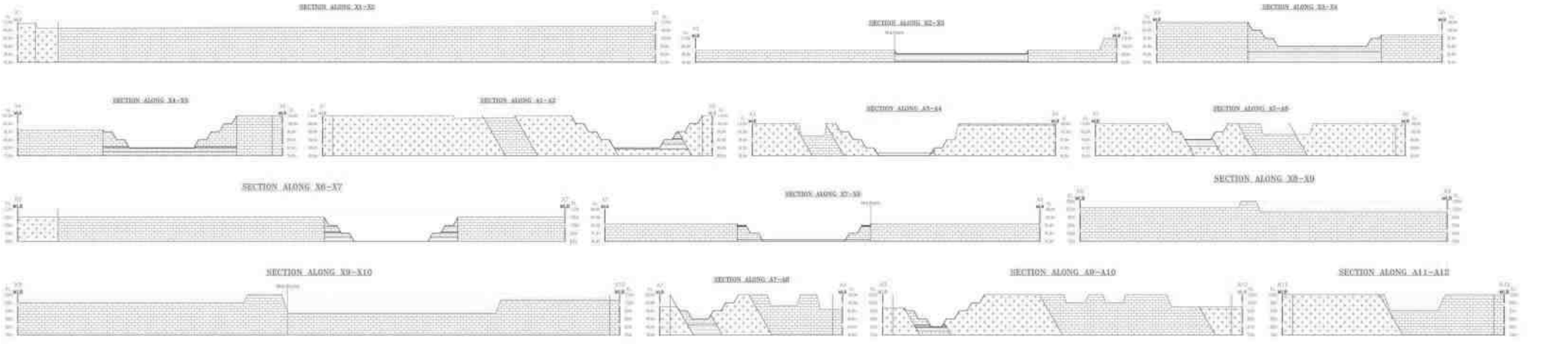
SCALE : 1 : 4000
PAPER SIZE = 900mm X 1300mm

PREPARED BY :

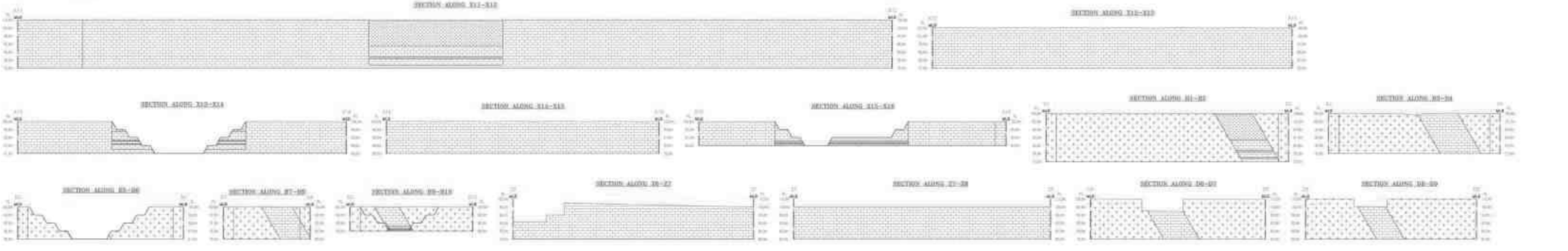
THIS IS TO CERTIFY THAT THE INFORMATION IN THIS PLATE IS TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND IS BASED ON THE LEASE MAP SUPPLIED BY STATE GOVERNMENT.

Dr. P. THIRUMALAI RAJA, M.Sc., M.Phil., Ph.D.
QUALIFIED PERSON

K2 Band&K3 Band



K4 Band



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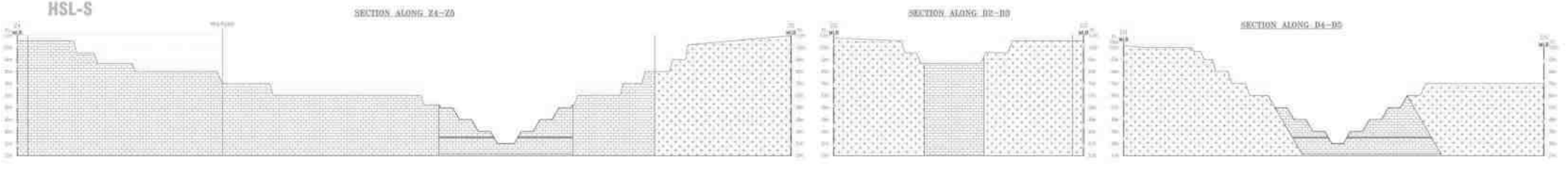

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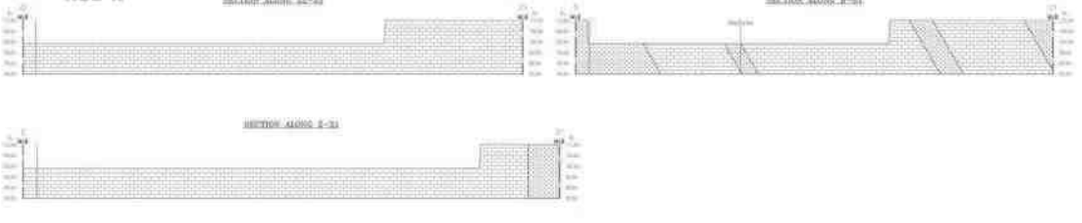


ALANKUAM & LAKSHMIPURAM LIMESTONE MINE
Lessee:M/s. TAMILNADU CEMENTS CORPORATION Ltd.

INDEX

- MINE LEASE BOUNDARY
- 7.5m SAFETY DISTANCE
- TOP SOIL
- MINERAL CONTACT LINE (Lat)
- LIMESTONE
- KANKAR
- WEATHERED GNEISS
- CHARNOCKITE
- BIOTITE GNEISS
- GNEISSIC ROCK
- SURFACE PROFILE
- PROPOSED BENCHES

LESSEE:

M/s. TAMIL NADU CEMENTS CORPORATION LIMITED,
3th FLOOR, AAVIN ILLAM, NO.3A,
PASUMPON MUTHURAMALINGAM
SALAI, NANDANAM,
CHENNAI - 600 035.

PLATE NO : IX-A1

DATE OF SURVEY : 07.04.2020

CONCEPTUAL SECTIONS

SCALE - 1 : 1000

PAPER SIZE - 900mm X 1200mm

LOCATION OF MINE :

G.O.No. : 215
EXTENT : 180.83.0 HECTARES.
VILLAGES : ALANKULAM &
LAKSHMIPURAM.
TALUK : VEMBAKKOTAI.
DISTRICT : VIRUDHUNAGAR.

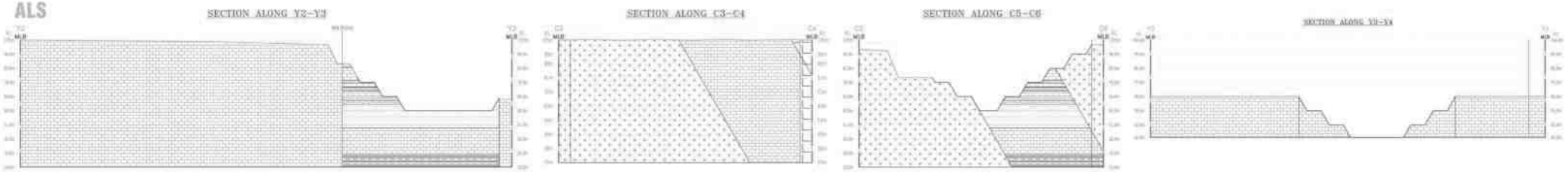
PREPARED BY :

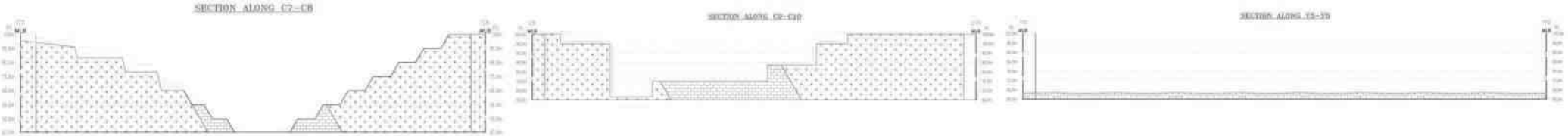
THIS IS TO CERTIFY THAT THE INFORMATION IN THIS PLAN IS TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE BASED UPON THE LEASE MAP REPRODUCED BY DIGIT GEOMANTIC

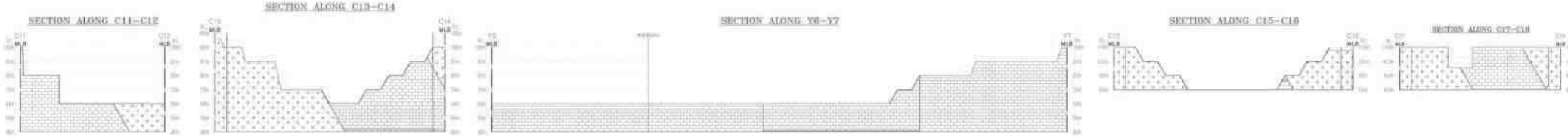
ALQ MINES

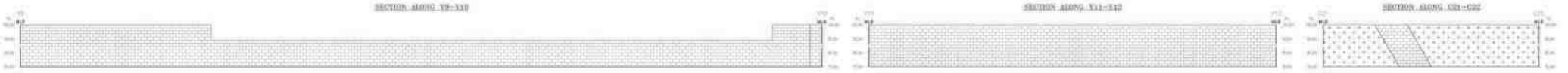
188

ALS









ALANKULAM & LAKSHMIPURAM LIMESTONE MINE
Lessee:M/s. TAMILNADU CEMENTS CORPORATION Ltd.

INDEX

- MINE LEASE BOUNDARY
- 7.5m SAFETY DISTANCE
- TOP SOIL
- MINERAL CONTACT LINE (Lst)
- LIMESTONE
- KANKAR
- WEATHERED GNEISS
- CHARNOCKITE
- BIOTITE GNEISS
- GNEISSIC ROCK
- SURFACE PROFILE
- PROPOSED BENCHES

LESSEE:

M/s. TAMIL NADU CEMENTS CORPORATION LIMITED,
5th FLOOR, AAVIN ILLAM, NO.3A, PASUMPON MUTHURAMALINGAM SALAI, NANDANAM, CHENNAI - 600 035.

LOCATION OF MINE :

G.O.No. : 215
EXTENT : 180.83.0 HECTARES.
VILLAGES : ALANKULAM & LAKSHMIPURAM.
TALUK : VEMBAKKOTAI.
DISTRICT : VIRUDHUNAGAR.

PLATE NO : IX-A2

DATE OF SURVEY : 07.06.2022

CONCEPTUAL SECTIONS

SCALE - 1 : 1000
PAPER SIZE = 800mm X 1100mm

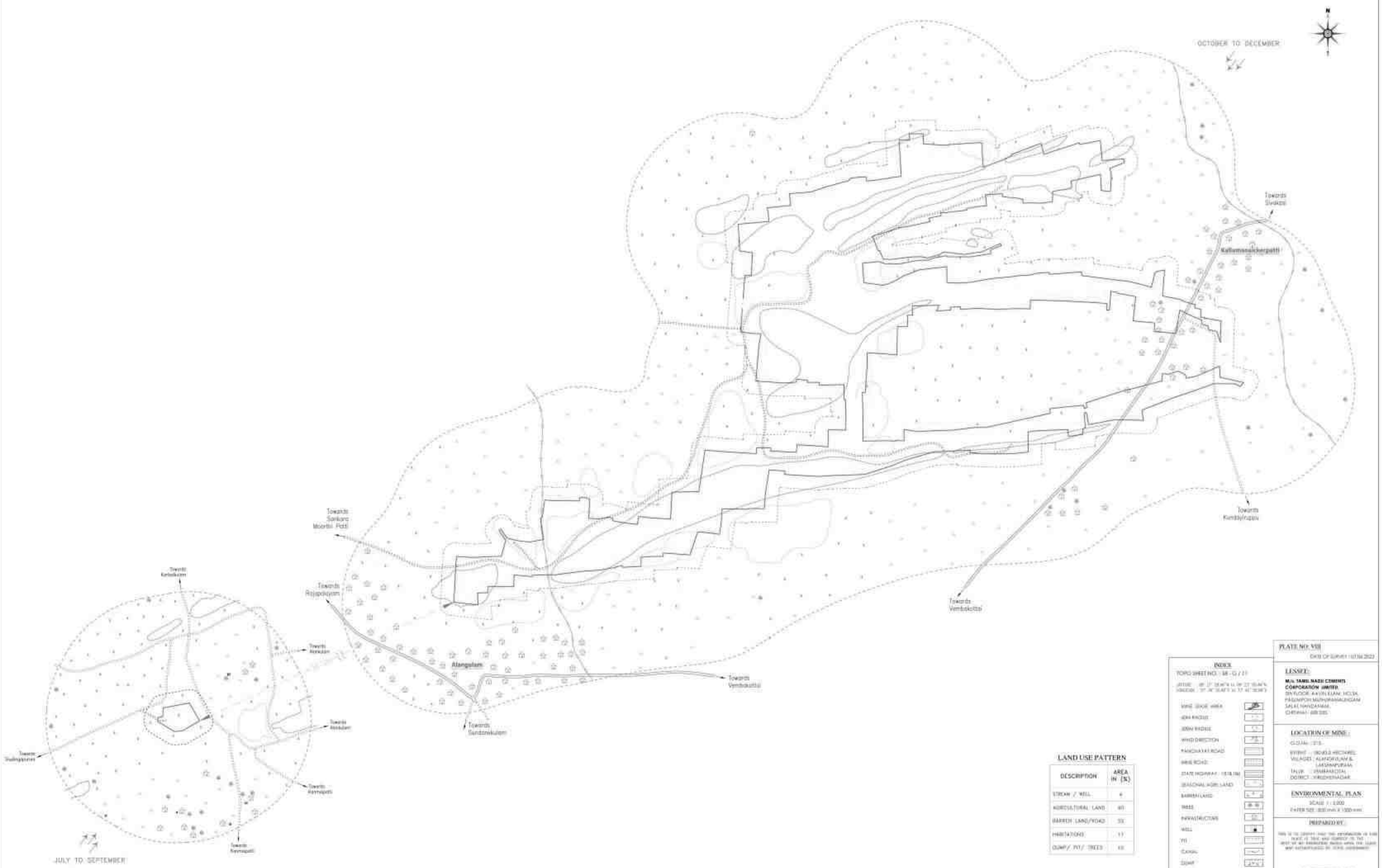
PREPARED BY :

THIS IS TO CERTIFY THAT THE INFORMATION IN THIS PLATE IS TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE BASED UPON THE LEASE MAP AUTHENTICATED BY STATE GOVERNMENT

P. THANGARAJU
2022-08-11 18:32:

188 A THANGARAJU

Dr.P.THANGARAJU,M.Sc.,Ph.D.,
QUALIFIED PERSON



LAND USE PATTERN

DESCRIPTION	AREA IN (%)
STREAM / WELL	6
AGRICULTURAL LAND	40
BARREN LAND/ROAD	33
HABITATIONS	11
DUMP/ PIT/ TREES	10

INDEX

TOPO SHEET NO. : 58 - G / 11

MINE LEASE AREA
WIND DIRECTION
PANCHAYAT ROAD
MINE ROAD
STATE HIGHWAY
SEASONAL AGRI. LAND
BARREN LAND
TREES
INFRASTRUCTURE
WELL
PIT
CANAL
DUMP

PLATE NO: VIII

LESSEE:

M/s. TAMIL NADU CEMENTS CORPORATION LIMITED

CHENNAI

LOCATION OF MINE :

VILLAGES : ALANGULAM & LAKSHMIPURAM

TALUK : VEMBAKOTTAI

DISTRICT : VIRUDHUNAGAR

ENVIRONMENTAL PLAN

SCALE 1 : 2,000

PREPARED BY:

EXISTING PIT DIMENSIONS			
Bund Name	Length (Avg) in (m)	Width (Avg) in (m)	Depth (Avg) in (m)
AGQ Mines	200	154	10
AGS - Pit 3	200	20	8
HSL - S	430	230	40
HSL - N	220	150	33
K - 3 - Pit 1	750	50	8
K - 2 - Pit 2	260	90	11
K - 3 - Pit 1	625	85	33
K - 3 - Pit 2	330	60	7
K - 3 - Pit 3	200	50	11
K - 4 - Pit 1	350	75	8
K - 4 - Pit 2	160	90	8
K - 4 - Pit 3	150	10	2
PROPOSED PIT DIMENSIONS			
Bund Name	Length (Avg) in (m)	Width (Avg) in (m)	Depth (Avg) in (m)
AGS - Pit 1	140	205	33
AGS - Pit 2	760	170	41

EXISTING & PROPOSED DUMP DIMENSIONS			
Dump Yard No.	Length (Avg) in (m)	Width (Avg) in (m)	Depth (Avg) in (m)
2	151	105	21.05
6	250	120	8
7a	77	50	10
7b	180	120	15
8	160	130	13.33
9	170	80	24.30
10	28	90	2
12a	330	64	10
12b	257	35	9.27
13	170	70	11
16	80	90	12

AREA CONSIDERED FOR FINANCIAL ASSURANCE

DESCRIPTION	PRESENT AREA (Ha)	ADDITIONAL AREA TO BE REQUIRED AT THIS SCHEME PERIOD (Ha)	NET AREA CONSIDERED FOR CALCULATION (Ha)	COLOUR CODE
AREA UNDER MINING	46.36.0	2.30.0	48.66.0	
DUMPS	16.69.0	NIL	16.69.0	
ROADS	2.00.0	NIL	2.00.0	
GREEN BELT	NIL	15.78.0	15.78.0	
TOTAL	65.05.0	18.08.0	83.13.0	

ALANKULAM & LAKSHMIPURAM LIMESTONE MINE
Lessee/M/s. TAMILNADU CEMENTS CORPORATION Ltd.

INDEX

- MINE LEASE BOUNDARY
- 7.5m SAFETY DISTANCE
- TEMPORARY BENCH MARK
- CRUSHER UNIT
- INFRASTRUCTURE
- MINE ROAD
- POWER LINE
- ODAI / STREAM
- HI ROAD
- VILLAGE ROAD
- TOPSOIL
- EXISTING PIT
- MINERAL CONTACT LINE (Lst)
- LIMESTONE
- STRIKE & DIP
- DUMP
- SPOT LEVEL
- R.L
- BORE HOLE
- CONTOUR
- FEASIBANT STRUCTURE
- TREES (SCRUB)
- PROPOSED PARAPET WALL
- PROPOSED FENCING
- PROPOSED GARLAND DRAIN
- ULTIMATE PIT

LESSEE:
M/s. TAMIL NADU CEMENTS CORPORATION LIMITED,
5th FLOOR, AAVIN ILLAM, NO.3A, PASUMPON MUTHURAMALINGAM SALAI, NANDANAM, CHENNAI - 600 035.

LOCATION OF MINE :
G.O.Ms. : 216
EXTENT : 180.83.0 HECTARES.
VILLAGES : ALANKULAM & LAKSHMIPURAM.
TALUK : VEMBAKKOTAI.
DISTRICT : VIRUDHUNAGAR.

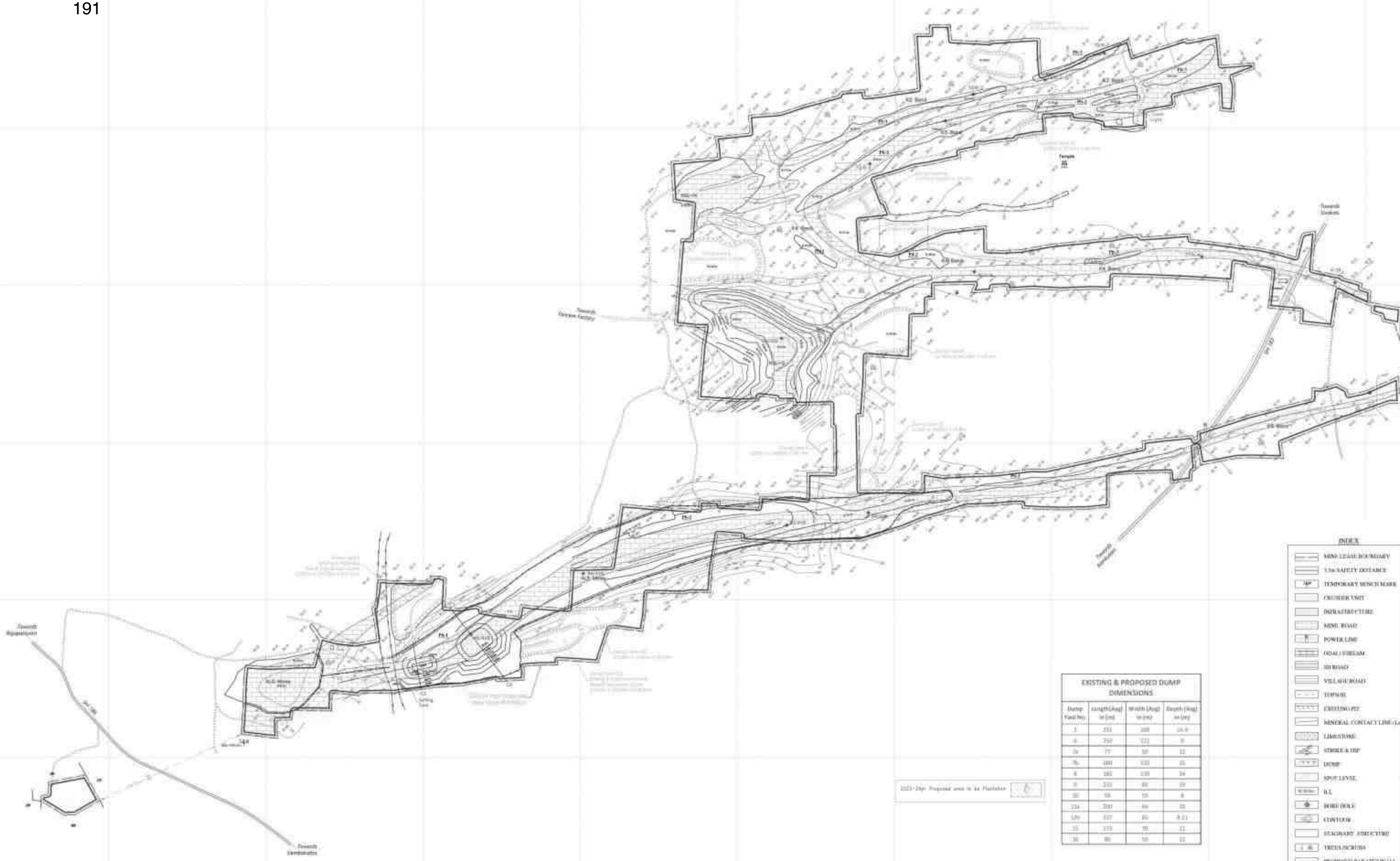
PLATE NO - X1
DATE OF SURVEY : 07.04.2023

FINANCIAL AREA ASSURANCE PLAN
SCALE : 1 : 4000
PAPER SIZE : 820mm X 1220mm

PREPARED BY

P. THANGARAJU

191



EXISTING & PROPOSED DUMP DIMENSIONS			
Dump Yard No.	Length (Avg) in (m)	Width (Avg) in (m)	Depth (Avg) in (m)
3	211	108	14.9
4	702	111	9
7a	77	59	22
7b	400	133	21
8	182	135	34
9	215	80	19
10	58	59	8
12a	200	64	30
12b	327	80	8.21
15	175	70	11
16	80	59	12

INDEX

- MINE LEASE BOUNDARY
- 7.5m SAFETY DISTANCE
- TEMPORARY BENCH MARK
- CRUSHER UNIT
- INFRASTRUCTURE
- MINE ROAD
- POWER LINE
- ODAI / STREAM
- SH ROAD
- VILLAGE ROAD
- TOPSOIL
- EXISTING PIT
- MINERAL CONTACT LINE (Lc)
- LIMESTONE
- STRIKE & DIP
- DUMP
- SPOT LEVEL
- R.L
- BORE HOLE
- CONTOUR
- STAGNANT STRUCTURE
- TREES /SCRUBS
- PROPOSED PARAPET WALL
- PROPOSED FENCING
- PROPOSED GARLAND DRAIN
- ULTIMATE PIT

ALANKULAM & LAKSHMIPURAM LIMESTONE MINE
Lessee:M/s. TAMILNADU CEMENTS CORPORATION Ltd.

LESSEE:

M/s. TAMIL NADU CEMENTS CORPORATION LIMITED.
5th FLOOR, AAVIN ILLAM, NO.3A,
PASUMPON MUTHURAMALINGAM
SALAI, NANDANAM,
CHENNAI - 600 035.

LOCATION OF MINE :

G.O.No. : 215
EXTENT : 180.83.0 HECTARES.
VILLAGES : ALANKULAM & LAKSHMIPURAM.
TALUK : VEMBAKKOTAI.
DISTRICT : VIRUDHUNAGAR.

PLATE NO. VII-A
DATE OF SURVEY : 07.06.2023

2023 - 24Yr

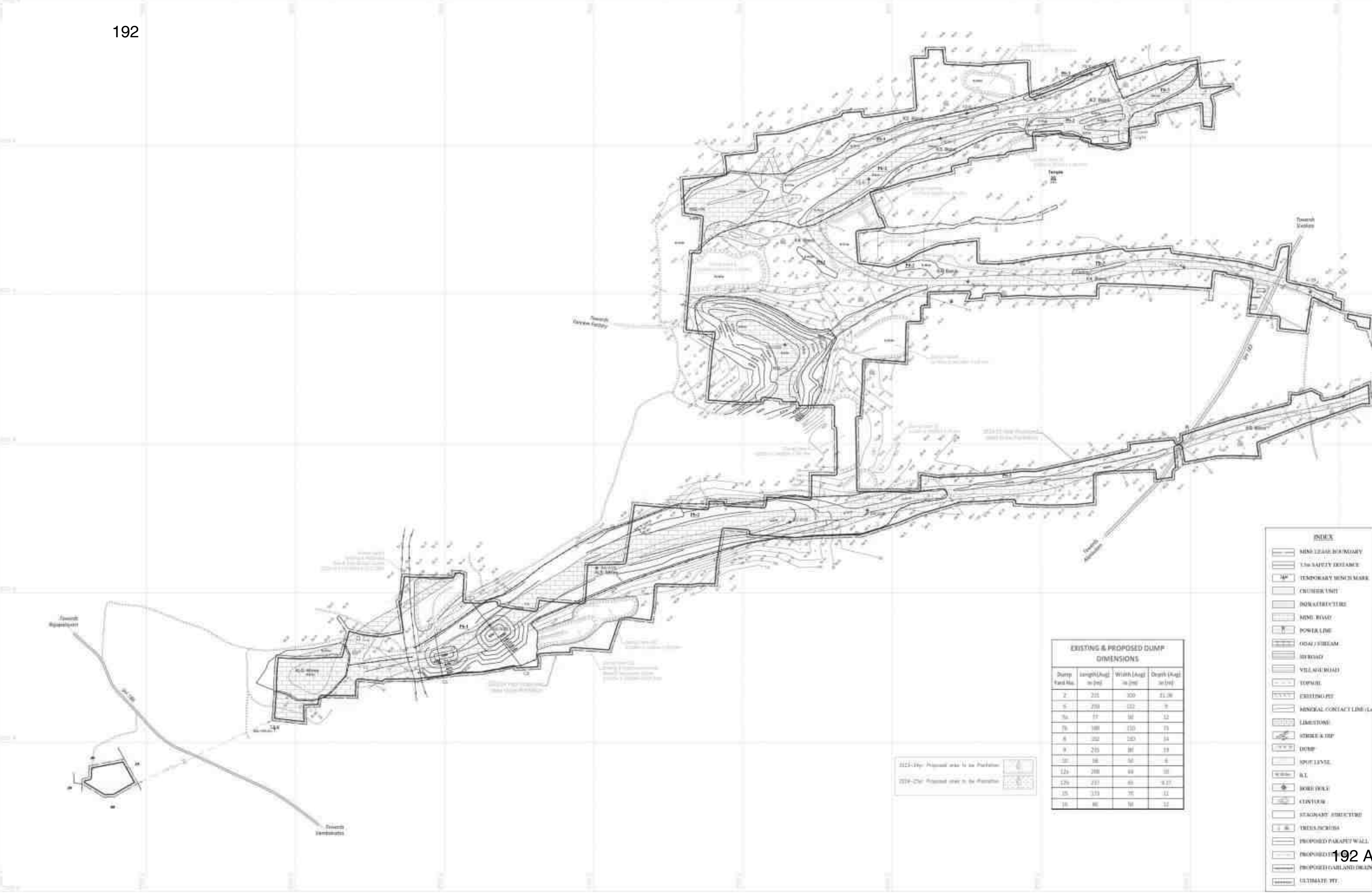
PROGRESSIVE MINE CLOSURE PLAN

SCALE - 1 : 4000

PREPARED BY:

191 A

192



EXISTING & PROPOSED DUMP DIMENSIONS

Dump Yard No.	Length (Avg) in (m)	Width (Avg) in (m)	Depth (Avg) in (m)
2	215	300	31.26
6	250	122	9
7a	77	50	12
7b	180	110	15
8	202	180	14
9	215	80	19
10	58	50	8
12a	288	64	10
12b	237	65	8.17
15	133	70	11
16	80	50	12

ALANKULAM & LAKSHMIPURAM LIMESTONE MINE
Lessee-M/s. TAMIL NADU CEMENTS CORPORATION Ltd.

LESSEE:

M/s. TAMIL NADU CEMENTS CORPORATION LIMITED.
5th FLOOR, AAVIN ILLAM, NO.34,
PASUMPON MUTHURAMALINGAM
SALAI, NANDANAM,
CHENNAI - 600 035.

LOCATION OF MINE :

G.O.No. : 215
EXTENT : 180.83.0 HECTARES.
VILLAGES : ALANKULAM & LAKSHMIPURAM.
TALUK : VEMBAKKOTAI.
DISTRICT : VIRUDHUNAGAR.

PLATE NO : VII-B
DATE OF SURVEY : 07.06.2023

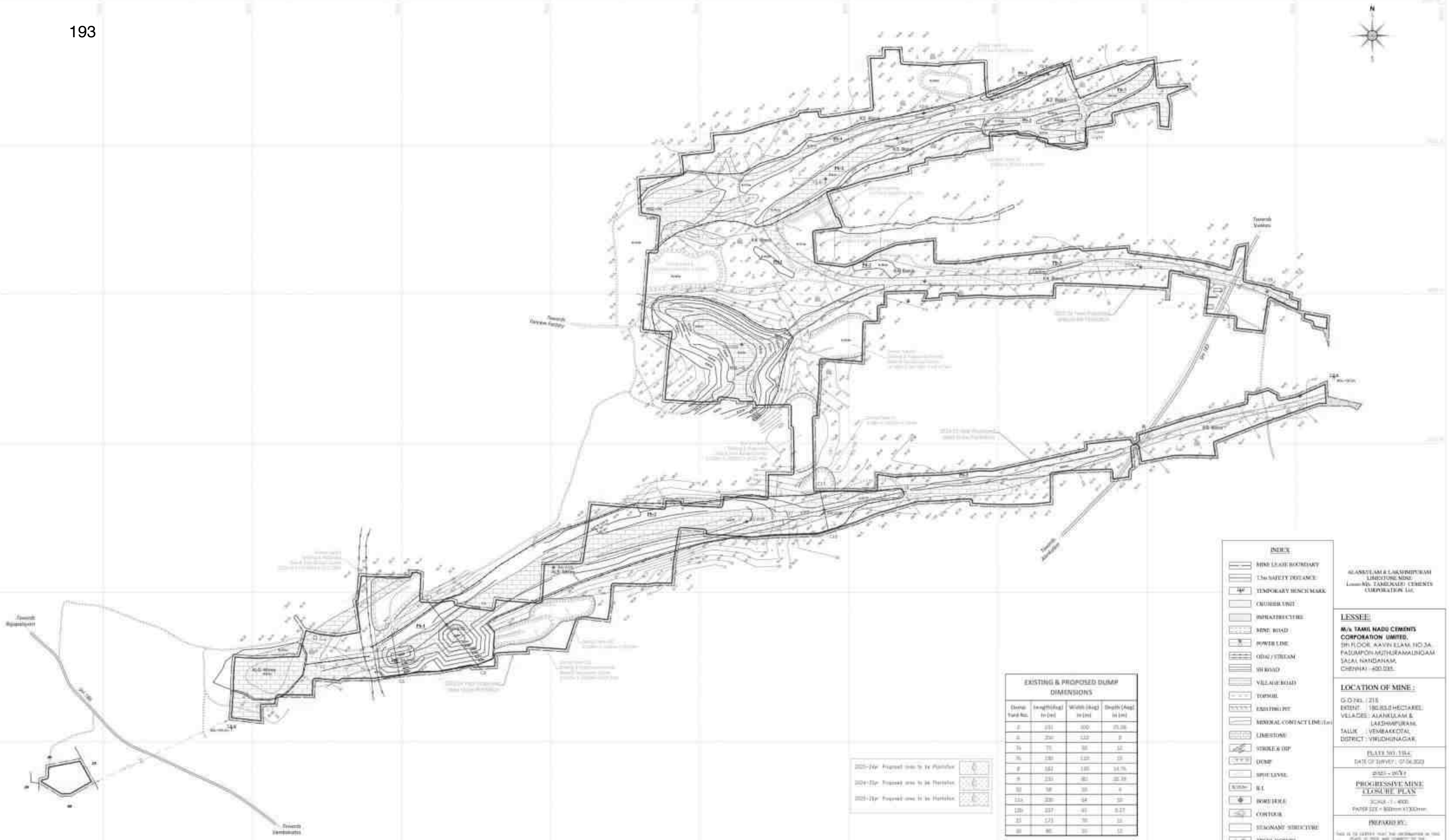
2024 - 25Yr

PROGRESSIVE MINE CLOSURE PLAN

SCALE - 1 : 4000

PREPARED BY:

192 A



EXISTING & PROPOSED DUMP DIMENSIONS			
Dump Yard No.	Length (Avg) in (m)	Width (Avg) in (m)	Depth (Avg) in (m)
2	231	100	25.06
6	250	110	8
7a	75	30	12
7b	190	110	15
8	182	100	14.75
9	233	80	20.39
10	58	30	6
11a	220	54	10
12b	237	41	8.27
15	173	70	11
16	80	30	12

2023-24yr Proposed area to be Plantation
2024-25yr Proposed area to be Plantation
2025-26yr Proposed area to be Plantation

INDEX

- MINE LEASE BOUNDARY
- 7.5m SAFETY DISTANCE
- TEMPORARY BENCH MARK
- CRUSHER UNIT
- INFRASTRUCTURE
- MINE ROAD
- POWER LINE
- ODAI / STREAM
- SH ROAD
- VILLAGE ROAD
- TOPSOIL
- EXISTING PIT
- MINERAL CONTACT LINE (Lst)
- LIMESTONE
- STRIKE & DIP
- DUMP
- SPOT LEVEL
- R.L
- BORE HOLE
- CONTOUR
- STAGNANT STRUCTURE
- TREES /SCRUBS
- PROPOSED PLANTATION
- PROPOSED FENCING
- PROPOSED GARLAND DRAIN

ALANKULAM & LAKSHMIPURAM LIMESTONE MINE
Lessee M/s. TAMILNADU CEMENTS CORPORATION Ltd.

LESSEE:

M/s. TAMIL NADU CEMENTS CORPORATION LIMITED.
5th FLOOR, AAVIN ILLAM, NO.3A,
PASUMPON MUTHURAMALINGAM SALAI, NANDANAM,
CHENNAI - 600 035.

LOCATION OF MINE :

G.O.No. : 215
EXTENT : 180.83.0 HECTARES
VILLAGES : ALANKULAM & LAKSHMIPURAM.
TALUK : VEMBAKKOTAI
DISTRICT : VIRUDHUNAGAR.

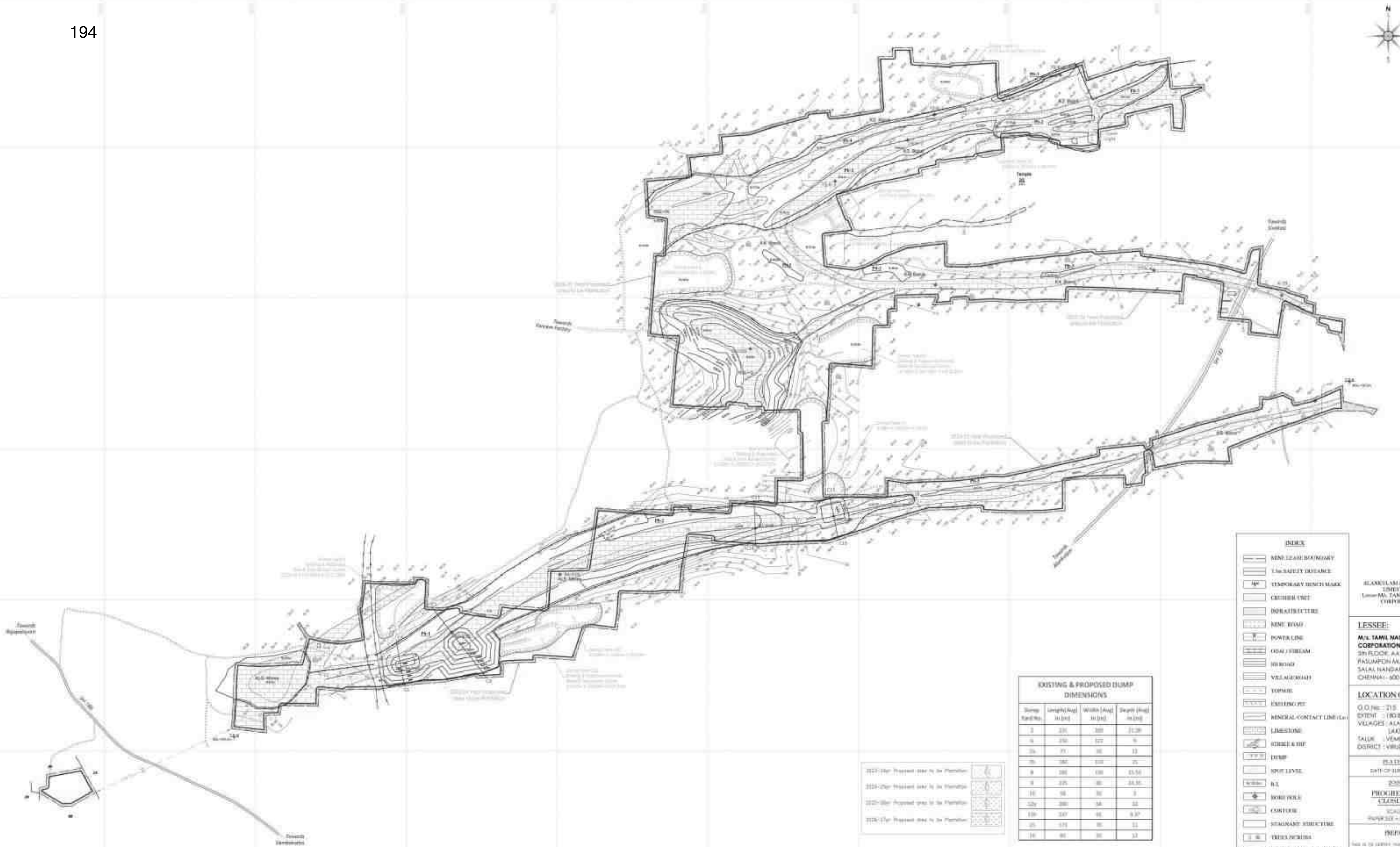
PLATE NO: 19A
DATE OF SURVEY : 07.06.2023

2023 - 2027

PROGRESSIVE MINE CLOSURE PLAN

SCALE - 1 : 4000
PAPER SIZE = 800mm X 1300mm

PREPARED BY:



EXISTING & PROPOSED DUMP DIMENSIONS			
Dump Yard No.	Length (Avg) in (m)	Width (Avg) in (m)	Depth (Avg) in (m)
3	231	309	21.28
6	250	122	9
7a	77	30	13
7b	182	110	25
8	180	130	15.54
9	225	80	24.35
10	58	30	3
12a	280	54	32
13b	247	45	8.37
15	173	35	11
16	80	35	12

INDEX

- MINE LEASE BOUNDARY
- 7.5m SAFETY DISTANCE
- TEMPORARY BENCH MARK
- CRUSHER UNIT
- INFRASTRUCTURE
- MINE ROAD
- POWER LINE
- ODAI / STREAM
- SH ROAD
- VILLAGE ROAD
- TOPSOIL
- EXISTING PIT
- MINERAL CONTACT LINE (Lc)
- LIMESTONE
- STRIKE & DIP
- DUMP
- SPOT LEVEL
- R.L
- BORE HOLE
- CONTOUR
- STAGNANT STRUCTURE
- TREES /SCRUBS
- PROPOSED PARAPET WALL
- PROPOSED FENCING
- PROPOSED GARLAND DRAIN
- ULTIMATE PIT

ALANKULAM & LAKSHMIPURAM LIMESTONE MINE
Lessee-M/s. TAMILNADU CEMENTS CORPORATION Ltd.

LESSEE:

M/s. TAMIL NADU CEMENTS CORPORATION LIMITED,
5th FLOOR, AAVIN ILLAM, NO.3A,
PASUMPON MUTHURAMALINGAM SALAI, NANDANAM,
CHENNAI - 600 035.

LOCATION OF MINE :

G.O.No. : 215
EXTENT : 180.83.0 HECTARES.
VILLAGES : ALANKULAM & LAKSHMIPURAM.
TALUK : VEMBAKKOTAI.
DISTRICT : VIRUDHUNAGAR.

PLATE NO : VII-D
DATE OF SURVEY : 07.04.2023

2026 - 27Yr

PROGRESSIVE MINE CLOSURE PLAN

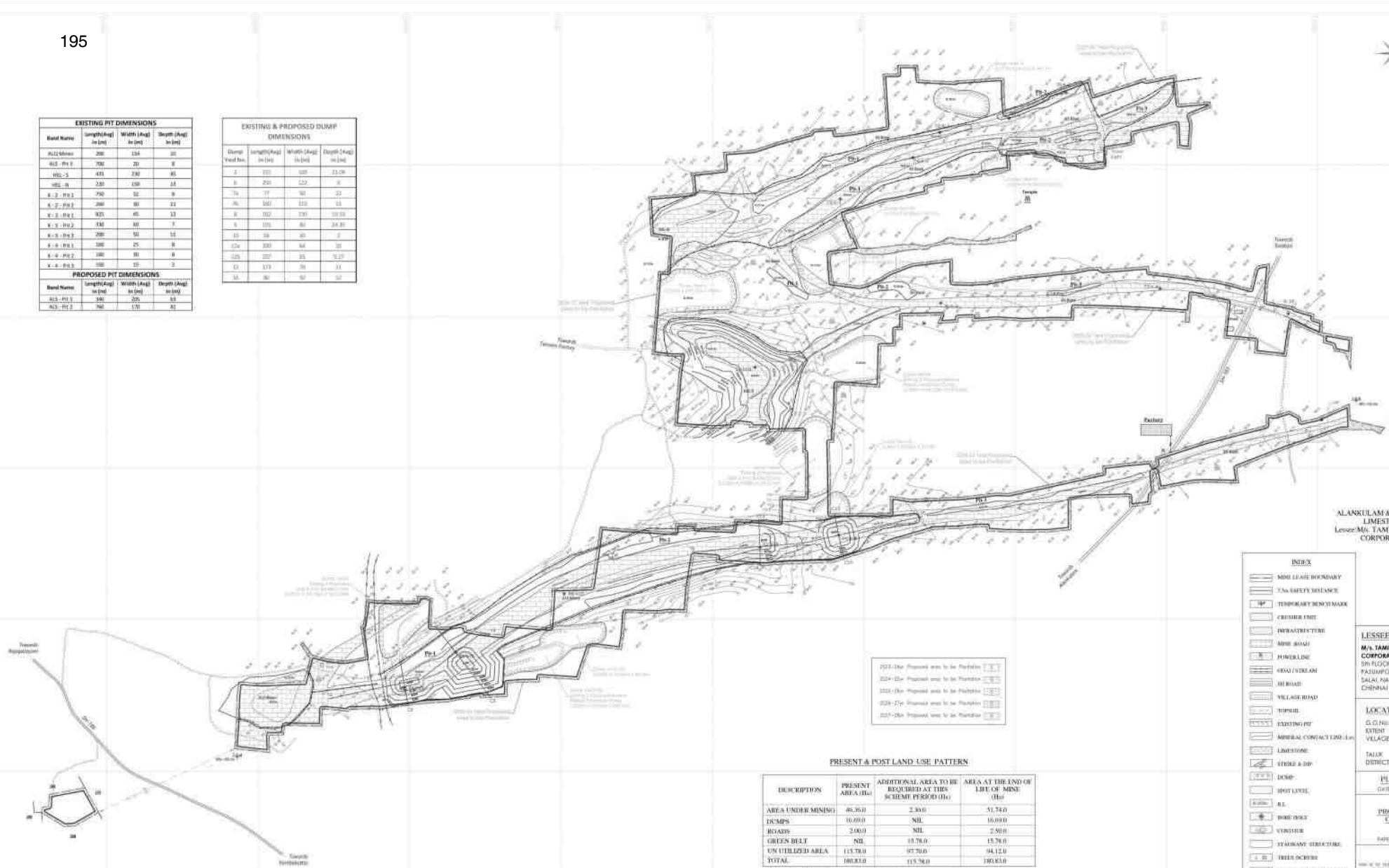
SCALE - 1 : 4000
PAPER SIZE = 400mm X 1300mm

PREPARED BY:

194 A

EXISTING PIT DIMENSIONS			
Band Name	Length(Avg) in (m)	Width (Avg) in (m)	Depth (Avg) in (m)
ALS2 Mines	200	154	10
ALS - Pit 3	700	20	8
HSL -5	435	230	45
HSL -N	230	150	14
X - 2 - Pit 3	750	50	9
X - 2 - Pit 3	260	80	11
X - 3 - Pit 3	925	45	13
X - 3 - Pit 2	330	60	7
X - 3 - Pit 3	200	50	10
X - 4 - Pit 1	100	25	9
X - 4 - Pit 2	180	30	9
X - 4 - Pit 3	150	10	3
PROPOSED PIT DIMENSIONS			
Band Name	Length(Avg) in (m)	Width (Avg) in (m)	Depth (Avg) in (m)
ALS - Pit 1	340	205	53
ALS - Pit 2	760	170	61

EXISTING & PROPOSED DUMP DIMENSIONS			
Dump Yard No.	Length(Avg) in (m)	Width (Avg) in (m)	Depth (Avg) in (m)
2	335	105	11.00
4	250	122	9
5a	77	50	22
5b	165	110	11
6	312	230	10.50
5	225	80	14.30
10	56	40	2
12a	330	64	20
12b	207	85	9.27
13	173	70	11
14	80	50	12



ALANKULAM & LAKSHMIPURAM
LIMESTONE MINE
Lessee:M/s. TAMILNADU CEMENTS CORPORATION Ltd.

INDEX

- MINE LEASE BOUNDARY
- 7.5m SAFETY DISTANCE
- TEMPORARY BENCH MARK
- CRUSHER UNIT
- INFRASTRUCTURE
- MINE ROAD
- POWER LINE
- ODAI / STREAM
- HI ROAD
- VILLAGE ROAD
- TOPSOIL
- EXISTING PIT
- MINERAL CONTACT LINE (Lst)
- LIMESTONE
- STRIKE & DIP
- DUMP
- SPOT LEVEL
- B.L
- BORE HOLE
- VORTEUR
- STAGNANT STRUCTURE
- TREES (SCRUB)
- PROPOSED PARAPET WALL
- PROPOSED FENCING
- PROPOSED GABION WALL
- ULTIMATE PIT

LESSEE:

M/s. TAMIL NADU CEMENTS CORPORATION LIMITED.
5th FLOOR, AAVIN ILLAM, NO.3A,
PASUMPON MUTHURAMALINGAM SALAI, NANDANAM,
CHENNAI - 600 035.

LOCATION OF MINE :

G.O.(Ms) No : 218
EXTENT : 180.83.0 HECTARES.
VILLAGES : ALANKULAM & LAKSHMIPURAM.
TALUK : VEMBAKKOTAI
DISTRICT : VIRUDHUNAGAR.

PLATE NO: VII-E
DATE OF SURVEY : 07.04.2022

SCALE - 1 : 4000

PROGRESSIVE MINE CLOSURE PLAN

SCALE - 1 : 4000
PAPER SIZE - 900mm (L) X 600mm

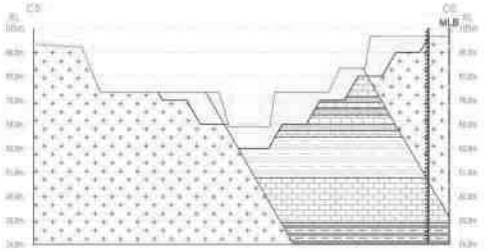
PREPARED BY :

PRESENT & POST LAND USE PATTERN

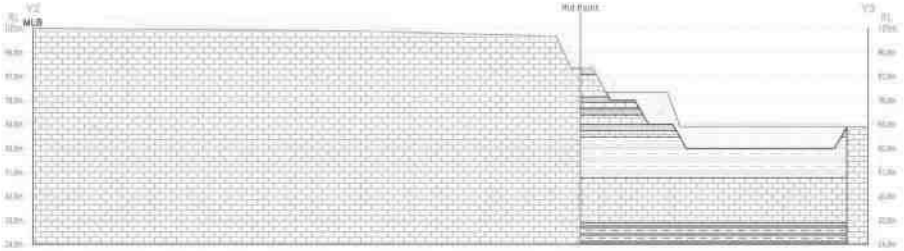
DESCRIPTION	PRESENT AREA (Ha)	ADDITIONAL AREA TO BE REQUIRED AT THIS SCHEME PERIOD (Ha)	AREA AT THE END OF LIFE OF MINE (Ha)
AREA UNDER MINING	46.36.0	2.80.0	51.74.0
DUMPS	10.69.0	NIL	10.69.0
ROADS	2.00.0	NIL	2.50.0
GREEN BELT	NIL	15.78.0	15.78.0
UN UTILIZED AREA	115.78.0	57.70.0	94.12.0
TOTAL	180.83.0	115.78.0	180.83.0

* Safe & Inert Burden Waste dump Backfilled back filled to 30 m and of life of mine

SECTION ALONG C5–C6



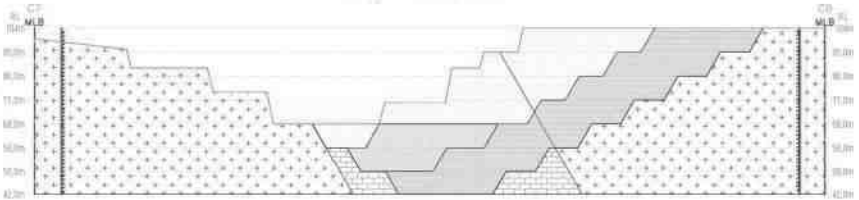
SECTION ALONG Y2–Y3



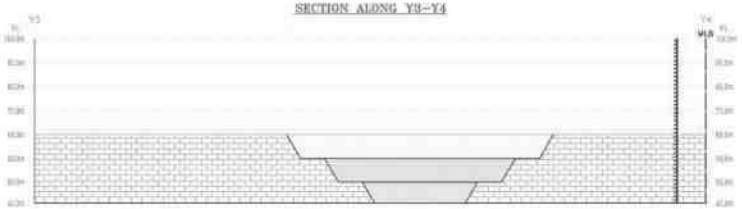
INDEX

- MINE LEASE BOUNDARY
- 7.5m SAFETY DISTANCE
- TOP SOIL
- MINERAL CONTACT LINE (Lst)
- LIMESTONE
- KANKAR
- WEATHERED GNEISS
- CHARNOCKITE
- BIOTITE GNEISS
- GNEISSIC ROCK
- SURFACE PROFILE
- PROPOSED BENCHES
- BACK FILLING
- ULTIMATE PIT

SECTION ALONG C7–C8

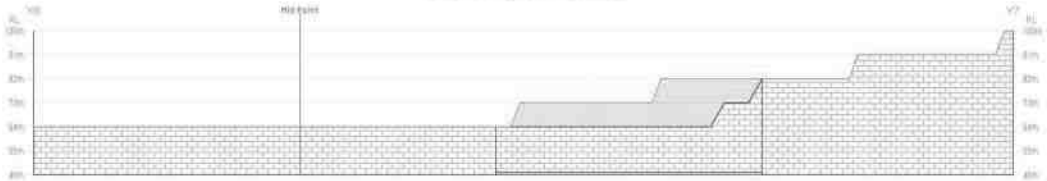


SECTION ALONG Y3–Y4

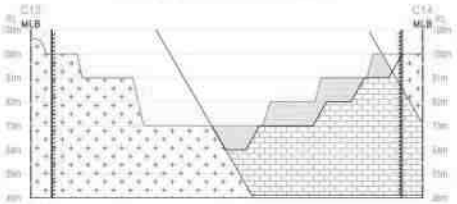


- 2023–24yr Proposed area to be Quarried
- 2024–25yr Proposed area to be Quarried
- 2025–26yr Proposed area to be Quarried
- 2026–27yr Proposed area to be Quarried
- 2027–28yr Proposed area to be Quarried

SECTION ALONG Y6–Y7



SECTION ALONG C13–C14



SECTION ALONG Y7–Y8

SECTION ALONG C15–C16

ALANKULAM & LAKSHMIPURAM LIMESTONE MINE
Lessee:M/s. TAMILNADU CEMENTS CORPORATION Ltd,

LESSEE:

M/s. TAMIL NADU CEMENTS CORPORATION LIMITED,
5th FLOOR, AAVIN ILLAM, NO.3A,
PASUMPON MUTHURAMALINGAM SALAI, NANDANAM,
CHENNAI - 600 035.

LOCATION OF MINE :

G.O.No. : 215
EXTENT : 180.83.0 HECTARES.
VILLAGES : ALANKULAM & LAKSHMIPURAM.
TALUK : VEMBAKKOTAI,
DISTRICT : VIRUDHUNAGAR.

PLATE NO : VII-A1

DATE OF SURVEY : 07.06.2023

PROGRESSIVE MINE CLOSURE PLAN SECTIONS

SCALE - 1 : 1000
PAPER SIZE = 600mm X 300mm

PREPARED BY :

THIS IS TO CERTIFY THAT THE INFORMATION IN THIS PLATE IS TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE BASED UPON THE LEASE MAP AUTHENTICATED BY STATE GOVERNMENT

P THANGARAJU

Dr.P.THANGARAJU,M.Sc.,Ph.D.,
QUALIFIED PERSON

CHENNAI METTEX LAB PRIVATE LIMITED®

(Approved by AAI, AGMARK, APEDA, BIS, EIC, FSSAI, GAFTA, IOPEPC, MOEF & TEA BOARD)

Jothi Complex, 83, M.K.N. Road, Guindy, Chennai - 600 032, Tamil Nadu, INDIA
Phone : +91 44 22323163, 22311034, 42179490, 42179491 | CIN: U74999TN2008PTC069459
Email : test@mettexlab.com | Web : www.mettexlab.com

TEST REPORT

ISSUED TO: Tancem Cements Corporation Limited, Extent of 268.80 & 180.83 Ha (G.O-427 & 215)
II Floor, LLA Building, 735 Anna Salai,
Chennai – 600 002.

Test Certificate No : CML/23-24/17052 Test Certificate Date : 06.06.2023
Sample Description : Ambient Air Monitoring
Location of Sampling : AAQ1- Core zone - 9°26'40.55"N 77°49'31.33"E
Sampling Plan &Procedure: IS 5182 Part 14:2000 & CML/LAB/ENV/SOP/07
Sampling Instrument ID &Calibration Due Date: CML/ENV/RDS/10& 29.11.2023
Sampling Instrument ID &Calibration Due Date: CML/ENV/FDS/11& 29.11.2023

Ambient Air Monitoring Details		Particulate Pollutant			Gaseous Pollutant					Metals Pollutant			Organic Pollutant	
Parameters		SPM	$PM_{2.5}$	PM_{10}	SO_2	NO_2	NH_3	O_3	CO	Pb	Ni	As	C_6H_6	BaP
NAAQ Norms		200	60	100	80	80	400	180	4	1	20	6	5	1
Unit		µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	mg/m³	µg/m³	ng/m³	ng/m³	µg/m³	ng/m³
Date	Period.hrs	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
03.03.2023	7:00-7:00	68.3	22.5	44.3	7.2	25.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04.03.2023	7:15-7:15	67.1	24.3	42.5	7.3	24.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10.03.2023	7:00-7:00	68.3	25.3	43.6	7.4	26.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11.03.2023	7:15-7:15	69.2	26.1	45.2	6.2	27.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17.03.2023	7:00-7:00	67.2	24.6	44.2	6.1	25.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18.03.2023	7:15-7:15	68.3	25.3	43.0	6.3	26.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24.03.2023	7:00-7:00	67.0	21.0	41.2	7.6	24.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25.03.2023	7:15-7:15	69.2	23.4	44.2	7.2	25.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
31.03.2023	7:00-7:00	67.3	22.6	43.6	7.0	26.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01.04.2023	7:15-7:15	68.2	25.0	42.1	8.3	27.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07.04.2023	7:00-7:00	67.1	26.8	41.5	8.0	25.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.04.2023	7:15-7:15	68.0	24.3	42.0	7.4	26.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.04.2023	7:00-7:00	69.4	23.5	43.6	8.2	27.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.04.2023	7:15-7:15	67.3	25.1	44.8	7.8	26.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21.04.2023	7:00-7:00	68.2	26.0	43.0	8.1	25.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22.04.2023	7:15-7:15	69.3	23.2	41.0	7.2	26.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28.04.2023	7:00-7:00	67.2	22.0	42.8	8.3	27.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.04.2023	7:15-7:15	68.0	21.6	43.5	7.6	26.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
05.05.2023	7:00-7:00	69.3	24.3	44.0	7.0	24.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
06.05.2023	7:15-7:15	67.4	25.6	45.4	8.2	25.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
12.05.2023	7:00-7:00	68.9	26.3	42.3	7.5	27.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13.05.2023	7:15-7:15	69.0	24.1	43.1	8.2	26.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
19.05.2023	7:00-7:00	69.3	25.0	44.6	8.2	27.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20.05.2023	7:15-7:15	68.5	24.6	45.8	7.6	25.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
26.05.2023	7:00-7:00	67.2	25.8	42.1	7.4	26.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
27.05.2023	7:15-7:15	68.5	26.8	41.3	8.0	24.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Note:BDL: Below Detection Limit ;**DL**: Detection Limit ; **NH_3**: BDL (DL:20); **O_3**: BDL (DL:20); **CO**: BDL (DL:1.0); **Pb**: BDL (DL:0.1); **Ni**: BDL (DL:1.0); **As**: BDL (DL:1.0); **C_6H_6**: BDL (DL:1.0); **BaP**: BDL (DL:0.1)
Remarks: The values observed for the pollutants given above are within the CPCB standards.

End of Report

For Chennai Mettex Lab Private Limited

Reviewed & Authorized By
P. KAVITHA
Technical Manager
Authorised Signatory

CHENNAI METTEX LAB PRIVATE LIMITED®

(Approved by AAI, AGMARK, APEDA, BIS, EIC, FSSAI, GAFTA, IOPEPC, MOEF & TEA BOARD)

Jothi Complex, 83, M.K.N. Road, Guindy, Chennai - 600 032, Tamil Nadu, INDIA
Phone : +91 44 22323163, 22311034, 42179490, 42179491 | CIN: U74999TN2008PTC069459
Email : test@mettexlab.com | Web : www.mettexlab.com

TEST REPORT

ISSUED TO: Tancem Cements Corporation Limited, Extent of 268.80 & 180.83 Ha (G.O-427 & 215)
II Floor, LLA Building, 735 Anna Salai,
Chennai – 600 002.

Test Certificate No : CML/23-24/17053 Test Certificate Date : 06.06.2023
Sample Description : Ambient Air Monitoring
Location of Sampling : AAQ2- Core zone - 9°24'0.91"N 77°46'38.11"E
Sampling Plan &Procedure: IS 5182 Part 14:2000 & CML/LAB/ENV/SOP/07
Sampling Instrument ID &Calibration Due Date: CML/ENV/RDS/12& 29.11.2023
Sampling Instrument ID &Calibration Due Date : CML/ENV/FDS/13& 29.11.2023

Ambient Air Monitoring Details		Particulate Pollutant			Gaseous Pollutant					Metals Pollutant			Organic Pollutant	
Parameters		SPM	$PM_{2.5}$	PM_{10}	SO_2	NO_2	NH_3	O_3	CO	Pb	Ni	As	C_6H_6	BaP
NAAQ Norms		200	60	100	80	80	400	180	4	1	20	6	5	1
Unit		µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	mg/m³	µg/m³	ng/m³	ng/m³	µg/m³	ng/m³
Date	Period.hrs	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
03.03.2023	7:00-7:00	73.2	25.3	43.5	6.2	23.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04.03.2023	7:15-7:15	74.2	24.1	45.1	7.0	22.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10.03.2023	7:00-7:00	73.0	22.0	44.0	6.8	21.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11.03.2023	7:15-7:15	72.1	24.3	42.3	7.2	20.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17.03.2023	7:00-7:00	74.5	21.0	41.0	6.2	23.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18.03.2023	7:15-7:15	73.2	23.2	43.6	7.4	24.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24.03.2023	7:00-7:00	72.4	22.1	44.5	6.3	22.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25.03.2023	7:15-7:15	74.6	22.6	45.7	7.5	23.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
31.03.2023	7:00-7:00	72.3	22.1	43.2	6.2	24.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01.04.2023	7:15-7:15	73.6	21.6	42.1	7.0	25.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07.04.2023	7:00-7:00	74.5	24.3	41.3	6.8	23.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.04.2023	7:15-7:15	73.6	25.3	43.6	7.0	23.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.04.2023	7:00-7:00	72.1	22.6	42.1	5.3	23.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.04.2023	7:15-7:15	73.4	23.5	44.5	5.0	24.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21.04.2023	7:00-7:00	74.3	21.3	45.6	5.2	24.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22.04.2023	7:15-7:15	74.1	22.5	41.0	5.6	25.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28.04.2023	7:00-7:00	75.3	23.6	42.5	5.8	24.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.04.2023	7:15-7:15	73.5	24.5	43.5	6.4	25.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
05.05.2023	7:00-7:00	74.1	22.7	44.8	7.3	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
06.05.2023	7:15-7:15	73.5	23.5	45.6	6.8	23.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
12.05.2023	7:00-7:00	72.0	25.6	43.1	5.2	21.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13.05.2023	7:15-7:15	73.8	24.2	44.2	5.4	25.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
19.05.2023	7:00-7:00	74.1	22.3	45.0	7.3	24.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20.05.2023	7:15-7:15	73.0	21.2	43.5	6.3	23.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
26.05.2023	7:00-7:00	72.4	22.3	44.2	7.1	21.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
27.05.2023	7:15-7:15	73.8	21.0	41.0	6.9	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Note:BDL: Below Detection Limit ;**DL**: Detection Limit ; **NH_3**: BDL (DL:20); **O_3**: BDL (DL:20); **CO**: BDL (DL:1.0); **Pb**: BDL (DL:0.1); **Ni**: BDL (DL:1.0); **As**: BDL (DL:1.0); **C_6H_6**: BDL (DL:1.0); **BaP**: BDL (DL:0.1)
Remarks: The values observed for the pollutants given above are within the CPCB standards.

End of Report

For Chennai Mettex Lab Private Limited

Reviewed & Authorized By
P. KAVITHA
Technical Manager
Authorised Signatory

CHENNAI METTEX LAB PRIVATE LIMITED®

(Approved by AAI, AGMARK, APEDA, BIS, EIC, FSSAI, GAFTA, IOPEPC, MOEF & TEA BOARD)

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Phone : +91 44 22323163, 22311034, 42179490, 42179491 | CIN: U74999TN2008PTC069459
Email : test@mettexlab.com | Web : www.mettexlab.com

TEST REPORT

ISSUED TO: Tancem Cements Corporation Limited, Extent of 268.80 & 180.83 Ha (G.O-427 & 215)
II Floor, LLA Building, 735 Anna Salai,
Chennai – 600 002.

Test Certificate No : CML/23-24/17054 Test Certificate Date : 06.06.2023
Sample Description : Ambient Air Monitoring
Location of Sampling : AAQ3- Core zone - 9°23'26.78"N 77°44'2.41"E
Sampling Plan &Procedure: IS 5182 Part 14:2000 & CML/LAB/ENV/SOP/07
Sampling Instrument ID &Calibration Due Date: CML/ENV/RDS/14& 29.11.2023
Sampling Instrument ID &Calibration Due Date: CML/ENV/FDS/15& 25.11.2023

Ambient Air Monitoring Details		Particulate Pollutant			Gaseous Pollutant					Metals Pollutant			Organic Pollutant	
Parameters		SPM	$PM_{2.5}$	PM_{10}	SO_2	NO_2	NH_3	O_3	CO	Pb	Ni	As	C_6H_6	BaP
NAAQ Norms		200	60	100	80	80	400	180	4	1	20	6	5	1
Unit		µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	mg/m³	µg/m³	ng/m³	ng/m³	µg/m³	ng/m³
Date	Period.hrs	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
03.03.2023	7:00-7:00	68.5	21.3	43.2	7.5	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04.03.2023	7:15-7:15	67.0	24.3	42.1	6.2	24.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10.03.2023	7:00-7:00	67.2	25.6	44.6	7.0	25.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11.03.2023	7:15-7:15	69.2	26.1	41.0	6.3	21.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17.03.2023	7:00-7:00	67.3	22.3	42.3	7.2	22.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18.03.2023	7:15-7:15	68.0	24.5	43.6	6.4	21.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24.03.2023	7:00-7:00	69.2	26.1	44.5	7.2	23.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25.03.2023	7:15-7:15	67.2	25.3	42.8	6.8	23.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
31.03.2023	7:00-7:00	69.4	22.0	43.6	7.1	24.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01.04.2023	7:15-7:15	68.2	21.3	44.8	6.3	23.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07.04.2023	7:00-7:00	69.3	22.3	42.6	7.2	22.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.04.2023	7:15-7:15	68.4	24.6	43.5	6.5	23.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.04.2023	7:00-7:00	69.2	26.3	45.1	7.3	24.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.04.2023	7:15-7:15	69.0	25.0	43.0	6.0	25.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21.04.2023	7:00-7:00	68.2	22.7	44.6	7.4	24.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22.04.2023	7:15-7:15	67.3	22.0	45.2	6.3	22.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28.04.2023	7:00-7:00	69.0	23.5	42.0	7.1	23.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.04.2023	7:15-7:15	67.1	23.5	44.3	7.0	24.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
05.05.2023	7:00-7:00	68.3	21.0	42.0	6.5	25.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
06.05.2023	7:15-7:15	67.0	23.6	43.6	7.3	24.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
12.05.2023	7:00-7:00	69.3	24.3	42.1	6.8	25.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13.05.2023	7:15-7:15	68.0	25.3	43.8	7.1	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
19.05.2023	7:00-7:00	67.8	26.1	44.6	6.0	21.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20.05.2023	7:15-7:15	68.4	21.3	42.1	7.3	24.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
26.05.2023	7:00-7:00	69.3	22.3	43.8	7.0	22.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
27.05.2023	7:15-7:15	67.2	23.5	42.5	6.5	23.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Note:BDL: Below Detection Limit ;**DL**: Detection Limit ; **NH_3**: BDL (DL:20); **O_3**: BDL (DL:20); **CO**: BDL (DL:1.0); **Pb**: BDL (DL:0.1); **Ni**: BDL (DL:1.0); **As**: BDL (DL:1.0); **C_6H_6**: BDL (DL:1.0); **BaP**: BDL (DL:0.1)
Remarks: The values observed for the pollutants given above are within the CPCB standards.

End of Report

For Chennai Mettex Lab Private Limited

Reviewed & Authorized By
P. KAVITHA
Technical Manager
Authorised Signatory

CHENNAI METTEX LAB PRIVATE LIMITED®

(Approved by AAI, AGMARK, APEDA, BIS, EIC, FSSAI, GAFTA, IOPEPC, MOEF & TEA BOARD)

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Phone : +91 44 22323163, 22311034, 42179490, 42179491 | CIN: U74999TN2008PTC069459
Email : test@mettexlab.com | Web : www.mettexlab.com

TEST REPORT

ISSUED TO: Tancem Cements Corporation Limited, Extent of 268.80 & 180.83 Ha (G.O-427 & 215)
II Floor, LLA Building, 735 Anna Salai,
Chennai – 600 002.

Test Certificate No : CML/23-24/17055 Test Certificate Date : 06.06.2023
Sample Description : Ambient Air Monitoring
Location of Sampling : AAQ4- Core zone - 9°22'30.36"N 77°41'36.60"E
Sampling Plan &Procedure: IS 5182 Part 14:2000 & CML/LAB/ENV/SOP/07
Sampling Instrument ID &Calibration Due Date: CML/ENV/RDS/16& 29.11.2023
Sampling Instrument ID &Calibration Due Date: CML/ENV/FDS/17& 25.11.2023

Ambient Air Monitoring Details		Particulate Pollutant			Gaseous Pollutant					Metals Pollutant			Organic Pollutant	
Parameters		SPM	$PM_{2.5}$	PM_{10}	SO_2	NO_2	NH_3	O_3	CO	Pb	Ni	As	C_6H_6	BaP
NAAQ Norms		200	60	100	80	80	400	180	4	1	20	6	5	1
Unit		µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	mg/m³	µg/m³	ng/m³	ng/m³	µg/m³	ng/m³
Date	Period.hrs	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
03.03.2023	7:00-7:00	69.3	22.5	47.2	6.3	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04.03.2023	7:15-7:15	68.2	23.4	47.2	7.0	21.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10.03.2023	7:00-7:00	69.3	24.0	46.1	6.3	23.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11.03.2023	7:15-7:15	69.0	23.5	46.6	7.2	21.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17.03.2023	7:00-7:00	68.1	22.1	46.3	6.5	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18.03.2023	7:15-7:15	67.2	21.3	47.0	7.0	22.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24.03.2023	7:00-7:00	68.3	24.3	47.5	6.8	23.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25.03.2023	7:15-7:15	68.0	22.1	47.0	7.2	21.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
31.03.2023	7:00-7:00	69.5	23.0	46.1	6.4	22.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01.04.2023	7:15-7:15	68.1	24.0	48.3	7.3	23.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07.04.2023	7:00-7:00	67.3	22.6	48.5	6.5	21.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.04.2023	7:15-7:15	68.5	23.5	47.6	7.3	22.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.04.2023	7:00-7:00	67.5	21.0	47.1	6.0	23.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.04.2023	7:15-7:15	69.3	24.3	46.0	7.1	23.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21.04.2023	7:00-7:00	68.2	22.5	46.1	7.8	24.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22.04.2023	7:15-7:15	68.0	23.6	46.6	6.2	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28.04.2023	7:00-7:00	69.3	22.0	47.0	7.3	23.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.04.2023	7:15-7:15	67.3	24.3	47.0	6.8	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
05.05.2023	7:00-7:00	68.0	23.0	47.1	7.4	22.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
06.05.2023	7:15-7:15	69.0	21.0	48.0	6.9	23.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
12.05.2023	7:00-7:00	68.2	22.6	48.6	7.5	24.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13.05.2023	7:15-7:15	67.1	23.5	47.8	6.8	23.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
19.05.2023	7:00-7:00	66.2	21.6	47.2	7.3	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20.05.2023	7:15-7:15	69.0	23.0	48.5	6.4	23.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
26.05.2023	7:00-7:00	69.2	24.0	48.1	7.3	22.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
27.05.2023	7:15-7:15	68.2	24.1	47.5	6.0	24.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Note:BDL: Below Detection Limit ;**DL**: Detection Limit ; **NH_3**: BDL (DL:20); **O_3**: BDL (DL:20); **CO**: BDL (DL:1.0); **Pb**: BDL (DL:0.1); **Ni**: BDL (DL:1.0); **As**: BDL (DL:1.0); **C_6H_6**: BDL (DL:1.0); **BaP**: BDL (DL:0.1)
Remarks: The values observed for the pollutants given above are within the CPCB standards.

End of Report

For Chennai Mettex Lab Private Limited

Reviewed & Authorized By
P. KAVITHA
Technical Manager
Authorised Signatory

CHENNAI METTEX LAB PRIVATE LIMITED®

(Approved by AAI, AGMARK, APEDA, BIS, EIC, FSSAI, GAFTA, IOPEPC, MOEF & TEA BOARD)

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Phone : +91 44 22323163, 22311034, 42179490, 42179491 | CIN: U74999TN2008PTC069459
Email : test@mettexlab.com | Web : www.mettexlab.com

TEST REPORT

ISSUED TO: Tancem Cements Corporation Limited, Extent of 268.80 & 180.83 Ha (G.O-427 & 215)
II Floor, LLA Building, 735 Anna Salai,
Chennai – 600 002.

Test Certificate No : CML/23-24/17056 Test Certificate Date : 06.06.2023
Sample Description : Ambient Air Monitoring
Location of Sampling : AAQ5- Core zone - 9°21'37.85"N 77°40'28.68"
Sampling Plan &Procedure: IS 5182 Part 14:2000 & CML/LAB/ENV/SOP/07
Sampling Instrument ID &Calibration Due Date: CML/ENV/RDS/18& 29.11.2023
Sampling Instrument ID &Calibration Due Date: CML/ENV/FDS/19& 29.11.2023

Ambient Air Monitoring Details		Particulate Pollutant			Gaseous Pollutant					Metals Pollutant			Organic Pollutant	
Parameters		SPM	$PM_{2.5}$	PM_{10}	SO_2	NO_2	NH_3	O_3	CO	Pb	Ni	As	C_6H_6	BaP
NAAQ Norms		200	60	100	80	80	400	180	4	1	20	6	5	1
Unit		µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	mg/m³	µg/m³	ng/m³	ng/m³	µg/m³	ng/m³
Date	Period.hrs	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
03.03.2023	7:00-7:00	65.3	22.5	44.5	5.5	23.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04.03.2023	7:15-7:15	64.2	23.5	42.3	6.2	21.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10.03.2023	7:00-7:00	66.3	24.0	44.0	7.2	22.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11.03.2023	7:15-7:15	68.3	22.3	45.2	6.4	25.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17.03.2023	7:00-7:00	67.1	23.5	43.1	7.6	24.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18.03.2023	7:15-7:15	69.2	22.0	43.0	5.0	25.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24.03.2023	7:00-7:00	66.2	24.0	45.0	6.8	23.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25.03.2023	7:15-7:15	64.2	21.3	44.2	7.2	22.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
31.03.2023	7:00-7:00	65.3	22.5	45.3	6.3	24.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01.04.2023	7:15-7:15	66.0	24.5	44.2	7.4	25.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07.04.2023	7:00-7:00	64.2	23.6	43.2	5.3	24.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.04.2023	7:15-7:15	66.0	22.1	44.1	6.5	25.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.04.2023	7:00-7:00	62.8	24.3	43.2	7.2	23.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.04.2023	7:15-7:15	64.2	23.1	42.0	5.4	25.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21.04.2023	7:00-7:00	66.3	24.6	43.1	7.6	24.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22.04.2023	7:15-7:15	67.0	22.3	44.5	6.2	25.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28.04.2023	7:00-7:00	62.4	22.1	43.0	7.3	23.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.04.2023	7:15-7:15	65.0	22.3	44.3	6.8	24.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
05.05.2023	7:00-7:00	67.0	22.1	42.1	7.1	25.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
06.05.2023	7:15-7:15	66.2	23.2	43.2	8.6	24.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
12.05.2023	7:00-7:00	67.2	22.4	44.5	7.0	25.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13.05.2023	7:15-7:15	64.5	21.3	41.3	6.2	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
19.05.2023	7:00-7:00	65.3	22.0	42.0	7.3	24.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20.05.2023	7:15-7:15	67.0	23.0	43.0	5.4	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
26.05.2023	7:00-7:00	65.3	22.5	44.5	6.3	23.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
27.05.2023	7:15-7:15	66.0	22.1	45.3	8.0	24.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Note:BDL: Below Detection Limit ;**DL**: Detection Limit ; **NH_3**: BDL (DL:20); **O_3**: BDL (DL:20); **CO**: BDL (DL:1.0); **Pb**: BDL (DL:0.1); **Ni**: BDL (DL:1.0); **As**: BDL (DL:1.0); **C_6H_6**: BDL (DL:1.0); **BaP**: BDL (DL:0.1)
Remarks: The values observed for the pollutants given above are within the CPCB standards.

End of Report

For Chennai Mettex Lab Private Limited

Reviewed & Authorized By
P. KAVITHA
Technical Manager
Authorised Signatory

CHENNAI METTEX LAB PRIVATE LIMITED®

(Approved by AAI, AGMARK, APEDA, BIS, EIC, FSSAI, GAFTA, IOPEPC, MOEF & TEA BOARD)

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Phone : +91 44 22323163, 22311034, 42179490, 42179491 | CIN: U74999TN2008PTC069459
Email : test@mettexlab.com | Web : www.mettexlab.com

TEST REPORT

ISSUED TO: Tancem Cements Corporation Limited, Extent of 268.80 & 180.83 Ha (G.O-427 & 215)
II Floor, LLA Building, 735 Anna Salai,
Chennai – 600 002.

Test Certificate No : CML/23-24/17057 Test Certificate Date : 06.06.2023
Sample Description : Ambient Air Monitoring
Location of Sampling : AAQ6- Sundankulam - 9°21'37.60"N 77°40'47.20"E
Sampling Plan &Procedure: IS 5182 Part 14:2000 & CML/LAB/ENV/SOP/07
Sampling Instrument ID &Calibration Due Date: CML/ENV/RDS/20& 29.11.2023
Sampling Instrument ID &Calibration Due Date: CML/ENV/FDS/21& 29.11.2023

Ambient Air Monitoring Details		Particulate Pollutant			Gaseous Pollutant					Metals Pollutant			Organic Pollutant	
Parameters		SPM	$PM_{2.5}$	PM_{10}	SO_2	NO_2	NH_3	O_3	CO	Pb	Ni	As	C_6H_6	BaP
NAAQ Norms		200	60	100	80	80	400	180	4	1	20	6	5	1
Unit		µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	mg/m³	µg/m³	ng/m³	ng/m³	µg/m³	ng/m³
Date	Period.hrs	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
03.03.2023	7:00-7:00	65.3	20.2	40.2	5.5	24.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04.03.2023	7:15-7:15	64.2	21.2	41.3	6.2	23.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10.03.2023	7:00-7:00	66.3	19.3	39.2	7.2	24.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11.03.2023	7:15-7:15	67.2	20.0	40.0	8.2	23.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17.03.2023	7:00-7:00	68.3	21.3	41.8	6.3	25.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18.03.2023	7:15-7:15	69.2	20.5	41.6	5.2	24.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24.03.2023	7:00-7:00	65.2	21.6	40.3	7.1	25.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25.03.2023	7:15-7:15	64.0	22.4	40.8	6.0	25.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
31.03.2023	7:00-7:00	66.3	21.3	41.5	5.8	24.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01.04.2023	7:15-7:15	67.2	21.0	40.3	7.2	23.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07.04.2023	7:00-7:00	68.3	22.5	39.0	8.2	25.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.04.2023	7:15-7:15	69.2	20.3	40.8	7.3	24.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.04.2023	7:00-7:00	65.0	22.3	41.2	6.4	25.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.04.2023	7:15-7:15	66.3	20.1	40.3	7.0	23.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21.04.2023	7:00-7:00	67.1	21.6	41.5	8.6	24.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22.04.2023	7:15-7:15	68.2	21.0	41.6	6.3	24.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28.04.2023	7:00-7:00	68.0	20.6	39.4	8.3	23.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.04.2023	7:15-7:15	69.3	21.8	41.3	5.2	25.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
05.05.2023	7:00-7:00	66.4	21.9	40.5	6.3	42.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
06.05.2023	7:15-7:15	67.3	21.3	41.0	7.2	25.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
12.05.2023	7:00-7:00	68.2	19.3	39.2	8.2	26.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13.05.2023	7:15-7:15	69.6	20.3	41.6	5.3	24.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
19.05.2023	7:00-7:00	65.3	21.5	39.2	6.4	25.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20.05.2023	7:15-7:15	66.4	22.3	40.6	8.1	24.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
26.05.2023	7:00-7:00	67.3	21.5	39.5	6.0	25.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
27.05.2023	7:15-7:15	68.2	22.6	41.3	8.3	24.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Note:BDL: Below Detection Limit ;**DL**: Detection Limit ; **NH_3**: BDL (DL:20); **O_3**: BDL (DL:20); **CO**: BDL (DL:1.0);
Pb: BDL (DL:0.1); **Ni**: BDL (DL:1.0); **As**: BDL (DL:1.0); **C_6H_6**: BDL (DL:1.0); **BaP**: BDL (DL:0.1)
Remarks: The values observed for the pollutants given above are within the CPCB standards.

End of Report

For Chennai Mettex Lab Private Limited

Reviewed & Authorized By

P. KAVITHA
Technical Manager
Authorised Signatory

CHENNAI METTEX LAB PRIVATE LIMITED®

(Approved by AAI, AGMARK, APEDA, BIS, EIC, FSSAI, GAFTA, IOPEPC, MOEF & TEA BOARD)

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TEST REPORT

ISSUED TO: Tancem Cements Corporation Limited, Extent of 268.80 & 180.83 Ha (G.O-427 & 215)
II Floor, LLA Building, 735 Anna Salai,
Chennai – 600 002.

Test Certificate No : CML/23-24/17058 Test Certificate Date : 06.06.2023
Sample Description : Ambient Air Monitoring
Location of Sampling : AAQ7- Uppupatt - 9°23'9.50"N 77°43'0.75"E
Sampling Plan &Procedure: IS 5182 Part 14:2000 & CML/LAB/ENV/SOP/07
Sampling Instrument ID &Calibration Due Date: CML/ENV/RDS/22& 29.11.2023
Sampling Instrument ID &Calibration Due Date: CML/ENV/FDS/23& 29.11.2023

Ambient Air Monitoring Details		Particulate Pollutant			Gaseous Pollutant					Metals Pollutant			Organic Pollutant	
Parameters		SPM	$PM_{2.5}$	PM_{10}	SO_2	NO_2	NH_3	O_3	CO	Pb	Ni	As	C_6H_6	BaP
NAAQ Norms		200	60	100	80	80	400	180	4	1	20	6	5	1
Unit		µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	mg/m³	µg/m³	ng/m³	ng/m³	µg/m³	ng/m³
Date	Period.hrs	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
03.03.2023	7:00-7:00	67.2	22.2	44.5	7.2	24.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04.03.2023	7:15-7:15	68.2	21.0	45.2	7.0	25.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10.03.2023	7:00-7:00	66.0	20.3	44.2	7.3	22.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11.03.2023	7:15-7:15	67.2	21.0	46.0	6.2	21.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17.03.2023	7:00-7:00	68.4	22.8	45.6	7.3	25.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18.03.2023	7:15-7:15	66.3	22.3	46.6	6.1	24.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24.03.2023	7:00-7:00	67.2	21.5	45.0	7.0	25.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25.03.2023	7:15-7:15	68.5	22.6	46.2	6.4	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
31.03.2023	7:00-7:00	67.3	20.3	44.0	7.3	24.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01.04.2023	7:15-7:15	68.2	21.6	46.6	6.8	21.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07.04.2023	7:00-7:00	66.4	22.5	45.2	7.2	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.04.2023	7:15-7:15	67.2	21.8	44.5	6.3	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.04.2023	7:00-7:00	68.3	22.8	46.0	7.5	23.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.04.2023	7:15-7:15	66.0	22.0	47.3	6.4	21.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21.04.2023	7:00-7:00	68.3	21.6	47.5	7.0	23.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22.04.2023	7:15-7:15	67.1	22.0	45.6	6.5	24.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28.04.2023	7:00-7:00	68.3	21.8	46.0	7.2	25.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.04.2023	7:15-7:15	67.2	20.6	46.6	6.0	25.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
05.05.2023	7:00-7:00	66.0	21.2	45.2	7.5	24.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
06.05.2023	7:15-7:15	67.0	22.5	45.5	6.2	22.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
12.05.2023	7:00-7:00	68.0	21.0	46.6	7.8	21.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13.05.2023	7:15-7:15	67.3	22.8	45.1	6.3	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
19.05.2023	7:00-7:00	68.2	22.1	45.5	7.4	24.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20.05.2023	7:15-7:15	66.0	20.9	46.0	6.8	25.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
26.05.2023	7:00-7:00	68.0	21.0	45.5	7.3	24.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
27.05.2023	7:15-7:15	67.2	22.4	46.5	6.5	23.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Note:BDL: Below Detection Limit ;**DL**: Detection Limit ; **NH_3**: BDL (DL:20); **O_3**: BDL (DL:20); **CO**: BDL (DL:1.0); **Pb**: BDL (DL:0.1); **Ni**: BDL (DL:1.0); **As**: BDL (DL:1.0); **C_6H_6**: BDL (DL:1.0); **BaP**: BDL (DL:0.1)
Remarks: The values observed for the pollutants given above are within the CPCB standards.

End of Report

For Chennai Mettex Lab Private Limited

Reviewed & Authorized By
P. KAVITHA
Technical Manager
Authorised Signatory

CHENNAI METTEX LAB PRIVATE LIMITED®

(Approved by AAI, AGMARK, APEDA, BIS, EIC, FSSAI, GAFTA, IOPEPC, MOEF & TEA BOARD)

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TEST REPORT

ISSUED TO: Tancem Cements Corporation Limited, Extent of 268.80 & 180.83 Ha (G.O-427 & 215)
II Floor, LLA Building, 735 Anna Salai,
Chennai – 600 002.

Test Certificate No : CML/23-24/17059 Test Certificate Date : 06.06.2023
Sample Description : Ambient Air Monitoring
Location of Sampling : AAQ8 - Near Ethirikottai Area - 9°22'41.19"N 77°43'36.73"E
Sampling Plan &Procedure: IS 5182 Part 14:2000 & CML/LAB/ENV/SOP/07
Sampling Instrument ID &Calibration Due Date: CML/ENV/RDS/24& 29.11.2023
Sampling Instrument ID &Calibration Due Date: CML/ENV/FDS/25& 29.11.2023

Ambient Air Monitoring Details		Particulate Pollutant			Gaseous Pollutant					Metals Pollutant			Organic Pollutant	
Parameters		SPM	$PM_{2.5}$	PM_{10}	SO_2	NO_2	NH_3	O_3	CO	Pb	Ni	As	C_6H_6	BaP
NAAQ Norms		200	60	100	80	80	400	180	4	1	20	6	5	1
Unit		µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	mg/m³	µg/m³	ng/m³	ng/m³	µg/m³	ng/m³
Date	Period.hrs	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
03.03.2023	7:00-7:00	69.5	20.2	40.2	5.5	23.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04.03.2023	7:15-7:15	68.2	21.3	39.2	6.2	21.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10.03.2023	7:00-7:00	65.2	22.4	41.2	7.2	22.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11.03.2023	7:15-7:15	64.3	20.3	41.0	6.0	24.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17.03.2023	7:00-7:00	66.3	21.0	40.2	7.4	22.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18.03.2023	7:15-7:15	65.8	22.3	39.5	5.5	21.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24.03.2023	7:00-7:00	64.2	21.4	40.3	6.2	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25.03.2023	7:15-7:15	65.3	22.0	41.6	7.3	21.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
31.03.2023	7:00-7:00	63.0	22.4	39.1	5.4	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01.04.2023	7:15-7:15	64.5	22.3	40.5	6.3	23.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07.04.2023	7:00-7:00	63.3	21.1	41.6	7.2	24.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.04.2023	7:15-7:15	65.0	22.0	41.0	5.2	23.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.04.2023	7:00-7:00	63.4	22.3	39.5	6.3	22.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.04.2023	7:15-7:15	64.3	21.0	41.3	7.1	24.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21.04.2023	7:00-7:00	63.2	22.5	40.1	5.2	23.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22.04.2023	7:15-7:15	64.0	21.6	41.5	6.4	24.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28.04.2023	7:00-7:00	63.3	22.3	39.2	7.2	21.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.04.2023	7:15-7:15	65.1	22.0	41.0	6.3	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
05.05.2023	7:00-7:00	65.2	21.5	39.0	7.0	23.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
06.05.2023	7:15-7:15	64.0	22.3	40.2	5.2	24.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
12.05.2023	7:00-7:00	64.4	22.0	39.5	6.8	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13.05.2023	7:15-7:15	65.3	21.5	41.6	7.0	24.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
19.05.2023	7:00-7:00	64.4	22.6	39.8	5.8	22.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20.05.2023	7:15-7:15	66.3	21.1	40.2	6.3	21.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
26.05.2023	7:00-7:00	62.4	22.4	41.3	7.4	23.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
27.05.2023	7:15-7:15	64.3	20.3	39.8	6.2	24.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Note:BDL: Below Detection Limit ;**DL**: Detection Limit ; **NH_3**: BDL (DL:20); **O_3**: BDL (DL:20); **CO**: BDL (DL:1.0); **Pb**: BDL (DL:0.1); **Ni**: BDL (DL:1.0); **As**: BDL (DL:1.0); **C_6H_6**: BDL (DL:1.0); **BaP**: BDL (DL:0.1)
Remarks: The values observed for the pollutants given above are within the CPCB standards.

End of Report

For Chennai Mettex Lab Private Limited

Reviewed & Authorized By
P. KAVITHA
Technical Manager
Authorised Signatory

CHENNAI METTEX LAB PRIVATE LIMITED®

(Approved by AAI, AGMARK, APEDA, BIS, EIC, FSSAI, GAFTA, IOPEPC, MOEF & TEA BOARD)

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Email : test@mettexlab.com | Web : www.mettexlab.com

TEST REPORT

ISSUED TO: Tancem Cements Corporation Limited, Extent of 268.80 & 180.83 Ha (G.O-427 & 215)
II Floor, LLA Building, 735 Anna Salai,
Chennai – 600 002.

Test Certificate No : CML/23-24/17060 Test Certificate Date : 06.06.2023
Sample Description : Ambient Air Monitoring
Location of Sampling : AAQ9 - Near Project Area - 9°24'1.25"N 77°46'7.42"
Sampling Plan &Procedure: IS 5182 Part 14:2000 & CML/LAB/ENV/SOP/07
Sampling Instrument ID &Calibration Due Date: CML/ENV/RDS/26& 29.11.2023
Sampling Instrument ID &Calibration Due Date: CML/ENV/FDS/27& 29.11.2023

Ambient Air Monitoring Details		Particulate Pollutant			Gaseous Pollutant					Metals Pollutant			Organic Pollutant	
Parameters		SPM	$PM_{2.5}$	PM_{10}	SO_2	NO_2	NH_3	O_3	CO	Pb	Ni	As	C_6H_6	BaP
NAAQ Norms		200	60	100	80	80	400	180	4	1	20	6	5	1
Unit		µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	mg/m³	µg/m³	ng/m³	ng/m³	µg/m³	ng/m³
Date	Period.hrs	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
03.03.2023	7:00-7:00	62.3	23.2	42.3	6.2	23.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04.03.2023	7:15-7:15	61.2	21.2	43.1	5.3	24.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10.03.2023	7:00-7:00	63.0	24.3	44.2	6.0	25.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11.03.2023	7:15-7:15	64.2	22.5	45.2	5.4	23.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17.03.2023	7:00-7:00	65.3	23.6	42.3	6.3	24.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18.03.2023	7:15-7:15	66.2	21.2	45.6	7.2	25.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24.03.2023	7:00-7:00	62.3	24.2	45.3	8.0	24.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25.03.2023	7:15-7:15	63.1	23.5	44.2	8.1	25.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
31.03.2023	7:00-7:00	64.2	21.3	42.0	6.4	24.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01.04.2023	7:15-7:15	65.1	22.5	43.2	7.2	25.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07.04.2023	7:00-7:00	66.2	23.6	44.3	8.3	24.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.04.2023	7:15-7:15	63.1	24.2	45.2	6.2	25.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.04.2023	7:00-7:00	62.1	21.2	42.3	8.1	23.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.04.2023	7:15-7:15	63.0	23.6	44.5	6.4	24.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21.04.2023	7:00-7:00	61.4	24.1	41.2	8.0	25.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22.04.2023	7:15-7:15	65.3	22.3	42.0	6.3	24.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28.04.2023	7:00-7:00	66.2	24.5	43.5	7.0	25.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.04.2023	7:15-7:15	61.4	23.6	44.1	6.8	23.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
05.05.2023	7:00-7:00	63.2	22.1	45.6	8.2	24.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
06.05.2023	7:15-7:15	65.2	21.3	43.0	8.6	25.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
12.05.2023	7:00-7:00	64.3	23.5	44.5	5.1	24.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13.05.2023	7:15-7:15	66.1	24.1	42.3	6.9	25.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
19.05.2023	7:00-7:00	64.3	22.3	41.2	7.2	23.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20.05.2023	7:15-7:15	63.5	24.1	40.2	8.3	25.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
26.05.2023	7:00-7:00	62.5	21.3	43.5	8.2	23.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
27.05.2023	7:15-7:15	64.5	22.5	44.1	7.2	23.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Note:BDL: Below Detection Limit ;**DL**: Detection Limit ; **NH_3**: BDL (DL:20); **O_3**: BDL (DL:20); **CO**: BDL (DL:1.0); **Pb**: BDL (DL:0.1); **Ni**: BDL (DL:1.0); **As**: BDL (DL:1.0); **C_6H_6**: BDL (DL:1.0); **BaP**: BDL (DL:0.1)
Remarks: The values observed for the pollutants given above are within the CPCB standards.

End of Report

For Chennai Mettex Lab Private Limited

Reviewed & Authorized By
P. KAVITHA
Technical Manager
Authorised Signatory

CHENNAI METTEX LAB PRIVATE LIMITED®

(Approved by AAI, AGMARK, APEDA, BIS, EIC, FSSAI, GAFTA, IOPEPC, MOEF & TEA BOARD)

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Phone : +91 44 22323163, 22311034, 42179490, 42179491 | CIN: U74999TN2008PTC069459
Email : test@mettexlab.com | Web : www.mettexlab.com

TEST REPORT

ISSUED TO: Tancem Cements Corporation Limited, Extent of 268.80 & 180.83 Ha (G.O-427 & 215)
II Floor, LLA Building, 735 Anna Salai,
Chennai – 600 002.

Test Certificate No : CML/23-24/17061 Test Certificate Date : 06.06.2023
Sample Description : Ambient Air Monitoring
Location of Sampling : AAQ10- Paranayakkanpatti- 9°24'33.57"N 77°46'55.98"E
Sampling Plan &Procedure: IS 5182 Part 14:2000 & CML/LAB/ENV/SOP/07
Sampling Instrument ID &Calibration Due Date: CML/ENV/RDS/28& 29.11.2023
Sampling Instrument ID &Calibration Due Date: CML/ENV/FDS/29& 29.11.2023

Ambient Air Monitoring Details		Particulate Pollutant			Gaseous Pollutant					Metals Pollutant			Organic Pollutant	
Parameters		SPM	$PM_{2.5}$	PM_{10}	SO_2	NO_2	NH_3	O_3	CO	Pb	Ni	As	C_6H_6	BaP
NAAQ Norms		200	60	100	80	80	400	180	4	1	20	6	5	1
Unit		µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	mg/m³	µg/m³	ng/m³	ng/m³	µg/m³	ng/m³
Date	Period.hrs	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
03.03.2023	7:00-7:00	73.2	23.5	43.2	5.5	21.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04.03.2023	7:15-7:15	71.2	22.1	42.0	6.0	20.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10.03.2023	7:00-7:00	72.6	24.3	41.0	7.3	23.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11.03.2023	7:15-7:15	73.2	25.0	44.3	8.2	21.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17.03.2023	7:00-7:00	74.6	23.2	45.2	6.5	22.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18.03.2023	7:15-7:15	72.1	24.2	46.1	5.5	23.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24.03.2023	7:00-7:00	71.3	25.3	47.6	7.4	21.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25.03.2023	7:15-7:15	70.2	22.0	44.2	8.3	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
31.03.2023	7:00-7:00	69.2	25.3	46.2	7.1	23.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01.04.2023	7:15-7:15	66.3	23.1	47.3	8.2	20.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07.04.2023	7:00-7:00	67.3	24.2	44.0	5.3	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.04.2023	7:15-7:15	68.2	25.3	42.1	6.1	21.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.04.2023	7:00-7:00	69.3	22.0	43.6	7.4	23.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.04.2023	7:15-7:15	60.2	24.3	44.5	5.8	22.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21.04.2023	7:00-7:00	67.3	25.0	45.3	6.2	20.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22.04.2023	7:15-7:15	68.2	22.0	46.1	7.2	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28.04.2023	7:00-7:00	66.4	23.1	47.5	8.3	23.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.04.2023	7:15-7:15	65.2	24.5	45.3	5.5	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
05.05.2023	7:00-7:00	67.0	25.6	44.2	6.4	23.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
06.05.2023	7:15-7:15	66.4	24.1	41.0	7.3	22.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
12.05.2023	7:00-7:00	65.2	25.3	43.5	8.4	23.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13.05.2023	7:15-7:15	67.3	22.1	44.6	6.4	21.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
19.05.2023	7:00-7:00	68.2	24.0	45.2	7.3	22.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20.05.2023	7:15-7:15	69.2	25.3	46.1	8.3	23.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
26.05.2023	7:00-7:00	67.3	24.5	47.2	7.3	22.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
27.05.2023	7:15-7:15	69.3	23.2	45.3	5.6	23.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Note:BDL: Below Detection Limit ;**DL**: Detection Limit ; **NH_3**: BDL (DL:20); **O_3**: BDL (DL:20); **CO**: BDL (DL:1.0); **Pb**: BDL (DL:0.1); **Ni**: BDL (DL:1.0); **As**: BDL (DL:1.0); **C_6H_6**: BDL (DL:1.0); **BaP**: BDL (DL:0.1)
Remarks: The values observed for the pollutants given above are within the CPCB standards.

End of Report

For Chennai Mettex Lab Private Limited

Reviewed & Authorized By

P. KAVITHA
Technical Manager
Authorised Signatory

CHENNAI METTEX LAB PRIVATE LIMITED®

(Approved by AAI, AGMARK, APEDA, BIS, EIC, FSSAI, GAFTA, IOPEPC, MOEF & TEA BOARD)

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Phone : +91 44 22323163, 22311034, 42179490, 42179491 | CIN: U74999TN2008PTC069459
Email : test@mettexlab.com | Web : www.mettexlab.com

TEST REPORT

ISSUED TO: Tancem Cements Corporation Limited, Extent of 268.80 & 180.83 Ha (G.O-427 & 215)
II Floor, LLA Building, 735 Anna Salai,
Chennai – 600 002.

Test Certificate No : CML/23-24/17062 Test Certificate Date : 06.06.2023
Sample Description : Ambient Air Monitoring
Location of Sampling : AAQ11- Near Project Area - 9°26'28.49"N 77°49'21.64"E
Sampling Plan &Procedure: IS 5182 Part 14:2000 & CML/LAB/ENV/SOP/07
Sampling Instrument ID &Calibration Due Date: CML/ENV/RDS/30& 29.11.2023
Sampling Instrument ID &Calibration Due Date: CML/ENV/FDS/31& 29.11.2023

Ambient Air Monitoring Details		Particulate Pollutant			Gaseous Pollutant					Metals Pollutant			Organic Pollutant	
Parameters		SPM	$PM_{2.5}$	PM_{10}	SO_2	NO_2	NH_3	O_3	CO	Pb	Ni	As	C_6H_6	BaP
NAAQ Norms		200	60	100	80	80	400	180	4	1	20	6	5	1
Unit		µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	mg/m³	µg/m³	ng/m³	ng/m³	µg/m³	ng/m³
Date	Period.hrs	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
03.03.2023	7:00-7:00	67.3	23.2	43.2	6.2	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04.03.2023	7:15-7:15	68.3	21.0	42.1	7.3	21.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10.03.2023	7:00-7:00	67.1	24.2	44.5	8.2	23.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11.03.2023	7:15-7:15	67.3	25.3	45.6	7.4	24.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17.03.2023	7:00-7:00	68.2	22.0	46.7	5.5	22.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18.03.2023	7:15-7:15	68.3	21.3	47.2	5.3	23.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24.03.2023	7:00-7:00	68.3	23.0	45.0	6.0	21.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25.03.2023	7:15-7:15	67.5	24.1	46.3	7.2	22.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
31.03.2023	7:00-7:00	66.3	25.3	47.1	8.2	23.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01.04.2023	7:15-7:15	67.5	24.1	44.3	6.4	23.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07.04.2023	7:00-7:00	66.2	22.3	45.2	7.5	22.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.04.2023	7:15-7:15	65.1	23.5	46.0	8.8	21.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.04.2023	7:00-7:00	66.0	25.0	47.2	7.3	23.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.04.2023	7:15-7:15	67.3	22.1	45.6	8.2	21.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21.04.2023	7:00-7:00	67.1	23.4	46.2	5.6	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22.04.2023	7:15-7:15	66.2	24.5	45.5	8.3	23.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28.04.2023	7:00-7:00	65.3	25.6	43.6	5.4	21.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.04.2023	7:15-7:15	65.1	22.1	44.2	8.2	23.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
05.05.2023	7:00-7:00	67.3	23.5	42.5	6.3	22.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
06.05.2023	7:15-7:15	66.3	24.5	44.3	7.4	23.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
12.05.2023	7:00-7:00	66.2	25.6	45.6	6.0	20.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13.05.2023	7:15-7:15	67.0	23.2	46.2	7.5	21.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
19.05.2023	7:00-7:00	65.0	24.1	47.5	8.2	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20.05.2023	7:15-7:15	64.2	25.6	42.3	6.5	23.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
26.05.2023	7:00-7:00	65.3	23.1	44.5	7.4	24.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
27.05.2023	7:15-7:15	66.2	22.0	45.0	8.5	23.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Note:BDL: Below Detection Limit ;**DL**: Detection Limit ; **NH_3**: BDL (DL:20); **O_3**: BDL (DL:20); **CO**: BDL (DL:1.0); **Pb**: BDL (DL:0.1); **Ni**: BDL (DL:1.0); **As**: BDL (DL:1.0); **C_6H_6**: BDL (DL:1.0); **BaP**: BDL (DL:0.1)
Remarks: The values observed for the pollutants given above are within the CPCB standards.

End of Report

For Chennai Mettex Lab Private Limited

Reviewed & Authorized By
P. KAVITHA
Technical Manager
Authorised Signatory

CHENNAI METTEX LAB PRIVATE LIMITED®

(Approved by AAI, AGMARK, APEDA, BIS, EIC, FSSAI, GAFTA, IOPEPC, MOEF & TEA BOARD)

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Phone : +91 44 22323163, 22311034, 42179490, 42179491 | CIN: U74999TN2008PTC069459
Email : test@mettexlab.com | Web : www.mettexlab.com

TEST REPORT

ISSUED TO: Tancem Cements Corporation Limited, Extent of 268.80 & 180.83 Ha (G.O-427 & 215)
II Floor, LLA Building, 735 Anna Salai,
Chennai – 600 002.

Test Certificate No : CML/23-24/17063 Test Certificate Date : 06.06.2023
Sample Description : Ambient Air Monitoring
Location of Sampling : AAQ12- Narayanapuram- 9°26'59.11"N 77°50'12.11"E
Sampling Plan &Procedure: IS 5182 Part 14:2000 & CML/LAB/ENV/SOP/07
Sampling Instrument ID &Calibration Due Date: CML/ENV/RDS/32& 29.11.2023
Sampling Instrument ID &Calibration Due Date: CML/ENV/FDS/33& 29.11.2023

Ambient Air Monitoring Details		Particulate Pollutant			Gaseous Pollutant					Metals Pollutant			Organic Pollutant	
Parameters		SPM	$PM_{2.5}$	PM_{10}	SO_2	NO_2	NH_3	O_3	CO	Pb	Ni	As	C_6H_6	BaP
NAAQ Norms		200	60	100	80	80	400	180	4	1	20	6	5	1
Unit		µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	mg/m³	µg/m³	ng/m³	ng/m³	µg/m³	ng/m³
Date	Period.hrs	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
03.03.2023	7:00-7:00	65.2	24.0	44.2	5.2	22.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04.03.2023	7:15-7:15	64.3	23.1	45.3	5.5	21.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10.03.2023	7:00-7:00	63.0	25.5	46.2	6.2	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11.03.2023	7:15-7:15	62.1	22.0	47.2	5.2	23.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17.03.2023	7:00-7:00	61.0	21.3	48.3	6.3	22.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18.03.2023	7:15-7:15	62.3	24.3	46.2	6.0	23.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24.03.2023	7:00-7:00	64.5	25.6	47.3	5.1	21.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25.03.2023	7:15-7:15	63.0	22.1	45.2	6.2	22.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
31.03.2023	7:00-7:00	62.1	24.3	44.2	5.3	23.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01.04.2023	7:15-7:15	61.2	23.5	48.3	6.4	22.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07.04.2023	7:00-7:00	63.5	21.0	44.0	5.0	21.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.04.2023	7:15-7:15	62.5	22.5	45.2	5.2	23.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.04.2023	7:00-7:00	63.5	23.5	43.1	6.3	22.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.04.2023	7:15-7:15	64.5	24.1	46.2	5.4	24.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21.04.2023	7:00-7:00	63.0	25.3	47.3	6.0	23.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22.04.2023	7:15-7:15	62.1	24.0	48.2	5.2	21.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28.04.2023	7:00-7:00	64.2	23.5	46.3	6.3	22.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.04.2023	7:15-7:15	62.5	22.1	44.5	5.6	24.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
05.05.2023	7:00-7:00	61.3	25.3	42.3	6.3	23.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
06.05.2023	7:15-7:15	62.0	23.0	41.1	5.4	21.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
12.05.2023	7:00-7:00	63.4	24.5	43.1	6.2	22.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13.05.2023	7:15-7:15	65.0	25.3	44.5	5.3	23.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
19.05.2023	7:00-7:00	62.4	24.1	45.6	6.4	22.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20.05.2023	7:15-7:15	61.3	25.6	46.2	5.2	23.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
26.05.2023	7:00-7:00	62.4	25.0	47.2	6.8	21.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
27.05.2023	7:15-7:15	60.2	23.1	45.5	5.3	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Note:BDL: Below Detection Limit ;**DL**: Detection Limit ; **NH_3**: BDL (DL:20); **O_3**: BDL (DL:20); **CO**: BDL (DL:1.0); **Pb**: BDL (DL:0.1); **Ni**: BDL (DL:1.0); **As**: BDL (DL:1.0); **C_6H_6**: BDL (DL:1.0); **BaP**: BDL (DL:0.1)
Remarks: The values observed for the pollutants given above are within the CPCB standards.

End of Report

For Chennai Mettex Lab Private Limited

Reviewed & Authorized By
P. KAVITHA
Technical Manager
Authorised Signatory

CHENNAI METTEX LAB PRIVATE LIMITED®

(Approved by AAI, AGMARK, APEDA, BIS, EIC, FSSAI, GAFTA, IOPEPC, MOEF & TEA BOARD)

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Email : test@mettexlab.com | Web : www.mettexlab.com

TEST REPORT

ISSUED TO: Tancem Cements Corporation Limited, Extent of 268.80 & 180.83 Ha (G.O-427 & 215)
II Floor, LLA Building, 735 Anna Salai,
Chennai – 600 002.

Test Certificate No : CML/23-24/17064 Test Certificate Date : 06.06.2023
Sample Description : Ambient Air Monitoring
Location of Sampling : AAQ13- Vadamangalapuram - 9°30'22.24"N 77°50'31.00"E
Sampling Plan &Procedure: IS 5182 Part 14:2000 & CML/LAB/ENV/SOP/07
Sampling Instrument ID &Calibration Due Date: CML/ENV/RDS/34& 29.11.2023
Sampling Instrument ID &Calibration Due Date: CML/ENV/FDS/35& 29.11.2023

Ambient Air Monitoring Details		Particulate Pollutant			Gaseous Pollutant					Metals Pollutant			Organic Pollutant	
Parameters		SPM	$PM_{2.5}$	PM_{10}	SO_2	NO_2	NH_3	O_3	CO	Pb	Ni	As	C_6H_6	BaP
NAAQ Norms		200	60	100	80	80	400	180	4	1	20	6	5	1
Unit		µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	mg/m³	µg/m³	ng/m³	ng/m³	µg/m³	ng/m³
Date	Period.hrs	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
03.03.2023	7:00-7:00	63.5	23.1	49.5	6.2	26.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04.03.2023	7:15-7:15	62.1	22.1	48.3	6.3	25.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10.03.2023	7:00-7:00	64.3	24.5	47.2	7.0	25.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11.03.2023	7:15-7:15	65.1	25.5	48.2	6.5	26.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17.03.2023	7:00-7:00	66.0	26.3	48.1	6.3	26.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18.03.2023	7:15-7:15	64.3	24.0	49.5	7.2	26.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24.03.2023	7:00-7:00	63.2	25.1	47.3	7.3	25.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25.03.2023	7:15-7:15	61.0	26.3	47.2	6.5	25.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
31.03.2023	7:00-7:00	62.5	25.0	48.1	7.2	26.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01.04.2023	7:15-7:15	63.4	24.1	48.1	7.3	26.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07.04.2023	7:00-7:00	64.5	26.3	48.5	6.8	26.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.04.2023	7:15-7:15	65.3	25.5	47.2	7.2	25.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.04.2023	7:00-7:00	64.0	24.3	47.0	7.5	25.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.04.2023	7:15-7:15	63.2	23.0	49.3	6.3	25.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21.04.2023	7:00-7:00	62.0	22.1	47.5	7.4	27.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22.04.2023	7:15-7:15	61.0	24.0	47.2	6.3	27.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28.04.2023	7:00-7:00	65.0	25.0	48.6	7.4	27.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.04.2023	7:15-7:15	64.2	23.2	49.0	6.2	27.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
05.05.2023	7:00-7:00	63.5	24.1	48.5	7.2	27.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
06.05.2023	7:15-7:15	62.1	25.6	47.1	6.8	25.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
12.05.2023	7:00-7:00	60.2	24.1	48.5	7.1	26.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13.05.2023	7:15-7:15	64.2	22.3	47.0	6.3	26.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
19.05.2023	7:00-7:00	65.3	21.5	48.0	7.8	26.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20.05.2023	7:15-7:15	64.2	22.5	48.2	6.1	25.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
26.05.2023	7:00-7:00	63.1	23.5	47.0	7.0	25.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
27.05.2023	7:15-7:15	62.2	24.6	49.0	7.1	25.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Note:BDL: Below Detection Limit ;**DL**: Detection Limit ; **NH_3**: BDL (DL:20); **O_3**: BDL (DL:20); **CO**: BDL (DL:1.0); **Pb**: BDL (DL:0.1); **Ni**: BDL (DL:1.0); **As**: BDL (DL:1.0); **C_6H_6**: BDL (DL:1.0); **BaP**: BDL (DL:0.1)
Remarks: The values observed for the pollutants given above are within the CPCB standards.

End of Report

For Chennai Mettex Lab Private Limited

Reviewed & Authorized By
P. KAVITHA
Technical Manager
Authorised Signatory

CHENNAI METTEX LAB PRIVATE LIMITED®

(Approved by AAI, AGMARK, APEDA, BIS, EIC, FSSAI, GAFTA, IOPEPC, MOEF & TEA BOARD)

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Phone : +91 44 22323163, 22311034, 42179490, 42179491 | CIN: U74999TN2008PTC069459
Email : test@mettexlab.com | Web : www.mettexlab.com

TEST REPORT

ISSUED TO: Tancem Cements Corporation Limited, Extent of 268.80 & 180.83 Ha (G.O-427 & 215)
II Floor, LLA Building, 735 Anna Salai,
Chennai – 600 002.

Test Certificate No : CML/23-24/17065 Test Certificate Date : 06.06.2023
Sample Description : Ambient Air Monitoring
Location of Sampling : AAQ14- Kakkivadakkanpatti - 9°24'12.28"N 77°43'15.67"E
Sampling Plan &Procedure: IS 5182 Part 14:2000 & CML/LAB/ENV/SOP/07
Sampling Instrument ID &Calibration Due Date: CML/ENV/RDS/36& 29.11.2023
Sampling Instrument ID &Calibration Due Date: CML/ENV/FDS/37& 29.11.2023

Ambient Air Monitoring Details		Particulate Pollutant			Gaseous Pollutant					Metals Pollutant			Organic Pollutant	
Parameters		SPM	$PM_{2.5}$	PM_{10}	SO_2	NO_2	NH_3	O_3	CO	Pb	Ni	As	C_6H_6	BaP
NAAQ Norms		200	60	100	80	80	400	180	4	1	20	6	5	1
Unit		µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	mg/m³	µg/m³	ng/m³	ng/m³	µg/m³	ng/m³
Date	Period.hrs	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
03.03.2023	7:00-7:00	67.5	23.2	45.3	6.2	26.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04.03.2023	7:15-7:15	66.3	24.5	44.2	7.0	25.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10.03.2023	7:00-7:00	69.1	22.3	46.0	6.3	25.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11.03.2023	7:15-7:15	68.2	21.3	42.3	7.2	26.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17.03.2023	7:00-7:00	69.0	22.3	44.5	6.4	26.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18.03.2023	7:15-7:15	67.1	24.5	46.1	7.5	26.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24.03.2023	7:00-7:00	68.3	25.5	42.3	6.0	25.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25.03.2023	7:15-7:15	69.1	26.0	41.2	7.3	25.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
31.03.2023	7:00-7:00	69.3	23.4	42.0	6.2	25.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01.04.2023	7:15-7:15	69.0	24.5	43.5	7.4	25.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07.04.2023	7:00-7:00	68.1	22.1	44.6	7.2	25.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.04.2023	7:15-7:15	68.3	24.3	45.1	6.8	26.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.04.2023	7:00-7:00	67.0	25.5	46.3	6.4	26.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.04.2023	7:15-7:15	67.4	26.2	44.0	7.1	25.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21.04.2023	7:00-7:00	67.5	25.0	42.3	6.5	25.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22.04.2023	7:15-7:15	66.1	24.3	45.1	7.3	25.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28.04.2023	7:00-7:00	65.0	23.6	43.0	6.8	24.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.04.2023	7:15-7:15	65.5	22.5	44.6	7.4	24.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
05.05.2023	7:00-7:00	65.1	23.5	451	6.3	24.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
06.05.2023	7:15-7:15	66.1	24.5	46.2	7.4	24.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
12.05.2023	7:00-7:00	64.3	26.3	45.3	6.2	24.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13.05.2023	7:15-7:15	67.4	25.0	44.2	6.0	24.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
19.05.2023	7:00-7:00	67.2	24.3	45.3	7.3	25.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20.05.2023	7:15-7:15	68.3	25.0	46.1	6.4	25.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
26.05.2023	7:00-7:00	68.3	26.1	43.8	7.3	25.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
27.05.2023	7:15-7:15	66.5	25.4	44.0	6.4	26.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Note:BDL: Below Detection Limit ;**DL**: Detection Limit ; **NH_3**: BDL (DL:20); **O_3**: BDL (DL:20); **CO**: BDL (DL:1.0); **Pb**: BDL (DL:0.1); **Ni**: BDL (DL:1.0); **As**: BDL (DL:1.0); **C_6H_6**: BDL (DL:1.0); **BaP**: BDL (DL:0.1)
Remarks: The values observed for the pollutants given above are within the CPCB standards.

End of Report

For Chennai Mettex Lab Private Limited

Reviewed & Authorized By
P. KAVITHA
Technical Manager
Authorised Signatory

CHENNAI METTEX LAB PRIVATE LIMITED®

(Approved by AAI, AGMARK, APEDA, BIS, EIC, FSSAI, GAFTA, IOPEPC, MOEF & TEA BOARD)

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Phone : +91 44 22323163, 22311034, 42179490, 42179491 | CIN: U74999TN2008PTC069459
Email : test@mettexlab.com | Web : www.mettexlab.com

TEST REPORT

ISSUED TO: Tancem Cements Corporation Limited, Extent of 268.80 & 180.83 Ha (G.O-427 & 215)
II Floor, LLA Building, 735 Anna Salai,
Chennai – 600 002.

Test Certificate No : CML/23-24/17066 Test Certificate Date : 06.06.2023
Sample Description : Ambient Air Monitoring
Location of Sampling : AAQ15- Thayilpatti - 9°22'36.09"N 77°48'0.22"E
Sampling Plan &Procedure: IS 5182 Part 14:2000 & CML/LAB/ENV/SOP/07
Sampling Instrument ID &Calibration Due Date: CML/ENV/RDS/38& 29.11.2023
Sampling Instrument ID &Calibration Due Date: CML/ENV/FDS/39& 29.11.2023

Ambient Air Monitoring Details		Particulate Pollutant			Gaseous Pollutant					Metals Pollutant			Organic Pollutant	
Parameters		SPM	$PM_{2.5}$	PM_{10}	SO_2	NO_2	NH_3	O_3	CO	Pb	Ni	As	C_6H_6	BaP
NAAQ Norms		200	60	100	80	80	400	180	4	1	20	6	5	1
Unit		µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	mg/m³	µg/m³	ng/m³	ng/m³	µg/m³	ng/m³
Date	Period.hrs	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
03.03.2023	7:00-7:00	62.3	23.5	43.2	6.2	25.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04.03.2023	7:15-7:15	61.2	24.3	44.1	7.3	25.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10.03.2023	7:00-7:00	62.3	25.1	45.3	8.2	24.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11.03.2023	7:15-7:15	64.3	26.2	46.2	6.3	23.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17.03.2023	7:00-7:00	65.5	22.0	43.2	8.2	24.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18.03.2023	7:15-7:15	62.3	21.3	44.2	7.4	24.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24.03.2023	7:00-7:00	64.3	23.5	45.1	6.3	25.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25.03.2023	7:15-7:15	62.1	24.5	46.3	8.2	25.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
31.03.2023	7:00-7:00	63.0	25.6	43.1	7.3	23.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01.04.2023	7:15-7:15	64.0	26.2	44.0	6.5	24.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07.04.2023	7:00-7:00	65.2	24.0	45.2	7.3	24.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.04.2023	7:15-7:15	63.0	25.3	46.0	6.4	24.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.04.2023	7:00-7:00	62.1	26.7	45.1	7.3	23.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.04.2023	7:15-7:15	64.2	25.3	44.2	6.0	23.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21.04.2023	7:00-7:00	60.0	22.3	46.3	7.0	22.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22.04.2023	7:15-7:15	65.5	24.1	44.1	6.3	23.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28.04.2023	7:00-7:00	62.3	22.0	45.2	7.4	24.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.04.2023	7:15-7:15	63.1	23.4	46.3	6.5	23.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
05.05.2023	7:00-7:00	62.1	25.5	44.1	7.3	22.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
06.05.2023	7:15-7:15	63.0	26.2	46.2	6.1	24.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
12.05.2023	7:00-7:00	65.0	24.2	45.2	7.3	22.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13.05.2023	7:15-7:15	64.2	25.3	45.1	6.2	23.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
19.05.2023	7:00-7:00	63.2	26.1	46.3	7.3	22.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20.05.2023	7:15-7:15	62.1	25.3	44.1	6.3	23.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
26.05.2023	7:00-7:00	60.2	22.3	45.2	7.2	24.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
27.05.2023	7:15-7:15	62.3	23.5	46.3	6.5	23.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Note:BDL: Below Detection Limit ;**DL**: Detection Limit ; **NH_3**: BDL (DL:20); **O_3**: BDL (DL:20); **CO**: BDL (DL:1.0); **Pb**: BDL (DL:0.1); **Ni**: BDL (DL:1.0); **As**: BDL (DL:1.0); **C_6H_6**: BDL (DL:1.0); **BaP**: BDL (DL:0.1)
Remarks: The values observed for the pollutants given above are within the CPCB standards.

End of Report

For Chennai Mettex Lab Private Limited

Reviewed & Authorized By
P. KAVITHA
Technical Manager
Authorised Signatory

CHENNAI METTEX LAB PRIVATE LIMITED®

(Approved by AAI, AGMARK, APEDA, BIS, EIC, FSSAI, GAFTA, IOPEPC, MOEF & TEA BOARD)

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Email : test@mettexlab.com | Web : www.mettexlab.com

TEST REPORT

ISSUED TO: Tancem Cements Corporation Limited, Extent of 268.80 & 180.83 Ha (G.O-427 & 215)
II Floor, LLA Building, 735 Anna Salai,
Chennai – 600 002.

Test Certificate No : CML/23-24/17067 Test Certificate Date : 06.06.2023
Sample Description : Ambient Air Monitoring
Location of Sampling : AAQ16- Mamsapuram - 9°25'35.33"N 77°42'26.36"E
Sampling Plan &Procedure: IS 5182 Part 14:2000 & CML/LAB/ENV/SOP/07
Sampling Instrument ID &Calibration Due Date: CML/ENV/RDS/40& 29.11.2023
Sampling Instrument ID &Calibration Due Date: CML/ENV/FDS/41& 29.11.2023

Ambient Air Monitoring Details		Particulate Pollutant			Gaseous Pollutant					Metals Pollutant			Organic Pollutant	
Parameters		SPM	$PM_{2.5}$	PM_{10}	SO_2	NO_2	NH_3	O_3	CO	Pb	Ni	As	C_6H_6	BaP
NAAQ Norms		200	60	100	80	80	400	180	4	1	20	6	5	1
Unit		µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	mg/m³	µg/m³	ng/m³	ng/m³	µg/m³	ng/m³
Date	Period.hrs	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
03.03.2023	7:00-7:00	63.4	23.4	44.5	6.0	24.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04.03.2023	7:15-7:15	62.1	22.1	42.3	7.2	25.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10.03.2023	7:00-7:00	61.0	21.0	43.6	6.3	24.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11.03.2023	7:15-7:15	63.5	22.5	41.0	7.4	26.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17.03.2023	7:00-7:00	64.3	24.6	45.2	7.8	24.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18.03.2023	7:15-7:15	65.5	25.0	46.3	6.2	25.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24.03.2023	7:00-7:00	63.2	26.3	47.2	7.3	25.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25.03.2023	7:15-7:15	64.0	27.2	45.0	6.1	24.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
31.03.2023	7:00-7:00	65.2	28.5	46.3	7.5	23.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01.04.2023	7:15-7:15	66.0	29.0	47.1	6.4	24.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07.04.2023	7:00-7:00	67.2	26.2	45.2	7.0	23.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.04.2023	7:15-7:15	63.2	24.3	46.3	6.2	22.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.04.2023	7:00-7:00	64.5	27.5	44.5	7.3	24.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.04.2023	7:15-7:15	65.2	28.6	43.2	6.4	25.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21.04.2023	7:00-7:00	67.0	29.3	42.1	7.5	25.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22.04.2023	7:15-7:15	64.3	24.1	43.0	6.4	25.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28.04.2023	7:00-7:00	63.2	26.3	44.5	7.0	24.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.04.2023	7:15-7:15	65.2	27.5	45.6	6.5	25.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
05.05.2023	7:00-7:00	66.0	28.2	46.2	7.0	23.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
06.05.2023	7:15-7:15	67.2	29.0	47.3	6.3	24.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
12.05.2023	7:00-7:00	66.3	25.3	44.1	7.5	24.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13.05.2023	7:15-7:15	64.3	24.6	45.3	6.4	24.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
19.05.2023	7:00-7:00	65.2	26.5	46.2	7.2	24.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20.05.2023	7:15-7:15	66.3	27.3	47.1	6.3	24.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
26.05.2023	7:00-7:00	67.1	28.2	45.2	7.4	25.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
27.05.2023	7:15-7:15	68.2	29.0	46.3	6.2	25.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Note:BDL: Below Detection Limit ;**DL**: Detection Limit ; **NH_3**: BDL (DL:20); **O_3**: BDL (DL:20); **CO**: BDL (DL:1.0); **Pb**: BDL (DL:0.1); **Ni**: BDL (DL:1.0); **As**: BDL (DL:1.0); **C_6H_6**: BDL (DL:1.0); **BaP**: BDL (DL:0.1)
Remarks: The values observed for the pollutants given above are within the CPCB standards.

End of Report

For Chennai Mettex Lab Private Limited

Reviewed & Authorized By

P. KAVITHA
Technical Manager
Authorised Signatory

CHENNAI METTEX LAB PRIVATE LIMITED®

(Approved by AAI, AGMARK, APEDA, BIS, EIC, FSSAI, GAFTA, IOPEPC, MOEF & TEA BOARD)

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Phone : +91 44 22323163, 22311034, 42179490, 42179491 | CIN: U74999TN2008PTC069459
Email : test@mettexlab.com | Web : www.mettexlab.com

TEST REPORT

ISSUED TO: Tancem Cements Corporation Limited, Extent of 268.80 & 180.83 Ha (G.O-427 & 215)
II Floor, LLA Building, 735 Anna Salai,
Chennai – 600 002.

Test Certificate No : CML/23-24/17068 Test Certificate Date : 06.06.2023
Sample Description : Ambient Air Monitoring
Location of Sampling : AAQ17- Appayanaickenpatti - 9°17'29.67"N 77°40'27.33"E
Sampling Plan &Procedure: IS 5182 Part 14:2000 & CML/LAB/ENV/SOP/07
Sampling Instrument ID &Calibration Due Date: CML/ENV/RDS/42& 29.11.2023
Sampling Instrument ID &Calibration Due Date: CML/ENV/FDS/43& 29.11.2023

Ambient Air Monitoring Details		Particulate Pollutant			Gaseous Pollutant					Metals Pollutant			Organic Pollutant	
Parameters		SPM	$PM_{2.5}$	PM_{10}	SO_2	NO_2	NH_3	O_3	CO	Pb	Ni	As	C_6H_6	BaP
NAAQ Norms		200	60	100	80	80	400	180	4	1	20	6	5	1
Unit		µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	mg/m³	µg/m³	ng/m³	ng/m³	µg/m³	ng/m³
Date	Period.hrs	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
03.03.2023	7:00-7:00	65.9	23.8	48.2	7.6	24.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04.03.2023	7:15-7:15	66.7	24.6	47.6	7.4	24.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10.03.2023	7:00-7:00	62.9	25.7	45.7	7.5	25.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11.03.2023	7:15-7:15	62.4	23.6	45.5	6.8	25.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17.03.2023	7:00-7:00	63.5	23.1	42.8	7.2	23.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18.03.2023	7:15-7:15	63.6	24.7	44.9	7.1	24.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24.03.2023	7:00-7:00	62.4	25.9	46.5	8.2	24.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25.03.2023	7:15-7:15	63.8	23.9	44.4	8.8	24.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
31.03.2023	7:00-7:00	66.4	24.3	45.7	7.6	23.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01.04.2023	7:15-7:15	65.8	25.1	43.6	7.7	24.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07.04.2023	7:00-7:00	65.5	25.3	42.8	7.2	23.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.04.2023	7:15-7:15	64.9	24.7	45.4	7.1	22.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.04.2023	7:00-7:00	63.7	23.2	46.7	7.9	24.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.04.2023	7:15-7:15	64.8	25.8	46.9	6.6	24.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21.04.2023	7:00-7:00	62.8	23.6	45.7	6.4	24.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22.04.2023	7:15-7:15	63.5	24.9	45.9	6.2	25.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28.04.2023	7:00-7:00	64.7	22.8	42.7	6.3	25.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.04.2023	7:15-7:15	65.2	23.7	43.6	6.9	25.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
05.05.2023	7:00-7:00	65.9	21.6	43.5	6.6	25.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
06.05.2023	7:15-7:15	64.4	22.5	43.6	7.7	24.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
12.05.2023	7:00-7:00	63.2	23.6	42.5	6.6	25.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13.05.2023	7:15-7:15	65.8	25.4	44.6	7.1	23.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
19.05.2023	7:00-7:00	65.2	25.8	46.8	7.0	25.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20.05.2023	7:15-7:15	63.4	22.9	45.3	7.5	24.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
26.05.2023	7:00-7:00	64.2	15.2	44.2	6.2	23.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
27.05.2023	7:15-7:15	63.2	23.0	43.2	6.5	21.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Note:BDL: Below Detection Limit ;**DL**: Detection Limit ; **NH_3**: BDL (DL:20); **O_3**: BDL (DL:20); **CO**: BDL (DL:1.0); **Pb**: BDL (DL:0.1); **Ni**: BDL (DL:1.0); **As**: BDL (DL:1.0); **C_6H_6**: BDL (DL:1.0); **BaP**: BDL (DL:0.1)
Remarks: The values observed for the pollutants given above are within the CPCB standards.

End of Report

For Chennai Mettex Lab Private Limited

Reviewed & Authorized By

P. KAVITHA
Technical Manager
Authorised Signatory

CHENNAI METTEX LAB PRIVATE LIMITED®

(Approved by AAI, AGMARK, APEDA, BIS, EIC, FSSAI, GAFTA, IOPEPC, MOEF & TEA BOARD)

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TEST REPORT

ISSUED TO: Tancem Cements Corporation Limited, Extent of 268.80 & 180.83 Ha (G.O-427 & 215)
II Floor, LLA Building, 735 Anna Salai,
Chennai – 600 002.

Test Certificate No : CML/23-24/17069 Test Certificate Date : 06.06.2023
Sample Description : Ambient Air Monitoring
Location of Sampling : AAQ18- Sivalingapuram- 9°20'46.75"N 77°38'24.98"E
Sampling Plan &Procedure: IS 5182 Part 14:2000 & CML/LAB/ENV/SOP/07
Sampling Instrument ID &Calibration Due Date: CML/ENV/RDS/44& 29.11.2023
Sampling Instrument ID &Calibration Due Date: CML/ENV/FDS/45& 29.11.2023

Ambient Air Monitoring Details		Particulate Pollutant			Gaseous Pollutant					Metals Pollutant			Organic Pollutant	
Parameters		SPM	$PM_{2.5}$	PM_{10}	SO_2	NO_2	NH_3	O_3	CO	Pb	Ni	As	C_6H_6	BaP
NAAQ Norms		200	60	100	80	80	400	180	4	1	20	6	5	1
Unit		µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	mg/m³	µg/m³	ng/m³	ng/m³	µg/m³	ng/m³
Date	Period.hrs	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
03.03.2023	7:00-7:00	69.9	23.8	48.2	7.6	24.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
04.03.2023	7:15-7:15	69.7	24.6	47.6	7.4	24.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10.03.2023	7:00-7:00	69.9	25.7	45.7	7.5	25.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11.03.2023	7:15-7:15	68.4	23.6	45.5	6.8	25.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17.03.2023	7:00-7:00	68.5	23.1	42.8	7.2	23.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18.03.2023	7:15-7:15	68.6	24.7	44.9	7.1	24.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24.03.2023	7:00-7:00	67.4	25.9	46.5	8.2	24.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
25.03.2023	7:15-7:15	68.8	23.9	44.4	8.8	24.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
31.03.2023	7:00-7:00	68.4	24.3	45.7	7.6	23.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
01.04.2023	7:15-7:15	68.8	25.1	43.6	7.7	24.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07.04.2023	7:00-7:00	67.5	25.3	42.8	7.2	23.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
08.04.2023	7:15-7:15	68.9	24.7	45.4	7.1	22.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.04.2023	7:00-7:00	69.7	23.2	46.7	7.9	24.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15.04.2023	7:15-7:15	68.8	25.8	46.9	6.6	24.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21.04.2023	7:00-7:00	68.8	23.6	45.7	6.4	24.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22.04.2023	7:15-7:15	67.5	24.9	45.9	6.2	25.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28.04.2023	7:00-7:00	67.7	22.8	42.7	6.3	25.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
29.04.2023	7:15-7:15	67.2	23.7	43.6	6.9	25.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
05.05.2023	7:00-7:00	68.9	21.6	43.5	6.6	25.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
06.05.2023	7:15-7:15	68.4	22.5	43.6	7.7	24.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
12.05.2023	7:00-7:00	68.2	23.6	42.5	6.6	25.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13.05.2023	7:15-7:15	68.8	25.4	44.6	7.1	23.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
19.05.2023	7:00-7:00	68.2	25.8	46.8	7.0	25.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20.05.2023	7:15-7:15	68.4	22.9	46.7	7.5	24.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
26.05.2023	7:00-7:00	67.0	24.1	43.2	7.3	23.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
27.05.2023	7:15-7:15	68.5	25.3	42.1	7.2	24.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Note:BDL: Below Detection Limit ;**DL**: Detection Limit ; **NH_3**: BDL (DL:20); **O_3**: BDL (DL:20); **CO**: BDL (DL:1.0); **Pb**: BDL (DL:0.1); **Ni**: BDL (DL:1.0); **As**: BDL (DL:1.0); **C_6H_6**: BDL (DL:1.0); **BaP**: BDL (DL:0.1)
Remarks: The values observed for the pollutants given above are within the CPCB standards.

End of Report

For Chennai Mettex Lab Private Limited

Reviewed & Authorized By

P. KAVITHA
Technical Manager
Authorised Signatory

CHENNAI METTEX LAB PRIVATE LIMITED®

(Approved by AAI, AGMARK, APEDA, BIS, EIC, FSSAI, GAFTA, IOPEPC, MOEF & TEA BOARD)

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TEST REPORT

ISSUED TO: Tancem Cements Corporation Limited, Extent of 268.80 & 180.83 Ha (G.O-427 & 215)
II Floor, LLA Building, 735 Anna Salai,
Chennai – 600 002.

Test Certificate No : CML/23-24/17070 Test Certificate Date : 06.06.2023

Sample Description : Ambient Noise Monitoring
Location of Sampling : N1 – Core Zone- 9°26'40.55"N 77°49'31.33"E
Location of Sampling : N2 – Core Zone- 9°24'0.91"N 77°46'38.11"E
Sampling Plan & Procedure: IS 9989:1981 & CML/LAB/ENV/SOP/10
Sampling Instrument : CML/ENV/SLM/001 & CML/ENV/SLM/002

Sampling Date: 06.03.2023						
Location	N1 – **Core Zone**			N2 – **Core Zone**		
Parameter	Min	Max	Result	Min	Max	Result
Time	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
06:00-07:00	40.3	43.2	42.0	40.3	42.5	41.5
07:00-08:00	41.2	43.2	42.3	41.1	43.2	42.3
08:00-09:00	40.2	43.6	42.2	40.2	42.1	41.3
09:00-10:00	42.3	44.2	43.4	42.5	44.3	43.5
10:00-11:00	41.6	43.5	42.7	41.3	43.5	42.5
11:00-12:00	41.5	42.3	41.9	40.2	42.1	41.3
12:00-13:00	40.3	44.5	42.9	40.3	42.6	41.6
13:00-14:00	41.6	43.2	42.5	42.5	44.5	43.6
14:00-15:00	40.2	42.3	41.4	40.1	42.1	41.2
15:00-16:00	40.6	43.1	42.0	41.1	43.2	42.3
16:00-17:00	36.2	40.2	38.6	40.5	42.8	41.8
17:00-18:00	35.2	42.3	40.1	42.1	44.3	43.3
18:00-19:00	34.1	44.1	41.5	38.2	40.1	39.3
19:00-20:00	33.2	45.6	42.8	34.2	36.2	35.3
20:00-21:00	31.2	44.1	41.3	36.4	38.2	37.4
21:00-22:00	39.2	41.3	40.4	34.9	41.3	39.2
22:00-23:00	38.2	40.1	39.3	35.6	37.6	36.7
23:00-00:00	37.1	39.2	38.3	32.5	35.6	34.3
00:00-01:00	36.4	38.2	37.4	34.5	36.2	35.4
01:00-02:00	34.5	36.5	35.6	36.2	38.2	37.3
02:00-03:00	35.5	37.5	36.6	34.1	36.5	35.5
03:00-04:00	34.6	36.1	35.4	35.2	37.2	36.3
04:00-05:00	33.2	35.2	34.3	33.2	35.6	34.6
05:00-06:00	32.8	34.6	33.8	36.1	38.2	37.3
Result	Day Means		**41.6**	Day Means		**40.8**
	Night Means		**35.9**	Night Means		**35.8**

Note: CPCB Norms Industrial Area Day Time:75 dB(A); Night Time:70 dB(A)
The Noise level in the above location exists within the permissible limits of CPCB.

End of Report

For Chennai Mettex Lab Private Limited

Reviewed & Authorized By
P. KAVITHA
Technical Manager
Authorised Signatory

CHENNAI METTEX LAB PRIVATE LIMITED®

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TEST REPORT

ISSUED TO: Tancem Cements Corporation Limited, Extent of 268.80 & 180.83 Ha (G.O-427 & 215)
II Floor, LLA Building, 735 Anna Salai,
Chennai – 600 002.

Test Certificate No : CML/23-24/17071 Test Certificate Date : 06.06.2023

Sample Description : Ambient Noise Monitoring
Location of Sampling : N3 —Core Zone - 9°23'26.78"N 77°44'2.41"E
Location of Sampling : N4 – Core Zone - 9°22'30.36"N 77°41'36.60"E
Sampling Plan & Procedure: IS 9989:1981 & CML/LAB/ENV/SOP/10
Sampling Instrument ID : CML/ENV/SLM/003 & CML/ENV/SLM/004

Sampling Date : 06.03.2023						
Location	N3 – **Core Zone**			N4 – **Core Zone**		
Parameter	Min	Max	Result	Min	Max	Result
Time	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
06:00-07:00	40.2	42.3	41.4	35.1	39.5	**37.8**
07:00-08:00	41.3	43.2	42.4	35.4	40.2	**38.4**
08:00-09:00	40.3	42.3	41.4	35.6	41.6	**39.6**
09:00-10:00	40.5	43.2	42.1	35.1	41.2	**39.1**
10:00-11:00	41.2	43.2	42.3	34.9	43.4	**41.0**
11:00-12:00	42.1	45.6	44.2	36.2	45.7	**43.2**
12:00-13:00	44.2	46.3	45.4	34.1	48.2	**45.4**
13:00-14:00	41.3	43.2	42.4	32.9	49.3	**46.4**
14:00-15:00	39.2	41.3	40.4	38.4	49.7	**47.0**
15:00-16:00	38.2	40.2	39.3	34.6	47.9	**45.1**
16:00-17:00	36.2	38.6	37.6	32.9	40.8	**38.4**
17:00-18:00	34.1	36.2	35.3	34.1	43.4	**40.9**
18:00-19:00	35.2	37.2	36.3	33.6	41.6	**39.2**
19:00-20:00	30.2	32.6	31.6	32.8	40.8	**38.4**
20:00-21:00	33.2	35.6	34.6	34.1	43.4	**40.9**
21:00-22:00	36.2	38.2	37.3	36.9	45.5	**43.1**
22:00-23:00	36.2	36.2	36.2	32.7	41.9	**39.4**
23:00-00:00	34.1	34.1	34.1	34.2	43.6	**41.1**
00:00-01:00	35.2	37.2	36.3	32.6	40.8	**38.4**
01:00-02:00	36.2	38.6	37.6	31.3	35.5	**33.9**
02:00-03:00	34.1	36.5	35.5	32.8	36.9	**35.3**
03:00-04:00	33.2	35.5	34.5	34.1	37.3	**36.0**
04:00-05:00	31.2	34.2	33.0	35.5	37.1	**36.4**
05:00-06:00	30.2	36.6	34.5	33.9	38.5	**36.8**
Result	Day Means		**39.4**	Day Means		**41.4**
	Night Means		**35.1**	Night Means		**36.8**

Note: CPCB Norms Residential Area Day Time:55 dB(A); Night Time:45 dB(A)
The Noise level in the above location exists within the permissible limits of CPCB.

End of Report

For Chennai Mettex Lab Private Limited

Reviewed & Authorized By
P. KAVITHA
Technical Manager
Authorised Signatory

CHENNAI METTEX LAB PRIVATE LIMITED®

(Approved by AAI, AGMARK, APEDA, BIS, EIC, FSSAI, GAFTA, IOPEPC, MOEF & TEA BOARD)

Jothi Complex, 83, M.K.N. Road, Guindy, Chennai - 600 032, Tamil Nadu, INDIA
Phone : +91 44 22323163, 22311034, 42179490, 42179491 | CIN: U74999TN2008PTC069459
Email : test@mettexlab.com | Web : www.mettexlab.com

TEST REPORT

ISSUED TO: Tancem Cements Corporation Limited, Extent of 268.80 & 180.83 Ha (G.O-427 & 215)
II Floor, LLA Building, 735 Anna Salai,
Chennai – 600 002.

Test Certificate No : CML/23-24/17072 Test Certificate Date : 06.06.2023

Sample Description : Ambient Noise Monitoring
Location of Sampling : N5 – Core Zone- 9°21'37.85"N 77°40'28.68"
Location of Sampling : N6 – Sundankulam- 9°21'37.60"N 77°40'47.20"E
Sampling Plan & Procedure: IS 9989:1981 & CML/LAB/ENV/SOP/10
Sampling Instrument : CML/ENV/SLM/001 & CML/ENV/SLM/002

Sampling Date :20.03.2023						
Location	N5 – **Core Zone**			N6 – **Sundankulam**		
Parameter	Min	*Max*	*Result*	Min	Max	Result
Time	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
06:00-07:00	40.2	42.3	41.4	40.2	42.3	41.4
07:00-08:00	41.3	42.8	42.1	42.3	44.2	43.4
08:00-09:00	42.3	43.1	42.7	41.2	43.6	42.6
09:00-10:00	40.2	42.1	41.3	42.3	44.5	43.5
10:00-11:00	41.2	43.6	42.6	40.2	42.3	41.4
11:00-12:00	40.3	42.5	41.5	42.3	44.5	43.5
12:00-13:00	41.2	43.1	42.3	44.2	46.3	45.4
13:00-14:00	40.2	42.6	41.6	38.6	40.2	39.5
14:00-15:00	43.2	45.2	44.3	33.5	42.3	39.8
15:00-16:00	42.1	44.5	43.5	36.5	38.2	37.4
16:00-17:00	39.2	40.2	39.7	35.2	36.1	35.7
17:00-18:00	38.2	42.3	40.7	34.1	36.5	35.5
18:00-19:00	37.2	42.8	40.8	36.2	38.5	37.5
19:00-20:00	36.2	38.2	37.3	34.2	36.6	35.6
20:00-21:00	35.5	37.2	36.4	37.2	40.2	39.0
21:00-22:00	34.2	36.2	35.3	36.2	42.3	40.2
22:00-23:00	33.6	34.2	33.9	34.2	38.1	36.6
23:00-00:00	32.5	34.2	33.4	33.2	36.5	35.2
00:00-01:00	31.2	33.2	32.3	32.1	35.2	33.9
01:00-02:00	33.2	34.6	34.0	31.2	33.6	32.6
02:00-03:00	34.2	36.5	35.5	32.6	35.2	34.1
03:00-04:00	36.2	38.2	37.3	33.6	36.5	35.3
04:00-05:00	35.1	37.2	36.3	34.2	36.5	35.5
05:00-06:00	38.2	40.2	39.3	36.2	38.2	37.3
Result	Day Means		**40.4**	Day Means		**39.9**
	Night Means		**35.4**	Night Means		**34.8**

Note: CPCB Norms Residential Area Day Time:55 dB(A); Night Time:45 dB(A)
The Noise level in the above location exists within the permissible limits of CPCB.

End of Report

For Chennai Mettex Lab Private Limited

Reviewed & Authorized By

P. KAVITHA
Technical Manager
Authorised Signatory

CHENNAI METTEX LAB PRIVATE LIMITED®

(Approved by AAI, AGMARK, APEDA, BIS, EIC, FSSAI, GAFTA, IOPEPC, MOEF & TEA BOARD)

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Phone : +91 44 22323163, 22311034, 42179490, 42179491 | CIN: U74999TN2008PTC069459
Email : test@mettexlab.com | Web : www.mettexlab.com

TEST REPORT

ISSUED TO: Tancem Cements Corporation Limited, Extent of 268.80 & 180.83 Ha (G.O-427 & 215)
II Floor, LLA Building, 735 Anna Salai,
Chennai – 600 002.

Test Certificate No : CML/23-24/17073 Test Certificate Date : 06.06.2023

Sample Description : Ambient Noise Monitoring
Location of Sampling : N7 - Near Uppupatti- 9°23'9.50"N 77°43'0.75"E
: N8 – Near Ethirikottai Area- 9°22'41.19"N 77°43'36.73"E
Sampling Plan & Procedure: IS 9989:1981 & CML/LAB/ENV/SOP/10
Sampling Instrument ID : CML/ENV/SLM/003 & CML/ENV/SLM/004

Sampling Date :20.03.2023						
Location	N7 - **Uppupatti**			N8 – **Ethirikottai**		
Parameter	Min	*Max*	*Result*	Min	*Max*	*Result*
Time	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
06:00-07:00	31.2	39.9	**37.4**	34.5	43.2	**40.7**
07:00-08:00	33.7	41.5	**39.2**	33.7	40.4	**38.2**
08:00-09:00	34.5	42.8	**40.4**	32.8	41.8	**39.3**
09:00-10:00	35.5	44.5	**42.0**	33.9	38.1	**36.5**
10:00-11:00	36.1	45.1	**42.6**	34.7	40.6	**38.6**
11:00-12:00	38.2	43.3	**41.5**	34.1	40.2	**38.1**
12:00-13:00	38.3	41.7	**40.3**	32.8	38.5	**36.5**
13:00-14:00	36.7	42.4	**40.4**	34.7	43.2	**40.8**
14:00-15:00	32.7	45.9	**43.1**	32.6	40.6	**38.2**
15:00-16:00	31.5	40.5	**38.0**	31.3	38.9	**36.6**
16:00-17:00	32.5	41.7	**39.2**	32.6	41.2	**38.8**
17:00-18:00	36.5	44.3	**42.0**	33.5	42.7	**40.2**
18:00-19:00	34.2	43.7	**41.2**	34.4	43.2	**40.7**
19:00-20:00	33.8	41.4	**39.1**	32.9	40.6	**38.3**
20:00-21:00	31.2	39.5	**37.1**	33.6	41.4	**39.1**
21:00-22:00	32.8	40.6	**38.3**	31.5	38.6	**36.4**
22:00-23:00	33.9	41.4	**39.1**	32.5	40.1	**37.8**
23:00-00:00	31.4	38.5	**36.3**	31.7	38.2	**36.1**
00:00-01:00	32.8	40.1	**37.8**	32.3	39.3	**37.1**
01:00-02:00	33.5	36.2	**35.1**	33.9	38.4	**36.7**
02:00-03:00	35.7	39.5	**38.0**	31.5	35.5	**33.9**
03:00-04:00	36.1	39.2	**37.9**	32.4	36.3	**34.8**
04:00-05:00	35.2	38.1	**36.9**	34.1	35.8	**35.0**
05:00-06:00	34.6	36.9	**35.9**	32.6	33.6	**33.1**
Result	Day Means		**40.0**	Day Means		**38.5**
	Night Means		**36.8**	Night Means		**35.2**

Note: CPCB Norms Residential Area Day Time:55 dB(A); Night Time:45 dB(A)
The Noise level in the above location exists within the permissible limits of CPCB.

End of Report

For Chennai Mettex Lab Private Limited

Reviewed & Authorized By
P. KAVITHA
Technical Manager
Authorised Signatory

CHENNAI METTEX LAB PRIVATE LIMITED®

(Approved by AAI, AGMARK, APEDA, BIS, EIC, FSSAI, GAFTA, IOPEPC, MOEF & TEA BOARD)

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Phone : +91 44 22323163, 22311034, 42179490, 42179491 | CIN: U74999TN2008PTC069459
Email : test@mettexlab.com | Web : www.mettexlab.com

TEST REPORT

ISSUED TO: Tancem Cements Corporation Limited, Extent of 268.80 & 180.83 Ha (G.O-427 & 215)
II Floor, LLA Building, 735 Anna Salai,
Chennai – 600 002.

Test Certificate No : CML/23-24/17074 Test Certificate Date : 06.06.2023

Sample Description : Ambient Noise Monitoring
Location of Sampling : N9 - Near Project Area - 9°24'1.25"N 77°46'7.42"
: N10 – Paranayakkanpatti - 9°24'33.57"N 77°46'55.98"E
Sampling Plan & Procedure: IS 9989:1981 & CML/LAB/ENV/SOP/10
Sampling Instrument ID : CML/ENV/SLM/003 & CML/ENV/SLM/004

Sampling Date :25.04.2023						
Location	N9 - **Near Project Area**			N10 – **Paranayakkanpatti**		
Parameter	Min	*Max*	*Result*	Min	*Max*	*Result*
Time	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
06:00-07:00	32.6	38.8	**36.7**	38.1	42.1	40.5
07:00-08:00	34.9	37.6	**36.5**	36.2	40.1	38.6
08:00-09:00	32.6	34.5	**33.7**	35.2	42.3	40.1
09:00-10:00	33.6	36.8	**35.5**	36.5	40.2	38.7
10:00-11:00	32.8	40.2	**37.9**	40.2	42.1	41.3
11:00-12:00	31.2	41.5	**38.9**	42.3	44.3	43.4
12:00-13:00	36.4	43.5	**41.3**	44.1	46.1	45.2
13:00-14:00	33.9	41.4	**39.1**	45.3	47.3	46.4
14:00-15:00	32.7	43.9	**41.2**	38.2	40.3	39.4
15:00-16:00	36.5	42.2	**40.2**	36.1	38.2	37.3
16:00-17:00	32.3	40.9	**38.5**	33.2	36.2	35.0
17:00-18:00	34.2	43.2	**40.7**	34.2	36.5	35.5
18:00-19:00	34.7	44.9	**42.3**	38.6	40.2	39.5
19:00-20:00	31.6	40.7	**38.2**	32.1	36.2	34.6
20:00-21:00	32.8	40.3	**38.0**	31.6	35.2	33.8
21:00-22:00	33.6	41.4	**39.1**	38.3	36.1	37.3
22:00-23:00	32.5	40.3	**38.0**	36.2	38.2	37.3
23:00-00:00	36.4	45.2	**42.7**	34.1	36.1	35.2
00:00-01:00	33.6	35	**34.4**	35.6	38.2	37.1
01:00-02:00	34.9	35.8	**35.4**	33.2	36.1	34.9
02:00-03:00	31.5	34.2	**33.1**	31.2	33.4	32.4
03:00-04:00	32.3	35.5	**34.2**	30.2	36.2	34.2
04:00-05:00	31.7	34.8	**33.5**	35.2	38.1	36.9
05:00-06:00	32.2	34.5	**33.5**	36.1	40.2	38.6
Result	Day Means		**38.6**	Day Means		**39.0**
	Night Means		**35.2**	Night Means		**35.6**

Note: CPCB Norms Residential Area Day Time:55 dB(A); Night Time:45 dB(A)
The Noise level in the above location exists within the permissible limits of CPCB.

End of Report

For Chennai Mettex Lab Private Limited

Reviewed & Authorized By
P. KAVITHA
Technical Manager
Authorised Signatory

CHENNAI METTEX LAB PRIVATE LIMITED®

(Approved by AAI, AGMARK, APEDA, BIS, EIC, FSSAI, GAFTA, IOPEPC, MOEF & TEA BOARD)

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Phone : +91 44 22323163, 22311034, 42179490, 42179491 | CIN: U74999TN2008PTC069459
Email : test@mettexlab.com | Web : www.mettexlab.com

TEST REPORT

ISSUED TO: Tancem Cements Corporation Limited, Extent of 268.80 & 180.83 Ha (G.O-427 & 215)
II Floor, LLA Building, 735 Anna Salai,
Chennai – 600 002.

Test Certificate No : CML/23-24/17077 Test Certificate Date : 06.06.2023

Sample Description : Ambient Noise Monitoring
Location of Sampling : N15 - Thayilpatti- 9°22'36.09"N 77°48'0.22"E
: N16– Mamsapuram - 9°25'35.33"N 77°42'26.36"E
Sampling Plan & Procedure: IS 9989:1981 & CML/LAB/ENV/SOP/10
Sampling Instrument ID : CML/ENV/SLM/003 & CML/ENV/SLM/004

Sampling Date : 02.05.2023						
Location	N15 - **Thayilpatti**			N16 – **Mamsapuram**		
Parameter	Min	*Max*	*Result*	Min	*Max*	*Result*
Time	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
06:00-07:00	36.4	40.2	38.7	38.2	41.6	40.2
07:00-08:00	38.6	40.5	39.7	40.2	42.8	41.7
08:00-09:00	36.2	38.4	37.4	41.3	43.6	42.6
09:00-10:00	34.6	38.9	37.3	38.9	40.2	39.6
10:00-11:00	33.1	36.4	35.1	37.1	39.9	38.7
11:00-12:00	36.2	38.2	37.3	38.1	40.2	39.3
12:00-13:00	34.1	39.2	37.4	37.6	41.2	39.8
13:00-14:00	32.9	38.9	36.9	37.6	42.3	40.6
14:00-15:00	38.4	40.2	39.4	37.2	40.2	39.0
15:00-16:00	34.6	42.3	40.0	38.5	41.2	40.1
16:00-17:00	36.9	38.7	37.9	39.2	42.3	41.0
17:00-18:00	34.1	36.8	35.7	36.8	38.6	37.8
18:00-19:00	33.6	35.4	34.6	37.5	39.9	38.9
19:00-20:00	32.8	35.9	34.6	36.4	38.4	37.5
20:00-21:00	34.1	36.8	35.7	33.7	35.6	34.8
21:00-22:00	36.9	38.4	37.7	38.2	40.2	39.3
22:00-23:00	32.7	36.5	35.0	34.4	36.2	35.4
23:00-00:00	34.2	36.8	35.7	34.6	36.1	35.4
00:00-01:00	32.6	35.1	34.0	35.8	37.8	36.9
01:00-02:00	31.3	35.5	33.9	36.2	39.9	38.4
02:00-03:00	32.3	38.7	36.6	35.6	39.4	37.9
03:00-04:00	33.4	36.9	35.5	34.8	38.5	37.0
04:00-05:00	31.2	36.7	34.8	35.5	36.9	36.3
05:00-06:00	32.6	35.8	34.5	36.4	38.4	37.5
Result	Day Means		**37.1**	Day Means		**39.2**
	Night Means		**35.0**	Night Means		**37.1**

Note: CPCB Norms Residential Area Day Time:55 dB(A); Night Time:45 dB(A)
The Noise level in the above location exists within the permissible limits of CPCB.

End of Report

For Chennai Mettex Lab Private Limited

Reviewed & Authorized By

P. KAVITHA
Technical Manager
Authorised Signatory

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Email : test@mettexlab.com | Web : www.mettexlab.com

TEST REPORT

ISSUED TO: Tancem Cements Corporation Limited, Extent of 268.80 & 180.83 Ha (G.O-427 & 215)
II Floor, LLA Building, 735 Anna Salai,
Chennai – 600 002.

Test Certificate No : CML/23-24/17076 Test Certificate Date : 06.06.2023

Sample Description : Ambient Noise Monitoring
Location of Sampling : N13 - Vadamangalapuram- 9°30'22.24"N 77°50'31.00"E
: N14– Kakkivadakkanpatti - 9°24'12.28"N 77°43'15.67"E
Sampling Plan & Procedure: IS 9989:1981 & CML/LAB/ENV/SOP/10
Sampling Instrument ID : CML/ENV/SLM/001 & CML/ENV/SLM/002

Sampling Date : 02.05.2023						
Location	N13 - **Vadamangalapuram**			N14 – **Kakkivadakkanpatti**		
Parameter	Min	*Max*	*Result*	Min	*Max*	*Result*
Time	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
06:00-07:00	35.5	38.6	37.3	35.6	38.1	37.0
07:00-08:00	38.9	42.8	41.3	36.2	40.7	39.0
08:00-09:00	39.6	41.3	40.5	34.1	41.4	39.1
09:00-10:00	38.9	42.1	40.8	33.5	39.5	37.5
10:00-11:00	38.5	41.2	40.1	36.5	40.2	38.7
11:00-12:00	38.1	42.3	40.7	38.2	41.4	40.1
12:00-13:00	37.6	41.6	40.0	35.6	43.6	41.2
13:00-14:00	37.6	39.5	38.7	34.3	38.4	36.8
14:00-15:00	37.2	40.2	39.0	33.9	41.7	39.4
15:00-16:00	38.5	42.3	40.8	32.5	40.9	38.5
16:00-17:00	39.2	42.6	41.2	34.8	43.6	41.1
17:00-18:00	41.6	43.6	42.7	32.6	40.4	38.1
18:00-19:00	41.8	44.5	43.4	35.1	38.6	37.2
19:00-20:00	42.5	45.6	44.3	36.1	39.2	37.9
20:00-21:00	33.7	36.5	35.3	34.2	36.4	35.4
21:00-22:00	32.1	35.2	33.9	36.5	38.6	37.7
22:00-23:00	31.2	36.2	34.4	33.8	35.4	34.7
23:00-00:00	34.6	36.1	35.4	33.9	36.5	35.4
00:00-01:00	31.2	37.8	35.6	31.5	35.2	33.7
01:00-02:00	32.2	38.6	36.5	32.9	36.4	35.0
02:00-03:00	33.1	39.4	37.3	33.4	36.8	35.4
03:00-04:00	30.2	34.2	32.6	31.7	35.4	33.9
04:00-05:00	32.1	35.6	34.2	32.6	36.5	35.0
05:00-06:00	31.2	36.4	34.5	31.3	38.6	36.3
Result	Day Means		**39.7**	Day Means		**38.2**
	Night Means		**35.2**	Night Means		**35.0**

Note: CPCB Norms Residential Area Day Time:55 dB(A); Night Time:45 dB(A)
The Noise level in the above location exists within the permissible limits of CPCB.

End of Report

For Chennai Mettex Lab Private Limited

Reviewed & Authorized By
P. KAVITHA
Technical Manager
Authorised Signatory

CHENNAI METTEX LAB PRIVATE LIMITED®

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Email : test@mettexlab.com | Web : www.mettexlab.com

TEST REPORT

ISSUED TO: Tancem Cements Corporation Limited, Extent of 268.80 & 180.83 Ha (G.O-427 & 215)
II Floor, LLA Building, 735 Anna Salai,
Chennai – 600 002.

Test Certificate No : CML/23-24/17075 Test Certificate Date : 06.06.2023

Sample Description : Ambient Noise Monitoring
Location of Sampling : N11 - Near Project Area - 9°26'28.49"N 77°49'21.64"E
: N12– Near Project Narayanapuram Area - 9°26'59.11"N 77°50'12.11"E
Sampling Plan & Procedure: IS 9989:1981 & CML/LAB/ENV/SOP/10
Sampling Instrument ID : CML/ENV/SLM/001 & CML/ENV/SLM/002

Sampling Date :25.04.2023						
Location	N11 - **Near Project area**			N12 – **Narayanapuram**		
Parameter	Min	*Max*	*Result*	Min	*Max*	*Result*
Time	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
06:00-07:00	36.2	38.1	36.2	37.5	39.2	38.4
07:00-08:00	35.1	40.7	35.1	36.2	38.1	37.3
08:00-09:00	36.1	41.4	36.1	35.1	37.6	36.5
09:00-10:00	33.1	39.5	33.1	38.2	40.2	39.3
10:00-11:00	35.2	40.2	35.2	40.2	42.3	41.4
11:00-12:00	36.1	41.4	36.1	44.3	41.2	43.0
12:00-13:00	38.2	43.6	38.2	45.2	43.1	44.3
13:00-14:00	31.8	38.4	31.8	46.2	44.1	45.3
14:00-15:00	33.9	41.7	33.9	39.1	40.3	39.7
15:00-16:00	32.5	40.9	32.5	38.2	41.2	40.0
16:00-17:00	34.8	43.6	34.8	37.2	45.3	42.9
17:00-18:00	32.6	40.4	32.6	36.1	38.2	37.3
18:00-19:00	35.1	43.1	35.1	35.2	37.1	36.3
19:00-20:00	36.1	40.2	36.1	34.2	36.1	35.3
20:00-21:00	34.2	43.6	34.2	33.2	35.2	34.3
21:00-22:00	36.5	47.1	36.5	32.1	34.1	33.2
22:00-23:00	33.8	41.2	33.8	31.2	38.1	35.9
23:00-00:00	33.9	42.1	33.9	33.5	37.2	35.7
00:00-01:00	31.5	39.4	31.5	32.5	35.2	34.1
01:00-02:00	32.9	40.2	32.9	30.6	36.5	34.5
02:00-03:00	33.4	41.7	33.4	32.1	34.6	33.5
03:00-04:00	31.7	38.5	31.7	31.2	36.8	34.8
04:00-05:00	32.6	40.8	32.6	33.2	35.4	34.4
05:00-06:00	31.3	38.6	31.3	32.5	36.5	34.9
Result	Day Means		**39.4**	Day Means		**38.8**
	Night Means		**37.9**	Night Means		**34.6**

Note: CPCB Norms Residential Area Day Time:55 dB(A); Night Time:45 dB(A)
The Noise level in the above location exists within the permissible limits of CPCB.

End of Report

For Chennai Mettex Lab Private Limited

Reviewed & Authorized By

Technical Manager
Authorised Signatory

CHENNAI METTEX LAB PRIVATE LIMITED®

(Approved by AAI, AGMARK, APEDA, BIS, EIC, FSSAI, GAFTA, IOPEPC, MOEF & TEA BOARD)

Jothi Complex, 83, M.K.N. Road, Guindy, Chennai - 600 032, Tamil Nadu, INDIA
Phone : +91 44 22323163, 22311034, 42179490, 42179491 | CIN: U74999TN2008PTC069459
Email : test@mettexlab.com | Web : www.mettexlab.com

TEST REPORT

ISSUED TO: Tancem Cements Corporation Limited, Extent of 268.80 & 180.83 Ha (G.O-427 & 215)
II Floor, LLA Building, 735 Anna Salai,
Chennai – 600 002.

Test Certificate No : CML/23-24/17078 Test Certificate Date : 06.06.2023

Sample Description : Ambient Noise Monitoring
Location of Sampling : N17 - Appayanaickenpatti- 9°17'29.67"N 77°40'27.33"E
: N18 – Sivalingapuram - 9°20'46.75"N 77°38'24.98"E
Sampling Plan & Procedure: IS 9989:1981 & CML/LAB/ENV/SOP/10
Sampling Instrument ID : CML/ENV/SLM/003 & CML/ENV/SLM/004

Sampling Date : 09.05.2023						
Location	N17 - **Appayanaickenpatti**			N18 –**Sivalingapuram**		
Parameter	Min	*Max*	*Result*	Min	*Max*	*Result*
Time	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
06:00-07:00	33.3	38.1	36.3	40.2	42.3	41.4
07:00-08:00	31.2	40.7	38.2	38.2	40.2	39.3
08:00-09:00	33.9	41.4	39.1	36.1	38.2	37.3
09:00-10:00	31.4	39.5	37.1	35.2	38.6	37.2
10:00-11:00	32.5	40.2	37.9	34.1	36.4	35.4
11:00-12:00	33.8	41.4	39.1	33.6	36.4	35.2
12:00-13:00	35.6	43.6	41.2	36.8	42.1	40.2
13:00-14:00	31.8	38.4	36.2	38.6	40.2	39.5
14:00-15:00	33.9	41.7	39.4	36.5	42.3	40.3
15:00-16:00	32.5	40.9	38.5	39.2	42.1	40.9
16:00-17:00	34.8	43.6	41.1	40.1	43.1	41.9
17:00-18:00	32.6	40.4	38.1	36.2	38.6	37.6
18:00-19:00	35.1	43.1	40.7	37.2	39.1	38.3
19:00-20:00	36.1	40.2	38.6	35.2	37.1	36.3
20:00-21:00	34.2	43.6	41.1	34.1	36.4	35.4
21:00-22:00	36.5	38.6	37.7	33.6	35.1	34.4
22:00-23:00	33.8	36.5	35.4	32.1	36.4	34.8
23:00-00:00	33.9	37.6	36.1	30.2	35.2	33.4
00:00-01:00	31.5	36.6	34.8	31.2	38.2	36.0
01:00-02:00	32.9	35.2	34.2	33.2	38.6	36.7
02:00-03:00	33.4	36.2	35.0	34.1	36.2	35.3
03:00-04:00	36.2	38.5	37.5	35.5	39.2	37.7
04:00-05:00	35.5	36.1	35.8	34.1	36.5	35.5
05:00-06:00	34.2	36.2	35.3	33.2	34.2	33.7
Result	Day Means		**38.6**	Day Means		**38.0**
	Night Means		**35.5**	Night Means		**35.5**

Note: CPCB Norms Residential Area Day Time:55 dB(A); Night Time:45 dB(A)
The Noise level in the above location exists within the permissible limits of CPCB.

End of Report

For Chennai Mettex Lab Private Limited

Reviewed & Authorized By

P. KAVITHA
Technical Manager
Authorised Signatory

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CHENNAI METTEX LAB PRIVATE LIMITED®

Jothi Complex, 83, M.K.N. Road, Guindy, Chennai - 600 032.

(Approved/Recognized by APEDA, AGMARK, GAFTA, EIC, FSSAI, BIS & MoEF)

TEST REPORT

ISSUED TO : Tancem Cements Corporation Limited, Extent of 268.80 & 180.83 Ha (G.O-427 & 215)
II Floor, LLA Building, 735 Anna Salai,
Chennai – 600 002.

Cust. Ref : SRF Dated: 22.05.2023.

Lab No : 24016230

Sample Description : **Surface Water (SW-1) - Periyakulam**
(as stated by customer)

T.C Date : 06.06.2023

T.C No : CML/23-24/17079

Date Of Receipt : 23.05.2023

Analysis Commenced On: 23.05.2023

Analysis Completed On : 03.06.2023

TEST	PROTOCOL	RESULTS
Discipline: Chemical	**Group:** Water	
Colour	IS 3025 Part 4:1983 (Reaff:2017)	7 Hazen
Odour	IS 3025 Part 5:2018	Agreeable
pH at 25°C	IS 3025 Part 11:1983 (Reaff:2017)	7.72
Conductivity @ 25°C	IS 3025 Part 14:2013 (Reaff:2019)	723 µmhos/cm
Turbidity	IS 3025 Part 10:1984 (Reaff:2017)	5.9 NTU
Total Dissolved Solids	IS 3025 Part 16:1984 (Reaff:2017)	426 mg/l
Total Hardness as $CaCO_3$	IS 3025 Part 21:2009 (Reaff:2019)	168 mg/l
Calcium as Ca	IS 3025 Part 40:1991 (Reaff:2019)	46.5 mg/l
Magnesium as Mg	IS 3025 Part 46:1994 (Reaff:2019)	12.6 mg/l
Total Alkalinity as $CaCO_3$	IS 3025 Part 23:1986 (Reaff:2019)	152 mg/l
Chloride as Cl	IS 3025 Part 32:1988 (Reaff:2019)	72.5 mg/l
Sulphate as SO_4	IS 3025 Part 24:1986 (Reaff:2019)	32.1 mg/l
Iron as Fe	IS 3025 Part 53:2003 (Reaff:2019)	0.23 mg/l
Residual Free Chlorine	IS 3025 Part 26:1986 (Reaff:2019)	BDL (DL:0.1 mg/l)
Fluoride as F	APHA 23rd Edn. 2017:4500 F,D	0.13 mg/l
Nitrate as NO_3	IS 3025 Part 34:1988 (Reaff:2019)	5.8 mg/l
Copper as Cu	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.01 mg/l)
Manganese as Mn	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.02 mg/l)
Mercury as Hg	USEPA 200.8	BDL (DL:0.0005 mg/l)
Cadmium as Cd	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.001 mg/l)
Selenium as Se	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.005 mg/l)

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CHENNAI METTEX LAB PRIVATE LIMITED®

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(Approved/Recognized by APEDA, AGMARK, GAFTA, EIC, FSSAI, BIS & MoEF)

Lab No: 24016230 T.C No: CML/23-24/17079 Dated : 06.06.2023

TEST	PROTOCOL	RESULTS
Aluminium as Al	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.005 mg/l)
Lead as Pb	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.005 mg/l)
Zinc as Zn	IS 3025 Part 65:2014 (Reaff:2019)	BDL(DL : 0.05 mg/l)
Total Chromium as Cr	IS 3025 Part 65:2014 (Reaff:2019)	BDL(DL : 0.02 mg/l)
Boron as B	IS 3025 Part 65:2014 (Reaff:2019)	BDL(DL : 0.05 mg/l)
Mineral Oil	IS 3025 Part 39-1991 (Reaff. 2019)	BDL(DL : 0.01 mg/l)
Phenolic compounds as C_6H_5OH	IS 3025 Part 43-1992(Reaff. 2019)	BDL (DL:0.0005 mg/l)
Anionic Detergents (as MBAS)	IS 13428 – 2005 (Reaff:2019) (Annex K)	BDL (DL:0.01 mg/l)
Cyanide as CN	IS 3025 Part 27-1986 (Reaff. 2019)	BDL (DL:0.01 mg/l)
BOD @ 27°C for 3 days	IS 3025 Part 44:1993 (Reaff:2019)	7.5 mg/l
Chemical Oxygen Demand	IS 3025 Part 58:2006 (Reaff:2017)	24 mg/l
Dissolved Oxygen	IS 3025 Part 38:1989 (Reaff:2019)	5.8 mg/l
Barium as Ba	IS 3025 Part 65:2014 (Reaff:2019)	BDL(DL:0.05 mg/l)
Ammonia (as total ammonia-N)	IS 3025 Part 34-1988 (Reaff. 2019)	3.2 mg/l
Sulphide as H_2S	IS 3025 Part 29-1986 (Reaff. 2019)	BDL (DL:0.01 mg/l)
Molybdenum as Mo	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.02 mg/l)
Total Arsenic as As	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.005 mg/l)
Total Suspended Solids	IS 3025 Part 17 -1984 (Reaff:2017)	8.6 mg/l
Discipline: Biological	**Group:** Water	
Total Coliform	APHA 23rd Edn. 2017:9221B	920 MPN/100ml
Escherichia coli	APHA 23rd Edn. 2017:9221F	140 MPN/100ml
Note : APHA – American Public Health Association, BDL – Below Detection Limit, DL – Detection Limit, MPN – Most Probable Number.		

End of Report

For Chennai Mettex Lab Private Limited

Reviewed & Authorized By

B. ARUNAN
Technical Manager
Authorised Signatory

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P. KAVITHA
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CHENNAI METTEX LAB PRIVATE LIMITED®

Jothi Complex, 83, M.K.N. Road, Guindy, Chennai - 600 032.

(Approved/Recognized by APEDA, AGMARK, GAFTA, EIC, FSSAI, BIS & MoEF)

TEST REPORT

ISSUED TO : Tancem Cements Corporation Limited, Extent of 268.80 & 180.83 Ha (G.O-427 & 215)
II Floor, LLA Building, 735 Anna Salai,
Chennai – 600 002.

Cust. Ref : SRF Dated: 22.05.2023.

Lab No : 24016231

Sample Description : **Surface Water (SW-2) – Vaippar River.**
(as stated by customer)

T.C Date : 06.06.2023

T.C No : CML/23-24/17080

Date Of Receipt : 23.05.2023

Analysis Commenced On: 23.05.2023

Analysis Completed On : 03.06.2023

TEST	PROTOCOL	RESULTS
Discipline: Chemical	**Group:** Water	
Colour	IS 3025 Part 4:1983 (Reaff:2017)	8 Hazen
Odour	IS 3025 Part 5:2018	Agreeable
pH at 25°C	IS 3025 Part 11:1983 (Reaff:2017)	7.91
Conductivity @ 25°C	IS 3025 Part 14:2013 (Reaff:2019)	725 µmhos/cm
Turbidity	IS 3025 Part 10:1984 (Reaff:2017)	6.4 NTU
Total Dissolved Solids	IS 3025 Part 16:1984 (Reaff:2017)	497 mg/l
Total Hardness as $CaCO_3$	IS 3025 Part 21:2009 (Reaff:2019)	180 mg/l
Calcium as Ca	IS 3025 Part 40:1991 (Reaff:2019)	49.7 mg/l
Magnesium as Mg	IS 3025 Part 46:1994 (Reaff:2019)	13.6 mg/l
Total Alkalinity as $CaCO_3$	IS 3025 Part 23:1986 (Reaff:2019)	169 mg/l
Chloride as Cl	IS 3025 Part 32:1988 (Reaff:2019)	88.9 mg/l
Sulphate as SO_4	IS 3025 Part 24:1986 (Reaff:2019)	51.3 mg/l
Iron as Fe	IS 3025 Part 53:2003 (Reaff:2019)	0.25 mg/l
Residual Free Chlorine	IS 3025 Part 26:1986 (Reaff:2019)	BDL (DL:0.1 mg/l)
Fluoride as F	APHA 23rd Edn. 2017:4500 F,D	0.15 mg/l
Nitrate as NO_3	IS 3025 Part 34:1988 (Reaff:2019)	6.3 mg/l
Copper as Cu	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.01 mg/l)
Manganese as Mn	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.02 mg/l)
Mercury as Hg	USEPA 200.8	BDL (DL:0.0005 mg/l)
Cadmium as Cd	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.001 mg/l)
Selenium as Se	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.005 mg/l)

...Contd....2

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CHENNAI METTEX LAB PRIVATE LIMITED®

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(Approved/Recognized by APEDA, AGMARK, GAFTA, EIC, FSSAI, BIS & MoEF)

Lab No: 24016231 T.C No: CML/23-24/17080 **Dated : 06.06.2023**

TEST	PROTOCOL	RESULTS
Aluminium as Al	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.005 mg/l)
Lead as Pb	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.005 mg/l)
Zinc as Zn	IS 3025 Part 65:2014 (Reaff:2019)	BDL(DL : 0.05 mg/l)
Total Chromium as Cr	IS 3025 Part 65:2014 (Reaff:2019)	BDL(DL : 0.02 mg/l)
Boron as B	IS 3025 Part 65:2014 (Reaff:2019)	BDL(DL : 0.05 mg/l)
Mineral Oil	IS 3025 Part 39-1991 (Reaff. 2019)	BDL(DL : 0.01 mg/l)
Phenolic compounds as C_6H_5OH	IS 3025 Part 43-1992(Reaff: 2019)	BDL (DL:0.0005 mg/l)
Anionic Detergents (as MBAS)	IS 13428 – 2005 (Reaff:2019) (Annex K)	BDL (DL:0.01 mg/l)
Cyanide as CN	IS 3025 Part 27-1986 (Reaff. 2019)	BDL (DL:0.01 mg/l)
BOD @ 27°C for 3 days	IS 3025 Part 44:1993 (Reaff:2019)	9.6 mg/l
Chemical Oxygen Demand	IS 3025 Part 58:2006 (Reaff:2017)	28 mg/l
Dissolved Oxygen	IS 3025 Part 38:1989 (Reaff:2019)	5.2 mg/l
Barium as Ba	IS 3025 Part 65:2014 (Reaff:2019)	BDL(DL:0.05 mg/l)
Ammonia (as total ammonia-N)	IS 3025 Part 34-1988 (Reaff. 2019)	3.7 mg/l
Sulphide as H_2S	IS 3025 Part 29-1986 (Reaff. 2019)	BDL (DL:0.01 mg/l)
Molybdenum as Mo	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.02 mg/l)
Total Arsenic as As	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.005 mg/l)
Total Suspended Solids	IS 3025 Part 17 -1984 (Reaff:2017)	9.2 mg/l
Discipline: Biological	**Group:** Water	
Total Coliform	APHA 23rd Edn. 2017:9221B	940 MPN/100ml
Escherichia coli	APHA 23rd Edn. 2017:9221F	120 MPN/100ml
Note : APHA – American Public Health Association, BDL – Below Detection Limit, DL – Detection Limit, MPN – Most Probable Number.		

End of Report

For Chennai Mettex Lab Private Limited

Reviewed & Authorized By

B. ARUNAN
Technical Manager
Authorised Signatory

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P. KAVITHA
Technical Manager
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CHENNAI METTEX LAB PRIVATE LIMITED®

Jothi Complex, 83, M.K.N. Road, Guindy, Chennai - 600 032.

(Approved/Recognized by APEDA, AGMARK, GAFTA, EIC, FSSAI, BIS & MoEF)

TEST REPORT

ISSUED TO : Tancem Cements Corporation Limited, Extent of 268.80 & 180.83 Ha (G.O-427 & 215)
II Floor, LLA Building, 735 Anna Salai,
Chennai – 600 002.

Cust. Ref : SRF Dated: 22.05.2023.

Lab No : 24016232

Sample Description (as stated by customer) : **Surface Water (SW-3) - Vadamangalapuram River**

T.C Date : 06.06.2023

T.C No : CML/23-24/17081

Date Of Receipt : 23.05.2023

Analysis Commenced On: 23.05.2023

Analysis Completed On : 03.06.2023

TEST	PROTOCOL	RESULTS
Discipline: Chemical	**Group:** Water	
Colour	IS 3025 Part 4:1983 (Reaff:2017)	10 Hazen
Odour	IS 3025 Part 5:2018	Agreeable
pH at 25°C	IS 3025 Part 11:1983 (Reaff:2017)	7.86
Conductivity @ 25°C	IS 3025 Part 14:2013 (Reaff:2019)	855 µmhos/cm
Turbidity	IS 3025 Part 10:1984 (Reaff:2017)	6.9 NTU
Total Dissolved Solids	IS 3025 Part 16:1984 (Reaff:2017)	504 mg/l
Total Hardness as $CaCO_3$	IS 3025 Part 21:2009 (Reaff:2019)	184 mg/l
Calcium as Ca	IS 3025 Part 40:1991 (Reaff:2019)	43.2 mg/l
Magnesium as Mg	IS 3025 Part 46:1994 (Reaff:2019)	25.8 mg/l
Total Alkalinity as $CaCO_3$	IS 3025 Part 23:1986 (Reaff:2019)	173 mg/l
Chloride as Cl	IS 3025 Part 32:1988 (Reaff:2019)	93.4 mg/l
Sulphate as SO_4	IS 3025 Part 24:1986 (Reaff:2019)	56.5 mg/l
Iron as Fe	IS 3025 Part 53:2003 (Reaff:2019)	0.28 mg/l
Residual Free Chlorine	IS 3025 Part 26:1986 (Reaff:2019)	BDL (DL:0.1 mg/l)
Fluoride as F	APHA 23rd Edn. 2017:4500 F,D	0.14 mg/l
Nitrate as NO_3	IS 3025 Part 34:1988 (Reaff:2019)	7.1 mg/l
Copper as Cu	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.01 mg/l)
Manganese as Mn	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.02 mg/l)
Mercury as Hg	USEPA 200.8	BDL (DL:0.0005 mg/l)
Cadmium as Cd	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.001 mg/l)
Selenium as Se	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.005 mg/l)

...Contd....2

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CHENNAI METTEX LAB PRIVATE LIMITED®

Jothi Complex, 83, M.K.N. Road, Guindy, Chennai - 600 032.

(Approved/Recognized by APEDA, AGMARK, GAFTA, EIC, FSSAI, BIS & MoEF)

Lab No: 24016232 T.C No: CML/23-24/17081 Dated : 06.06.2023

TEST	PROTOCOL	RESULTS
Aluminium as Al	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.005 mg/l)
Lead as Pb	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.005 mg/l)
Zinc as Zn	IS 3025 Part 65:2014 (Reaff:2019)	BDL(DL : 0.05 mg/l)
Total Chromium as Cr	IS 3025 Part 65:2014 (Reaff:2019)	BDL(DL : 0.02 mg/l)
Boron as B	IS 3025 Part 65:2014 (Reaff:2019)	BDL(DL : 0.05 mg/l)
Mineral Oil	IS 3025 Part 39-1991 (Reaff. 2019)	BDL(DL : 0.01 mg/l)
Phenolic compounds as C_6H_5OH	IS 3025 Part 43-1992(Reaff: 2019)	BDL (DL:0.0005 mg/l)
2 Anionic Detergents (as MBAS)	IS 13428 – 2005 (Reaff:2019) (Annex K)	BDL (DL:0.01 mg/l)
Cyanide as CN	IS 3025 Part 27-1986 (Reaff. 2019)	BDL (DL:0.01 mg/l)
BOD @ 27°C for 3 days	IS 3025 Part 44:1993 (Reaff:2019)	12.8 mg/l
Chemical Oxygen Demand	IS 3025 Part 58:2006 (Reaff:2017)	36 mg/l
Dissolved Oxygen	IS 3025 Part 38:1989 (Reaff:2019)	4.8 mg/l
Barium as Ba	IS 3025 Part 65:2014 (Reaff:2019)	BDL(DL:0.05 mg/l)
Ammonia (as total ammonia-N)	IS 3025 Part 34-1988 (Reaff. 2019)	4.1 mg/l
Sulphide as H_2S	IS 3025 Part 29-1986 (Reaff: 2019)	BDL (DL:0.01 mg/l)
Molybdenum as Mo	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.02 mg/l)
Total Arsenic as As	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.005 mg/l)
Total Suspended Solids	IS 3025 Part 17 -1984 (Reaff:2017)	9.8 mg/l
Discipline: Biological	**Group:** Water	
Total Coliform	APHA 23rd Edn. 2017:9221B	920 MPN/100ml
Escherichia coli	APHA 23rd Edn. 2017:9221F	110 MPN/100ml
Note : APHA – American Public Health Association, BDL – Below Detection Limit, DL – Detection Limit, MPN – Most Probable Number.		

End of Report

For Chennai Mettex Lab Private Limited

Reviewed & Authorized By

B. ARUNAN
Technical Manager
Authorised Signatory

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Technical Manager
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TEST REPORT

ISSUED TO : Tancem Cements Corporation Limited, Extent of 268.80 & 180.83 Ha (G.O-427 & 215)
II Floor, LLA Building, 735 Anna Salai,
Chennai – 600 002.

Cust. Ref : SRF Dated: 22.05.2023.

Lab No : 24016233

Sample Description : Ground Water (WW-1) – Mamsapuram.
(as stated by customer)

T.C Date : 06.06.2023

T.C No : CML/23-24/17082

Date Of Receipt : 23.05.2023

Analysis Commenced On: 23.05.2023

Analysis Completed On : 03.06.2023

TEST	PROTOCOL	RESULTS
Discipline: Chemical	**Group:** Water	
Colour	IS 3025 Part 4:1983 (Reaff:2017)	5
Odour	IS 3025 Part 5:2018	Agreeable
pH at 25°C	IS 3025 Part 11:1983 (Reaff:2017)	7.53
Conductivity @ 25°C	IS 3025 Part 14:2013 (Reaff:2019)	624 µmhos/cm
Turbidity	IS 3025 Part 10:1984 (Reaff:2017)	<1 NTU
Total Dissolved Solids	IS 3025 Part 16:1984 (Reaff:2017)	368 mg/l
Total Hardness as $CaCO_3$	IS 3025 Part 21:2009 (Reaff:2019)	124 mg/l
Calcium as Ca	IS 3025 Part 40:1991 (Reaff:2019)	32.1 mg/l
Magnesium as Mg	IS 3025 Part 46:1994 (Reaff:2019)	10.7 mg/l
Total Alkalinity as $CaCO_3$	IS 3025 Part 23:1986 (Reaff:2019)	109 mg/l
Chloride as Cl	IS 3025 Part 32:1988 (Reaff:2019)	75.6 mg/l
Sulphate as SO_4	IS 3025 Part 24:1986 (Reaff:2019)	39.4 mg/l
Iron as Fe	IS 3025 Part 53:2003 (Reaff:2019)	0.18 mg/l
Residual Free Chlorine	IS 3025 Part 26:1986 (Reaff:2019)	BDL (DL:0.1 mg/l)
Fluoride as F	APHA 23rd Edn. 2017:4500 F,D	0.14 mg/l
Nitrate as NO_3	IS 3025 Part 34:1988 (Reaff:2019)	3.6 mg/l
Copper as Cu	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.01 mg/l)
Manganese as Mn	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.02 mg/l)
Mercury as Hg	USEPA 200.8	BDL (DL:0.0005 mg/l)
Cadmium as Cd	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.001 mg/l)
Selenium as Se	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.005 mg/l)

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Lab No: 24016233 T.C No: CML/23-24/17082 **Dated : 06.06.2023**

TEST	PROTOCOL	RESULTS
Aluminium as Al	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.005 mg/l)
Lead as Pb	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.005 mg/l)
Zinc as Zn	IS 3025 Part 65:2014 (Reaff:2019)	BDL(DL : 0.05 mg/l)
Total Chromium as Cr	IS 3025 Part 65:2014 (Reaff:2019)	BDL(DL : 0.02 mg/l)
Boron as B	IS 3025 Part 65:2014 (Reaff:2019)	BDL(DL : 0.05 mg/l)
Mineral Oil	IS 3025 Part 39-1991 (Reaff. 2019)	BDL(DL : 0.01 mg/l)
Phenolic compounds as C_6H_5OH	IS 3025 Part 43-1992(Reaff. 2019)	BDL (DL:0.0005 mg/l)
Anionic Detergents (as MBAS)	IS 13428 – 2005 (Reaff:2019) (Annex K)	BDL (DL:0.01 mg/l)
Cyanide as CN	IS 3025 Part 27-1986 (Reaff. 2019)	BDL (DL:0.01 mg/l)
Barium as Ba	IS 3025 Part 44:1993 (Reaff:2019)	BDL(DL:0.05 mg/l)
Ammonia (as total ammonia-N)	IS 3025 Part 58:2006 (Reaff:2017)	BDL (DL:0.01 mg/l)
Sulphide as H_2S	IS 3025 Part 38:1989 (Reaff:2019)	BDL (DL:0.01 mg/l)
Molybdenum as Mo	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.02 mg/l)
Total Arsenic as As	IS 3025 Part 34-1988 (Reaff. 2019)	BDL (DL:0.005 mg/l)
Total Suspended Solids	IS 3025 Part 29-1986 (Reaff. 2019)	BDL (DL:1.0 mg/l)
Discipline: Biological	**Group:** Water	
Total Coliform	APHA 23rd Edn. 2017:9221B	1600 MPN/100ml
Escherichia coli	APHA 23rd Edn. 2017:9221F	< 1.8 MPN/100ml
Note : APHA – American Public Health Association, BDL – Below Detection Limit, DL – Detection Limit, MPN – Most Probable Number,< 1.8 MPN/100ml can be taken as "No Microbial Growth".		

End of Report

For Chennai Mettex Lab Private Limited

Reviewed & Authorized By

B. ARUNAN
Technical Manager
Authorised Signatory

Reviewed & Authorized By

P. KAVITHA
Technical Manager
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(Approved/Recognized by APEDA, AGMARK, GAFTA, EIC, FSSAI, BIS & MoEF)

TEST REPORT

ISSUED TO : Tancem Cements Corporation Limited, Extent of 268.80 & 180.83 Ha (G.O-427 & 215)
II Floor, LLA Building, 735 Anna Salai,
Chennai – 600 002.

Cust. Ref : SRF Dated: 22.05.2023.

Lab No : 24016234

Sample Description (as stated by customer) : **Ground Water (WW-2) – Sudankulam.**

T.C Date : 06.06.2023

T.C No : CML/23-24/17083

Date Of Receipt : 23.05.2023

Analysis Commenced On: 23.05.2023

Analysis Completed On : 03.06.2023

TEST	PROTOCOL	RESULTS
Discipline: Chemical	**Group:** Water	
Colour	IS 3025 Part 4:1983 (Reaff:2017)	<5
Odour	IS 3025 Part 5:2018	Agreeable
pH at 25°C	IS 3025 Part 11:1983 (Reaff:2017)	7.32
Conductivity @ 25°C	IS 3025 Part 14:2013 (Reaff:2019)	665 µmhos/cm
Turbidity	IS 3025 Part 10:1984 (Reaff:2017)	<1 NTU
Total Dissolved Solids	IS 3025 Part 16:1984 (Reaff:2017)	399 mg/l
Total Hardness as $CaCO_3$	IS 3025 Part 21:2009 (Reaff:2019)	132 mg/l
Calcium as Ca	IS 3025 Part 40:1991 (Reaff:2019)	28.8 mg/l
Magnesium as Mg	IS 3025 Part 46:1994 (Reaff:2019)	14.6 mg/l
Total Alkalinity as $CaCO_3$	IS 3025 Part 23:1986 (Reaff:2019)	129 mg/l
Chloride as Cl	IS 3025 Part 32:1988 (Reaff:2019)	83.5 mg/l
Sulphate as SO_4	IS 3025 Part 24:1986 (Reaff:2019)	43.6 mg/l
Iron as Fe	IS 3025 Part 53:2003 (Reaff:2019)	0.19 mg/l
Residual Free Chlorine	IS 3025 Part 26:1986 (Reaff:2019)	BDL (DL:0.1 mg/l)
Fluoride as F	APHA 23rd Edn. 2017:4500 F,D	0.17 mg/l
Nitrate as NO_3	IS 3025 Part 34:1988 (Reaff:2019)	4.7 mg/l
Copper as Cu	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.01 mg/l)
Manganese as Mn	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.02 mg/l)
Mercury as Hg	USEPA 200.8	BDL (DL:0.0005 mg/l)
Cadmium as Cd	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.001 mg/l)
Selenium as Se	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.005 mg/l)

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Lab No: 24016234 T.C No: CML/23-24/17083 Dated : 06.06.2023

TEST	PROTOCOL	RESULTS
Aluminium as Al	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.005 mg/l)
Lead as Pb	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.005 mg/l)
Zinc as Zn	IS 3025 Part 65:2014 (Reaff:2019)	BDL(DL : 0.05 mg/l)
Total Chromium as Cr	IS 3025 Part 65:2014 (Reaff:2019)	BDL(DL : 0.02 mg/l)
Boron as B	IS 3025 Part 65:2014 (Reaff:2019)	BDL(DL : 0.05 mg/l)
Mineral Oil	IS 3025 Part 39-1991 (Reaff. 2019)	BDL(DL : 0.01 mg/l)
Phenolic compounds as C_6H_5OH	IS 3025 Part 43-1992(Reaff: 2019)	BDL (DL:0.0005 mg/l)
Anionic Detergents (as MBAS)	IS 13428 – 2005 (Reaff:2019) (Annex K)	BDL (DL:0.01 mg/l)
Cyanide as CN	IS 3025 Part 27-1986 (Reaff. 2019)	BDL (DL:0.01 mg/l)
Barium as Ba	IS 3025 Part 44:1993 (Reaff:2019)	BDL(DL:0.05 mg/l)
Ammonia (as total ammonia-N)	IS 3025 Part 58:2006 (Reaff:2017)	BDL (DL:0.01 mg/l)
Sulphide as H_2S	IS 3025 Part 38:1989 (Reaff:2019)	BDL (DL:0.01 mg/l)
Molybdenum as Mo	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.02 mg/l)
Total Arsenic as As	IS 3025 Part 34-1988 (Reaff. 2019)	BDL (DL:0.005 mg/l)
Total Suspended Solids	IS 3025 Part 29-1986 (Reaff: 2019)	BDL (DL:1.0 mg/l)
Discipline: Biological	**Group:** Water	
Total Coliform	APHA 23rd Edn. 2017:9221B	140 MPN/100ml
Escherichia coli	APHA 23rd Edn. 2017:9221F	< 1.8 MPN/100ml
Note : APHA – American Public Health Association, BDL – Below Detection Limit, DL – Detection Limit, MPN – Most Probable Number,< 1.8 MPN/100ml can be taken as "No Microbial Growth".		

End of Report

For Chennai Mettex Lab Private Limited

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TEST REPORT

ISSUED TO : Tancem Cements Corporation Limited, Extent of 268.80 & 180.83 Ha (G.O-427 & 215)
II Floor, LLA Building, 735 Anna Salai,
Chennai – 600 002.

Cust. Ref : SRF Dated: 22.05.2023.

Lab No : 24016235

Sample Description (as stated by customer) : **Ground Water (WW-3) – Appayanaickenpatti**

T.C Date : 06.06.2023

T.C No : CML/23-24/17084

Date Of Receipt : 23.05.2023

Analysis Commenced On: 23.05.2023

Analysis Completed On : 03.06.2023

TEST	PROTOCOL	RESULTS
Discipline: Chemical	**Group:** Water	
Colour	IS 3025 Part 4:1983 (Reaff:2017)	<5
Odour	IS 3025 Part 5:2018	Agreeable
pH at 25°C	IS 3025 Part 11:1983 (Reaff:2017)	7.56
Conductivity @ 25°C	IS 3025 Part 14:2013 (Reaff:2019)	774 µmhos/cm
Turbidity	IS 3025 Part 10:1984 (Reaff:2017)	<1NTU
Total Dissolved Solids	IS 3025 Part 16:1984 (Reaff:2017)	464 mg/l
Total Hardness as $CaCO_3$	IS 3025 Part 21:2009 (Reaff:2019)	192 mg/l
Calcium as Ca	IS 3025 Part 40:1991 (Reaff:2019)	40.1 mg/l
Magnesium as Mg	IS 3025 Part 46:1994 (Reaff:2019)	17.5 mg/l
Total Alkalinity as $CaCO_3$	IS 3025 Part 23:1986 (Reaff:2019)	159.6 mg/l
Chloride as Cl	IS 3025 Part 32:1988 (Reaff:2019)	93.4 mg/l
Sulphate as SO_4	IS 3025 Part 24:1986 (Reaff:2019)	47.6 mg/l
Iron as Fe	IS 3025 Part 53:2003 (Reaff:2019)	0.21 mg/l
Residual Free Chlorine	IS 3025 Part 26:1986 (Reaff:2019)	BDL (DL:0.1 mg/l)
Fluoride as F	APHA 23rd Edn. 2017:4500 F,D	0.16 mg/l
Nitrate as NO_3	IS 3025 Part 34:1988 (Reaff:2019)	6.3 mg/l
Copper as Cu	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.01 mg/l)
Manganese as Mn	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.02 mg/l)
Mercury as Hg	USEPA 200.8	BDL (DL:0.0005 mg/l)
Cadmium as Cd	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.001 mg/l)
Selenium as Se	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.005 mg/l)

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Lab No: 24016235 T.C No: CML/23-24/17084 **Dated : 06.06.2023**

TEST	PROTOCOL	RESULTS
Aluminium as Al	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.005 mg/l)
Lead as Pb	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.005 mg/l)
Zinc as Zn	IS 3025 Part 65:2014 (Reaff:2019)	BDL(DL : 0.05 mg/l)
Total Chromium as Cr	IS 3025 Part 65:2014 (Reaff:2019)	BDL(DL : 0.02 mg/l)
Boron as B	IS 3025 Part 65:2014 (Reaff:2019)	BDL(DL : 0.05 mg/l)
Mineral Oil	IS 3025 Part 39-1991 (Reaff. 2019)	BDL(DL : 0.01 mg/l)
Phenolic compounds as C_6H_5OH	IS 3025 Part 43-1992(Reaff. 2019)	BDL (DL:0.0005 mg/l)
Anionic Detergents (as MBAS)	IS 13428 – 2005 (Reaff:2019) (Annex K)	BDL (DL:0.01 mg/l)
Cyanide as CN	IS 3025 Part 27-1986 (Reaff. 2019)	BDL (DL:0.01 mg/l)
Barium as Ba	IS 3025 Part 44:1993 (Reaff:2019)	BDL(DL:0.05 mg/l)
Ammonia (as total ammonia-N)	IS 3025 Part 58:2006 (Reaff:2017)	BDL (DL:0.01 mg/l)
Sulphide as H_2S	IS 3025 Part 38:1989 (Reaff:2019)	BDL (DL:0.01 mg/l)
Molybdenum as Mo	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.02 mg/l)
Total Arsenic as As	IS 3025 Part 34-1988 (Reaff. 2019)	BDL (DL:0.005 mg/l)
Total Suspended Solids	IS 3025 Part 29-1986 (Reaff. 2019)	BDL (DL:1.0 mg/l)
Discipline: Biological	**Group:** Water	
Total Coliform	APHA 23rd Edn. 2017:9221B	70 MPN/100ml
Escherichia coli	APHA 23rd Edn. 2017:9221F	< 1.8 MPN/100ml

Note : APHA – American Public Health Association, BDL – Below Detection Limit, DL – Detection Limit, MPN – Most Probable Number,< 1.8 MPN/100ml can be taken as "No Microbial Growth".

End of Report

For Chennai Mettex Lab Private Limited

Reviewed & Authorized By
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Authorised Signatory

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TEST REPORT

ISSUED TO : Tancem Cements Corporation Limited, Extent of 268.80 & 180.83 Ha (G.O-427 & 215)
II Floor, LLA Building, 735 Anna Salai,
Chennai – 600 002.

Cust. Ref : SRF Dated: 22.05.2023.

Lab No : 24016236

Sample Description (as stated by customer) : **Ground Water (BW-1) – Paranayakkanpatti**

T.C Date : 06.06.2023
T.C No : CML/23-24/17085
Date Of Receipt : 23.05.2023
Analysis Commenced On: 23.05.2023
Analysis Completed On : 03.06.2023

TEST	PROTOCOL	RESULTS
Discipline: Chemical	**Group:** Water	
Colour	IS 3025 Part 4:1983 (Reaff:2017)	<5
Odour	IS 3025 Part 5:2018	Agreeable
pH at 25°C	IS 3025 Part 11:1983 (Reaff:2017)	6.98
Conductivity @ 25°C	IS 3025 Part 14:2013 (Reaff:2019)	721 µmhos/cm
Turbidity	IS 3025 Part 10:1984 (Reaff:2017)	<1 NTU
Total Dissolved Solids	IS 3025 Part 16:1984 (Reaff:2017)	425 mg/l
Total Hardness as $CaCO_3$	IS 3025 Part 21:2009 (Reaff:2019)	156 mg/l
Calcium as Ca	IS 3025 Part 40:1991 (Reaff:2019)	35.2 mg/l
Magnesium as Mg	IS 3025 Part 46:1994 (Reaff:2019)	16.5 mg/l
Total Alkalinity as $CaCO_3$	IS 3025 Part 23:1986 (Reaff:2019)	136.7 mg/l
Chloride as Cl	IS 3025 Part 32:1988 (Reaff:2019)	89.5 mg/l
Sulphate as SO_4	IS 3025 Part 24:1986 (Reaff:2019)	40.3 mg/l
Iron as Fe	IS 3025 Part 53:2003 (Reaff:2019)	0.17 mg/l
Residual Free Chlorine	IS 3025 Part 26:1986 (Reaff:2019)	BDL (DL:0.1 mg/l)
Fluoride as F	APHA 23rd Edn. 2017:4500 F,D	0.15 mg/l
Nitrate as NO_3	IS 3025 Part 34:1988 (Reaff:2019)	8.4 mg/l
Copper as Cu	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.01 mg/l)
Manganese as Mn	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.02 mg/l)
Mercury as Hg	USEPA 200.8	BDL (DL:0.0005 mg/l)
Cadmium as Cd	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.001 mg/l)
Selenium as Se	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.005 mg/l)

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Lab No: 24016236 T.C No: CML/23-24/17085 Dated : 06.06.2023

TEST	PROTOCOL	RESULTS
Aluminium as Al	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.005 mg/l)
Lead as Pb	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.005 mg/l)
Zinc as Zn	IS 3025 Part 65:2014 (Reaff:2019)	BDL(DL : 0.05 mg/l)
Total Chromium as Cr	IS 3025 Part 65:2014 (Reaff:2019)	BDL(DL : 0.02 mg/l)
Boron as B	IS 3025 Part 65:2014 (Reaff:2019)	BDL(DL : 0.05 mg/l)
Mineral Oil	IS 3025 Part 39-1991 (Reaff. 2019)	BDL(DL : 0.01 mg/l)
Phenolic compounds as C_6H_5OH	IS 3025 Part 43-1992(Reaff. 2019)	BDL (DL:0.0005 mg/l)
Anionic Detergents (as MBAS)	IS 13428 – 2005 (Reaff:2019) (Annex K)	BDL (DL:0.01 mg/l)
Cyanide as CN	IS 3025 Part 27-1986 (Reaff. 2019)	BDL (DL:0.01 mg/l)
Barium as Ba	IS 3025 Part 44:1993 (Reaff:2019)	BDL(DL:0.05 mg/l)
Ammonia (as total ammonia-N)	IS 3025 Part 58:2006 (Reaff:2017)	BDL (DL:0.01 mg/l)
Sulphide as H_2S	IS 3025 Part 38:1989 (Reaff:2019)	BDL (DL:0.01 mg/l)
Molybdenum as Mo	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.02 mg/l)
Total Arsenic as As	IS 3025 Part 34-1988 (Reaff. 2019)	BDL (DL:0.005 mg/l)
Total Suspended Solids	IS 3025 Part 29-1986 (Reaff. 2019)	BDL (DL:1.0 mg/l)
Discipline: Biological	**Group:** Water	
Total Coliform	APHA 23rd Edn. 2017:9221B	110 MPN/100m
Escherichia coli	APHA 23rd Edn. 2017:9221F	< 1.8 MPN/100ml

Note : APHA – American Public Health Association, BDL – Below Detection Limit, DL – Detection Limit, MPN – Most Probable Number, < 1.8 MPN/100ml can be taken as "No Microbial Growth".

End of Report

For Chennai Mettex Lab Private Limited

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TEST REPORT

ISSUED TO : Tancem Cements Corporation Limited, Extent of 268.80 & 180.83 Ha (G.O-427 & 215)
II Floor, LLA Building, 735 Anna Salai,
Chennai – 600 002.

Cust. Ref : SRF Dated: 22.05.2023.

Lab No : 24016237

Sample Description : **Ground Water (BW-2) – Valayapatti.**
(as stated by customer)

T.C Date : 06.06.2023

T.C No : CML/23-24/17086

Date Of Receipt : 23.05.2023

Analysis Commenced On: 23.05.2023

Analysis Completed On : 03.06.2023

TEST	PROTOCOL	RESULTS
Discipline: Chemical	**Group:** Water	
Colour	IS 3025 Part 4:1983 (Reaff:2017)	<5
Odour	IS 3025 Part 5:2018	Agreeable
pH at 25°C	IS 3025 Part 11:1983 (Reaff:2017)	7.03
Conductivity @ 25°C	IS 3025 Part 14:2013 (Reaff:2019)	726 µmhos/cm
Turbidity	IS 3025 Part 10:1984 (Reaff:2017)	<1 NTU
Total Dissolved Solids	IS 3025 Part 16:1984 (Reaff:2017)	428 mg/l
Total Hardness as $CaCO_3$	IS 3025 Part 21:2009 (Reaff:2019)	140 mg/l
Calcium as Ca	IS 3025 Part 40:1991 (Reaff:2019)	30.4 mg/l
Magnesium as Mg	IS 3025 Part 46:1994 (Reaff:2019)	15.6 mg/l
Total Alkalinity as $CaCO_3$	IS 3025 Part 23:1986 (Reaff:2019)	133 mg/l
Chloride as Cl	IS 3025 Part 32:1988 (Reaff:2019)	84.5 mg/l
Sulphate as SO_4	IS 3025 Part 24:1986 (Reaff:2019)	45.3 mg/l
Iron as Fe	IS 3025 Part 53:2003 (Reaff:2019)	0.14 mg/l
Residual Free Chlorine	IS 3025 Part 26:1986 (Reaff:2019)	BDL (DL:0.1 mg/l)
Fluoride as F	APHA 23rd Edn. 2017:4500 F,D	0.18 mg/l
Nitrate as NO_3	IS 3025 Part 34:1988 (Reaff:2019)	8.7 mg/l
Copper as Cu	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.01 mg/l)
Manganese as Mn	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.02 mg/l)
Mercury as Hg	USEPA 200.8	BDL (DL:0.0005 mg/l)
Cadmium as Cd	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.001 mg/l)
Selenium as Se	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.005 mg/l)

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(Approved/Recognized by APEDA, AGMARK, GAFTA, EIC, FSSAI, BIS & MoEF)

Lab No: 24016237 T.C No: CML/23-24/17086 Dated : 06.06.2023

TEST	PROTOCOL	RESULTS
Aluminium as Al	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.005 mg/l)
Lead as Pb	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.005 mg/l)
Zinc as Zn	IS 3025 Part 65:2014 (Reaff:2019)	BDL(DL : 0.05 mg/l)
Total Chromium as Cr	IS 3025 Part 65:2014 (Reaff:2019)	BDL(DL : 0.02 mg/l)
Boron as B	IS 3025 Part 65:2014 (Reaff:2019)	BDL(DL : 0.05 mg/l)
Mineral Oil	IS 3025 Part 39-1991 (Reaff. 2019)	BDL(DL : 0.01 mg/l)
Phenolic compounds as C_6H_5OH	IS 3025 Part 43-1992(Reaff: 2019)	BDL (DL:0.0005 mg/l)
Anionic Detergents (as MBAS)	IS 13428 – 2005 (Reaff:2019) (Annex K)	BDL (DL:0.01 mg/l)
Cyanide as CN	IS 3025 Part 27-1986 (Reaff. 2019)	BDL (DL:0.01 mg/l)
Barium as Ba	IS 3025 Part 44:1993 (Reaff:2019)	BDL(DL:0.05 mg/l)
Ammonia (as total ammonia-N)	IS 3025 Part 58:2006 (Reaff:2017)	BDL (DL:0.01 mg/l)
Sulphide as H_2S	IS 3025 Part 38:1989 (Reaff:2019)	BDL (DL:0.01 mg/l)
Molybdenum as Mo	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.02 mg/l)
Total Arsenic as As	IS 3025 Part 34-1988 (Reaff. 2019)	BDL (DL:0.005 mg/l)
Total Suspended Solids	IS 3025 Part 29-1986 (Reaff. 2019)	BDL (DL:1.0 mg/l)
Discipline: Biological	**Group:** Water	
Total Coliform	APHA 23rd Edn. 2017:9221B	150 MPN/100m
Escherichia coli	APHA 23rd Edn. 2017:9221F	< 1.8 MPN/100ml
Note : APHA – American Public Health Association, BDL – Below Detection Limit, DL – Detection Limit, MPN – Most Probable Number,< 1.8 MPN/100ml can be taken as "No Microbial Growth".		

End of Report

For Chennai Mettex Lab Private Limited

Reviewed & Authorized By
B. ARUNAN
Technical Manager
Authorised Signatory

Reviewed & Authorized By
P. KAVITHA
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CHENNAI METTEX LAB PRIVATE LIMITED®

Jothi Complex, 83, M.K.N. Road, Guindy, Chennai - 600 032.

(Approved/Recognized by APEDA, AGMARK, GAFTA, EIC, FSSAI, BIS & MoEF)

TEST REPORT

ISSUED TO : Tancem Cements Corporation Limited, Extent of 268.80 & 180.83 Ha (G.O-427 & 215)
II Floor, LLA Building, 735 Anna Salai,
Chennai – 600 002.

Cust. Ref : SRF Dated: 22.05.2023.

Lab No : 24016238

Sample Description : Ground Water (BW-3) – Naranapuram.
(as stated by customer)

T.C Date : 06.06.2023

T.C No : CML/23-24/17087

Date Of Receipt : 23.05.2023

Analysis Commenced On: 23.05.2023

Analysis Completed On : 03.06.2023

TEST	PROTOCOL	RESULTS
Discipline: Chemical	**Group:** Water	
Colour	IS 3025 Part 4:1983 (Reaff:2017)	<5
Odour	IS 3025 Part 5:2018	Agreeable
pH at 25°C	IS 3025 Part 11:1983 (Reaff:2017)	7.23
Conductivity @ 25°C	IS 3025 Part 14:2013 (Reaff:2019)	621 µmhos/cm
Turbidity	IS 3025 Part 10:1984 (Reaff:2017)	<1 NTU
Total Dissolved Solids	IS 3025 Part 16:1984 (Reaff:2017)	366 mg/l
Total Hardness as $CaCO_3$	IS 3025 Part 21:2009 (Reaff:2019)	128 mg/l
Calcium as Ca	IS 3025 Part 40:1991 (Reaff:2019)	33.6 mg/l
Magnesium as Mg	IS 3025 Part 46:1994 (Reaff:2019)	10.7 mg/l
Total Alkalinity as $CaCO_3$	IS 3025 Part 23:1986 (Reaff:2019)	110mg/l
Chloride as Cl	IS 3025 Part 32:1988 (Reaff:2019)	68.7 mg/l
Sulphate as SO_4	IS 3025 Part 24:1986 (Reaff:2019)	39.7 mg/l
Iron as Fe	IS 3025 Part 53:2003 (Reaff:2019)	0.15 mg/l
Residual Free Chlorine	IS 3025 Part 26:1986 (Reaff:2019)	BDL (DL:0.1 mg/l)
Fluoride as F	APHA 23rd Edn. 2017:4500 F D	0.12 mg/l
Nitrate as NO_3	IS 3025 Part 34:1988 (Reaff:2019)	5.2 mg/l
Copper as Cu	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.01 mg/l)
Manganese as Mn	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.02 mg/l)
Mercury as Hg	USEPA 200.8	BDL (DL:0.0005 mg/l)
Cadmium as Cd	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.001 mg/l)
Selenium as Se	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.005 mg/l)

...Contd....2

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Lab No: 24016238 T.C No: CML/23-24/17087 Dated : 06.06.2023

TEST	PROTOCOL	RESULTS
Aluminium as Al	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.005 mg/l)
Lead as Pb	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.005 mg/l)
Zinc as Zn	IS 3025 Part 65:2014 (Reaff:2019)	BDL(DL : 0.05 mg/l)
Total Chromium as Cr	IS 3025 Part 65:2014 (Reaff:2019)	BDL(DL : 0.02 mg/l)
Boron as B	IS 3025 Part 65:2014 (Reaff:2019)	BDL(DL : 0.05 mg/l)
Mineral Oil	IS 3025 Part 39-1991 (Reaff. 2019)	BDL(DL : 0.01 mg/l)
Phenolic compounds as C_6H_5OH	IS 3025 Part 43-1992(Reaff: 2019)	BDL (DL:0.0005 mg/l)
Anionic Detergents (as MBAS)	IS 13428 – 2005 (Reaff:2019) (Annex K)	BDL (DL:0.01 mg/l)
Cyanide as CN	IS 3025 Part 27-1986 (Reaff. 2019)	BDL (DL:0.01 mg/l)
Barium as Ba	IS 3025 Part 44:1993 (Reaff:2019)	BDL(DL:0.05 mg/l)
Ammonia (as total ammonia-N)	IS 3025 Part 58:2006 (Reaff:2017)	BDL (DL:0.01 mg/l)
Sulphide as H_2S	IS 3025 Part 38:1989 (Reaff:2019)	BDL (DL:0.01 mg/l)
Molybdenum as Mo	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.02 mg/l)
Total Arsenic as As	IS 3025 Part 34-1988 (Reaff. 2019)	BDL (DL:0.005 mg/l)
Total Suspended Solids	IS 3025 Part 29-1986 (Reaff: 2019)	BDL (DL:1.0 mg/l)
Discipline: Biological	**Group:** Water	
Total Coliform	APHA 23rd Edn. 2017:9221B	110 MPN/100m
Escherichia coli	APHA 23rd Edn. 2017:9221F	< 1.8 MPN/100ml
Note : APHA – American Public Health Association, BDL – Below Detection Limit, DL – Detection Limit, MPN – Most Probable Number,< 1.8 MPN/100ml can be taken as "No Microbial Growth".		

End of Report

For Chennai Mettex Lab Private Limited

Reviewed & Authorized By
B. ARUNAN
Technical Manager
Authorised Signatory

Reviewed & Authorized By
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TEST REPORT

ISSUED TO : Tancem Cements Corporation Limited, Extent of 268.80 & 180.83 Ha (G.O-427 & 215)
II Floor, LLA Building, 735 Anna Salai,
Chennai – 600 002.

Cust. Ref : SRF Dated: 22.05.2023.

Lab No : 24016239

Sample Description : Ground Water (BW-4) – Nadugudi.
(as stated by customer)

T.C Date : 06.06.2023
T.C No : CML/23-24/17088
Date Of Receipt : 23.05.2023
Analysis Commenced On: 23.05.2023
Analysis Completed On : 03.06.2023

TEST	PROTOCOL	RESULTS
Discipline: Chemical	**Group:** Water	
Colour	IS 3025 Part 4:1983 (Reaff:2017)	<5
Odour	IS 3025 Part 5:2018	Agreeable
pH at 25°C	IS 3025 Part 11:1983 (Reaff:2017)	7.36
Conductivity @ 25°C	IS 3025 Part 14:2013 (Reaff:2019)	680 µmhos/cm
Turbidity	IS 3025 Part 10:1984 (Reaff:2017)	<1 NTU
Total Dissolved Solids	IS 3025 Part 16:1984 (Reaff:2017)	401 mg/l
Total Hardness as $CaCO_3$	IS 3025 Part 21:2009 (Reaff:2019)	136 mg/l
Calcium as Ca	IS 3025 Part 40:1991 (Reaff:2019)	35.2 mg/l
Magnesium as Mg	IS 3025 Part 46:1994 (Reaff:2019)	11.7 mg/l
Total Alkalinity as $CaCO_3$	IS 3025 Part 23:1986 (Reaff:2019)	121.8mg/l
Chloride as Cl	IS 3025 Part 32:1988 (Reaff:2019)	76.4mg/l
Sulphate as SO_4	IS 3025 Part 24:1986 (Reaff:2019)	44.6 mg/l
Iron as Fe	IS 3025 Part 53:2003 (Reaff:2019)	0.16 mg/l
Residual Free Chlorine	IS 3025 Part 26:1986 (Reaff:2019)	BDL (DL:0.1 mg/l)
Fluoride as F	APHA 23rd Edn. 2017:4500 F,D	0.13 mg/l
Nitrate as NO_3	IS 3025 Part 34:1988 (Reaff:2019)	5.6 mg/l
Copper as Cu	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.01 mg/l)
Manganese as Mn	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.02 mg/l)
Mercury as Hg	USEPA 200.8	BDL (DL:0.0005 mg/l)
Cadmium as Cd	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.001 mg/l)
Selenium as Se	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.005 mg/l)

...Contd....2

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Lab No: 24016239 T.C No: CML/23-24/17088 Dated : 06.06.2023

TEST	PROTOCOL	RESULTS
Aluminium as Al	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.005 mg/l)
Lead as Pb	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.005 mg/l)
Zinc as Zn	IS 3025 Part 65:2014 (Reaff:2019)	BDL(DL : 0.05 mg/l)
Total Chromium as Cr	IS 3025 Part 65:2014 (Reaff:2019)	BDL(DL : 0.02 mg/l)
Boron as B	IS 3025 Part 65:2014 (Reaff:2019)	BDL(DL : 0.05 mg/l)
Mineral Oil	IS 3025 Part 39-1991 (Reaff. 2019)	BDL(DL : 0.01 mg/l)
Phenolic compounds as C_6H_5OH	IS 3025 Part 43-1992(Reaff. 2019)	BDL (DL:0.0005 mg/l)
Anionic Detergents (as MBAS)	IS 13428 – 2005 (Reaff:2019) (Annex K)	BDL (DL:0.01 mg/l)
Cyanide as CN	IS 3025 Part 27-1986 (Reaff. 2019)	BDL (DL:0.01 mg/l)
Barium as Ba	IS 3025 Part 44:1993 (Reaff:2019)	BDL(DL:0.05 mg/l)
Ammonia (as total ammonia-N)	IS 3025 Part 58:2006 (Reaff:2017)	BDL (DL:0.01 mg/l)
Sulphide as H_2S	IS 3025 Part 38:1989 (Reaff:2019)	BDL (DL:0.01 mg/l)
Molybdenum as Mo	IS 3025 Part 65:2014 (Reaff:2019)	BDL (DL:0.02 mg/l)
Total Arsenic as As	IS 3025 Part 34-1988 (Reaff. 2019)	BDL (DL:0.005 mg/l)
Total Suspended Solids	IS 3025 Part 29-1986 (Reaff: 2019)	BDL (DL:1.0 mg/l)
Discipline: Biological	**Group:** Water	
Total Coliform	APHA 23rd Edn. 2017:9221B	210 MPN/100m
Escherichia coli	APHA 23rd Edn. 2017:9221F	< 1.8 MPN/100ml
Note : APHA – American Public Health Association, BDL – Below Detection Limit, DL – Detection Limit, MPN – Most Probable Number,< 1.8 MPN/100ml can be taken as "No Microbial Growth".		

End of Report

For Chennai Mettex Lab Private Limited

Reviewed & Authorized By

B. ARUNAN
Technical Manager
Authorised Signatory

Reviewed & Authorized By

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Technical Manager
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(Approved/Recognized by APEDA, AGMARK, GAFTA, EIC, FSSAI, BIS & MoEF)

TEST REPORT

ISSUED TO : Tancem Cements Corporation Limited, Extent of 268.80 & 180.83 Ha (G.O-427 & 215)
II Floor, LLA Building, 735 Anna Salai,
Chennai – 600 002.

T.C Date : 06.06.2023
T.C No : CML/23-24/17089
Cust. Ref : SRF Dated : 22.05.2023.
Date Of Receipt : 23.05.2023
Lab No : 24016240
Analysis Commenced On: 23.05.2023
Sample Description : **Soil – 1 – Core Zone**
(as stated by customer)
Analysis Completed On : 06.06.2023

S. No	Test Parameters	Protocols	Results
01	pH @ 25°C	IS 2720 Part 26 - 1987 (Reaff:2016)	8.72
02	Conductivity @ 25°C	IS 14767 - 2000 (Reaff : 2016)	385 µmhos/cm
03	**Texture :**		
	Clay	Gravimetric Method	38.3 %
	Sand		31.2 %
	Silt		30.5 %
04	Water Holding Capacity	By Gravimetric Method	39.7 %
05	Bulk Density	By Cylindrical Method	1.06 g/cm^3
06	Porosity	By Gravimetric Method	34.5 %
07	Calcium as Ca	USEPA 3050 B – 1996 & USEPA 6010 C - 2000	148 mg/kg
08	Magnesium as Mg		24.2 mg/kg
09	Manganese as Mn		18.9mg/kg
10	Zinc as Zn		0.22 mg/kg
11	Boron as B		0.48 mg/kg
12	Chloride as Cl	APHA 23rd Edn 2019 4500 Cl B	168 mg/kg
13	Total Soluble Sulphate as SO_4	IS 2720 Part 27 : 1977 (Reaff:2015)	0.015 %
14	Potassium as K	USEPA 3050 B – 1996 & USEPA 6010 C - 2000	31.2 mg/kg
15	Total Phosphorus as P	IS 10158 : 1982 (Reaff: 2019)	0.71 mg/kg
16	Total Nitrogen as N	IS 14684 : 1999 (Reaff:2019)	248 mg/kg
17	Cadmium as Cd	USEPA 3050 B – 1996 & USEPA 6010 C - 2000	BDL (DL : 1.0 mg/kg)
18	Total Chromium as Cr		BDL (DL : 1.0 mg/kg)
19	Copper as Cu		BDL (DL : 1.0 mg/kg)
20	Lead as Pb		0.73 mg/kg
21	Iron as Fe		1.22 mg/kg
22	Organic Matter	IS : 2720 Part 22: 1972 (Reaff: 2015)	1.60%
23	Organic Carbon	IS : 2720 Part 22: 1972 (Reaff: 2015)	0.93 %
24	Cation Exchange Capacity	USEPA 9080 – 1986	33.1 meq/100g of soil

End of Report

For Chennai Mettex Lab Private Limited

Reviewed & Authorized By
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TEST REPORT

ISSUED TO : Tancem Cements Corporation Limited, Extent of 268.80 & 180.83 Ha (G.O-427 & 215)
II Floor, LLA Building, 735 Anna Salai,
Chennai – 600 002.

Cust. Ref : SRF Dated : 22.05.2023.

Lab No : 24016241

Sample Description : Soil – 2 – Core Zone
(as stated by customer)

T.C Date : 06.06.2023

T.C No : CML/23-24/17090

Date Of Receipt : 23.05.2023

Analysis Commenced On: 23.05.2023

Analysis Completed On : 06.06.2023

S. No	Test Parameters	Protocols	Results
01	pH @ 25°C	IS 2720 Part 26 - 1987 (Reaff:2016)	8.21
02	Conductivity @ 25°C	IS 14767 - 2000 (Reaff : 2016)	415 µmhos/cm
03	**Texture :**		
	Sand	Gravimetric Method	32.1 %
	Silt		31.5 %
	Clay		36.4%
04	Water Holding Capacity	By Gravimetric Method	38.1 %
05	Bulk Density	By Cylindrical Method	1.02 g/cm^3
06	Porosity	By Gravimetric Method	33.3 %
07	Calcium as Ca	USEPA 3050 B – 1996 & USEPA 6010 C - 2000	152 mg/kg
08	Magnesium as Mg		22.8 mg/kg
09	Manganese as Mn		17.6 mg/kg
10	Zinc as Zn		0.34 mg/kg
11	Boron as B		0.56 mg/kg
12	Chloride as Cl	APHA 23rd Edn 2019 4500 Cl B	143 mg/kg
13	Total Soluble Sulphate as SO_4	IS 2720 Part 27 : 1977 (Reaff:2015)	0.013 %
14	Potassium as K	USEPA 3050 B – 1996 & USEPA 6010 C - 2000	30.7 mg/kg
15	Total Phosphorus as P	IS 10158 : 1982 (Reaff: 2019)	1.14 mg/kg
16	Total Nitrogen as N	IS 14684 : 1999 (Reaff:2019)	276 mg/kg
17	Cadmium as Cd	USEPA 3050 B – 1996 & USEPA 6010 C - 2000	BDL (DL : 1.0 mg/kg)
18	Total Chromium as Cr		BDL (DL : 1.0 mg/kg)
19	Copper as Cu		BDL (DL : 1.0 mg/kg)
20	Lead as Pb		0.78 mg/kg
21	Iron as Fe		1.32 mg/kg
22	Organic Matter	IS : 2720 Part 22: 1972 (Reaff: 2015)	2.46 %
23	Organic Carbon	IS : 2720 Part 22: 1972 (Reaff: 2015)	1.43 %
24	Cation Exchange Capacity	USEPA 9080 – 1986	28.6 meq/100g of soil

End of Report

For Chennai Mettex Lab Private Limited

Reviewed & Authorized By
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TEST REPORT

ISSUED TO : Tancem Cements Corporation Limited, Extent of 268.80 & 180.83 Ha (G.O-427 & 215)
II Floor, LLA Building, 735 Anna Salai,
Chennai – 600 002.

T.C Date : 06.06.2023
T.C No : CML/23-24/17091
Cust. Ref : SRF Dated : 22.05.2023.
Date Of Receipt : 23.05.2023
Lab No : 24016242
Analysis Commenced On: 23.05.2023
Sample Description : **Soil – 3 – Core Zone**
(as stated by customer)
Analysis Completed On : 06.06.2023

S. No	Test Parameters	Protocols	Results
01	pH @ 25°C	IS 2720 Part 26 - 1987 (Reaff:2016)	8.23
02	Conductivity @ 25°C	IS 14767 - 2000 (Reaff : 2016)	408 µmhos/cm
03	**Texture :**		
	Sand	Gravimetric Method	33.6 %
	Silt		30.4 %
	Clay		36.0 %
04	Water Holding Capacity	By Gravimetric Method	37.6 %
05	Bulk Density	By Cylindrical Method	1.01/cm^3
06	Porosity	By Gravimetric Method	31.8 %
07	Calcium as Ca	USEPA 3050 B – 1996 & USEPA 6010 C - 2000	145 mg/kg
08	Magnesium as Mg		20.7 mg/kg
09	Manganese as Mn		16.7 mg/kg
10	Zinc as Zn		0.42 mg/kg
11	Boron as B		0.74 mg/kg
12	Chloride as Cl	APHA 23rd Edn 2019 4500 Cl B	137 mg/kg
13	Total Soluble Sulphate as SO_4	IS 2720 Part 27 : 1977 (Reaff:2015)	0.019 %
14	Potassium as K	USEPA 3050 B – 1996 & USEPA 6010 C - 2000	28.6 mg/kg
15	Total Phosphorus as P	IS 10158 : 1982 (Reaff: 2019)	1.02 mg/kg
16	Total Nitrogen as N	IS 14684 : 1999 (Reaff:2019)	257 mg/kg
17	Cadmium as Cd	USEPA 3050 B – 1996 & USEPA 6010 C - 2000	BDL (DL : 1.0 mg/kg)
18	Total Chromium as Cr		BDL (DL : 1.0 mg/kg)
19	Copper as Cu		BDL (DL : 1.0 mg/kg)
20	Lead as Pb		0.65 mg/kg
21	Iron as Fe		1.29 mg/kg
22	Organic Matter	IS : 2720 Part 22: 1972 (Reaff: 2015)	2.22 %
23	Organic Carbon	IS : 2720 Part 22: 1972 (Reaff: 2015)	1.29 %
24	Cation Exchange Capacity	USEPA 9080 – 1986	23.1 meq/100g of soil

End of Report

For Chennai Mettex Lab Private Limited

Reviewed & Authorized By

P. KAVITHA
Technical Manager
Authorised Signatory

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CHENNAI METTEX LAB PRIVATE LIMITED®

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(Approved/Recognized by APEDA, AGMARK, GAFTA, EIC, FSSAI, BIS & MoEF)

TEST REPORT

ISSUED TO : Tancem Cements Corporation Limited, Extent of 268.80 & 180.83 Ha (G.O-427 & 215)
II Floor, LLA Building, 735 Anna Salai,
Chennai – 600 002.

Cust. Ref : SRF Dated : 22.05.2023.

Lab No : 24016243

Sample Description : Soil – 4 – Core Zone
(as stated by customer)

T.C Date : 06.06.2023
T.C No : CML/23-24/17092
Date Of Receipt : 23.05.2023
Analysis Commenced On: 23.05.2023
Analysis Completed On : 06.06.2023

S. No	Test Parameters	Protocols	Results
01	pH @ 25°C	IS 2720 Part 26 - 1987 (Reaff:2016)	7.98
02	Conductivity @ 25°C	IS 14767 - 2000 (Reaff : 2016)	452 µmhos/cm
03	**Texture :**		
	Sand	Gravimetric Method	30.7 %
	Silt		30.3 %
	Clay		39.0 %
04	Water Holding Capacity	By Gravimetric Method	40.1 %
05	Bulk Density	By Cylindrical Method	1.20 g/cm^3
06	Porosity	By Gravimetric Method	32.6 %
07	Calcium as Ca	USEPA 3050 B – 1996 & USEPA 6010 C - 2000	164 mg/kg
08	Magnesium as Mg		23.5 mg/kg
09	Manganese as Mn		18.4 mg/kg
10	Zinc as Zn		0.63 mg/kg
11	Boron as B		0.0.71 mg/kg
12	Chloride as Cl	APHA 23rd Edn 2019 4500 Cl B	151 mg/kg
13	Total Soluble Sulphate as SO_4	IS 2720 Part 27 : 1977 (Reaff:2015)	0.018 %
14	Potassium as K	USEPA 3050 B – 1996 & USEPA 6010 C - 2000	33.2 mg/kg
15	Total Phosphorus as P	IS 10158 : 1982 (Reaff: 2019)	1.21 mg/kg
16	Total Nitrogen as N	IS 14684 : 1999 (Reaff:2019)	265 mg/kg
17	Cadmium as Cd	USEPA 3050 B – 1996 & USEPA 6010 C - 2000	BDL (DL : 1.0 mg/kg)
18	Total Chromium as Cr		BDL (DL : 1.0 mg/kg)
19	Copper as Cu		BDL (DL : 1.0 mg/kg)
20	Lead as Pb		0.81 mg/kg
21	Iron as Fe		1.36 mg/kg
22	Organic Matter	IS : 2720 Part 22: 1972 (Reaff: 2015)	2.60 %
23	Organic Carbon	IS : 2720 Part 22: 1972 (Reaff: 2015)	1.51 %
24	Cation Exchange Capacity	USEPA 9080 – 1986	29.6 meq/100g of soil

End of Report

For Chennai Mettex Lab Private Limited

Reviewed & Authorized By
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Authorised Signatory

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Jothi Complex, 83, M.K.N. Road, Guindy, Chennai - 600 032.

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TEST REPORT

ISSUED TO : Tancem Cements Corporation Limited, Extent of 268.80 & 180.83 Ha (G.O-427 & 215)
II Floor, LLA Building, 735 Anna Salai,
Chennai – 600 002.

Cust. Ref : SRF Dated : 22.05.2023.

Lab No : 24016244

Sample Description : Soil – 5 – Core Zone
(as stated by customer)

T.C Date : 06.06.2023

T.C No : CML/23-24/17093

Date Of Receipt : 23.05.2023

Analysis Commenced On: 23.05.2023

Analysis Completed On : 06.06.2023

S. No	Test Parameters	Protocols	Results
01	pH @ 25°C	IS 2720 Part 26 - 1987 (Reaff:2016)	8.34
02	Conductivity @ 25°C	IS 14767 - 2000 (Reaff : 2016)	439 µmhos/cm
03	**Texture :**		
	Sand	Gravimetric Method	30.9 %
	Silt		31.8 %
	Clay		37.3 %
04	Water Holding Capacity	By Gravimetric Method	38.4 %
05	Bulk Density	By Cylindrical Method	1.09 g/cm^3
06	Porosity	By Gravimetric Method	31.2 %
07	Calcium as Ca	USEPA 3050 B – 1996 & USEPA 6010 C - 2000	149 mg/kg
08	Magnesium as Mg		21.3 mg/kg
09	Manganese as Mn		17.2 mg/kg
10	Zinc as Zn		0.54 mg/kg
11	Boron as B		0.63 mg/kg
12	Chloride as Cl	APHA 23rd Edn 2019 4500 Cl B	146 mg/kg
13	Total Soluble Sulphate as SO_4	IS 2720 Part 27 : 1977 (Reaff:2015)	0.009 %
14	Potassium as K	USEPA 3050 B – 1996 & USEPA 6010 C - 2000	34.5 mg/kg
15	Total Phosphorus as P	IS 10158 : 1982 (Reaff: 2019)	1.34 mg/kg
16	Total Nitrogen as N	IS 14684 : 1999 (Reaff:2019)	298 mg/kg
17	Cadmium as Cd	USEPA 3050 B – 1996 & USEPA 6010 C - 2000	BDL (DL : 1.0 mg/kg)
18	Total Chromium as Cr		BDL (DL : 1.0 mg/kg)
19	Copper as Cu		BDL (DL : 1.0 mg/kg)
20	Lead as Pb		0.91 mg/kg
21	Iron as Fe		1.47 mg/kg
22	Organic Matter	IS : 2720 Part 22: 1972 (Reaff: 2015)	2.27 %
23	Organic Carbon	IS : 2720 Part 22: 1972 (Reaff: 2015)	1.32 %
24	Cation Exchange Capacity	USEPA 9080 – 1986	31.6 meq/100g of soil

End of Report

For Chennai Mettex Lab Private Limited

Reviewed & Authorized By

P. KAVITHA
Technical Manager
Authorised Signatory

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CHENNAI METTEX LAB PRIVATE LIMITED®

Jothi Complex, 83, M.K.N. Road, Guindy, Chennai - 600 032.

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TEST REPORT

ISSUED TO : Tancem Cements Corporation Limited, Extent of 268.80 & 180.83 Ha (G.O-427 & 215)
II Floor, LLA Building, 735 Anna Salai,
Chennai – 600 002.

Cust. Ref : SRF Dated : 22.05.2023.

Lab No : 24016245

Sample Description : **Soil – 6 – Appayanaickenpatti**
(as stated by customer)

T.C Date : 06.06.2023

T.C No : CML/23-24/17094

Date Of Receipt : 23.05.2023

Analysis Commenced On: 23.05.2023

Analysis Completed On : 06.06.2023

S. No	Test Parameters	Protocols	Results
01	pH @ 25°C	IS 2720 Part 26 - 1987 (Reaff:2016)	8.63
02	Conductivity @ 25°C	IS 14767 - 2000 (Reaff : 2016)	395 µmhos/cm
03	**Texture :**		
	Sand	Gravimetric Method	32.6 %
	Silt		30.4 %
	Clay		37.0 %
04	Water Holding Capacity	By Gravimetric Method	38.4 %
05	Bulk Density	By Cylindrical Method	1.04 g/cm^3
06	Porosity	By Gravimetric Method	34.6 %
07	Calcium as Ca	USEPA 3050 B – 1996 & USEPA 6010 C - 2000	132 mg/kg
08	Magnesium as Mg		18.8 mg/kg
09	Manganese as Mn		15.6 mg/kg
10	Zinc as Zn		0.27 mg/kg
11	Boron as B		0.38 mg/kg
12	Chloride as Cl	APHA 23rd Edn 2019 4500 Cl B	127 mg/kg
13	Total Soluble Sulphate as SO_4	IS 2720 Part 27 : 1977 (Reaff:2015)	0.018 %
14	Potassium as K	USEPA 3050 B – 1996 & USEPA 6010 C - 2000	33.7 mg/kg
15	Total Phosphorus as P	IS 10158 : 1982 (Reaff: 2019)	1.07 mg/kg
16	Total Nitrogen as N	IS 14684 : 1999 (Reaff:2019)	243 mg/kg
17	Cadmium as Cd	USEPA 3050 B – 1996 & USEPA 6010 C - 2000	BDL (DL : 1.0 mg/kg)
18	Total Chromium as Cr		BDL (DL : 1.0 mg/kg)
19	Copper as Cu		BDL (DL : 1.0 mg/kg)
20	Lead as Pb		0.67 mg/kg
21	Iron as Fe		1.23 mg/kg
22	Organic Matter	IS : 2720 Part 22: 1972 (Reaff: 2015)	1.60 %
23	Organic Carbon	IS : 2720 Part 22: 1972 (Reaff: 2015)	0.93 %
24	Cation Exchange Capacity	USEPA 9080 – 1986	29.7 meq/100g of soil

End of Report

For Chennai Mettex Lab Private Limited

Reviewed & Authorized By

P. KAVITHA
Technical Manager
Authorised Signatory

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TEST REPORT

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II Floor, LLA Building, 735 Anna Salai,
Chennai – 600 002.

Cust. Ref : SRF Dated : 22.05.2023.

Lab No : 24016246

Sample Description : **Soil – 7 – Mamsapuram**
(as stated by customer)

T.C Date : 06.06.2023
T.C No : CML/23-24/17095
Date Of Receipt : 23.05.2023
Analysis Commenced On: 23.05.2023
Analysis Completed On : 06.06.2023

S. No	Test Parameters	Protocols	Results
01	pH @ 25°C	IS 2720 Part 26 - 1987 (Reaff:2016)	8.34
02	Conductivity @ 25°C	IS 14767 - 2000 (Reaff : 2016)	408 µmhos/cm
03	**Texture :**		
	Sand	Gravimetric Method	32.6 %
	Silt		29.7 %
	Clay		37.7 %
04	Water Holding Capacity	By Gravimetric Method	39.1 %
05	Bulk Density	By Cylindrical Method	1.08 g/cm^3
06	Porosity	By Gravimetric Method	35.4 %
07	Calcium as Ca	USEPA 3050 B – 1996 & USEPA 6010 C - 2000	141.6 mg/kg
08	Magnesium as Mg		20.2 mg/kg
09	Manganese as Mn		16.1 mg/kg
10	Zinc as Zn		0.37 mg/kg
11	Boron as B		0.40 mg/kg
12	Chloride as Cl	APHA 23rd Edn 2019 4500 Cl B	137 mg/kg
13	Total Soluble Sulphate as SO_4	IS 2720 Part 27 : 1977 (Reaff:2015)	0.015 %
14	Potassium as K	USEPA 3050 B – 1996 & USEPA 6010 C - 2000	30.6 mg/kg
15	Total Phosphorus as P	IS 10158 : 1982 (Reaff: 2019)	1.10 mg/kg
16	Total Nitrogen as N	IS 14684 : 1999 (Reaff:2019)	254 mg/kg
17	Cadmium as Cd	USEPA 3050 B – 1996 & USEPA 6010 C - 2000	BDL (DL : 1.0 mg/kg)
18	Total Chromium as Cr		BDL (DL : 1.0 mg/kg)
19	Copper as Cu		BDL (DL : 1.0 mg/kg)
20	Lead as Pb		0.73 mg/kg
21	Iron as Fe		1.31 mg/kg
22	Organic Matter	IS : 2720 Part 22: 1972 (Reaff: 2015)	1.79 %
23	Organic Carbon	IS : 2720 Part 22: 1972 (Reaff: 2015)	1.04 %
24	Cation Exchange Capacity	USEPA 9080 – 1986	28.2 meq/100g of soil

End of Report

For Chennai Mettex Lab Private Limited

Reviewed & Authorized By
P. KAVITHA
Technical Manager
Authorised Signatory

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TEST REPORT

ISSUED TO : Tancem Cements Corporation Limited, Extent of 268.80 & 180.83 Ha (G.O-427 & 215)
II Floor, LLA Building, 735 Anna Salai,
Chennai – 600 002.

Cust. Ref : SRF Dated : 22.05.2023.

Lab No : 24016247

Sample Description : Soil – 8 – Thayilpatti
(as stated by customer)

T.C Date : 06.06.2023
T.C No : CML/23-24/17096
Date Of Receipt : 23.05.2023
Analysis Commenced On: 23.05.2023
Analysis Completed On : 06.06.2023

S. No	Test Parameters	Protocols	Results
01	pH @ 25°C	IS 2720 Part 26 - 1987 (Reaff:2016)	7.96
02	Conductivity @ 25°C	IS 14767 - 2000 (Reaff : 2016)	515 µmhos/cm
03	**Texture :**		
	Sand	Gravimetric Method	19.8 %
	Silt		36.7 %
	Clay		43.5 %
04	Water Holding Capacity	By Gravimetric Method	41.2 %
05	Bulk Density	By Cylindrical Method	1.12 g/cm^3
06	Porosity	By Gravimetric Method	33.1 %
07	Calcium as Ca	USEPA 3050 B – 1996 & USEPA 6010 C - 2000	146.3 mg/kg
08	Magnesium as Mg		21.3 mg/kg
09	Manganese as Mn		17.4 mg/kg
10	Zinc as Zn		0.94 mg/kg
11	Boron as B		0.43 mg/kg
12	Chloride as Cl	APHA 23rd Edn 2019 4500 Cl B	134 mg/kg
13	Total Soluble Sulphate as SO_4	IS 2720 Part 27 : 1977 (Reaff:2015)	0.012 %
14	Potassium as K	USEPA 3050 B – 1996 & USEPA 6010 C - 2000	31.4 mg/kg
15	Total Phosphorus as P	IS 10158 : 1982 (Reaff: 2019)	1.26 mg/kg
16	Total Nitrogen as N	IS 14684 : 1999 (Reaff:2019)	321 mg/kg
17	Cadmium as Cd	USEPA 3050 B – 1996 & USEPA 6010 C - 2000	BDL (DL : 1.0 mg/kg)
18	Total Chromium as Cr		BDL (DL : 1.0 mg/kg)
19	Copper as Cu		BDL (DL : 1.0 mg/kg)
20	Lead as Pb		0.81 mg/kg
21	Iron as Fe		1.13 mg/kg
22	Organic Matter	IS : 2720 Part 22: 1972 (Reaff: 2015)	2.13 %
23	Organic Carbon	IS : 2720 Part 22: 1972 (Reaff: 2015)	1.24 %
24	Cation Exchange Capacity	USEPA 9080 – 1986	26.5 meq/100g of soil

End of Report

For Chennai Mettex Lab Private Limited

Reviewed & Authorized By

P. KAVITHA
Deputy Manager
Authorised Signatory

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Chennai – 600 002.

T.C Date : 06.06.2023
T.C No : CML/23-24/17097
Date Of Receipt : 23.05.2023
Analysis Commenced On: 23.05.2023
Analysis Completed On : 06.06.2023

Cust. Ref : SRF Dated : 22.05.2023.

Lab No : 24016248

Sample Description : **Soil – 9 – Kakkivadakkanpatti**
(as stated by customer)

S. No	Test Parameters	Protocols	Results
01	pH @ 25°C	IS 2720 Part 26 - 1987 (Reaff:2016)	8.07
02	Conductivity @ 25°C	IS 14767 - 2000 (Reaff : 2016)	431 µmhos/cm
03	**Texture :**		
	Sand	Gravimetric Method	31.4 %
	Silt		29.4 %
	Clay		39.2 %
04	Water Holding Capacity	By Gravimetric Method	36.6 %
05	Bulk Density	By Cylindrical Method	1.17 g/cm^3
06	Porosity	By Gravimetric Method	32.7 %
07	Calcium as Ca	USEPA 3050 B – 1996 & USEPA 6010 C - 2000	145.7 mg/kg
08	Magnesium as Mg		22.3 mg/kg
09	Manganese as Mn		18.7 mg/kg
10	Zinc as Zn		0.48 mg/kg
11	Boron as B		0.46 mg/kg
12	Chloride as Cl	APHA 23rd Edn 2019 4500 Cl B	141 mg/kg
13	Total Soluble Sulphate as SO_4	IS 2720 Part 27 : 1977 (Reaff:2015)	0.015 %
14	Potassium as K	USEPA 3050 B – 1996 & USEPA 6010 C - 2000	29.5 mg/kg
15	Total Phosphorus as P	IS 10158 : 1982 (Reaff: 2019)	0.97 mg/kg
16	Total Nitrogen as N	IS 14684 : 1999 (Reaff:2019)	321 mg/kg
17	Cadmium as Cd	USEPA 3050 B – 1996 & USEPA 6010 C - 2000	BDL (DL : 1.0 mg/kg)
18	Total Chromium as Cr		BDL (DL : 1.0 mg/kg)
19	Copper as Cu		BDL (DL : 1.0 mg/kg)
20	Lead as Pb		0.78 mg/kg
21	Iron as Fe		1.36 mg/kg
22	Organic Matter	IS : 2720 Part 22: 1972 (Reaff: 2015)	2.17 %
23	Organic Carbon	IS : 2720 Part 22: 1972 (Reaff: 2015)	1.26 %
24	Cation Exchange Capacity	USEPA 9080 – 1986	26.3 meq/100g of soil

End of Report

For Chennai Mettex Lab Private Limited

Reviewed & Authorized By
P. KAVITHA
Technical Manager

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II Floor, LLA Building, 735 Anna Salai,
Chennai – 600 002.

T.C Date : 06.06.2023

T.C No : CML/23-24/17098

Cust. Ref : SRF Dated : 22.05.2023.

Date Of Receipt : 23.05.2023

Lab No : 24016249

Analysis Commenced On: 23.05.2023

Sample Description : **Soil – 10 – Vadamangalapuram**
(as stated by customer)

Analysis Completed On : 06.06s.2023

S. No	Test Parameters	Protocols	Results
01	pH @ 25°C	IS 2720 Part 26 - 1987 (Reaff:2016)	8.22
02	Conductivity @ 25°C	IS 14767 - 2000 (Reaff : 2016)	546 µmhos/cm
03	**Texture :**		
	Sand	Gravimetric Method	34.7 %
	Silt		30.2 %
	Clay		35.1 %
04	Water Holding Capacity	By Gravimetric Method	42.6 %
05	Bulk Density	By Cylindrical Method	1.19 g/cm^3
06	Porosity	By Gravimetric Method	35.2 %
07	Calcium as Ca	USEPA 3050 B – 1996 & USEPA 6010 C - 2000	159 mg/kg
08	Magnesium as Mg		24.7 mg/kg
09	Manganese as Mn		20.3 mg/kg
10	Zinc as Zn		0.69 mg/kg
11	Boron as B		0.72 mg/kg
12	Chloride as Cl	APHA 23rd Edn 2019 4500 Cl B	132 mg/kg
13	Total Soluble Sulphate as SO_4	IS 2720 Part 27 : 1977 (Reaff:2015)	0.010 %
14	Potassium as K	USEPA 3050 B – 1996 & USEPA 6010 C - 2000	36.4 mg/kg
15	Total Phosphorus as P	IS 10158 : 1982 (Reaff: 2019)	1.34 mg/kg
16	Total Nitrogen as N	IS 14684 : 1999 (Reaff:2019)	308 mg/kg
17	Cadmium as Cd	USEPA 3050 B – 1996 & USEPA 6010 C - 2000	BDL (DL : 1.0 mg/kg)
18	Total Chromium as Cr		BDL (DL : 1.0 mg/kg)
19	Copper as Cu		BDL (DL : 1.0 mg/kg)
20	Lead as Pb		0.87 mg/kg
21	Iron as Fe		1.79 mg/kg
22	Organic Matter	IS : 2720 Part 22: 1972 (Reaff: 2015)	2.36 %
23	Organic Carbon	IS : 2720 Part 22: 1972 (Reaff: 2015)	1.37 %
24	Cation Exchange Capacity	USEPA 9080 – 1986	32.7 meq/100g of soil

End of Report

For Chennai Mettex Lab Private Limited

Reviewed & Authorized By
P. KAVITHA
Technical Manager
Authorised Signatory

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Geo Exploration & Mining Solutions, Salem

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*The organization is accredited as **Category-A** under the QCI-NABET Scheme for Accreditation of EIA Consultant Organization, Version 3: for preparing EIA-EMP reports in the following Sectors –*

S.No	Sector Description	Sector (as per)		Cat.
		NABET	MoEFCC	
1	Mining of minerals opencast only	1	1 (a) (i)	A
2	Industrial estates/ parks/ complexes/areas, export processing Zones (EPZs), Special Economic Zones (SEZs), Biotech Parks, Leather Complexes	31	7 (c)	B
3	Building and construction projects	38	8(a)	B

Note: Names of approved EIA Coordinators and Functional Area Experts are mentioned in RAAC minutes dated Jan 06, 2023 and posted on QCI-NABET website.

The Accreditation shall remain in force subject to continued compliance to the terms and conditions mentioned in QCI-NABET's letter of accreditation bearing no QCI/NABET/ENV/ACO/23/2684 dated Feb 20, 2023. The accreditation needs to be renewed before the expiry date by Geo Exploration & Mining Solutions, Salem following due process of assessment.

Sr. Director, NABET
Dated: Feb 20, 2023

Certificate No.
NABET/EIA/2225/RA 0276

Valid up to
August 06, 2025

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